



Environmental Compliance Report for June 2023 to November 2023



EC Compliance Report

CHRYSO India Pvt. Ltd.,

Plot No, E-72, MIDC Additional Patalganga, At – Karade (Budruk), Tal: Panvel, Dist. Raigad, Maharashtra

CHRYSO India Pvt. Ltd. having an operational manufacturing unit, located at Plot No, E-72, MIDC Additional Patalganga, At – Karade (Budruk), Tal: Panvel, Dist. Raigad, Maharashtra. The unit is manufacturing wide range of chemicals for construction (cement admixture) and cement industries (cement grinding aid) since 2018.

Prior to expansion, the facility had a capacity of 60,000 metric tons per month (MT/M) of Cement Admix and Cement Grinding Aid (through blending and mixing activity only) which falls under MSME category. The earlier operations did not fall under EIA Notification, 2006 and EC was not required. Company had obtained Consent to Establish and Operate from Maharashtra Pollution Control Board (MPCB) for manufacturing of Cement Admixture & Cement Grinding Aid through blending & mixing activities only.

The company planned for expansion of manufacturing facility in the same premises within same premises to manufacture one of its current key raw material namely Acrylic Co-Polymer. Chryso has obtained the Environmental Clearance vide Letter No. F.No. IA-J-11011/253/2019-IA II(I) dated 14th July 2020 (Annexure I) for the proposed expansion and Consent to Establish (CTE) vide Letter No.Format1.0/AS(T)/UAN No. 0000093396/CE-2007001439 dated 22nd July 2020 (Annexure II).

Post construction and installation activities, Chryso has obtained the Consent to Operate (CTO) for abovesaid expansion alongwith amalgamation of existing CTO on 12th April 2023 vide Letter No. Format1.0/AS(T)/UAN No. MPCB-CONSENT-0000158770/CR/2304000763 from MPCB (Annexure III). The financial closure of the project was done on 16th March 2021 and the date of start of the commercial production was 25th March, 2021 (Declaration copy attached as Annexure IV).

The site can be accessed from Mumbai through Mumbai-Pune Expressway. The Patalganga Industrial area and site is connected with Mumbai-Pune Expressway through Dand-Apta Road (4.7 km aerial distance). The nearest Railway station is Apta, which is approximately, 1.8 km (aerial distance).) The nearest Airport Chhatrapati Shivaji Maharaj International Airport, Mumbai- 64 km (road distance).

Chryso had carried out the expansion of manufacturing facility in the same premises within the existing shed to manufacture one of its current key raw material namely Acrylic Co-Polymer. The raw material, acrylic co-polymer for Cement Admixtures are imported as there are limited manufacturer in India. Therefore, producing this will reduce import cost of the company. The salient features of the expansion project is provided as *Annexure V*.

Chryso is committed towards conserving the environment and work for the welfare of the neighbouring community. As part of CER, Chryso has engaged with the local regulatory authority to understand the needs of the community.

The compliance status of the conditions mandated with the Environmental Clearance with the proposed expansion project is provided below.

Compliance Status on Environmental Clearance

for June 2023 - November 2023

vide Letter No. F.No. IA-J-11011/253/2019-IA II(I) dated 14th July 2020

S. No	Specific Conditions	Compliance Status
S. No 12 (i)	Specific Conditions Individual risk contours and societal risk F-N curves for acrylic acid shall be submitted by 3 D CFD technique	 Compliance Status Based on expert opinion, CFD studies are normally performed to assess the dispersion of flammable or toxic releases, or overpressures resulting from explosions. Also, FD studies are often used to assess probabilistic risks associated with a facility, including those due to explosions. In principle, CFD should enable more refined Quantitative Risk Assessment (QRA) modelling of explosions, but often the CFD output is of limited benefits due to range of factors, such as Acrylic acid is flammable liquid under normal conditions, resulting in potential pool fire scenario when released. At different process condition, there may be other hazardous outcomes. Many scenarios will be considered in QRA, while a limited number of design cases are modelled in CFD; Extracting information from a CFD file can often be complex, expensive, time consuming and rely on manual estimates from figures/ interpolation from data tables; Hence, QRA using PHAST software is a prudent option for two numbers of 50 KL Acrylic acid tank. The quantitative risk modelling report is
		attached herewith as Annexure VI .
12 (ii)	As already committed by the project proponent, Zero Liquid Discharge shall be ensured and no waste/treated water shall be discharged outside the premises. All the waste water to be collected and to be reused after treatment	There are no external discharge of the wastewater from the facility. Domestic wastewater is treated in the STP and wastewater generated from floor washing is treated in the ETP. This is a ZLD facility. The facility has an existing ETP of 5.0 m ³ /day. The effluent generated from Cooling Tower blow down and Scrubber blow down and floor washing is being treated in the

		existing ETP and the treated water will
		be utilized in the blending process.
(iii)	Solvent management shall be carried out as	Solvents are not handled at the facility,
	follows:	hence not applicable
12 (iii) a.	Reactors shall be connected to chilled brine condenser system	Not applicable
12(iii) b	Reactor and solvent handling pump shall	Not applicable
	have mechanical seals to prevent leakages	
12 (iii) c	The condensers shall be provided with	Not applicable
	sufficient HTA and residence time so as to	
	achieve more than 99.7% recovery	
12 (iii) d	Solvents shall be stored in a separate space	Not applicable
	specified with all safety measures.	
12 (iii) e	Proper earthing shall be provided in all the	Not applicable
	electrical equipment wherever solvent	
40 (:::) f	nandling is done	Neteralizable
12 (III) I	Entire plant shall be hame proof. The solvent	Not applicable
	breather valve to prevent losses	
12 (iii) a	All the solvent storage tanks shall be	Not applicable
(, 5	connected with vent condensers with chilled	
	brine circulation.	
12(iv)	Total fresh water requirement shall not	Chryso has an agreement with MIDC
	exceed 108 cum/day, proposed to be met	for supply 50 m ³ /day of water. Earlier,
	from MIDC water supply. Prior permission	the monthly average consumption was
	in this regard shall be obtained from the	800 m ³ . Post-expansion, the water
	concerned regulatory authority	requirement has increased to 1603 m ³
		equivalent to around 53 m ³ /day. It is to
		be noted that the water consumption is
		the requirement will not exceed 108
		m ³ /day.
12(v)	Process effluent/any wastewater shall not be	Site layout showing storm water and
()	allowed to mix with storm water. The storm	wastewater network is provided as
	water from the premises shall be collected	Annexure VII. Wastewater will not be
	and discharged through a separate	allowed to mix with the storm water. All
	conveyance system. All the vent pipes should	the vent pipes such as scrubbers and
	be above the roof level	stack connected with the heater are
40()		above the roof level.
12(VI)	Process organic residue and spent	Process organic residue and spent
	carbon, il any, shall be sent to cement	will be cent to an authorized TSDE
	evanoration salt shall be disposed off to the	will be sent to all authorised TSDF.
	TSDF	
12(vii)	The company shall undertake waste minimiza	ation measures as below:-
12(vii) a.	Metering and control of quantities of active	All raw materials are weighed and
	ingredients to minimize waste	charged to the system. There is a flow
		meter connected to the load cell to the
		vessel and reactor.
		Efforts to minimize active ingredients in
		the production process have been
		implemented.

12(vii) b.	Reuse of by-products from the process as raw materials or as raw material substitutes in other processes	Not applicable
12(vii) c.	Use of automated filling to minimize spillage	Noted. Automatic filling system is connected and present with all storage tanks of raw materials and products with interlocking system.
12(vii) d.	Use of Close Feed system into batch reactors	Noted. Use of Close Feed system into batch reactors is available.
12(vii) e.	Venting equipment through vapour recovery system	Dedicated scrubber for acrylic acid storage tank and solution vessel and the reactor are provided.
12(vii) f.	Use of high pressure hoses for equipment clearing to reduce wastewater generation	Noted. High pressure hoses for equipment cleaning to reduce wastewater generation is present.
12 (viii)	The green belt of at least 3-5 m width shall ·be developed, mainly along the plant periphery, in downward wind direction, and along road sides etc. Considering the land constraints in the project site, as proposed green belt shall be developed in the adjacent plot covering 33% of total project area The project proponent shall purchase the adjacent land or shall have agreement with the -concerned authority for a longer period. The status of the greenbelt and additional area so acquired shall be informed to the Regional Office of the Ministry through the six monthly compliance report	The facility is spread over 8001 sq. m. The plant has earmarked approx. 350 sq.m for greenbelt development. Approx. 200 sq.m of land has already been covered under greenbelt. Chryso has taken adjacent MIDC plot no OS-9, admeasuring 6925 sq.m on lease for the purpose of plantation. A total of 355 plant species (<i>Annexure VIII</i>) were planted covering more than 2646 sqm (equivalent to 38.2%) as part of plantation drive during spring time in 2021. The photographs of the plantation drive are provided in <i>Annexure VIII A</i> . On 5 th June, 2022 Chryso planted another 50 nos. of tree in same area.
12 (ix)	Wild Life Conservation Plan shall be implemented as proposed, with the guidance from the State Forest/Wildlife Department	wild life is not applicable since the plot/property is MIDC approved
12 (x)	At least 2.5 % of the project cost shall be allocated towards Corporate Environment Responsibility (CER). The CER amount shall be spend within a period of 3 years in the nearby villages as per the socio-economic study. The project proponent shall have separate CER bu9get and the same shall not be linked with CSR. Details of work done shall be informed to the Regional Office of the Ministry in six monthly compliance report.	A CER report has been prepared in consultation with District Collectorate, Raigad –I, school officials of Karade Budruk and Kharade Budruk. The CER plan was finalized for utilization in Kharade Budruk village. The CER plan was submitted to the District Collectorate, Raigad –I on 08/06/2021 and quotation of CER has already been received and purchase order has received and work will be initiated from 2 nd week of December. The CER plan is provided as Annexure IX .
12 (xi)	The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Fire-fighting system shall be as per the norms	Fire-fighting arrangement has been made in the facility. The provisions of fire- fighting system present in Chryso is provided in <i>Annexure X</i> .

12 (xii)	Continuous online (24x7) monitoring system for stack emissions shall be installed for measurement of flue gas discharge and the pollutants concentration, and the data to be transmitted to the CPCB and SPCB server. For ZLD, the unit shall install web camera with night vision capability and flow meters in the channel/drain carrying effluent within the premises	On line monitoring system is now working & healthy only MPCB/CPCB connectivity is pending.
12.1	The grant of environmental clearance is further conditions as under:-	subject to compliance of other general
12.1 (i)	The project proponent shall prepare a site specific conservation plan and wildlife management plan in case of the presence of Schedule-1 species in the study area, as applicable to the project, and submit to Chief Wildlife Warden for approval. The recommendations shall be implemented in consultation with the State Forest/Wildlife Department in a time bound manner.	A site-specific conservation plan and wildlife management plan was prepared and submitted to Alibaug Forest Department. The plan was approved and forwarded by Panvel Forest Department and is being reviewed by Principal Conservator, Thane Divisional Forest Office, Maharashtra.
12.1 (ii)	No further expansion or modifications in the plant, other than mentioned in the EIA Notification, 2006 and its amendments, shall be -carried out without prior approval of the Ministry of Environment, Forest and Ciimate Change. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	Noted
12.1 (iii)	The energy source for lighting purpose shall be preferably LED based, or advance having preference in energy conservation arid environment betterment.	LED based lighting is used inside the industrial premises.
12.1 (iv)	The locations of ambient air quality monitoring stations shall be decided in consultation with the State Pollution Control. Board (SPCB) and it shall be ensured that at least one station each is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.	Ambient air monitoring was done at three locations on 04 th and 05 th October, 2023 by a Ministry of Environment, Forest and Climate Change (MoEF&CC) recognized laboratory. The parameters monitored are as follows: • Particulate Matter (10); • Particulate Matter (2.5); • Sulfur dioxide; • Oxides of Nitrogen; • Carbon monoxide; • Lead; • Ozone;

		 Ammonia; Benzene; Benzo-alpha-pyrene; Arsenic; and Nickel. The monitoring locations are as follows: Near main gate of Chryso; Near tanker loading area; Near Effluent treatment plant; All the parameters monitored were within the stipulated limit of National Ambient Air Quality Standards (NAAQS), 2009. The report in detail is provided in <i>Annexure XI</i>.
12.1 (v)	The overall noise levels in and around the plant area shall be -kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).	Ambient noise was monitored in and around the premises (total 4 cardinal locations) of Chryso on 04th October, 2023 by a MoEF&CC recognized laboratory. The ambient noise monitored at four cardinal directions at the periphery of the site was between 59.6 dB(A) and 62.3 dB(A) during daytime and between 52.5 dB(A) and 55.2 dB(A) at night time. Work place noise was measured at shop floor area and near Effluent Treatment Plant (ETP). The noise level at the work place ranged between 65 dB(A) and 66.4 dB(A) during daytime and between 56.9 dB(A) and 59.2 dB(A) at night time. The noise monitoring report is provided as Annexure XI .
12.1 (vi)	The Company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and to utilize the same for process requirements	Noted and will be complied to.
12.1 (vii)	Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted The company shall also comply with all the	Training on health and safety aspects of chemicals handling is done, periodically. The records are provided as <i>Annexure XII</i> . Pre-employment medical check-up is done. Training on handling of chemicals will be imparted periodically. Noted and will be complied to.
(viii)	environmental protection measures and safeguards proposed in the documents submitted to the Ministry. All the recommendation made in the EIA/EMP in respect of environmental management, and	

	risk mitigation measures relating to the	
12.1 (ix)	The company' shall undertake all relevant measures for improving the socioeconomic conditions of the surrounding area. CER activities shall be undertaken by involving local villages and administration and shall be implemented.	A CER report has been prepared in consultation with District Collectorate, Raigad –I, school officials of Karade Khurd and Kharade Budruk. The CER plan was finalized for utilization in Kharade Budruk village. The CER plan was submitted to the District Collectrorate, Raigad –I on 08/062021 and work on CER will be initiated in 2022-2023 financial year.
12.1 (x)	The company shall undertake eco- developmental measures including community welfare measure's in the project area for the overall improvement of the environment	Chryso is in discussion with local gram- panchayet/MIDC on undertaking eco- development measures including community welfare measures in the project and adjoining area for the overall improvement of the environment.
12.1 (xi)	A separate Environmental Management Cell (having qualified person with Environmental Science/Environmental Engineering/specialization in the project area) equipped with full-fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions.	Chryso has recruited an environment, health and safety officer for its Patalganga Unit.
12.1 (xii)	The company shall earmark sufficient funds towards capital cost and recurring cost per annum to · implement the conditions stipulated by the Ministry of Environment, Forest and Climate Change as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/ pollution control measures shall not be diverted for any other purpose.	Chryso India Limited has earmarked 7.49 crores for Capital cost and INR 1.725 lakh for recurring cost during construction and 49 lakhs during operation stage.
12.1 (xiii)	A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, Zillaparish.ad/Municipal Corporation, Urban local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal.	A copy of an environmental clearance letter was submitted to MIDC, Patalganga (<i>Annexure XII</i>).
12.1 (xiv)	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC the respective Zonal Office of CPCB and SPCB. A copy of Environmental Clearance	Chryso is already complying with this condition. It has already submitted the first six monthly EC compliance in May,2023.

	and six monthly compliance status report shall be posted on the website .of the company	
12.1 (xv)	The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned State Pollution Control Board as prescribed · under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Offices of MoEF&CC by e-mail.	Last environment statement submitted on 29 th September, 2023 and present year will be submitted before scheduled time.
12.1 (xvi)	The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry and at https://parivesh.nic.in/. This shall be advertised within seven days from the .date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional office of the Ministry.	An advertisement was placed in a National Daily - Times of India (Mumbai/Navi Mumbai edition) on 9 th October, 2020 and in a Marathi newspaper Mumbai Times on 9 th October 2020. The clipping of the advertisement has been attached herewith. Refer Annexure XIII .
12.1 (xvii)	The project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and	Noted and will be complied
13	the date of start of the project. The Ministry reserves the right to stipulate additional conditions, if found necessary at subsequent stages and the project proponent shall implement all the said conditions in a time bound manner. The Ministry may revoke. or suspend the environmental	Noted
14	Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and · attract action under the provisions of the Environment (Protection) Act, 1986	Noted
15	Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30	Noted

	days as prescribed under Section 16 of the	
	National Green Tribunal Act, 2010	
16	The above conditions shall be enforced,	Noted and will be complied
	inter-alia under the provisions of the	
	Water (Prevention & Control of Pollution)	
	Act, 1974, the Air (Prevention & Control of	
	Pollution) Act, 1981, the Environment	
	(Protection) Act, 1986, Hazardous and	
	Other Wastes (Management and	
	Transboundary Movement) Rules, 2016	
	and the Public Liability Insurance Act, 1991	
	along with their amendment and Rules	
	and any other orders passed by the Hon'ble	
	Supreme Court of India / High courts and	
	any other Court of Law relating to the subject	
	matter.	

ANNEXURES

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- Annexure III Consent to Operate
- Annexure IV Declaration copy of Commercial Production
- Annexure V Process flow diagram of Acrylic Acid Co-Polymer
- Annexure VI Quantitative Risk Assessment
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Annexure XIV – A copy of the advertisement of the stating accordance of EC to Chryso in National Dailies

ANNEXURE I ENVIRONMENTAL CLEARANCE

www.erm.com

By Speed Post/Online



F.No. IA-J-11011/253/2019- IA II(I) Government of India Ministry of Environment, Forest and Climate Change (IA-IISection)

> Indira Paryavaran Bhawan Jorbagh Road, New Delhi - 3

> > Dated: 14th July, 2020

To

M/s Chryso India Private Limited Plot No, E-72, MIDC Additional Patalganga Karade(Budruk), Taluka Panvel

District Raigad, Maharashtra

Sub: Setting up Acrylic Co-Polymers manufacturing unit of capacity 4000 TPM in the existing Industrial facilities at Plot No, E-72, MIDC Additional Patalganga, Karade(Budruk), Taluka Panvel, District Raigad, Maharashtraby M/s Chryso India Private Limited- Environmental Clearance - reg.

Sir,

This has reference to your proposal No.IA/MH/IND2/113824/2019 dated 30th November 2019, submitting the EIA/EMP report on the above subject matter.

2. The Ministry of Environment, Forest and Climate Change has examined the proposal for environmental clearance to the projectfor Setting up Acrylic Co-Polymers manufacturing unit of capacity 4000 TPM in the existing Industrial facilities by M/s Chryso India Pavate Limited in an area of 8001 sqm located at Plot No, E-72, MIDC Additional Patalganga, Karade (Budruk), Taluka Panvel, District Raigad, Maharashtra.

The details of products and by-products are as under:

S No	Product		Existing	Proposed	Total	
1	Acrylic co-polymer			4000 TPM	4000 TPM	
2	Cement Admixture Cement Grinding Aid	8	60000TPM		60000 TPM	

4. The existing land area is 8001 sqm, and no additional land will be required for proposed expansion. Industry will develop greenbelt in an area of 5 % i.e.,0.04 Ha. within existing facility. In order to comply with 33% greenbelt requirement, an additional plot adjacent to existing facility (Plot No.OS-9) of 0.6295 Ha (6295 sqm) has been allocated by MIDC. Approximately 0.2 Ha (2000 sqm) will be used for greenbelt development. The total green belt area for the proposed project shall be 0.264 ha (2650 sqm) i.e. approximately 33% of total project area. The estimated project cost is Rs.7.8 crores and recurring cost (O&M) earmarked towards environmental pollution control measures is Rs. 0.1005crore per annum. The project will provide employment for 20persons.

5. The Karnala Bird Sanctuaryis located at 3.62 km (West)from the project site. It has been informed that the Eco-Sensitive Zonearound the Karnala Bird Sanctuary has been notified on 22^{rb}January, 2016, and the project site is located 2.67km away from the ESZ. Patalgangariver is flowing at a distance of 0.64 km inwest direction.

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6. Total fresh water requirement is estimated to be 108 cum/day, which will be met from MIDC piped water supply Effluent of 0.27cum/daywill be treated through effluent treatment plant and reused in existing process along with 2.2cum/day wastewater generated from scrubber and cooling tower blowdown. Domestic wastewater of quality 0.8 cum/day will be treated through septic tank and soak pit. There will be no discharge of treated/untreated waste water from the unit, and thus ensuring Zero Liquid Discharge.

Power requirement for proposed project is185 kVA/225 KW, sufficed through grid Supply from Maharashtra State Electricity Distribution Company OneDG set of 250 KVA will kept as standby. There is no boiler operation involved in the project. Used/Spent Oll, Bags, Liners and empty barrels will be disposed of through MPCB Authorized Recycler While chemical Sludge from ETP will be disposed through, MPCB authorized TSDF Paper waste will be disposed to municipal waste collection trucks regularly.

7. The project/activity is covered under category B of item 5(f) 'Synthetic organic chemicals industry' of the schedule to the Environment Impact Assessment (EIA) Notification, 2006. However, considering the general condition (location of the project site within 5 km of the Wildlife sanctuary), the project requires appraisal at central level by sectoral Expert Appraisal Committee (EAC) in the Ministry.

8. The Terms of Reference (ToR) has been issued by Ministry vide letter dated 23rd October 2019. Public hearing is exempted in accordance with the Ministry's OM dated 27th April 2018, as the project site is located in the notified industrial area.

It is reported that the current operations does not fall under the purview of the EIA Notification, 2006 and EC was not required during inception. Company has obtained Consent to Operate (Consent No. RO-Raigad/Consent-1805000636 dated 15.05.2018) from Maharashtra Pollution Control Board for manufacturing of Cement Admixture & Cement Grinding Aid through blending & mixing activities only.

9. The proposal was considered by the Expert Appraisal Committee (Industry-2) in Its meetings held on 30-31 December, 2019 & 1st January, 2020and 11-13 May, 2020in the Ministry, wherein theproject proponent and their accredited consultant M/s ERM India PvtLtdpresented the EIA/EMP report as per the ToR. The Committee found the EIA/EMP report complying with the ToR and recommended the project for grant of environmental clearance.

10. The EAC, constituted under the provision of the EIA Notification, 2006 and comprising of Experts Members/domain experts in various fields, have examined the proposal submitted by the Project Proponent in desired form along with EIA/EMP report prepared and submitted by the Consultant accredited by the QCI/ NABET on behalf of the Project Proponent.

The EAC noted that the Project Proponent has given undertaking that the data and information given in the application and enclosures are true to the best of his knowledge and belief and no information has been suppressed in the EIA/EMP report. If any part of data/information submitted is found to be false/ misleading at any stage, the project will be rejected and Environmental Clearance given, if any, will be revoked at the risk and cost of the project proponent.

The Committee noted that the EIA/EMP report is in compliance of the ToR issued for the project, reflecting the present environmental concerns and the projected scenario for all the environmental components. The Committee has found the baseline data and incremental GLC due to the proposed project within NAAQ standards. The Committee has also deliberated on the additional documents/details and CER plan and found to be addressing the issues in the study area and concerns raised by the Committee.

The EAC has deliberated the proposal and has made due diligence in the process as notified under the provisions of the EIA Notification, 2006, as amended from time to

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time and accordingly made the recommendations to the proposal. The Experts Members of the EAC have found the proposal in order and have recommended for grant of Environmental Clearance.

11. The recommendation of the Expert Appraisal Committee has been examined in the Ministry. The EC granted to the project/ activity is strictly under the provisions of the EIA Notification, 2006 and its amendments issued from time to time. It does not tantamount/ construe to approvals/ consent/ permissions etc. required to be obtained or standards/conditions to be followed under any other Acts/Rules/Subordinate legislations, etc., as may be applicable to the project.

12. Based on the proposal submitted by the project proponent and recommendations of the EAC (Industry-2), Ministry of Environment, Forest and Climate change hereby accords environmental clearance to the project for Setting up Acrylic Co-Polymers manufacturing unit of capacity 4000 TPM in the existing Industrial facilities by M/s Chryso India Private Limitedat Plot No, E-72, MIDC Additional Patalganga, Karade (Budruk), Taluka Panvel, District Raigad, Maharashtra, under the provisions of the EIA Notification, 2006, subject to the compliance of terms and conditions as under:-

- Individual risk contours and societal risk F-N curves for acrylic acid shall be submitted after undertaking 3D CFD technique.
- (ii) As already committed by the project proponent, Zero Liquid Discharge shall be ensured and no waste/treated water shall be discharged outside the premises. All the waste water to be collected and to be reused after treatment.
- (ill) Solvent management shall be carried out as follows:

(a)Reactor shall be connected to chilled brine condenser system.

- (b)Reactor and solvent handling pump shall have mechanical seals to prevent leakages.
- (c) The condensers shall be provided with sufficient HTA and residence time so as to achieve more than 99.7% recovery.
- (d)Solvents shall be stored in a separate space specified with all safety measures.
- (e)Proper earthing shall be provided in all the electrical equipment wherever solvent handling is done.
- (f) Entire plant shall be flame proof. The solvent storage tanks shall be provided with breather valve to prevent losses.
- (g)All the solvent storage tanks shall be connected with vent condensers with chilled brine circulation.
- (iv) Total fresh water requirement shall not exceed 108 cum/day, proposed to be met from MIDC water supply. Prior permission in this regard shall be obtained from the concerned regulatory authority.
- (v) Process effluent/any wastewater shall not be allowed to mix with storm water. The storm water from the premises shall be collected and discharged through a separate conveyance system. All the vent pipes should be above the roof level.
- (vi) Process organic residue and spent carbon, if any, shall be sent to cement industries. ETP sludge, process inorganic & evaporation salt shall be disposed off to the TSDF.
- (vii) The company shall undertake waste minimization measures as below:-
 - (a) Metering and control of quantities of active ingredients to minimize waste.
 - (b)Reuse of by-products from the process as raw materials or as raw material substitutes in other processes.
 - (c) Use of automated filling to minimize spillage.
 - (d)Use of Close Feed system into batch reactors.
 - (e)Venting equipment through vapour recovery system.

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- (f) Use of high pressure hoses for equipment clearing to reduce wastewater generation.
- (viii) The green belt of at least 3-5 m width shall be developed, mainly along the plant periphery, in downward wind direction, and along road sides etc. Considering the land constraints in the project site, as proposed green belt shall be developed in the adjacent plot covering 33% of total project area. The project proponent shall purchase the adjacent land or shall have agreement with the concerned authority for a longer period. The status of the greenbelt and additional area so acquired shall be informed to the Regional Office of the Ministry through the six monthly compliance report.
- (ix) Wild Life Conservation Plan shall be implanted as proposed, with the guidance from the State Forest/Wildlife Department.
- (x) At least 2.5 % of the project cost shall be allocated towards Corporate Environment Responsibility (CER). The CER amount shall be spend within a period of 3 years in the nearby villages as per the socio-economic study. The project proponent shall have separate CER budget and the same shall not be linked with CSR. Details of work done shall be informed to the Regional Office of the Ministry in six monthly compliance report.
- (xi) The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Fire-fighting system shall be as per the norms.
- (xli) Continuous online (24x7) monitoring system for stack emissions shall be installed for measurement of flue gas discharge and the pollutants concentration, and the data to be transmitted to the CPCB and SPCB server. For ZLD, the unit shall install web camera with night vision capability and flow meters in the channel/drain carrying effluent within the premises.

12.1 The grant of environmental clearance is further subject to compliance of other general conditions as under:-

- (i) The project proponent shall prepare a site specific conservation plan and wildlife management plan in case of the presence of Schedule-1 species in the study area, as applicable to the project, and submit to Chief Wildlife Warden for approval. The recommendations shall be implemented in consultation with the State Forest/Wildlife Department in a time bound manner.
- (ii) No further expansion or modifications in the plant, other than mentioned in the EIA Notification, 2006 and its amendments, shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.
- (iii) The energy source for lighting purpose shall be preferably LED based, or advance having preference in energy conservation and environment betterment.
- (iv) The locations of ambient air quality monitoring stations shall be decided in consultation with the State Pollution Control Board (SPCB) and it shall be ensured that at least one station each is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.
- (v) The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).

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- (vi) The Company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and to utilize the same for process requirements.
- (vii) Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.
- (viii) The company shall also comply with all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry. All the recommendations made in the EIA/EMP in respect of environmental management, and risk mitigation measures relating to the project shall be implemented.
- (ix) The company shall undertake all relevant measures for improving the socioeconomic conditions of the surrounding area. CER activities shall be undertaken by involving local villages and administration and shall be implemented.
- (x) The company shall undertake eco-developmental measures including community welfare measures in the project area for the overall improvement of the environment.
- (xi) A separate Environmental Management Cell (having qualified person with Environmental Science/Environmental Engineering/specialization in the project area) equipped with full fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions.
- (xii) The company shall earmark sufficient funds towards capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment, Forest and Climate Change as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/ pollution control measures shall not be diverted for any other purpose.
- (xili) A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, ZlllaParishad/Municipal Corporation, Urban local Body and the local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal.
- (xiv) The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and SPCB. A copy of Environmental Clearance and six monthly compliance status report shall be posted on the website of the company.
- (xv) The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the respective Regional Offices of MoEF&CC by e-mail.
- (xvi) The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry and at https://parivesh.nic.in/. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional Office of the Ministry.

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- (xvii) The project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.
- (xviii) This environmental clearance is granted subject to final outcome of Hon'ble Supreme Court of India, Hon'ble High Court, Hon'ble NGT and any other Court of Law, if any, as may be applicable to this project.

13. The Ministry reserves the right to stipulate additional conditions, if found necessary at subsequent stages and the project proponent shall implement all the said conditions in a time bound manner. The Ministry may revoke or suspend the environmental clearance, if implementation of any of the above conditions is not found satisfactory.

14. Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in. withdrawal of this clearance and attract action under the provisions of the Environment (Protection) Act, 1986.

Any appeal against this environmental clearance shall lie with the National Green 15. Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

The above conditions shall be enforced, inter-alia under the provisions of the 16. Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.

This issues with approval of the competent authority.

(Dr. R. B. Lal)

Scientist 'E'/Additional Director

(दा. आए. या. लाल) (Dr. R. B. LAL) an at the second state NO LI EIN INTO ?? day, of tama New Della

Copy to: -

- 1. The Deputy DGF (C), MoEF&CC Regional Office(WCZ), Ground Floor, East Wing, New Secretariat Building, Civil Line, Nagpur - 1
- 2. The Secretary, Environment Department, Government of Maharashtra, 15th Floor, New Administrative Building, Mantralaya, Mumbal - 32
- 3. The Member Secretary, Central Pollution Control Board, ParlveshBhawan, CBDcum-Office Complex, East Arjun Nagar, Delhl - 32
- 4. The Member Secretary, Maharashtra Pollution Control Board, Kalpataru Point, 3rd and 4th Floor, Opp. Cine Planet, Sion Circle, Mumbai - 22
- The District Collector, District Raigad (Maharashtra)
- Guard File/Monitoring File/Website/Record File

(Dr. R. B. Lal) Scientist 'E'/Additional Director

Tele-fax: 011-24695362 Email-rb.lal@nic.in

ANNEXURE II CONSENT TO ESTABLISH

MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 24010706/24010437 Fax: 24023516 Website: http://mpcb.gov.in Email: ast@mpcb.gov.in



Kalpataru Point, 2nd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (E), Mumbal-400022

RED/L.S.I ()

Date: 22 07/2020

No:- Format1.0/AS(T)/UAN No.0000093396/CE-2007001439

M/s. Chryso India Private Limited., Plot No. E-72, MIDC Additional Patalganga, At.-Karade (Budruk), Tal:- Panvel, Dist:- Raigad.

Sub: Consent to establish for expansion in RED/LSI category

- Ref: 1. Consent to Operate granted by Board vide- No-MPCB/RO-Raigad/ CONSENT-2005000259 dtd. 08.05.2020 which is valid upto 28.02.2022.
 - 2. Your application No.MPCB-CONSENT-0000093396 Dated 18.06.2020

Your application No.MPCB-CONSENT-0000093396 Dated 18.06.2020

For: grant of Consent to Establish under Section 25 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II, III & IV annexed to this order:

- The consent to establish is granted for a period up to commissioning of the unit or up to 5 year whichever is earlier.
- The capital investment of the project is Rs.7.12 Crs. (As per undertaking submitted by pp Existing Cl is-6.50 Rs. Crs + Expansion in C.I. - Rs. 7.12 Crs)
- 3. Consent is valid for the manufacture of:

Sr Product		Maximum Quantity UOM		
Produc	cts			
1 A	crylic Co-Polymer	4000	MT/M	

4. Conditions under Water (P&CP), 1974 Act for discharge of effluent:

Sr No	Description	Permitted (in CMD)	Standards to	Disposal Path
1.	Trade effluent	2.5	As per Schedule-I	Recycle 100% to achieve ZLD
2.	Domestic effluent	1.6	As per Schedule-I	Soaked in soak pit

5. Conditions under Air (P& CP) Act, 1981 for air emissions:

Sr No.	Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
1	5-1	Hot Water System	1.	As per Schedule -II
2	5-2	D. G. Set (250 KVA)	1	As per Schedule -II

M/S Chryso India Privata Limited/CE/UAN No.MPCE-CONSENT-0000093396

SI		Type o	f Waste	Qu	antity	UoM	Treat	nent	Disposal
Ne	F	ood waste			3.0	Kg/Day	Compo	sting U	sed as Manure
2	0	ffice Wast	e		1.0	Ton/Y	Sale	S	ale to authorized arty
3	P	ackaging v	vaste (pa	per	6.0	Ton/Y	Sale	Sp	ale to authorized arty
Cor	Idit	ions und	er Haza	rdous	& Oti	er Was	stes (I	AT	M) Rules 2016 for
tre	itm	ategory	isposal (e Qui	antity	UoM	Tre	atment	Disposal
1	5.	1 Used or s	pent oil		100	KL/A	R	ecycle	Sale to authorized party /CHWTSDF
2	35 fro	.3 Chemic om waste v	al sludge vater	1	09.5	KL/A	L	andfil	CHWTSDF
3	33 co	1.3 Discard Intainers /	ed barrels /	1	.000	No/M	Reco	ondition	Sale to authorized reconditioner / CHWTSDF
4	33 c0 c1	3.2 Contan otton rags eaning ma	ninated or other terials	1	000	Kg/Annu	m Inci	ineration	h, CHWTSDF
Co	ndit r No 1	ions und Type of Used Ba	Waste Maste	lies (M Quanti 3.00	anager ty Uol Nos.	Ment &	Handli back arr	ng) Rul Dispos angeme de	es, 2001: Fal Path ent/ Sale to authorized aler.
Si ii iii Ci	The oth rec The Bu rec	fic Condit e applicant er than b ycler/ imple e applicant ik consum yclers only tions und	ions for shall en y deposi orter/ re-c shall file ners to th /. er E-Wa	used I sure the ting with condition half-year heir us ste Ma	Batterio at used th the a mer or a sarly ret er units magem	es: I batterie authorize at the de- urn in Fo s may a ent:	es are n ed deal signate erm VIII uction	ot dispo ier/ mar d collect to the M used bi	al Path
S	r No	Type of Ewa	waste (1.00	MT/A	M	PCB au	thorized	e-waste Recycler

M/S Chryso India Private Limited/CE/UAN No.MPCB-CONSENT-0000093396

- 10 The Board reserves the right to review, amend, suspend, revoke this consent and the same shall be binding on the industry.
- 11 This consent should not be construed as exemption from obtaining necessary NOC/ permission from any other Government authorities.
- 12 The applicant should not take any effective steps for implementation of the project before obtaining Environmental Clearance as per EIA Notification 2006 and amendments thereto. As per Para 2 of EIA notification dated- 14.09.2006, the effective steps include starting of any construction work or preparation of land by the project management. However as clarified by the MoEF vide office memorandum no. J-1103/41/2006-IA.II(I); Dated- 19/08/2010, fencing of the site to protect it from getting encroached and construction of temporary shed(s) for the guard(s) & acquisition of land not be treated as an effective step.
- 13 Industry shall install online continuous monitoring system as per CPCB guidelines & data to be transmitted directly from Data Logger to Board server.
- 14 The applicant shall obtain Consent to Operate from Maharashtra Pollution Control Board before actual commencement of the Unit/Activity.
- 15 This consent is issued as per the delegation of power to HOD's vide Board Office Order dtd. 01.03.2013

For and on behalf of the Maharashtra Pollution Control Board.

(P.K.Mirashe) Assistant Secretary (Tech.)

Received Consent fee of -

Sr.No	Amount(Rs.)	Transaction/DR.No.	Date	Transaction Type
1	25000.00	TXN2006001595	27/06/2020	Online Payment

Copy to:

- 1. Regional Officer, MPCB, Raigad and Sub-Regional Officer, MPCB, Raigad I
- They are directed to ensure the compliance of the consent conditions.
- 2. Chief Accounts Officer, MPCB, Sion, Mumbai



M/S Chryso India Private Limited/CE/UAN No.MPC8-CONSENT-0000093396

	1	Terms & conditions for compliance	e of Water Pollution C	ontrol:				
1.	A) As per your application, industrial effluent generation form your activity is 2.5 CMD for the treatment of the same, you have proposed to provide Effluent Treatment Plant (ETP) of designed capacity of 3.00 CMD which consisting of Primary treatment (Collection tank, Neutralization tank, Primary Clarifier/Primary Settling Tank followed by SDB) and Tertiary treatment (PSF & ACF).							
	B) The efflu purp Disc gen	Applicant shall operate the effluent ient and recycle the entire treated coses such as for cooling, process & charge. There shall be no discharg erated from this unit.	treatment plant (ETP) (d effluent into the pro Scrubbing so as to act te on land or outside t	to treat the trade ocess for various hieve Zero Liquid factory premises				
	C] The serv	Industry shall ensure connectivity er, including separate energy meter f	online monitoring syster or pollution control syster	tem to the MPCB				
2.	A] As p trea	er your application, you have provide tment of 1.6 CMD of sewage.	d Septic Tank followed b	by Soak pit for the				
	B] The as to	Applicant shall operate the sewage to achieve the following standards.	treatment system to tre	at the sewage so				
	1	Suspended Solids Not	to exceed	100 mg/l				
	2	BOD 3 days 27oC Not	to exceed	30 ma/l				
1.	The Box plant se	and reserves its rights to review plan tup for the treatment of waterworks	s, specifications or othe for the purification then	er data relating to e of & the system				
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M/S Chryso India Private Limited/CE/UAN No.MPCE-CONSENT-0000093396

* Mumba



S-1 Hot Water System Stack 18.0 HSD 62.79 Ltr/Hr 1.00 30.13 S-2 D.G. Set (250 Acoustic 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 S-3 D.G. Set (250 Acoustic 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 S-3 D.G. Set (250 Acoustic 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 S-3 D.G. Set (250 Acoustic 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 (*Above roof level) The Applicant shall provide Specific Air Pollution control equipments as per conditions of EP Act, 1986 and rule made there under from time to the following standards: The applicant shall operate and maintain above mentioned air pollution consystem, so as to achieve the level of pollutants to the following standards: Not to exceed 150 mg/Nm3 SO2 Not to exceed 50 ppm The Applicant shall obtain necessary prior permission for providing additional con equipment with necessary specifications and operation thereof or alteration replacement/alteration well before its life come to an end or erection of new pollute control equipment. The Board reserves its rights to vary all or any of the condition in the c	Stac No.	k Stack Attached To	APC System	Height in Mtrs.	Type of Fuel	Quantity & UoM	5%	SO; (kg/da)
5-2 D.G. Set (250 Acoustic 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 5-3 D.G. Set (250 Acoustic 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 (*-Above roof level) The Applicant shall provide Specific Air Pollution control equipments as per conditions of EP Act, 1986 and rule made there under from time to the Environmental Clearance / CREP guidelines. The applicant shall operate and maintain above mentioned air pollution consystem, so as to achieve the level of pollutants to the following standards: Parameters Standards Total Particulate Matter Not to exceed 150 mg/Nm3 SO2 Not to exceed 50 ppm The Applicant shall obtain necessary prior permission for providing additional con equipment with necessary specifications and operation thereof or alteration replacement/alteration well before its life come to an end or erection of new pollut control equipment. The Board reserves its rights to vary all or any of the condition in the consent, if due any technological improvement or otherwise such variation (including the change any control equipment, other in whole or in part is necessary).	S-1	Hot Water System	Stack	18.0	HSD	62.79 Ltr/Hr	1.00	30.13
S-3 D.G. Set (250 Acoustic Enclosure 6.0* HSD 5.0 Ltr/Hr 1.00 2.40 (*Above roof level) The Applicant shall provide Specific Air Pollution control equipments as per conditions of EP Act, 1986 and rule made there under from time to the Environmental Clearance / CREP guidelines. The applicant shall operate and maintain above mentioned air pollution con- system, so as to achieve the level of pollutants to the following standards: Parameters Standards Total Particulate Matter Not to exceed 150 mg/Nm3 SO2 The Applicant shall obtain necessary prior permission for providing additional con- replacement/alteration well before its life come to an end or erection of new pollut control equipment. The Board reserves its rights to vary all or any of the condition in the consent, if due any technological improvement or otherwise such variation (including the change any control equipment, other in whole or in part is necessary).	5-2	D.G. Set (250 KVA)	Acoustic Enclosure	6.0*	HSD	5.0 Ltr/Hr	1.00	2.40
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Parameters Standards Total Particulate Matter Not to exceed 150 mg/Nm3 SO2 Not to exceed 50 ppm The Applicant shall obtain necessary prior permission for providing additional con- equipment with necessary specifications and operation thereof or alteration replacement/alteration well before its life come to an end or erection of new pollut control equipment. The Board reserves its rights to vary all or any of the condition in the consent, if due any technological improvement or otherwise such variation (including the change any control equipment, other in whole or in part is necessary).	The A condi Enviro The a system	pplicant shall p tions of EP Act nmental Clearand pplicant shall op n, so as to achiev	rovide Specif , 1986 and te / CREP guid perate and n e the level of	fic Air Poli rule mad lelines. naintain al pollutants	ution co le there bove m to the fo	entrol equipm e under from entioned air illowing stand	pollut ards:	as per e to tir ion con
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M/S Chryso India Private Limited/CE/UAN No.MPCE-CONSENT-0000093396

		D	SCHED etalls of Ban	ULE-III		
Sr. No	Consent (C2E/ C2O /C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
1	Consent to establish (Expansion)	Rs. 1.0 Lakh	Within 15 days	Towards compliance of consent condition and shall not take any effective steps towards implementation of the project before obtaining EC	30.06.2025	30.10.202
the legic	above Bank onal Officer	Guarante at the resp	e(s) shall be bective Regio	submitted by the nal Office within 1	applicant in days from i	favour
		Ama	BG Forfel	ture History		
irno.	Conser (C2E/C2O/	C2R) imp	ng Subm Subm Subm Subm Subm Subm Subm Subm	ission Purpose rlod of BG	Amount of I BG Forfeiture I	Reason of BG
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SCHEDULE-IV General Conditions:

- Consumers or bulk consumers of electrical and electronic equipment listed in Schedule
 I shall ensure that e-waste generated by them is channelised through collection centre
 or dealer of authorised producer or dismantler or recycler or through the designated
 take back service provider of the producer to authorised dismantler or recycler
- Bulk consumers of electrical and electronic equipment listed in Schedule I shall maintain records of e-waste generated by them in Form-2 and make such records available for scrutiny by the concerned State Pollution Control Board
- Consumers or bulk consumers of electrical and electronic equipment listed in Schedule I shall ensure that such end-of-life electrical and electronic equipment are not admixed with e-waste containing radioactive material as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under;
- 4. Bulk consumers of electrical and electronic equipment listed in Schedule I shall file annual returns in Form-3, to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates. In case of the bulk consumer with multiple offices in a State, one annual return combining information from all the offices shall be filed to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates.
- 5. The Energy source for lighting purpose shall preferably be LED based
- The PP shall harvest rainwater from roof tops of the buildings and storm water drains to recharge the ground water and utilize the same for different industrial applications within the plant
- 7. Conditions for D.G. Set
 - a) Noise from the D.G. Set should be controlled by providing an acoustic enclosure or by treating the room acoustically.
 - b) Industry should provide acoustic enclosure for control of noise. The acoustic enclosure/ acoustic treatment of the room should be designed for minimum 25 dB (A) Insertion loss or for meeting the ambient noise standards, whichever is on higher side. A suitable exhaust muffler with insertion loss of 25 dB (A) shall also be provided. The measurement of insertion loss will be done at different points at 0.5 meters from acoustic enclosure/room and then average.
 - c) Industry should make efforts to bring down noise level due to DG set, outside industrial premises, within ambient noise requirements by proper sitting and control measures.
 - d) Installation of DG Set must be strictly in compliance with recommendations of DG Set manufacturer.
 - e) A proper routine and preventive maintenance procedure for DG set should be set and followed in consultation with the DG manufacturer which would help to prevent noise levels of DG set from deteriorating with use.
 - f) D.G. Set shall be operated only in case of power failure.
 - g) The applicant should not cause any nuisance in the surrounding area due to operation of D.G. Set.
 - h) The applicant shall comply with the notification of MoEFCC, India on Environment. (Protection) second Amendment Rules vide GSR 371(E) dated 17.05.2002 and its amendments regarding noise limit for generator sets run with diesel.
- 8. The applicant shall maintain good housekeeping.
- The non-hazardous solid waste arising in the factory premises, sweepings, etc. be disposed
 of scientifically so as not to cause any nuisance / pollution. The applicant shall take
 necessary permissions from civic authorities for disposal of solid waste. An

M/S Chryso India Privata Limited/CE/UAN No.MPCB-CONSENT-000009330

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- 10. The applicant shall not change or alter the quantity, quality, the rate of discharge, temperature or the mode of the effluent/emissions or hazardous wastes or control equipments provided for without previous written permission of the Board. The industry will not carry out any activity, for which this consent has not been granted/without prior consent of the Board.
- The industry shall ensure that fugitive emissions from the activity are controlled so as to maintain clean and safe environment in and around the factory premises.
- The industry shall submit quarterly statement in respect of industries obligation towards consent and pollution control compliance's duly supported with documentary evidences (format can downloaded from MPCB official site).
- The industry shall submit official e-mail address and any change will be duly informed to the MPCB.
- The industry shall achieve the National Ambient Air Quality standards prescribed vide Government of India, Notification No. B-29016/20/90/PCI-L dated, 18.11.2009 as amended.
- 15. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto.
- 16. The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
- 17. The PP shall provide personal protection equipment as per norms of Factory Act
- Industry should monitor effluent quality, stack emissions and ambient air quality monthly/quarterly.
- 19. Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess of standards laid down, such information shall be forthwith Reported to Board, concerned Police Station, office of Directorate of Health Services, Department of Explosives, Inspectorate of Factories and Local Body. In case of failure of pollution control equipments, the production process connected to it shall be stopped.
- 20. The applicant shall provide an alternate electric power source sufficient to operate all pollution control facilities installed to maintain compliance with the terms and conditions of the consent. In the absence, the applicant shall stop, reduce or otherwise, control production to abide by terms and conditions of this consent.
- 21. The industry shall recycle/reprocess/reuse/recover Hazardous Waste as per the provision contain in the Hazardous and Other Wastes (M & TM) Rules 2016, which can be recycled /processed /reused /recovered and only waste which has to be incinerated shall go to incineration and waste which can be used for land filling and cannot be recycled/reprocessed etc. should go for that purpose, in order to reduce load on incineration and landfill site/environment.
- An inspection book shall be opened and made available to the Board's officers during their visit to the applicant.
- Industry shall strictly comply with the Water (P&CP) Act, 1974, Air (P&CP) Act, 1981 and Environmental Protection Act, 1986 and industry specific standard under EP Rules 1986 which are available on MPCB website (www.mpcb.gov.in).

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- 24. Separate drainage system shall be provided for collection of trade and sewage effluents. Terminal manholes shall be provided at the end of the collection system with arrangement for measuring the flow. No effluent shall be admitted in the pipes/sewers downstream of the terminal manholes. No effluent shall find its way other than in designed and provided collection system.
- Neither storm water nor discharge from other premises shall be allowed to mix with the effluents from the factory.
- 26. The industry should not cause any nuisance in surrounding area.
- 27. The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standard in respect of noise to less than 75 dB (A) during day time and 70 dB (A) during night time. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.
- 28. The industry shall create the Environmental Cell by appointing an Environmental Engineer, Chemist and Agriculture expert for looking after day to day activities related to Environment and irrigation field where treated effluent is used for irrigation.
- 29. The applicant shall provide ports in the chimney/(s) and facilities such as ladder, platform etc. for monitoring the air emissions and the same shall be open for inspection to/and for use of the Board's Staff. The chimney(s) vents attached to various sources of emission shall be designated by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.
- 30. The industry should comply with the Hazardous and Other Wastes (M & TM) Rules, 2016 and submit the Annual Returns as per Rule 6(5) & 20(2) of Hazardous and Other Wastes (M & TM) Rules, 2016 for the preceding year April to March in Form-IV by 30th June of every year.
- The applicant shall install a separate meter showing the consumption of energy for operation of domestic and industrial effluent treatment plants and air pollution control system. A register showing consumption of chemicals used for treatment shall be maintained.
- 32. The applicant shall bring minimum 33% of the available open land under green coverage/'plantation. The applicant shall submit a yearly statement by 30th September every year on available open plot area, number of trees surviving as on 31st March of the year and number of trees planted by September end,
- 33. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions.
- 34. The firm shall submit to this office, the 30th day of September every year, the Environment Statement Report for the financial year ending 31st March in the prescribed FORM-V as per the provisions of Rule 14 of the Environment (Protection) (second Amendment) Rules, 1992.
- 35. The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/alteration well before its life come to an end or erection of new pollution control equipment.
- 36. The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary).
- 37. The applicant shall provide facility for collection of environmental samples and samples of trade and sewage effluents, air emissions and hazardous waste to the Board staff at the terminal or designated points and shall pay to the Board for the services rendered in this behalf.

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M/S Chryso India Private Limited/CE/UAN No.NPC8-CONSENT-0000093096

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ANNEXURE III CONSENT TO OPERATE

MAHARASHTRA POLLUTION CONTROL BOARD

Tel: 24010706/24010437 Fax: 24023516 Website: http://mpcb.gov.in Email: ast@mpcb.gov.in



Kalpataru Point, 2nd and 4th floor, Opp. Cine Planet Cinema, Near Sion Circle, Sion (É), Mumbai-400022

RED/L.S.I (R22) No:- Format1.0/AS(T)/UAN No.MPCB-CONSENT-0000158770/CR/2304000763 Date: 12/04/2023

To, M/s. Chryso India Private Limited., Plot No. E-72, MIDC Additional Patalganga, At.-Karade (Budruk), Tal:- Panvel, Dist:- Raigad.



Sub: Grant of Renewal of consent to Operate under RED/LSI

- Ref: 1. Consent to Operate accorded by the Board vide No Format1.0/AS(T)/UAN No. 0000106113/CO-2103000175, dtd. 23/03/2021 which was valid upto 28/02/2023.
 - Environmental Clearance accorded by MoEF & CC, Gol New Delhi vide dtd 14/07/2020.

Your application No.MPCB-CONSENT-0000158770 Dated 10.01 2023

For: grant of Consent to Operate under Section 26 of the Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981 and Authorization under Rule 6 of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules 2016 is considered and the consent is hereby granted subject to the following terms and conditions and as detailed in the schedule I, II. III & IV annexed to this order:

- 1 The consent to renewal is granted for a period up to 29/02/2028
- The capital investment of the project is Rs.21.55 Crs. (As per C.A Certificate submitted by industry Existing Cl is-Rs. 7.49 Crs + Increase in C.I. - Rs. 14.06 Crs)
- 3. Consent is valid for the manufacture of:

Sr No	Product	Maximum Quantity	иом
Pro	ducts		
1	Acrylic co-polymer	4000	MT/M
2	Cement admixture and cement grinding aid	60000	MT/M

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4. Conditions under Water (P&CP), 1974 Act for discharge of effluent:

Sr No	Description	Permitted (in CMD)	Standards to	Disposal Path
1.	Trade effluent	2.5	As per Schedule-I	Recycle 100% to achieve ZLD
2.	Domestic effluent	1.6	As per Schedule-I	Soaked in soak pit

5. Conditions under Air (P& CP) Act, 1981 for air emissions:

Sr No.	Stack No.	Description of stack / source	Number of Stack	Standards to be achieved
1	5-1	Hot Water System (6 TPH)	1	As per Schedule -II
2	S-2	D. G. Set-I (250 kVA)	1	As per Schedule -II
3	5-3	D. G. Set-II (250 kVA)	1	As per Schedule -II
4	S-4	Process Vent	1	As per Schedule -II

6. Non-Hazardous Wastes:

Sr No	Type of Waste	Quantity	UoM	Treatment	Disposal
1	Food Waste	3	Kg/Day	Composting	Mannure
2	Office Waste	1	Ton/Y	Sale	Sold to authorized party
3	Packaging waste	б	Ton/Y	Sale	Sold to authorized party

Conditions under Hazardous & Other Wastes (M & T M) Rules 2016 for treatment and disposal of hazardous waste:

Sr No	Category No./ Type	Quantity	UoM	Treatment	Disposal
1	5.1 Used or spent oli	100	KL/A	Recycle	Sale to authorised party / CHWTSDF
2	33.1 Empty barrels /containers /liners contaminated with hazardous chemicals /wastes	1000	No/M	Recycle*	Sale to authorised party / CHWTSDF
a	33.2 Contaminated cotton rags or other cleaning materials	1000	Kg/Annum	Incineration	CHWTSDF
4	35.3 Chemical sludge from waste water treatment	109.5	KL/A	Landfill	CHWTSDF

* Industry shall ensure disposal to the Actual user having permissions under Rule 9 of Hazardous and other Waste (M & TM) Rules, 2016

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	Sr No	Type of W	laste	Quantit	y UoM	Disposal Path
	1	Used batte	eries	3.00	Nos./Y	Buy back arrangement
	Specific	Conditions f	or used B	Batteries	:	
	i. The ap other recycle	pplicant shall than by depo er/ importer/ r	ensure th ositing will e-conditio	at used b th the au ner or at l	atteries are thorized de the designa	not disposed of in any manne aler/ manufacturer/ registered ted collection center.
	il. The ap	plicant shall f	file half-ye	arly retur	n in Form V	II to the M.P.C. Board.
	iii. Bulk c recycle	onsumers to ers only.	their use	er units r	nay auctio	n used batteries to registered
9	Condition	ns under E-W	laste Ma	nagemen	it:	
	Sr No Ty	pe of Waste	Quantit	y UoM		Disposal Path
	1 E-	waste	2.00	Nos./Y	Through MR	CB authorized e-waste Recycle
10.	The Board same shall	i reserves the	right to r	eview, an istry.	nend, suspe	end, revoke this consent and th
11	This consi permission	ent should no n from any oth	t be cons her Gover	trued as	exemption thorities.	from obtaining necessary NO
12.	The applic vide letter	ant shall com No. SEAC-20	ply with t 13/CR-259	he conditi //TC-2 dtd	ons of the E 14/12/201	nvironmental Clearance grante 5
13.	The appli without C applicable	cant shall no Consent of th	t carry ou e Board	ut any ex and with	cess produ out Enviror	ction or produce new product imental Clearance wherever
14.	The applie Waste to Rule-2016	cant shall pro CHWTSDF, I an keep prop	perly coll n complia per manife	ect, trans ance of t st thereof	port & reg he Hazardo	ularly dispose-off the Hazardou ous and other Waste (M & Th
15.	The indust and Healt	try shall obtai h (DISH).	n necessa	ry permis	sion from th	e Directorate of Industrial Safe
16	This conse No. 12/20	ent is issued 20 dtd. 23/12/	as per the 2020.	e Office O	rder for Co	nsent Management of the Boar
17.	Industry s the Zero I install sep	hall ensure or Liquid Discha arate energy	nline moni rge and it meter to t	toring sys connections the pollution	tem i.e. IP (vity to the on control o	Camera and flow meter to ensur MPCB server. Industry shall als levices.
	The applic	ant shall mak	æ an appl	ication for	renewal of	consent 60 days prior to date of
18.	exhilly of c					

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Maharashtra Pollation Control Board

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Sr.No	Amount(Rs.)	Transaction/DR No.	Date	Transaction Type
1	250000.00	MPCB-DR-16760	31/01/2023	NEFT
2	50000.00	MPCB-DR-17418	22/02/2023	NEFT
3	50000.00	MPCB-DR-18484	11/04/2023	NEFT

Copy to:

- 1. Regional Officer, MPCB, Raigad and Sub-Regional Officer, MPCB, Raigad I
 - They are directed to ensure the compliance of the consent conditions.
- 2. Chief Accounts Officer; MPCB, Sion, Mumbai



SCHEDULE-I

Terms & conditions for compliance of Water Pollution Control:

- A) As per your application, you have provided Effluent Treatment Plant (ETP) of designed capacity of 5.00 CMD consisting of Primary (Collection tank, Neutralization tank, Equalization tank, Primary Clarifier/Primary Settling Tank), Tertiary (Pressure sand filter, Activated carbon filter), Sludge treatment (Sludge drying bed) for the treatment of 2.5 CMD of trade effluent.
 - B) The Applicant shall operate the effluent treatment plant (ETP) to treat the trade effluent and recycle the entire treated effluent into the process for various purposes such as for cooling, process & Scrubbing with metering system so as to achieve Zero Liquid Discharge. There shall be no discharge on land or outside factory premises.
 - C] Industry shall ensure online monitoring system i.e. IP Camera and flow meter to ensure the Zero Liquid Discharge and it connectivity to the MPCB server. Industry shall also install separate energy meter to the pollution control devices.
- 2 A] As per your application, you have provided Septic Tank followed by Soak pit for the treatment of 1.6 CMD of sewage.
 - B) The Applicant shall operate the sewage treatment system to treat the sewage so as to achieve the following standards.

Sr.No	Parameters Standards (mg/l)		s (mg/l)
1	BOD (3 days 27°C)	Not to exceed	30 mg/l
2	Suspended solids	Not to exceed	100 mg/l

- C] The treated sewage shall be soaked in soak pit and overflow if any shall be discharged on and for gardening within premise after confirming above standards.
- 3. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification there of & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto.
- The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
- The Applicant shall comply with the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and as amended, by installing water meters and other provisions as contained in the said act:

Sr. No.	Purpose for water consumed	Water consumption quantity (CMD)
1.	Industrial Cooling, spraying in mine pits or boiler feed	6.00
2.	Domestic purpose	2.00

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Sr. No:	Purpose for water consumed	Water consumption quantity (CMD)
3.	Processing whereby water gets polluted & pollutants are easily biodegradable	97 00
4.	Processing whereby water gets polluted & pollutants are not easily biodegradable and are toxic	0.00
5,	Gardening	30

 The Applicant shall provide Specific Water Pollution control system as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance/ CREP guidelines.



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SCHEDULE-II Terms & conditions for compliance of Air Pollution Control:

 As per your application, you have provided the Air pollution control (APC) system and erected following stack (s) to observe the following fuel pattern:

Stack No.	Source	APC System provided/pro posed	Stack Height(in mtr)	Type of Fuel	Sulphur Content(in %)	Pollutant	Standard	
51	Hot	Stack	19.00	HSD	1	TPM	150 Mg/Nm ³	
21	System	DIGEN	18.00	Ltr/Hr		502	30,13 Kg/Day	
62	DG Set	Acoustic	6.00	HSD	-	трм	150 Mg/Nm ¹	
32	KVA)	Enclosure	0.00	5 Ltr/Hr	1	502	0.8 Kg/Day	
63	DG Set	Acoustic	6.00	HSD		трм	150 Mg/Nm ⁴	
23	(250 KVA)	Enclosure	6.00 5 Ltr/Hr		Enclosure Ltr/Hr		SQ2	0.8 Kg/Day
54	Process Vent	Scrubber	12.00	00- NA	•	Acid Mist	35 Mg/Nm [®]	

(*- Above roof level)

 The Applicant shall provide Specific Air Pollution control equipments as per the conditions of EP Act, 1986 and rule made there under from time to time/ Environmental Clearance / CREP guidelines.

- The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/alteration well before its life come to an end or erection of new pollution control equipment.
- The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary).
- 5. Solvent Management shall be carried out as follows:
 - a. Reactors shall be connected to Water / Chilled Water /Brine Condenser system.
 - Reactors and solvent handling pumps shall have mechanical seals to prevent the leakages.
 - c. The condensers shall be provided with adequate Heat transfer area (HTA) and residence time so as to achieve more than 97% overall recovery
 - d. Solvents shall be stored in a separate space specified with all safety measures.
 - Proper earthing shall be provided in all the equipment's, wherever solvent handling is done.
 - Entire plant shall be flame proof. The solvent storage tanks shall be provided with breather valve to prevent losses.
 - g. All the solvent storage tanks shall be connected with vent condensers with Water / chilled water / Brine circulation.

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- h. Fugitive emissions shall be controlled at 99.95% with effective chillers.
 - Solvent transfer shall be through pump.
- Metering and control of quantities of active ingredients to minimize wastes.
- k. Use of automatic filling to minimize spillage.
- Use of close feed system into batch reactors.
- m. Venting equipment through vapour recovery system.

SCHEDULE-III Details of Bank Guarantees:

Sr. No	Consent (C2E/ C20 /C2R)	Amt of BG Imposed	Submission Period	Purpose of BG	Compliance Period	Validity Date
1	C to R (Existing to be extended)	Rs. 1 Lakh	15 days	Towards O&M of PCS and Compliance of consent condition	29/02/2028	31/08/2028

**Existing BG obtained for above purpose if any, may be extended for period of validity as above.

BG Forfeiture History

Srno.	Consent (C2E/C2O/C2R)	Amount of BG imposed	Submission Period	Purpose of BG	Amount of BG Forfeiture	Reason of BG Forfeiture
-			NA			
		В	G Return deta	lls		

Srno. Consent (C2E/C2O/C2R) BG imposed Purpose of BG Amount of BG Returned
NA

SCHEDULE-IV General Conditions:

- Consumers or bulk consumers of electrical and electronic equipment listed in Schedule I shall ensure that e-waste generated by them is channelised through collection centre or dealer of authorised producer or dismantler or recycler or through the designated take back service provider of the producer to authorised dismantier or recycler
- Bulk consumers of electrical and electronic equipment listed in Schedule I shall maintain records of e-waste generated by them in Form-2 and make such records available for scrutiny by the concerned State Pollution Control Board
- Consumers or bulk consumers of electrical and electronic equipment listed in Schedule I shall ensure that such end-of-life electrical and electronic equipment are not admixed with e-waste containing radioactive material as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made there under;
- 4. Bulk consumers of electrical and electronic equipment listed in Schedule I shall file annual returns in Form-3, to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates. In case of the bulk consumer with multiple offices in a State, one annual return combining information from all the offices shall be filed to the concerned State Pollution Control Board on or before the 30th day of June following the financial year to which that return relates.
- Specific Conditions for storage, Handling and Disposal of Waste from Electrical & Electronic equipment (WEEE):
 - Collection of WEEE The applicant must provide appropriate and dedicated vehicles duly identified as per the norms for transportation of Hazardous Waste. The applicant shall obtain all the required permits for transportation of WEEE from competent authority. The applicant shall ensure the safe transport of the WEEE without any spillage during transportation.

Storage for disassembled parts: The applicant must provide appropriate storage for disassembled spare parts from WEEE. Some spare parts (e.g. motors and compressors) will contain oil and/or other fluids. Such part must be appropriately segregated and stored in containers that are secured such that oil and other fluids cannot escape from them. These containers must be stored on an area with an area with an impermeable surface and a sealed drainage system.

- 2. Storage for other components and residues: Other components and residues arising from the treatment of WEEE will need to be contained following their removal for disposal or recovery. Where they contain hazardous substances they should be stored on impermeable surface and in appropriate containers or bays with weatherproof covering. Containers should be clearly labelled to identify their contents and must be secured so that liquids, including rain water cannot enter them. Components should be segregated having regard to their eventual destinations and the compatibility of the component types. All batteries should be handled and stored having regard to the potential fire risk associated with team.
- 3. Balances : WEEE Guidelines also requires that sites for handling of WEEE have "balances to measure the weight of the segregated waste". The objective is to ensure that a record of weights can be maintained of WEEE entering a facility and components and materials leaving each site (together with their destinations). The nature of the weighing equipment should be appropriate for the type and quantity of WEEE being processed.

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- Plastic, which cannot be recycled and is hazardous in nature, is recommended to be land filled in nearby CHWTSDF.
- Ferrous and nonferrous metal recycling facilities fall under the purview of existing environmental regulations for air, water, noise, land and soil pollution and generation of hazardous waste and the same should be followed.
- CFCS should be either reused or incinerated in common hazardous waste Incineration facilities at CHWTSDF.
- Waste Oil should be either reused or incinerated in common hazardous waste incineration facilities.
- PCB's containing capacitors shall be incinerated in common hazardous waste incineration facilities at CHWTSDF.
- Mercury recovery and lead recycling facilities from batteries fall under the Hazardous & Other Wastes (M & TM) Rules, 2016.
- Existing environmental regulations for air; water; noise, land and soli pollution and generation of hazardous waste and the same should be followed. In case Mercury or lead recovery is very low, they can be temporarily stored at e-waste recycling facility and later disposed in TSDF.
- The industry shall maintain records of the e-waste purchased, processed in Form-2 and shall file annual returns of its activities of previous year in Form-3 as per Rules 11(9) & 13(3)(vii) of the E-Waste(M) Rules, 2016; on or before 30th day of june of every year.
- 6. The Energy source for lighting purpose shall preferably be LED based
- The PP shall harvest rainwater from roof tops of the buildings and storm water drains to recharge the ground water and utilize the same for different industrial applications within the plant
- 8. Conditions for D.G. Set
 - a) Noise from the D.G. Set should be controlled by providing an acoustic enclosure or by treating the room acoustically.
 - b) Industry should provide acoustic enclosure for control of noise. The acoustic enclosure/ acoustic treatment of the room should be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on higher side. A suitable exhaust muffler with insertion loss of 25 dB (A) shall also be provided. The measurement of insertion loss will be done at different points at 0.5 meters from acoustic enclosure/room and then average.
 - c) Industry should make efforts to bring down noise level due to DG set, outside industrial premises, within ambient noise requirements by proper sitting and control measures.
 - d) Installation of DG Set must be strictly in compliance with recommendations of DG Set manufacturer.
 - e) A proper routine and preventive maintenance procedure for DG set should be set and followed in consultation with the DG manufacturer which would help to prevent noise levels of DG set from deteriorating with use.
 - D.G. Set shall be operated only in case of power failure.
 - g) The applicant should not cause any nuisance in the surrounding area due to operation of D.G. Set.
 - h) The applicant shall comply with the notification of MoEFCC, India on Environment (Protection) second Amendment Rules vide GSR 371(E) dated 17.05.2002 and its amendments regarding noise limit for generator sets run with diesel.
- The applicant shall maintain good housekeeping.

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- The non-hazardous solid waste arising in the factory premises, sweepings, etc. be disposed of scientifically so as not to cause any nuisance / pollution. The applicant shall take necessary permissions from civic authorities for disposal of solid waste.
- 11. The applicant shall not change or alter the quantity, quality, the rate of discharge, temperature or the mode of the effluent/emissions or hazardous wastes or control equipments provided for without previous written permission of the Board. The industry will not carry out any activity, for which this consent has not been granted/without prior consent of the Board.
- 12 The industry shall ensure that fugitive emissions from the activity are controlled so as to maintain clean and safe environment in and around the factory premises.
- The industry shall submit quarterly statement in respect of industries obligation towards consent and pollution control compliance's duly supported with documentary evidences (format can downloaded from MPCB official site).
- The Industry shall submit official e-mail address and any change will be duly informed to the MPCB.
- The industry shall achieve the National Ambient Air Quality standards prescribed vide Government of India, Notification No. B-29016/20/90/PCI-L dated. 18.11.2009 as amended.
- 16. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions. The Applicant shall obtain prior consent of the Board to take steps to establish the unit or establish any treatment and disposal system or an extension or addition thereto.
- The industry shall ensure replacement of pollution control system or its parts after expiry of its expected life as defined by manufacturer so as to ensure the compliance of standards and safety of the operation thereof.
- 18. The PP shall provide personal protection equipment as per norms of Factory Act
- Industry should monitor effluent quality, stack emissions and ambient air quality monthly/quarterly.
- 20. Whenever due to any accident or other unforeseen act or even, such emissions occur or is apprehended to occur in excess of standards laid down, such information shall be forthwith Reported to Board, concerned Police Station, office of Directorate of Health Services, Department of Explosives, Inspectorate of Factories and Local Body. In case of failure of pollution control equipments, the production process connected to it shall be stopped.
- 21. The applicant shall provide an alternate electric power source sufficient to operate all pollution control facilities installed to maintain compliance with the terms and conditions of the consent. In the absence, the applicant shall stop, reduce or otherwise, control production to abide by terms and conditions of this consent.
- 22. The industry shall recycle/reprocess/reuse/recover Hazardous Waste as per the provision contain in the Hazardous and Other Wastes (M & TM) Rules 2016, which can be recycled /processed /reused /recovered and only waste which has to be incinerated shall go to incineration and waste which can be used for land filling and cannot be recycled/reprocessed etc. should go for that purpose, in order to reduce load on incineration and landfill site/environment.
- An inspection book shall be opened and made available to the Board's officers during their visit to the applicant.

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- 24. Industry shall strictly comply with the Water (P&CP) Act, 1974, Air (P&CP) Act, 1981 and Environmental Protection Act, 1986 and industry specific standard under EP Rules 1986 which are available on MPCB website (www.mpcb.gov.in).
- 25. Separate drainage system shall be provided for collection of trade and sewage effluents. Terminal manholes shall be provided at the end of the collection system with arrangement for measuring the flow. No effluent shall be admitted in the pipes/sewers downstream of the terminal manholes. No effluent shall find its way other than in designed and provided collection system.
- 26 Neither storm water nor discharge from other premises shall be allowed to mix with the effluents from the factory.
- 27. The industry should not cause any nuisance in surrounding area.
- 28. The industry shall take adequate measures for control of noise levels from its own sources within the premises so as to maintain ambient air quality standard in respect of noise to less than 75 dB (A) during day time and 70 dB (A) during night time. Day time is reckoned in between 6 a.m. and 10 p.m. and night time is reckoned between 10 p.m. and 6 a.m.
- 29. The industry shall create the Environmental Cell by appointing an Environmental Engineer. Chemist and Agriculture expert for looking after day to day activities related to Environment and Irrigation field where treated effluent is used for Irrigation.
- 30. The applicant shall provide ports in the chimney/(s) and facilities such as ladder, platform etc. for monitoring the air emissions and the same shall be open for inspection to/and for use of the Board's Staff. The chimney(s) vents attached to various sources of emission shall be designated by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.
- 31. The industry should comply with the Hazardous and Other Wastes (M & TM) Rules, 2016 and submit the Annual Returns as per Rule 6(5) & 20(2) of Hazardous and Other Wastes (M & TM) Rules, 2016 for the preceding year April to March in Form-IV by 30th June of every year.
- 32. The applicant shall install a separate meter showing the consumption of energy for operation of domestic and industrial effluent treatment plants and air pollution control system. A register showing consumption of chemicals used for treatment shall be maintained.
- 33. The applicant shall bring minimum 33% of the available open land under green coverage/ plantation. The applicant shall submit a yearly statement by 30th September every year on available open plot area, number of trees surviving as on 31st March of the year and number of trees planted by September end.
- 34. The Board reserves its rights to review plans, specifications or other data relating to plant setup for the treatment of waterworks for the purification thereof & the system for the disposal of sewage or trade effluent or in connection with the grant of any consent conditions.
- 35. The firm shall submit to this office, the 30th day of September every year, the Environment Statement Report for the financial year ending 31st March in the prescribed FORM-V as per the provisions of Rule 14 of the Environment (Protection) (second Amendment) Rules, 1992.
- 36. The Applicant shall obtain necessary prior permission for providing additional control equipment with necessary specifications and operation thereof or alteration or replacement/alteration well before its life come to an end or erection of new pollution control equipment.

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37. The Board reserves its rights to vary all or any of the condition in the consent, if due to any technological improvement or otherwise such variation (including the change of any control equipment, other in whole or in part is necessary). 38. The applicant shall provide facility for collection of environmental samples and samples of trade and sewage effluents, air emissions and hazardous waste to the Board staff at the terminal or designated points and shall pay to the Board for the services rendered in this behalf. This certificate is digitally & electronically signed. M/S Chryso India Private Limited/CR/UAN No.MPCB-CONSENT-0000158770/Indus-Id.65636 (12-04-2023 06:32:08 pm) /QMS.P06_F02/00 Page 13 of 13 Scanned with CamScanner

ANNEXURE IV DECLARATION OF FINANCIAL CLOSURE AND COMMERCIAL OPERATION OF THE PROJECT



ANNEXURE I

Dated: 26 April 2021

To whomsoever it May Concern

This is to state that Chryso India Private Limited, Plot No. E-72, MIDC Additional Patalganga, At.-Karade (Budruk), Taluka - Panvel, Raigad, Maharashtra has obtained Environmental Clearance vide Letter No. F.No. IA-J-11011/253/2019-IA II(I) dated 14* July 2020 for the proposed expansion and Consent to Establish (CTE) vide Letter No.Format1.0/AS(T)/UAN No. 0000093396/CE-2007001439 dated 22^{ed} July 2020.

Post construction and installation activities, Chryso has obtained the Consent to Operate (CTO) vide Letter No. Format1.0/AS (T)/UAN NO.0000106113/CO-2103000175 dated 23rd March 2021 from Maharashtra Pollution Control Board. The date of the financial closure of the project was 16rd March 2021 and the date of start of the commercial production was 25rd March 2021.

This is for your kind information.

Best Regards Anirban Majumder (AVP-Industrial and Projects)

For, Chryso India Private Limited,

Plot No. E-72, MIDC Additional Patalganga, At.-Karade (Budruk), Taluka - Panvel, Raigad, Maharashtra



191 22 2768 5991/2/3

isustominiserince-desk@chryso.com

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ANNEXURE V SALIENT FEATURES OF THE PROJECT

ANNEXURE V

1. MANUFACTURING PROCESS

1.1 Process Details

Detailed project description with process details has been provided in the following section.

1.1.1 Existing Plant Scenario

At present CHRYSO India Pvt Limited manufactures different grade of Concrete Admixture & Cement Grinding Aid at their Patalganga plant. Both these products are manufactured under same manufacturing process, having same process description and mass balance for the final product. Details of these products are discussed below.

1.1.1.1 Manufacture of Concrete Admixture & Cement Grinding Aid

Process Description

The current products are water based and manufactured through blending and mixing only. Liquid raw materials, stored in tanks in the tank farm or IBCs are pumped to the Blender in specified measured quantity. Some quantity of powdered raw materials and additives are added manually in to the Blender through the addition pot. Then mixing of all raw materials is done in the Blender with the help of agitator. Samples are then checked at laboratory and after confirming results the batch is released for packing. As per the customer requirements products are dispatched in tanker or packed in 225 Kg drums or 1000 Kgs IBCs (Industrial Bulk Container) and dispatched to the customer.

Mass Balance

The mass balance of existing products like Concrete Admixture & Cement Girding Aid and has been provided in the following **Table 1.1**.





INPUT	Kg/MT	Output in Kg/MT	
Raw Material		Product	
Acrylic co-polymer	500	Concrete Admixtures/Cement Grinding Aid	1000
Sodium Ligno Sulphonate	15	Waste Water to ETP	
Sodium Gluconate	50	WASTE WATER	0
Glucose	20	Solid /Hazardous Waste	
Caustic flakes	5	Solid & hazardous waste	0
Water	410	Emission to Air	
		Vapour loss to scrubber	0
TOTAL	1000	Total	1000

Table 1.1 Mass Balance Table for Product A

INPUT	Kg/MT	Output in Kg/MT				
Raw Materials		Product				
Sulphonated Napthalene Formaldehyde (SNF)	500	Concrete Admixtures/Cement Grinding Aid	1000			
Sodium Gluconate	50	Waste Water to ETP				
Caustic flakes	5	Waste Water	0			
Water	445	Solid /Hazardous Waste				
		Solid & hazardous waste	0			
		Emission to Air				
		Vapour loss to scrubber	0			
TOTAL	1000	Total	1000			

Table 1.2Mass Balance of Product B

1.1.2 Proposed Expansion Project

The expansion project will help CHRYSO in reduction of cost, support Make in India initiative of Indian Government and reduce the dependency on imports. One of the raw material, *Acrylic Co-polymer* used for manufacturing Product A (refer *Table 1.1)* will be manufactured in-house within the CHRYSO Patalganga facility. Details pertaining to process description and mass balance are explained below.

1.1.2.1 Proposed Manufacture of Acrylic Co-polymer

Process Description



Environmental Compliance Report

Step 1: Solution preparation

Acrylic Acid monomer, Sodium hypophosphite, Ascorbic acid and water measured quantity is taken into monomer day tank.

Step 2: Water, HPEG and Hydrogen peroxide measured quantity taken into reactor.

Step 3: Reaction

Add feeding solution at controlled condition into reactor maintaining 60°C for reaction. Cool the reaction mass to ambient temperature and transfer to storage tank.

Mass Balance

Mass balance has been provided in following Table 1.3.



Figure 1.2 Process Flow Diagram of New Product

 Table 1.3
 Mass Balance of New Product

INPUT	Kg/MT	Output in Kg/MT	
Raw Materials		Product	
Acrylic acid monomer	53.7	Acrylic Co-polymer	999.96

Environmental Compliance Report

SALIENT FEATURES OF THE PROJECT

Sodium hypophosphite	8.52	Waste Water to ETP	
Ascorbic Acid	1.88	Waste Water	0
HPEG	534.64	Solid/Hazardous Waste	
H ₂ O ₂	3.62	Solid & hazardous waste	0
Water	397.64	Emission to Air	
		Vapour loss to scrubber	0.04
TOTAL	1000	Total	1000

Figure 1.3 Existing and Proposed Site Layout on Satellite Imagery



ANNEXURE VI QUANTITATIVE RISK ASSESSMENT



QRA Study Report – Acrylic Acid Storage Tanks – CHRYSO India Pvt. Ltd

QRA Study Report

30 April 2021

Project No.: 0507656

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Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	QRA Study Report – Acrylic Acid Storage Tanks – CHRYSO India Pvt. Ltd
Document subtitle	QRA Study Report
Project No.	0507656
Date	30 April 2021
Version	2.0
Author	Sunith M
Client Name	CHRYSO India Pvt. Ltd

Document	history					
				ERM appro	val to issue	
Version	Revision	Author	Reviewed by	Name	Date	Comments
1.0	A	Sunith M	Arunkumar A	Indrani Ghosh		
2.0	В	Sunith M	Arunkumar A	Indrani Ghosh		

30 April 2021

QRA Study Report – Acrylic Acid Storage Tanks – CHRYSO India Pvt. Ltd

QRA Study Report

Swaroop Banerjee Partner-in-Charge Subhradeb Pramanik Principal Consultant

ERM India Private Limited

Building 10A

4th Floor, DLF Cyber City

Gurgaon, NCR - 122002

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1. EXECUTIVE SUMMARY

CHRYSO India Pvt. Ltd. Patalganga facility is presently having the capacity of 60000 metric tonnes per month (MT/M) of Cement Admix and Cement Grinding Aid. The company proposes for expansions of manufacturing facility in the same premises within the same shed to manufacture one of its currently key raw material namely Acrylic Co-Polymer. The proposed expansion project requires Environmental Clearance (EC) form Ministry of Environment, Forest and Climate Change (MoEFCC). M/s Erm India Pvt. Ltd has been engaged by CHRYSO India Pvt Ltd. for conducting EIA Study and to support in obtaining environmental clearance. In this context, ERM intends to conduct Quantitative Risk Analysis for the Acrylic Acid Storage Tanks (2 no's) to assess the impact to Personnel in the facility.

The objectives of this Quantitative Risk Assessment (QRA) study is to identify and quantify all potential failure modes that may lead to hazardous consequences and to evaluate their frequencies and extent. Typical hazardous consequences include fire, explosion and toxic releases. This study provides an assessment of the risk to plant personnel and to ensure that they comply with the adopted risk criteria and to demonstrate that risk has been reduced to the extent that is reasonable as per the risk criteria.

In order to meet the objective of the assessment, ERM have identified, assessed potential scenarios and specified the likelihood and consequence of each event related to potential accidental releases occurring in the facility.

The detailed assumption register for this QRA study is presented in Appendix A of this report and the Isolatable section drawing is given as Appendix B of this report.

Based on the results from the assessment, following conclusion and recommendations were made for further risk mitigating measures.

The following Table shows the LSIR values for workers category.

Table 1 - Location	Specific Individual	Risk (LSIR)
--------------------	---------------------	-------------

S. No	Location Description	LSIR (per year)
1	Tankage area	1.25E-03



The following LSIR contour is produced for CHRYSO Acrylic Acid Storage Tanks

Figure 1 - LSIR Contour for CHRYSO Acrylic Acid Storage Tanks

Location Specific Individual Risk

Based on the result of above figure, the following observations are inferred.

- Individual risk contour of 1.0E-01 and 1.0E-2 per year are not realised in the facility.
- Individual Risk contour of 1.0E-03 and 1.0E-04 per year are realized in the storage tank area is due to Pool Fire Hazard. And Individual Risk contour of 1.0E-03 frequency is mostly confined to the tankage area.
- Individual Risk contour of 1.0E-05 per year is covering other storage tank area and Individual Risk contour of 1.0E-06 per year is almost covering all other storage tank area in the facility.

Individual Risk Per Annum

Individual Risk Per Annum (IRPA) is calculated for the workers in the facility considering the working hours of 8 per day. Accordingly, the estimated IRPA for workers in the facility area shown below:

Table 2 – IRPA for Workers

S. No	Location Description	IRPA
1	Tankage area	4.15E-04

From the above table, it is observed that, IRPA for workers in the facility fall under 'ALARP' region.

However, the results indicate that the risk is tolerable provided it is kept As Low As Reasonably

F-N Curve

Practicable (ALARP).

Societal risk is the risk exposure by a group of people exposed to the hazard. The F-N curve (Societal risk) is calculated for onsite personnel's using societal risk criteria.

Following FN curve shows the frequency (F) of there being 'N' of more fatalities due to different failure cases for facility.



Figure 2 - Frequency (F) - Number of Fatalities (N) Curve

From the above figure, it is observed that the calculated F-N curve for facility falls in ALARP Region upto 1 fatality and above 1 fatality falls in broadly acceptable region. Maximum number of fatality due to loss of containment event from the facility is 2 at a frequency of 9.19 E-08 per year which is within the broadly acceptable region.

Recommendations

Based on the risk results, the following are recommended to reduce the risk / hazard.

- 1. Major contributor to risk in the facility is due to pool fire scenarios. Hence it is recommended to consider the Passive Fire Protection (PFP) for critical load bearing structure to reduce / prevent the escalation of fire and explosion hazard. Also, consider proper bunding and drain system in the unit to reduce the pool fire duration.
- 2. To reduce risk from hydrocarbon release, a Risk Based Inspection (RBI) program shall be considered in order to reduce the frequency of release.
- 3. Personnel at facility shall be trained regularly on emergency response and preparedness. Ensure that emergency handling and mitigation systems are adequate. Mock drills based on emergency scenario shall be conducted at regular intervals to review emergency preparedness.

2. INTRODUCTION & BACKGROUND

2.1 Introduction

CHRYSO India Pvt. Ltd. Patalganga facility is presently having the capacity of 60000 metric tonnes per month (MT/M) of Cement Admix and Cement Grinding Aid (through blending and mixing activity only) which falls under MSME category. The company proposes for expansions of manufacturing facility in the same premises within the same shed to manufacture one of its currently key raw material namely Acrylic Co-Polymer.

The proposed expansion project requires Environmental Clearance (EC) form Ministry of Environment, Forest and Climate Change (MoEFCC). M/s Erm India Pvt. Ltd has been engaged by CHRYSO India Pvt Ltd. for conducting EIA Study and to support in obtaining environmental clearance. In this context, ERM intends to conduct Quantitative Risk Analysis for the Acrylic Acid Storage Tanks (2 no's) to assess the impact to Personnel in the facility.

2.2 Report Structure

The remainder of this Assumption register is structured as follows:

- Section 3 provides the objective, scope of work
- Section 4 sets out the Methodology for QRA Study
- Section 5 provides the Failure Case development for QRA Study
- Section 6 provides the Consequence Modelling
- Section 7 provides the Consequence Analysis & Results
- Section 8 provides the Risk Integration
- Section 9 provides the Risk Assessment & Results
- Section 10 provides the Safe Handling and Design Consideration for Acrylic Acid
- Section 11 provides the Conclusion and Recommendation
- Section 12 provides the references for the QRA Study

3. **OBJECTIVE & SCOPE OF WORK**

Objectives 3.1

The following are the objectives of this QRA study

- Identify hazards associated with the facility.
- Determine the consequences of Acrylic Acid releases from the Storage vessels
- This shall include part counts of proposed facilities, if necessary.
- Determine the frequency of Storage Vessel releases
- Quantify Individual risk (LSIR & IRPA)
- Quantity Societal risk (F-N Curve)
- Evaluate the acceptability of these risk levels against risk tolerability criteria

3.2 Scope of work

The scope of work is to carry out Quantitative Risk Analysis Study for the proposed Acrylic Acid Storage Tanks (2 no's) and the adjacent piping using DNV Software SAFETI 8.22.

3.3 **Definitions**

- CONSEQUENCE It is defined as an event or chain of events that result from the release of a hazard. The impact or effect is the degree of harm caused by the event.
- EVENT TREE A logic diagram of success and failure combinations of events used to identify accident sequences leading to all possible consequences of a given initiating event.
- **F-N CURVE** FN curves are frequency-fatality plots, showing the cumulative frequencies (F) of events involving N or more fatalities. They are derived by sorting the frequencyfatality (FN) pairs from each outcome of each accidental event and summing them to form cumulative frequency-fatality (FN) co-ordinates for the plot.
- FREQUENCY The number of times an outcome is expected to occur in a given period of time.
- HAZARD A state or condition having the potential to cause a deviation from uniform or intended behaviour which, in turn, may result in damage to property, people or environment
- LOCATION Location specific individual risk for personnel who's exposure to 365 days SPECIFIC (Continuous presence at that location). The probability that in one year a person **INDIVIDUAL** will become a victim to an accident if the person remains permanently and RISK unprotected in a certain locations. Often the probability of occurrence in one year is replaced by the frequency of occurrence per year. The individual risk at different locations around a particular plant varies.
- RISK The combination of the likelihood and the consequences of a hazard occurrence resulting in an undesirable event.
- SAFETY It is the inverse of risk. The higher the risk for an occupation or installation, the lower is its safety. The popular understanding of safety sometimes appears to be "zero risk", but this is impossible in an intrinsically hazardous activity such as oil and gas production

SOCIETAL RISK	The relationship between frequency and the number of people suffering from a specified level of harm in a given population from the realization of specified hazards. Societal risk is normally presented in the form of F-N curves, which is a graph of the chance or frequency (F) of events, which can result in N or more fatalities.
LFL	Lower Flammable Limit also called as Lower Explosive Limit (LEL). It is the lower end of the concentration range over which a flammable mixture of gas or vapour in air can be ignited at a given temperature and pressure.

VCE Vapour Cloud Explosion

3.4 Abbreviations

Abbreviations	Definition
ALARP	As Low As Reasonably Practicable
CCPS	Centre for Chemical Process Safety
EC	Environmental Clearance
EIA	Environmental Impact Assessment
ESD	Emergency Shutdown Valves
FBR	Full-bore Rupture
HAZID	Hazard Identification
IRPA	Individual Risk Per Annum
LFL	Lower Flammability Limit
LSIR	Location Specific Individual Risk
MOEFCC	Ministry of Environment, Forest and Climate Change
OGP	Oil and Gas Producers
PFP	Passive Fire Protection
QRA	Quantitative Risk Analysis
RBI	Risk Based Inspection
SDV	Shut Down Valve
SR	Societal Risk
UKOOA	UK Offshore Operators Associations

4. **QRA METHODOLOGY**

The initial key step is the identification of the release scenarios, which are based on Hazard Identification process usually carried out by internal review of the Process Flow diagrams and Piping & Instrumentation drawings, and layout configurations. Once the scenarios are defined, then these are evaluated further for their potential frequency of occurrence and consequence hazard zone. The frequency analysis is based on the facility equipment count paired with historical frequency data.

The risk result is estimated by the combination of the scenario frequency and consequence with potential impact to the facility and personnel. A variety of risk metrics may be evaluated depending on the scope, including Individual risk, societal risk. The risk results are compared to relevant criteria to evaluate the tolerability and to offer guidance for risk reduction. The key components are illustrated in below figure:



Figure 3 - QRA METHODOLOGY

Hazard Identification

The hazard identification (HAZID) process identifies the hazards that can exist from the system. There are several techniques for identifying hazards. The HAZID identifies the range of loss of Containment scenarios that shall be used as an input in the risk study. The HAZID session results are further developed to define system boundaries, isolatable sections within the process, release conditions, materials to be modelled, and other factors.

Estimation of Failure Frequency by Parts-Count Method

The term risk is defined as a function of frequency and consequence. The frequency of occurrence provides information on how often the event is likely to happen, while the consequences describe the behaviour of an initial event, such as a hydrocarbon leak.

ERM ensures its guality and accuracy on QRA results by Parts Count method. ERM entrusts partscount method which is widely used and agreed in oil and gas industry. The calculations arrived from parts count method is fed into LEAK Software to estimate the leak frequencies for all the credible scenarios identified.

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The parts-count method involves counting number of components (actuated valve, manual valve, flange, instrument connection, piping, vessel, rotating equipment, etc.) within a particular section boundary. The entire facility will be divided into understandable isolable sections according to the location of emergency shutdown valves (SDV) that can isolate the hydrocarbon volume from other hydrocarbon volumes or isolatable sections. In the event of a release, only the material in an isolatable is considered to be released. Failure frequency of each isolatable section is estimated by parts-count method so that comprehensive estimate of failure frequency can be done for risk estimation.

DNV's leak frequency software model LEAKv3.3 shall be used to estimate the expected leak frequencies of each isolatable section in the facility. The number of and size of manual valves, actuated valves, flanges, instrument connection, pumps, process vessels, piping, etc. are input to the model, together with dimensions.

Consequence Modelling

In parallel with the frequency analysis, consequence modelling evaluates the resulting effects (if the accidents are to occur) together with the impact on people and assets. In general, the types of consequences included in the evaluation depend on the scope of the QRA study. Calculation of the consequences of each possible event often requires some form of computer modelling.

Consequence analysis requires the modelling of a number of distinctive situations, i.e., discharge, dispersion, fires and explosions (for flammable materials), and impact assessment of how the fire, explosion or toxic cloud affects human beings.

Risk Calculations

After the frequencies and consequences of each modelled scenario (combination of initiating event, cause, and consequence) are estimated, they are combined to produce quantified risk results. The risk shall be calculated for each frequency-consequence pair, and then summed for each area of interest to yield a total risk for the area.

Risk quantification results are typically presented in several different ways to provide a complete picture. The quantified risk results can be grouped into two general groups – Individual and Societal Risk.

Location Specific Individual Risk (LSIR) is a measure of the risk at a particular location, without regard to whether a person might be present or not. Individual Risk Per Annum (IRPA) is defined as the frequency at which an individual may be expected to sustain a given level of harm from the realisation of specified hazards. It is usually taken to be the risk of death, and usually expressed as a frequency per year. For this scope of work, ERM would report the risk to personnel during the normal operations phase.

Societal (Group) Risk - Societal Risk (SR) is typically presented as an FN curve plotted on a log-log scale. SR is a measure of the relationship between the cumulative frequency (F) and number of fatalities (N). It is defined as the risk experienced by a group of people (including workers and the public) exposed to the hazard.

Risk Assessment

Risk assessment is the process of comparing the level of risk against a set of criteria as well as identifying major risk contributors. In the risk assessment stage, the quantified risk results are compared to pre-established risk criteria (from governmental regulatory requirements, recommended guidelines, or corporate guidelines) to indicate whether the risks are tolerable or to make some other judgment about their significance.

Risk assessment identifies the level of risk associated with loss of containment and evaluates against risk acceptance criteria. It also can be used to identify recommendations that may further reduce the risk to tolerable levels, if risks are found to be intolerable, or to reduce the overall level of risk to a level As Low As Reasonably Practicable (ALARP)

Risk Reducing Measures

A risk assessment can identify risks that exceed the tolerable criteria. In such cases, risk reducing measures are identified to reduce the risk / hazard.

5. FAILURE CASE DEVELOPMENT

Failure cases are representations in a risk assessment of the range of possible accidents that might occur. Hydrocarbon releases from Acrylic acid Storage tanks from CHRYSO INDIA are further analysed in the below sections.

5.1 Failure Case Scenarios

The failure case scenarios for the Acrylic Acid Storage tanks are identified as per the location of Storage tanks. In the event of a release, only the material in the section is released. Based on the process information the following failure case scenarios are identified for the analysis.

Isolatable Section No.	Section Description	Representative Leak Location	Leak Size (mm)	Failure Scenario ID
		Outlet pipe from Tank	7	CHRYSO/ISO-1/L/S
ISO1	Acrylic Acid Storage Tank (ST-302)	AOD Pump (TP-302A)	22	CHRYSO/ISO-1/L/M
		Heat Exchanger (HE-301A)	50	CHRYSO/ISO-1/L/L
		Storage Tank (ST-302)	Rupture	CHRYSO/ISO-1/L/FBR
		Outlet pipe from Tank	7	CHRYSO/ISO-2/L/S
ISO2	Acrylic Acid Storage Tank	AOD Pump (TP-303A)	22	CHRYSO/ISO-2/L/M
	(ST-303)	Heat Exchanger (HE-302A)	50	CHRYSO/ISO-2/L/L
		Storage Tank (ST-303)	Rupture	CHRYSO/ISO-2/L/FBR

Note:

L – Liquid S – Small M – Medium

L – Large

FBR – Full Bore Rupture

The Isolatable section markup in P&ID is given as Appendix B of this report.

5.2 **Process Conditions and Failure Frequencies**

Identified failure cases are defined in terms of material released, quantity released, temperature, pressure, leak size, leak frequency and ignition probability and the same are provided as input to the model. Operating pressure, temperature and leak size play a vital role in estimating the release rates and subsequent consequence of the failure scenario. Input data required for estimation of release rates and inventory data are taken from enquiry document at the time of study.

The failure frequency considered for the Acrylic Acid Storage tanks scenarios are also shown in the below table.

Isolatable Section No.	Section Description	Leak Size (mm)	Failure Scenario ID	Operating Temperature Deg C	Operating Pressure (Barg)	Failure Frequency
	Acrylic Acid	7	CHRYSO/ISO-1/L/S	25.00	0.00	8.19E-03
ISO1	Storage	22	CHRYSO/ISO-1/L/M	25.00	0.00	1.46E-03
	Tank (ST -	50	CHRYSO/ISO-1/L/L	25.00	0.00	7.01E-04
	302)	Rupture	CHRYSO/ISO-1/L/FBR	25.00	0.00	3.00E-06
	Acrylic Acid	7	CHRYSO/ISO-2/L/S	25.00	0.00	8.19E-03
ISO2	Storage	22	CHRYSO/ISO-2/L/M	25.00	0.00	1.46E-03
	Tank (ST -	50	CHRYSO/ISO-2/L/L	25.00	0.00	7.01E-04
	303)	Rupture	CHRYSO/ISO-2/L/FBR	25.00	0.00	3.00E-06

6. CONSEQUENCE MODELLING

6.1 Release Scenario Development

The key parameters determining the behaviour of each release, and the subsequent consequences, are the operating pressure, operating temperature, leak size, release rate, type of material being released, release duration, isolation times, release inventory, and the release velocity. The general approach adopted in deriving each of these parameters is explained in detail in the following sections

6.2 Release Detection and Isolation

Release rate affects the size of the resulting inventory of Hydrocarbon and hence the probability of ignition. Reduction in release rate (in effect, the duration of the release) is important because it limits the damage that the fire may cause.

10 minutes (600 seconds) of action time for detection and isolation has been considered as per CPR 18E for all scenarios since it is a monitored operation.

Dispersion modelling involves physical modelling of the releases using the failure case data developed along with the atmospheric/ environmental factors to predict cloud size, shape and concentration for a vapour release and pool size for a liquid release.

Factors affecting dispersion include release velocity versus wind velocity, atmospheric turbulence, weather conditions, surface roughness and release location. DNV SAFETI 8.22 software undertakes consequence calculations for each identified failure, starting with the release of a material from the source, and then calculates the dispersion and behaviour of the released material in the environment.

6.3 Environmental Conditions

The consequences of released flammable materials into the atmosphere are strongly dependent upon the rate at which the released material is diluted and dispersed to safe concentrations. The local meteorology is therefore important in two respects. First, the wind direction determines whether a release drifts towards or away from vulnerable locations. Second, the actual weather conditions, in terms of wind speed and stability to determine how quickly the plume disperses.

Variation in wind direction defines the apparent orientation of consequences DNV SAFETI 8.22 accounts for the different wind directions from the wind distribution probability input and combine the values into the risk calculation. Atmospheric conditions, which include temperature and humidity, are also addressed.

Stability classes were finalized as per Pasquill-Gifford stability classes as mentioned in Chemical Process Quantitative Risk Analysis and are shown below.

		Day Time		Nigh	Any Time Heavy	
Surface Wind Speed, m/s	Strong	Moderate	Slight >4/8 Low Cloud		< 4/8 Cloudiness	Overcast
<2	А	A-B	В	E	F	D
2-3	A-B	В	С	E	F	D
3-4	В	B-C	С	D	E	D
4-6	С	C-D	D	D	D	D
>6	С	D	D	D	D	D

Table 4 - Wind Speed and Pasquill Stability Class

Data on the distribution of wind speeds and directions as referred from India Meteorological Department Data for Nanded, Maharashtra is tabulated below:

Table 5 - Wind Speed and Direction Data

Wind distribution	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	wsw	w	WNW	NW	NNW
Night	2.46	3.28	4.10	3.28	2.46	2.46	2.46	2.46	2.46	7.38	12.30	14.34	16.39	11.89	7.38	4.92
Day	4.76	6.75	8.73	5.95	3.17	3.57	3.97	2.78	1.59	5.56	9.52	9.52	9.52	9.13	8.73	6.75

Table 6 - Site Meteorological Data

Average ambient air temperature (Average Value)	Day: 34.3℃; Night: 19.6℃
Average air humidity	Day: 42%; Night: 61%
Solar radiation flux (kW/m ²)	0.5

The following environmental conditions will be modelled for the risk analysis:

- Wind speed 1.5 m/s and Pasquill stability factor F for Night Time (1.5F)
- Wind speed 3 m/s and Pasquill stability factor D for Day Time (3D)

1.5F implies a wind speed of 1.5 m/s and F refers to Stable Condition. 3D implies a wind speed of 3 m/s and D refers to Neutral Condition.

The Event Outcomes and the Damage Criteria used for the Acrylic Acid Storage Tanks is given in the Assumption register and please refer Appendix A for the basis considered for the QRA Study.

7. CONSEQUENCE ANALYSIS & RESULTS

7.1 Consequence Results

The observations of consequences analysis for the Acrylic Acid Storage Tanks for Chryso India is presented in this section. Consequence distance results for all scenarios are shown in the below Table:

	Failure Scenario ID	JET FIRE		FLASH FIRE	Pool Fire		JET FIRE		FLASH FIRE	Pool Fire					
S.No.		1.5F						3D							
		Jet Fire (in kw/m2)		Flash Fire LFL	Pool Fire (in kw/m2)			Jet Fire (in kw/m2)			Flash Fire LFL	Pool Fire (in kw/m2)			
		4	12.5	37.5	100% LFL	4	12.5	37.5	4	12.5	37.5	100% LFL	4	12.5	37.5
1	CHRYSO/ISO-1/L/S	2.20	n/a	n/a	2.07	14.41	9.66	n/a	1.99	n/a	n/a	2.53	15.10	10.73	n/a
	CHRYSO/ISO-1/L/M	3.98	n/a	n/a	2.41	20.33	12.28	n/a	3.42	3.42	n/a	2.80	21.30	13.91	n/a
	CHRYSO/ISO-1/L/L	4.89	n/a	n/a	2.55	20.33	12.28	n/a	4.48	4.30	n/a	2.74	21.30	13.91	n/a
	CHRYSO/ISO-1/L/FBR	n/a	n/a	n/a	6.90	24.44	14.80	8.25	n/a	n/a	n/a	7.94	25.54	16.67	8.58
2	CHRYSO/ISO-2/L/S	2.20	n/a	n/a	2.07	14.41	9.66	n/a	1.99	n/a	n/a	2.53	15.10	10.73	n/a
	CHRYSO/ISO-2/L/M	3.98	n/a	n/a	2.41	20.33	12.28	n/a	3.42	3.42	n/a	2.80	21.30	13.91	n/a
	CHRYSO/ISO-2/L/L	4.89	n/a	n/a	2.55	20.33	12.28	n/a	4.48	4.30	n/a	2.74	21.30	13.91	n/a
	CHRYSO/ISO-2/L/FBR	n/a	n/a	n/a	6.90	24.44	14.80	8.25	n/a	n/a	n/a	7.94	25.54	16.67	8.58

Table 7 - Consequence	(Fire) Distance Results
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Table 8 - Consequence (Toxic) Distance Results

		ERPG-1	ERPG-2	ERPG-3	ERPG-1	ERPG-2	ERPG-3	
S.No.	Failure Scenario ID	1.5	F Weather Condit	ions	3D Weather Conditions			
		1ppm	50 ppm	250 ppm	1ppm	50 ppm	250 ppm	
	CHRYSO/ISO-1/L/S	382.11	36.84	n/a	194.14	27.61	11.62	
4	CHRYSO/ISO-1/L/M	5004.66	n/a	n/a	283.43	57.43	n/a	
1	CHRYSO/ISO-1/L/L	3613.57	n/a	n/a	304.40	66.67	20.11	
	CHRYSO/ISO-1/L/FBR	846.24	49.50	40.68	304.86	47.64	29.48	
2	CHRYSO/ISO-2/L/S	382.11	36.84	n/a	194.14	27.61	11.62	

		ERPG-1	ERPG-2	ERPG-3	ERPG-1	ERPG-2	ERPG-3	
S.No.	Failure Scenario ID	1.5	F Weather Condit	ions	3D Weather Conditions			
		1ppm	50 ppm	250 ppm	1ppm	50 ppm	250 ppm	
	CHRYSO/ISO-2/L/M	5004.66	n/a	n/a	283.43	57.43	n/a	
	CHRYSO/ISO-2/L/L	3613.57	n/a	n/a	304.40	66.67	20.11	
	CHRYSO/ISO-2/L/FBR	846.24	49.50	40.68	304.86	47.64	29.48	

7.2 Consequence Contour

Consequence contours for each scenario mentioned in the above table in Section 7.1 is pictorially referred below



Figure 4 - Consequence Contour (Toxic) - CHRYSO/ISO-1/L/S



Figure 5 - Consequence Contour (Jet Fire) - CHRYSO/ISO-1/L/S




Figure 6 - Consequence Contour (Pool Fire) - CHRYSO/ISO-1/L/S



Figure 7 - Consequence Contour (Flash Fire) - CHRYSO/ISO-1/L/S



Figure 8 - Consequence Contour (Toxic) - CHRYSO/ISO-1/L/M



Figure 9 - Consequence Contour (Jet Fire) - CHRYSO/ISO-1/L/M



Figure 10 - Consequence Contour (Pool Fire) - CHRYSO/ISO-1/L/M



Figure 11 - Consequence Contour (Flash Fire) - CHRYSO/ISO-1/L/M

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Figure 13 - Consequence Contour (Jet Fire) - CHRYSO/ISO-1/L/L



Figure 14 - Consequence Contour (Pool Fire) - CHRYSO/ISO-1/L/L



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Figure 15 - Consequence Contour (Flash Fire) - CHRYSO/ISO-1/L/L



Figure 16 - Consequence Contour (Toxic) - CHRYSO/ISO-1/L/FBR



Figure 17 - Consequence Contour (Pool Fire) - CHRYSO/ISO-1/L/FBR

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Figure 18 - Consequence Contour (Flash Fire) - CHRYSO/ISO-1/L/FBR



Figure 19 - Consequence Contour (Toxic) - CHRYSO/ISO-2/L/S



Figure 20 - Consequence Contour (Jet Fire) - CHRYSO/ISO-2/L/S

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Figure 21 - Consequence Contour (Pool Fire) - CHRYSO/ISO-2/L/S



Figure 22 - Consequence Contour (Flash Fire) - CHRYSO/ISO-2/L/S



Figure 23 - Consequence Contour (Toxic) - CHRYSO/ISO-2/L/M





Figure 24 - Consequence Contour (Jet Fire) - CHRYSO/ISO-2/L/M



Figure 25 - Consequence Contour (Pool Fire) - CHRYSO/ISO-2/L/M



Figure 26 - Consequence Contour (Flash Fire) - CHRYSO/ISO-2/L/M

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Figure 27 - Consequence Contour (Toxic) - CHRYSO/ISO-2/L/L



Figure 28 - Consequence Contour (Jet Fire) - CHRYSO/ISO-2/L/L



Figure 29 - Consequence Contour (Pool Fire) - CHRYSO/ISO-2/L/L

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Figure 30 - Consequence Contour (Flash Fire) - CHRYSO/ISO-2/L/L



Figure 31 - Consequence Contour (Toxic) - CHRYSO/ISO-2/L/FBR



Figure 32 - Consequence Contour (Pool Fire) - CHRYSO/ISO-2/L/FBR



Figure 33 - Consequence Contour (Flash Fire) - CHRYSO/ISO-2/L/FBR

8. **RISK INTEGRATION**

The risk associated with a hazardous event is assessed based on both the damage caused and probability of its occurrence. Risk is function of Consequence and Frequency. The risks are defined in terms of risks to an individual and risk to a group of population.

All identified failure cases are defined in terms of location, material released, release duration, temperature, pressure, leak size, release orientation and leak frequency.

Each failure case calculation in DNV SAFETI 8.22 starts with discharge modelling. Based on release duration and type of material being released, it directs the dispersion and consequence calculations to one of 4 alternates, built-in consequence outcome event trees.

For each release case, SAFETI takes the failure case release frequency, multiplies this by the weather class/ wind speed probability, for the wind directions considered in the study. DNV SAFETI takes this result and multiplies it by the immediate ignition probability or delayed ignition probability. These results are multiplied by the event tree consequence branch probabilities, relating to immediate or delayed ignition branch path.

SAFETI takes the calculated consequence hazard range over equal sized grids and verifies which grid points are within the consequence hazard area and calculates the magnitude of the consequence at those grid points. The calculated consequence magnitude at each grid point is then compared to the SAFETI programmed impact criteria levels. The likelihood of fatality is calculated, based on the impact probability criteria in SAFETI, for the type of consequence and the magnitude of the consequence.

This calculation is repeated for each event tree alternate consequence outcome at each grid point, for all weather classes/ wind speeds and wind direction, and the result added to the previous risk level, at each grid point.

Once all risk calculations at all grid points have been completed for the first failure case, the next failure case will be calculated, again adding all results cumulatively at each grid point. This is repeated until all failure cases have been calculated, while SAFETI also tracks the risk contribution made by each failure case at each grid point.

Once completed, SAFETI produces individual risk contour results by linking points of equal risk using linear interpolation between relevant grid points. The risk contour results are super imposed on the electronic site map, entered in the SAFETI software. Similar calculations are performed for calculation of societal risk using Population details at each location of the facility. The persons inside each grid are

equally distributed in the grid cell instead of at the centre of the grid cell as considered in individual risk calculations. Refer Appendix A for population data used for the analysis.

8.1 Ignition Probabilities

OGP Data Base estimates the ignition probabilities based on 28 mathematical functions drawn from the UKOOA look-up correlation which relates ignition probabilities in air to release rate for typical scenarios both onshore and offshore. The values presented in OGP relate to "total" ignition probability, which can be considered as the sum of the probability of immediate ignition and delayed ignition.

The following UKOOA look-up correlations was used for determining the ignition probabilities.

Releases of flammable lik my significant flash fract eleased from small onsh o 1200 m2, site area up t he liquid releases from th punded or otherwise cont	aukis that do not have ion (10% or less) if ore plants (plant area u o 35,000 m2) and when se plant area are suitab ained.
Release Rate (kg/s)	Ignition Probability
0.1	0.0010
0.2	0.0013
0.5	0.0018
1	0.0024
2	0.0042
5	0.0088
10	0.0130
20	0.0130
50	0.0130
100	0.0130
200	0.0130
500	0.0130

Figure 34 - Ignition Probabilities

The IP review of ignition and explosion probabilities concludes that, there are too little data to draw any firm conclusions but that "risk assessment approaches based on 30:70 to 50:50 split delayed ignition or jet / pool fire: flash fire / explosion are reasonable". Furthermore, it also identifies that, on average, approximately 20% of ignited gas releases result in explosions.

The proposed explosion probability rule set is therefore:

- 50% of all ignitions are immediate resulting in jet/pool fires (F);
- 50% of all ignitions result in explosion (PEX) and flash fires (1-F-PEX);

Based on the above, the ratio between P (immediate ignition) and P (delayed ignition) is estimated as 50:50. This estimate is supported by the joint industry Ignition Probability Review (IP Research Report), which shows that approximately 50% of ignitions occur within a minute or so of the leak commencing. Hence, the split immediate: delayed ignition used will be 50:50 for Risk analysis.

The immediate ignition probability can be calculated as,

P_{immediate} = P_{total} x 0.50, for plant areas where P_{total} is calculated from UKOOA look-up table.

8.2 Individual Risk Acceptance Criteria

Individual Risk

The term "Individual Risk" is used for the calculations of the risk of fatality for someone at a specific location, if the person is always present at the location, i.e., is continuously exposed to the risk at that location. This is sometimes referred to as Location-Specific Individual Risk (LSIR).

The process for calculating the levels of risk associated with the facility is:

- Calculate the Location Specific Individual Risk (LSIR) from Major Accident Hazard events using the QRA model
- Define the worker groups and groups of the public (if any) by their location and movements within the effects zone of the facility
- Use the QRA model to calculate societal risk, F-N curve

To determine acceptability, the risk results are assessed against a set of risk criteria. The individual risk criteria adopted for this study is based on UK HSE Criteria and is presented below.

Fatality Risk Criteria



Figure 35 – Individual Risk Acceptance Criteria for Workers



Figure 36 - Individual Risk Acceptance Criteria for Public

Risk criteria for Individual Risk for Workers are as follows:

- Individual risk levels above 1 x 10⁻³ per year will be considered unacceptable and will be reduced, irrespective of cost.
- Individual risk levels below 1 x 10⁻⁶ per year will be deemed acceptable.
- Risk levels between 1 x 10⁻³ and 1 x 10⁻⁶ per year will be treated to levels as low as reasonably practicable (ALARP).

Risk criteria for Individual Risk for Public are as follows:

- Individual risk levels above 1 x 10⁻⁴ per year will be considered unacceptable and will be reduced, irrespective of cost
- Individual risk levels below 1 x 10⁻⁶ per year will be deemed acceptable

Individual risk between 1 x 10⁻⁴ per year to 1 x 10⁻⁶ per year will be in the ALARP region

Interpretation of the figure and the values presented above is that if the calculated risk of fatality for any individual within the specific group of workers is greater than 1×10^{-3} per year then the risk is unacceptably high and requires immediate action. If the calculated figure is less than 1×10^{-6} per year, then it is deemed acceptable with no further action. The benchmark figures are an aid as to where the risk of fatality per person per year is anticipated to be, given experience of risk assessments throughout the industry. The tolerable risk level lies between the acceptable and unacceptable levels then it is in ALARP.

8.3 Societal Risk Acceptance Criteria

Societal Risk is the risk experience in a given time period by the whole group of personnel exposed, reflecting the severity of the hazard and the number of people in proximity to it. It is defined as the relationship between the frequency and the number of people suffering a given level of harm (normally taken to refer to risk of death) from the realization of the specified hazards. It is expressed in the form of F-N curve using UK HSE FN curve criteria. The UK HSE F-N Curve societal risk criterion is shown in following Figure.



Figure 37 - F-N Curve Acceptance Criteria

9. RISK ASSESSMENT AND RISK RESULTS

Risk assessment is the process of comparing the level of risk against a set of criteria as well as the identification of major risk contributors. The purpose of risk assessment is to develop mitigation measures for unacceptable generators of risk, as well as to reduce the overall level of risk to ALARP.

9.1 Location Specific Individual Contour (LSIR)

9.2

Risk Contours

Location specific Individual risk, the term "Individual Risk" is used for the calculations of the risk of fatality for someone at a specific location, if the person is always present at the location, i.e., is continuously exposed to the risk at that location. This is sometimes referred to as Location-Specific Individual Risk (LSIR). The following Table shows the LSIR values for workers category.

S. No	Location Description	LSIR (per year)
1	Tankage area	1.25E-03



Figure 38 - Individual Risk contour



Figure 39 - Individual Risk contour (Zoom-in)

Location Specific Individual Risk

Based on the result of above figure, the following observations are inferred.

- Individual risk contour of 1.0E-01 and 1.0E-2 per year are not realised in the facility.
- Individual Risk contour of 1.0E-03 and 1.0E-04 per year are realized in the storage tank area.
- Individual Risk contour of 1.0E-05 per year is covering other storage tank area and Individual Risk contour of 1.0E-06 per year is almost covering all other storage tank area in the facility.

9.3 Individual Risk Per Annum (IRPA)

IRPA is calculated for the workers in the facility considering the working hours of 8 per day. Accordingly, the estimated IRPA for workers in the facility area shown below:

Table	10 -	IRPA
-------	------	------

S. No	Location Description	IRPA
1	Tankage area	4.15E-04

From the above table, it is observed that, IRPA for workers in the facility fall under 'ALARP' region.

However, the results of indicate that the risk is tolerable provided it is kept As Low As Reasonably Practicable (ALARP).

9.4 Frequency (F) – Number of Fatalities (N) Curve

Societal risk is the risk exposure by a group of people exposed to the hazard.

Following FN curve shows the frequency (F) of there being 'N' of more fatalities due to different failure cases for facility.





From the above figure, it is observed that the calculated F-N curve for facility falls in ALARP Region upto 1 fatality and above 1 fatality falls in broadly acceptable region. Maximum number of fatality due to loss of containment event from the facility is 2 at a frequency of 9.19 E-08 per year which is within the broadly acceptable region.

9.5 Explosion Risk

A vapour cloud explosion involves a flame moving through a fuel-air mixture. In absence of any turbulence generation the cloud will burn as a flash fire without the generation of high overpressures. However, significant turbulence can be generated by obstacles encountered by a flame as it propagates though the vapour cloud in obstructed regions. This process is subject to a positive feedback so that as more obstacles are encountered, more turbulence is generated, and this further accelerates the flame. It is explosions that occur in the presence of obstacles that can generate overpressures with potential for extensive damage.

The following areas in the facility has been identified as the potential explosion site for explosion analysis.

Tankage area

Overpressure hazard distances of 0.14 bar,0.21 bar and 0.35 bar due to flammable releases in the facility is shown in the below figure:



Figure 41 - Explosion Overpressure Level (1E-07 per year)

From the above, it is observed that the 0.14 bar,0.21 bar and 0.35 bar overpressure due to limited failure scenarios identified from the facility is mostly confined to the facility.

10. SAFE HANDLING AND DESIGN CONSIDERATION FOR ACRYLIC ACID

10.1 Major Hazard from Acrylic Acid Storage

Acrylic acid is stable when stored and handled under recommended conditions. Commercially available acrylic acid is stabilized (inhibited) with hydroquinone monomethyl ether (MEHQ), which prolongs the shelf life, i.e., the time before spontaneous polymerization occurs. However, this shelf life is reduced exponentially with increasing temperature. Exposure to high temperatures, therefore, must be avoided.

The polymerization of acrylic acid can be very violent, evolving considerable heat and pressure and ejecting hot vapor and polymer, which may auto ignite. An explosion hazard exists due to extremely rapid pressure build up. Several case histories are known in which vessels of acrylic acid exploded due to violent ("runaway") polymerization when proper procedures were not followed.

10.2 Causes

Experience has shown that overheating of acrylic acid is by far the most common cause of inadvertent polymerization. This overheating is often caused by improper procedures being used to thaw frozen acrylic acid or by heat generated by deadheaded (blocked in) pumps. Other causes of polymerization are the removal of oxygen (oxygen is necessary to activate the storage inhibitor, MEHQ) or contamination with incompatible chemicals.

10.3 Prevention

The presence of dissolved oxygen is necessary for MEHQ to function effectively. Thus, acrylic acid should never be handled or stored under an oxygen-free atmosphere. A gas mixture containing 5 to 21 vol. % of oxygen at one atmosphere should always be maintained above the monomer to ensure inhibitor effectiveness. In a closed system, this atmosphere must be periodically replenished since dissolved oxygen is gradually consumed in the inhibition process, forming oligomeric peroxides.

10.3.1 Temperature Control of Bulk Storage Tank and Accessories

The installation of a reliable freeze protection system, which avoids accidental overheating of the acrylic acid, is highly recommended for all climates where freezing can occur. **Thawing Frozen Acrylic Acid can be Extremely Hazardous**.

Piping systems located outdoors (including valves, pumps and filters) should be insulated and heattraced to avoid cold spots, which can result in plugging by frozen acrylic acid. **Under No Circumstances Should Steam be used to Heat or Thaw Acrylic Acid.** Electrical heat tracing should not be used on piping systems (including pumps, valves and filters) or vessels in acrylic acid service unless it can be ensured that the resulting maximum product temperature cannot exceed 45°C (113°F) during heating or thawing. Self-limiting or constant-wattage electrical heat tracing limited to temperatures below 65°C (149°F) and instrumented to control at ≤ 45 °C is acceptable for this service because of their additional safety features.

An independent high temperature shutdown at $\leq 45^{\circ}$ C (113°F) may also be included as an additional safety feature to guard against failure of the tracing system.

10.3.2 Protection of Pumps from Overheating

It is highly advised that reliable engineering safeguards, such as redundant instrument interlocks, be provided to prevent accidental overheating of acrylic acid pumps. Overheating of acrylic acid pumps can cause a violent polymerization, which may result in serious injury and/or loss of property.

Air driven diaphragm pumps are used for acrylic acid service. Diaphragm pumps usually stop pumping if deadheaded and may not require instrument interlocks to protect against overheating.

10.3.3 Avoid Polymer Formation in Vent Nozzles and Lines

It is advisable that precautions be taken to minimize potential condensation of acrylic acid in vent nozzles and lines. Acrylic acid condensed from vapor does not contain MEHQ stabilizer and is prone to form polymer, which can plug critical pressure and vacuum relief lines. Below are some precautions which can be taken.

1. Insulate and trace vent nozzles and lines to help keep the temperature above the dew point. For tracing, use heat transfer fluid $\leq 45^{\circ}$ C (113° F). Under no circumstances should steam be used to heat or thaw acrylic acid. Electrical heat tracing should not be used on piping systems (including pumps, valves and filters) or vessels in acrylic acid service unless it can be ensured that the resulting maximum product temperature cannot exceed 45°C (113°F) during heating or thawing. Self-limiting or constant-wattage electrical heat tracing limited to temperatures below 65° C (149° F) and instrumented to control at $\leq 45^{\circ}$ C is acceptable for this service because of their additional safety features. An independent high temperature shutdown at $\leq 45^{\circ}$ C (113° F) may also be included as an additional safety feature to guard against failure of the tracing system.

2. Nozzles which are prone to plug can be swept with a gas in order to minimize condensation. Inject some gas containing 5 to 21 vol. % of oxygen into vent nozzles. The use of dry, oil free air is suggested.

3. Slope vent lines to drain condensed liquid back to a vessel when possible and provide liquid drains where stagnant liquid pockets may develop. Polymer formation is likely in stagnant pockets of uninhibited acrylic acid.

10.3.4 Indoor Acrylic Acid Storage Facility

Indoor acrylic acid storage facilities must be well ventilated to prevent local accumulation of vapors, which can have potential harmful effects on personnel. It is suggested that local exhaust systems be considered to supplement the general exhaust system and that adequate air change rates are ensured. It is recommended that all laboratories be provided with a sufficient number of properly designed exhaust hoods. All indoor bulk storage tanks should vent outside of the building.

11. CONCLUSION AND RECOMMENDATIONS

QRA Study has been carried out as per the Methodology provided in Section 4 of this Report.

Based on the results from the assessment, following conclusion and recommendations were made for further risk mitigating measures.

The following Table shows the LSIR values for workers category.

Table 11 - Location Specific Individual Risk (LSIR)

S. No	Location Description	LSIR (per year)
1	Tankage area	1.25E-03

The following LSIR contour is produced for CHRYSO Acrylic Acid Storage Tanks



Figure 42 - LSIR Contour for CHRYSO Acrylic Acid Storage Tanks

Location Specific Individual Risk

Based on the result of above figure, the following observations are inferred.

- Individual risk contour of 1.0E-01 and 1.0E-2 per year are not realised in the facility.
- Individual Risk contour of 1.0E-03 and 1.0E-04 per year are realized in the storage tank area is due to Pool Fire Hazard. And Individual Risk contour of 1.0E-03 frequency is mostly confined to the tankage area.
- Individual Risk contour of 1.0E-05 per year is covering other storage tank area and Individual Risk contour of 1.0E-06 per year is almost covering all other storage tank area in the facility.

Individual Risk Per Annum

Individual Risk Per Annum (IRPA) is calculated for the workers in the facility considering the working hours of 8 per day. Accordingly, the estimated IRPA for workers in the facility area shown below:

S. No	Location Description	IRPA
1	Tankage area	4.15E-04

Table 12 – IRPA for Workers

From the above table, it is observed that, IRPA for workers in the facility fall under 'ALARP' region.

However, the results indicate that the risk is tolerable provided it is kept As Low As Reasonably Practicable (ALARP).

F-N Curve

Societal risk is the risk exposure by a group of people exposed to the hazard. The F-N curve (Societal risk) is calculated for onsite personnel's using societal risk criteria.

Following FN curve shows the frequency (F) of there being 'N' of more fatalities due to different failure cases for facility.



Figure 43 - Frequency (F) – Number of Fatalities (N) Curve

From the above figure, it is observed that the calculated F-N curve for facility falls in ALARP Region upto 1 fatality and above 1 fatality falls in broadly acceptable region. Maximum number of fatality due to loss of containment event from the facility is 2 at a frequency of 9.19 E-08 per year which is within the broadly acceptable region.

11.1 Recommendations

Based on the risk results, the following are recommended to reduce the risk / hazard.

- Major contributor to risk in the facility is due to pool fire scenarios. Hence it is recommended to consider the Passive Fire Protection (PFP) for critical load bearing structure to reduce / prevent the escalation of fire and explosion hazard. Also, consider proper bunding and drain system in the unit to reduce the pool fire duration.
- 2. To reduce risk from hydrocarbon release, a Risk Based Inspection (RBI) program shall be considered in order to reduce the frequency of release.
- 3. Personnel at facility shall be trained regularly on emergency response and preparedness. Ensure that emergency handling and mitigation systems are adequate. Mock drills based on emergency scenario shall be conducted at regular intervals to review emergency preparedness.

12. **REFERENCES**

- /1/ Guidelines for Quantitative Risk Assessment CPR 18 E (Purple book), Committee for the Prevention of Disasters, Netherlands (Edition: PGS 3, 2005)
- /2/ OGP, Risk assessment Data Directory, March 2010.
- /3/ Information/ Data provided by the Client.

ANNEXURE A - ASSUMPTION REGISTER



QRA Study Assumption Register – Acrylic Acid Storage Tanks – CHRYSO India Pvt. Ltd

Assumption Register

11 February 2021

Project No.: 0507656

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Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	QRA Study Assumption Register – Acrylic Acid Storage Tanks – CHRYSO India Pvt. Ltd
Document subtitle	Assumption Register
Project No.	<mark>0507656</mark>
Date	11 February 2021
Version	1.0
Author	Sunith M
Client Name	CHRYSO India Pvt. Ltd

Document history						
				ERM approval	to issue	
Version	Revision	Author	Reviewed by	Name	Date	Comments
1.0	A	Sunith M	Arunkumar A	Indrani Ghosh		

Signature Page

11 February 2021

QRA Study Assumption Register – Acrylic Acid Storage Tanks – CHRYSO India Pvt. Ltd

Assumption Register

Swaroop Banerjee Partner-in-Charge Subhradeb Pramanik Principal Consultant

ERM India Private Limited

Building 10A

4th Floor, DLF Cyber City

Gurgaon, NCR - 122002

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1. INTRODUCTION & BACKGROUND

1.1 Introduction

CHRYSO India Pvt. Ltd. Patalganga facility is presently having the capacity of 60000 metric tonnes per month (MT/M) of Cement Admix and Cement Grinding Aid (through blending and mixing activity only) which falls under MSME category. The company proposes for expansions of manufacturing facility in the same premises within the same shed to manufacture one of its currently key raw material namely Acrylic Co-Polymer.

The proposed expansion project requires Environmental Clearance (EC) form Ministry of Environment, Forest and Climate Change (MoEFCC). M/s Erm India Pvt. Ltd has been engaged by CHRYSO India Pvt Ltd. For conducting EIA Study and to support in obtaining environmental clearance. In this context, ERM intends to conduct Quantitative Risk Analysis for the Acrylic Acid Storage Tanks (2 no's) to assess the impact to Personnel in the facility.

1.2 Assumption Register Structure

The remainder of this Assumption register is structured as follows:

- Section 2 provides the objective, scope of work;
- Section 3 sets out the Methodology for QRA Study;
- Section 4 provides Assumptions & Input Data

QRA STUDY ASSUMPTION REGISTER – ACRYLIC ACID STORAGE TANKS – CHRYSO INDIA PVT. LTD Assumption Register

2. OBJECTIVE & SCOPE OF WORK

2.1 **Objectives**

Following are the objectives of this QRA study

- Identify hazards associated with the facility;
- Determine the consequences of Acrylic Acid releases from the Storage vessels;
- This shall include part counts of proposed facilities, if necessary.
- Determine the frequency of Storage Vessel releases;
- Quantify Individual risk (LSIR & IRPA);
- Quantity Societal risk (F-N Curve);
- Evaluate the acceptability of these risk levels against risk tolerability criteria;

2.2 Scope of work

The scope of work is to carry out Quantitative Risk Analysis Study for the proposed Acrylic Acid Storage Tanks (2 no's) and the adjacent piping using DNVGL Software PHAST & SAFETI 8.22.

3. QRA METHODOLOGY

The initial key step is the identification of the release scenarios, which are based on Hazard Identification process usually carried out by internal review of the Process Flow diagrams and Piping & Instrumentation drawings, and layout configurations. Once the scenarios are defined, then these are evaluated further for their potential frequency of occurrence and consequence hazard zone. The frequency analysis is based on the facility equipment count paired with historical frequency data.

The risk result is estimated by the combination of the scenario frequency and consequence with potential impact to the facility and personnel. A variety of risk metrics may be evaluated depending on the scope, including Individual risk, societal risk. The risk results are compared to relevant criteria to evaluate the tolerability and to offer guidance for risk reduction. The key components are illustrated in below figure:



Figure 1 - QRA METHODOLOGY

Hazard Identification

The hazard identification (HAZID) process identifies the hazards that can exist from the system. There are several techniques for identifying hazards. The HAZID identifies the range of loss of Containment scenarios that shall be used as an input in the risk study. The HAZID session results are further developed to define system boundaries, isolatable sections within the process, release conditions, materials to be modelled, and other factors.

Estimation of Failure Frequency by Parts-Count Method

The term risk is defined as a function of frequency and consequence. The frequency of occurrence provides information on how often the event is likely to happen, while the consequences describe the behaviour of an initial event, such as a hydrocarbon leak.

ERM ensures its quality and accuracy on QRA results by Parts Count method. ERM entrusts partscount method which is widely used and agreed in oil and gas industry. The calculations arrived from parts count method is fed into LEAK Software to estimate the leak frequencies for all the credible scenarios identified. The parts-count method involves counting number of components (actuated valve, manual valve, flange, instrument connection, piping, vessel, rotating equipment, etc.) within a particular section boundary. The entire facility will be divided into understandable isolable sections according to the location of emergency shutdown valves (SDV) that can isolate the hydrocarbon volume from other hydrocarbon volumes or isolatable sections. In the event of a release, only the material in an isolatable is considered to be released. Failure frequency of each isolatable section is estimated by parts-count method so that comprehensive estimate of failure frequency can be done for risk estimation.

DNV GL's leak frequency software model LEAKv3.3 shall be used to estimate the expected leak frequencies of each isolatable section in the facility. The number of and size of manual valves, actuated valves, flanges, instrument connection, pumps, process vessels, piping, etc. are input to the model, together with dimensions.

Consequence Modelling

In parallel with the frequency analysis, consequence modelling evaluates the resulting effects (if the accidents are to occur) together with the impact on people and assets. In general, the types of consequences included in the evaluation depend on the scope of the QRA study. Calculation of the consequences of each possible event often requires some form of computer modelling.

Consequence analysis requires the modelling of a number of distinctive situations, i.e., discharge, dispersion, fires and explosions (for flammable materials), and impact assessment of how the fire, explosion or toxic cloud affects human beings.

Risk Calculations

After the frequencies and consequences of each modelled scenario (combination of initiating event, cause, and consequence) are estimated, they are combined to produce quantified risk results. The risk shall be calculated for each frequency-consequence pair, and then summed for each area of interest to yield a total risk for the area.

Risk quantification results are typically presented in several different ways to provide a complete picture. The quantified risk results can be grouped into two general groups – Individual and Societal Risk.

Location Specific Individual Risk (LSIR) is a measure of the risk at a particular location, without regard to whether a person might be present or not. Individual Risk Per Annum (IRPA) is defined as the frequency at which an individual may be expected to sustain a given level of harm from the realisation of specified hazards. It is usually taken to be the risk of death, and usually expressed as a frequency per year. For this scope of work, ERM would report the risk to personnel during the normal operations phase.

Societal (Group) Risk - Societal Risk (SR) is typically presented as an FN curve plotted on a log-log scale. SR is a measure of the relationship between the cumulative frequency (F) and number of fatalities (N). It is defined as the risk experienced by a group of people (including workers and the public) exposed to the hazard.

Risk Assessment

Risk assessment is the process of comparing the level of risk against a set of criteria as well as identifying major risk contributors. In the risk assessment stage, the quantified risk results are compared to pre-established risk criteria (from governmental regulatory requirements, recommended guidelines, or corporate guidelines) to indicate whether the risks are tolerable or to make some other judgment about their significance.

Risk assessment identifies the level of risk associated with loss of containment and evaluates against risk acceptance criteria. It also can be used to identify recommendations that may further reduce the risk to tolerable levels, if risks are found to be intolerable, or to reduce the overall level of risk to a level As Low As Reasonably Practicable (ALARP)

Risk Reducing Measures

A risk assessment can identify risks that exceed the tolerable criteria. In such cases, risk reducing measures are identified to reduce the risk / hazard.

4. ASSUMPTIONS AND INPUT DATA

As part of the QRA process, rule sets / assumptions have to be agreed prior to the execution of the critical steps. The rule sets and assumptions that will be applied for QRA Study are outlined below

If any of the values applied in this document are altered, the risk results presented in the report may no longer be valid. Consequently, alteration of any of these assumptions may generate a need for update of the QRA study. The table below gives an overview of the assumptions and basis made for QRA study. A detailed description of the assumptions is found in the subsequent forms in this section.

S. No	Description
1	Failure Cases Selection
2	Process Parameters
3	Leak size, Release Rate and Release direction
4	Detection & Isolation Time
5	Parts Count & Failure Frequencies
6	Ignition Probability Data
7	Meteorological Data
8	Population
9	Event Trees
10	Event Outcomes
11	Impact Criteria
12	Individual Risk Criteria
13	Societal Risk Criteria
14	Software & Database
15	Report Structure

Table 1 – List of Assumptions

QRA STUDY ASSUMPTION REGISTER – ACRYLIC ACID STORAGE TANKS – CHRYSO INDIA PVT. LTD Assumption Register

Quantitative Risk Assessment

Assumption No: 01

Subject: Failure Cases Selection

All facilities normally containing hazardous material shall be considered during identification of failure cases. All identified failure cases shall be defined in terms of location, material released, quantity released, released condition including inventory flow/ pumped flow, temperature, pressure, leak size, leak direction, leak elevation, leak frequency and ignition probability.

Identification of isolatable sections is required to determine the inventory available for release upon loss of containment. Following assumptions are made for determining isolatable sections.

An isolatable section is defined as section between SDVs. Isolatable inventory will be considered for modelling purpose.

QRA study inputs like isolatable sections, process parameters etc. will be based on the P&ID, PFD, and Plot Plan etc. Isolatable sections will be marked up on the P&IDs for traceability, if necessary.

Normally No Flow (NNF) lines are not considered for inventory analysis.

Open and closed drains are generally low pressure and NNF type and will not be considered in inventory analysis or for the purpose of identifying isolatable sections.

A representative release location for each release scenario shall be derived from the plot plan/ equipment layout of the respective area.

Representative release sizes will be considered to determine the frequencies and release rates.

ERM shall use systematic naming convention to detail the various failure cases.

Failure case Id structure: Area/Segment / Phase/Leak size

For e.g., CHRYSO/ISO1/L/S

Where,

ISO1 is Leaking Isolatable Segment between XV-XXXX and XV-XXXX

G is the phase of the release, typically "G" for gas, "L" for Liquid and "T" for Two-Phase

S is the Leak size, typically "S" for Small, "M" for Medium, "L" for Large and "FBR" for Full Bore Rupture.

Reference for Documentation:

General Practice

Quantitative Risk Assessment

Assumption No: 02

Subject: Process Parameters

For each failure case, the key inputs to the derivation of release parameters will be the material, phase, process conditions (temperature and pressure), flow rate and isolatable section volume / inventory, as described below:

Material: The releases will be represented as a mixture composition, based on the various hydrocarbons in the stream and input to the PHAST discharge modelling.

Table 2 - Materials handled inside the facility

S. No	Materials
1	Acrylic Acid

Process conditions (temperature and pressure) – Temp. = 17 to 25 Degree C; Pressure – Vacuum 250 mm WC.

Flow Rate: 20 m3/hr from recycle pump

Volume / Inventory: The section volume is derived from the vessel volumes, together with estimates of line lengths associated with each section and the estimated fill fraction of each vessel.

Reference for Documentation:

ERM General Practice

Quantitative Risk Assessment

Assumption No: 03

Subject: Leak Size, Release Rate and Release Direction

The representative leak hole sizes to be modelled are selected to ensure that the entire range of potential hole size is represented in the modelling. The leak hole size in reality can range from a pinhole leak on one side to a full-bore rupture on the other extreme.

Leak Size for Process Installations:

For each of the sections containing process equipment or piping, four representative leak sizes will be considered to determine the initial frequencies and release rates:

- Small: Leaks between 0 and 10 mm modelled as 7 mm hole size
- Medium: Leaks between 10 and 50 mm– modelled as 22 mm hole size
- Large: Leaks between 50 and 150 mm- modelled as 70 mm hole size
- FBR: Leaks greater than 150 mm modelled as full-bore rupture.

Table 3 - Representative leak sizes for Process Installations

Leak Category	Representative Hole Size (mm) for Process Installations	Hole Size Range (mm) (Based on OGP 434-1)
Small	7	1 – 10
Medium	22	10 - 50
Large	70	50 – 150
FBR	Full-Bore Rupture	> 150 (Note 1)

Note 1: Leak size for rupture case would be maximum piping size connected to equipment

Release from Storage Tanks

For Storage Tanks, two representative leak sizes will be considered to determine the initial frequencies and release rates:

Table 4 - Representative leak sizes for Storage Tanks

Leak Category	Representative Hole Size (mm)
Small	10 mm
Catastrophic Rupture	-

Release Rate

Gas Release Case:

The representative release rate in gas release case is generally taken as the initial release rate, which is calculated within the PHAST Discharge Model.

Liquid Release Case:

The representative release rate in liquid release case is generally taken as the initial release rate, which is calculated within the PHAST Discharge Model. In case, the initial release rate (calculated by PHAST Discharge model) is very large (larger than normal flow rate) then the representative release rate will be restricted to the normal flow rate.

Release direction
Assumption No: 03

Subject: Leak Size, Release Rate and Release Direction

Release will be modelled as oriented horizontally at a height of 1m to ensure conservatism.

Reference for Documentation:

- ERM General Practice
- OGP, Risk Assessment Data Directory, Report No. 434-1, March -2010
- OGP, Risk Assessment Data Directory, Report No. 434-4, March -2010

Assumption No: 04

Subject: Detection & Isolation Time

The total inventory includes static as well as dynamic inventories. The dynamic inventory is calculated as the product of the representative release rate and the duration for which it is applied. Static inventory is the hold-up volume in the isolatable section. Thus, the inventory released is the mass released prior to isolation plus the isolatable static inventory.

- Detection Time is the time required by the Leak Detection System to detect a leak.
- Response Time is the time taken by the operator to validate the leak and respond.
- Shutdown Time is the time for the SDVs to close down.
- Total isolation time includes detection time, response time and shutdown time.

Blocking systems can be present to limit the outflow once a loss of containment occurs. The operation of blocking valves can be triggered by, for instance, a detection system for gas or the detection of an excess flow. The blocking valves can be closed either automatically or through an operator.

Three different types of blocking systems are distinguished

- An automatic blocking system is a system where the detection of the leakage and closure of the blocking valves is fully automatic. There is no action of an operator required.
 - The closing time of the blocking valves is two minutes.
- A remote-controlled blocking system is a system where the detection of the leakage is fully automatic. The detection results in a signal in the control room. The operator validates the signal and closes the blocking valves using a switch in the control room.
 - The closing time of the blocking valves is ten minutes.
- A hand-operated blocking system is a system where the detection of the leakage is fully automatic. The detection results in a signal in the control room. The operator validates the signal, goes to the location of the blocking valves and closes the valves by hand.
 - The closing time of the blocking valves is 30 minutes.

Based on the detection and blocking system considered in engineering, the closure time of 10 <u>minutes</u> shall be considered for inventory analysis.

Reference for Documentation:

CPR 18E, Purple Book. Section 4.4.1

Assumption No: 05

Subject: Parts Count and Failure Frequencies

Failure Frequency data used as in the study is presented in this section.

Process Piping / Equipment for Installations

Failure Frequency Estimation within the Process Installation involves counting the number of components (valves, flanges, blinds, instrument tapping, etc.) within a particular section boundary.

In part count, the scope of valve includes the valve body, stem, and packing but excludes flanges. These flanges shall be counted separately. Normally opened valve assembly may be counted as one valve and two flanged joints; whereas normally closed valve assembly (where only leaks from one side of valve would cause the consequence) may be counted as 0.5 times of the valve and one flange joint. Sample parts count methodology is detailed in Table below.

Symbols	Parts Count		
	1 Manual Valve & 2 flanged joints		
	Gasket 1 flanged joint		
	Valves (Manual Valve, Control Valve, NRV, BDV)		
	<u>1 valve (if valve has flanged joints and normally open)</u> is counted as:		
	1 Valve		
	2 flanged joints		
	<u>1 valve (if valve has flanged joints and normally close)</u> is counted as:		
	0.5 valve		
	1 flanged joint		
Isolatable Section 1	Actuated Valve (SDV)		
	For Isolatable Section 1		
Isolatable Section 2	0.5 Valve		
	1 flanged joint		
	For Isolatable Section 2		
	0.5 Valve		
	1 flanged joint		

Table 5 – Parts Count Methodology

Quantitative Risk Assessment	
Assumption No: 05	
Subject: Parts Count and Failure Fre	quencies
	PSV
	0.5 Actuated Valve
Fluid stops here	1 flanged joint
	1 Instrument Connection is counted as:
	1 instrument connection
\sim	In case of flow orifice instrument is counted as:
	1 instrument connection.
	1.5 flanged joint
	Includes the instrument itself plus up to 2 instrument valves, 4 flanges, 1 fitting and associated small-bore piping.
10 (17) 10 (17) 10 (17) 10 (17)	Spectacle Blind = 1.5 flanged joint

Generic data for leak frequencies of individual items of process equipment together with the distribution of leak sizes are derived from analysis of OGP, Risk Assessment Data Directory, Report – 434-1, March 2010. The same is mentioned in below tables.

For QRA study, leak frequencies will be estimated using Leak v3.3 based on Full & Limited Release type data from OGP.

Table 6 - Failure Frequencies for Piping for Full Releases from OGP

HOLE DIA Rânge (mm)	2- D)A (50 mm)	8" DIA (150 町雨)	12" DIA (300 mm)	18" DIA (450 (450)	24" DIA (600 mm)	36" DIA (900 171m)
1 to 3	5.5E-05	2.68-05	2.3E-05	2,35-05	2.3E-05	2.38-05
3 to 10	1.8E-05	8.52-06	7.6E-06	7.55-06	7.4E-06	7.4E-06
10 to 50	7.0E-06	2.7E-06	2.4E-06	2.4E-06	2.4E-05	2.3E-06
50 to 150	0.0E+00	6.0E-07	3.78-07	3.6E-07	3.6E-07	3.6E-07
>150	0.02+00	0.0 E +00	1.7E-07	1.76-07	1.5E-07	1.6E-07
TOTAL	8.0E-05	3.66-05	3.42-05	3.3E-05	3.3E-05	3.3E-05

Table 7 - Failure Frequencies for Flanged Joint for Full Releases from OGP

HOLE DIA RANGE (mm)	21 D(A (50 mm)	8" ĐÌA (150 mm)	12" DIA (300 mm)	18" DJA (450 mm)	24° DIA (800 mm)	36" DIA (900 (月11)
1 to 3	2.6E-05	3.7E-05	5.95-05	8.32-05	1.1E-04	1.7E-04
3 to 10	7.6E-06	1.1E-05	1.7 E -05	2.4E-05	3.2E-05	4.92-05
10 to 50	4.02-06	3.02-06	4.7E-06	6.52-06	8.65-00	1.45-05
50 to 150	0.05+00	2.02-05	6.1E-07	8.72-07	1.16-05	1.85-06
>150	0.02+00	0.02+00	1.78-06	1.8E-06	1.96-08	2.2E-05
TOTAL	3.8E-05	5.3 E-0 5	8.35-05	1.2E-04	1.5E-04	2.4E-04

HOLE DIA RANGE (mm)	2" DIA (\$0 mm)	6" DIA (150 (151)	12" DIA (300 mm)	18" DIA (450 mm)	24" DIA (600 mm)	36° DIA (900 mm)
1 to 3	2.02-05	3.18-05	4.32-05	5.32-05	6.22-05	7.8E-05
3 to 10	7.7 E- 05	1.22-05	1.78-05	2.18-05	2.48-05	3.0E-05
10 to 50	4.9E-06	4.7 E- 06	6.5E-06	8.0E-06	9.42-06	1.22-05
50 to 150	0.0R+00	2.45-06	1.2E-06	1.56-06	1.8E-06	2.2E+06
>150	0.0E+00	0.02+00	1.78-06	1.92-06	2.12-05	2.32-06
TOTAL	3.2E-05	5.0E-05	6.9E-05	8.56-05	1.0E-04	1_2E-04

Table 9 - Failure Frequencies for Actuated Valves for Full Releases from OGP

NOLE DIA RANGE (mm)	2" DIA 2" DIA	6" DIA (150 mm)	12" DIA (300 mm)	16" DIA (450 mm)	24" DIA (600 mm)	36" DIA (909 mm)
1 to 3	2.4E-04	2.22-04	2.1E-04	2.0E-04	2.0E-04	1.98-04
3 lo 10	7.36-05	6.65-05	8.36-05	6.0E-05	5.9E-05	5.6E-05
10 to 50	3.0E-05	1.9E-05	1.82-05	1.78-05	1.7E-05	1.62-05
50 Io 150	0.0E+00	8.6E-06	2.46-06	2.3E-06	2.2E-06	2.26-06
≥150	0.0E+00	0.02+00	6.0E-05	5.9E-06	5.9E-06	5.9E-06
TÖTAL	3.5E-04	3.25-04	3.0E-04	2.9E-04	2.8E-04	2.78-04

Table 10 - Failure Frequencies for Instrument Connections from OGP

(10 to 50mm Diameter)					
HOLE DIA RANGE (mm)	Failure Frequencies				
	Full Releases	Limited Releases			
1 to 3	1.8E-04	1.6E-04			
3 to 10	6.8E-05	7.4E-05			
10 to 50	2.5E-05	3.6E-05			
TOTAL	2.8E-04	2.7E-04			

Table 11 - Failure Frequencies for Pressure Vessels from OGP

(50 to 150 mm Diameter)				
HOLE DIA RANGE (mm)	Failure Frequencies			
	Full Releases	Limited Releases		
1 to 3	3.9E-04	3.5E-04		
3 to 10	2.0E-04	2.0E-04		
10 to 50	1.0E-04	1.2E-04		
>50	5.1E-05	7.9E-05		
TOTAL	7.4E-04	7.4E-04		

Table 12 - Failure Frequencies for Pressure Vessels from OGP

(> 150 mm Diameter)

	Failure Frequencies		
HOLE DIA RANGE (mm)	Full Releases	Limited Releases	
1 to 3	3.9E-04	3.5E-04	

Quantitative Risk Assessment						
Assumption No: 05						
Subject: Parts Count and Failure Frequencies						
3 to 10	2.0E-04	2.0E-04				
10 to 50	1.0E-04	1.2E-04				
50 to 150	2.7E-05	3.7E-05				
>150	2.4E-05	4.2E-05				
TOTAL	7.4E-04	7.4E-04				

Table 13 - Failure Frequencies for Centrifugal Pump Inlets (50 to 150 mm Diameter)

	Failure Frequencies			
HOLE DIA RANGE (mm)	Full Releases	Limited Releases		
1 to 3	3.40E-03	1.30E-03		
3 to 10	1.00E-03	5.60E-04		
10 to 50	2.90E-04	2.40E-04		
>50	5.40E-05	8.30E-05		
TOTAL	4.80E-03	2.20E-03		

 Table 14 - Failure Frequencies for Centrifugal Pump Inlets

(> 150 mm Diameter)

	Failure Frequencies			
HOLE DIA RANGE (mm)	Full Releases	Limited Releases		
1 to 3	3.40E-03	1.30E-03		
3 to 10	1.00E-03	5.60E-04		
10 to 50	2.90E-04	2.40E-04		
50 to 150	3.90E-05	5.00E-05		
>150	1.50E-05	3.30E-05		
TOTAL	4.80E-03	2.20E-03		

Table 15 - Failure Frequencies for Filters Inlets from OGP

(50 to 150 mm Diameter)

	Failure Frequencies			
HOLE DIA RANGE (mm)	Full Releases	Limited Releases		
1 to 3	1.30E-03	5.10E-04		
3 to 10	5.10E-04	3.30E-04		
10 to 50	1.90E-04	2.30E-04		
>50	5.50E-05	2.10E-04		
TOTAL	2.10E-03	1.30E-03		

Failure Frequency for Storage Tanks

Table 16 - Failure Frequencies for Storage Tanks

Type of Tank	Type of Release	Leak Frequency Per year
Fixed/Floating roof	Leak	2.8E-03

Quantitative Risk Assessment						
Assumption No: 05						
Subject: Parts Count and Failure Frequencies						
	Catastrophic Rupture	3.0E-06				
Tank on Fire 9.0E-05						
Failure Frequency for Plate Heat Exchangers						
Table 17 – Failure Frequencies for Plate Heat Exchangers (50 to 150 mm diameter)						

Heat exchanger release frequencies (per heat exchanger year; inlets 50 to 150

mm dian	neter)
---------	--------

HOLE DIA RANGE (mm)	ALL RELEASES	FULL RELEASES	LIMITED	ZERO PRESSURE RELEASES
1 to 3	5.1E-03	3.9E-03	2.7E-03	0.0E+00
3 to 10	2.8E-03	2.0E-03	1.3E-03	0.0E+00
10 to 50	1.6E-03	1.1E-03	6.7E-04	0.0E+00
>50	9.9E-04	6.3E-04	3.2E-04	0.0E+00
TOTAL	1.0E-02	7.3E-03	5.0E-03	0.0E+00

Table 18 – Failure Frequencies for Plate Exchangers (>150 mm diameter)

Heat exchanger release frequencies (per heat exchanger year; inlets >150 mm

diameter)

HOLE DIA RANGE (mm)	ALL RELEASES	FULL RELEASES	RELEASES	ZERO PRESSURE RELEASES
1 to 3	5.1E-03	3.9E-03	2.7E-03	0.0E+00
3 to 10	2.8E-03	2.0E-03	1.3E-03	0.0E+00
10 to 50	1.6E-03	1.1E-03	6.7E-04	0.0E+00
50 to 150	4.8E-04	3.2E-04	1.7E-04	0.0E+00
>150	5.1E-04	3.1E-04	1.5E-04	0.0E+00
TOTAL	1.0E-02	7.3E-03	5.0E-03	0.0E+00

Leak Software:

DNV's leak frequency software model, LEAK v 3.3, is used to estimate the expected leak frequencies.

OGP Leak Frequencies are based on HCRD Failure Data 2006.

Leak software version 3.3 is inbuilt with HCRD failure data 2006 and is a simplified tool used to calculate failure frequencies for various isolatable segments.

The number and size of valves, flanges, instrument connections, and piping are input to the model, together with dimensions. Each of the failure frequencies thus calculated from Leak will be for a section, location/ area and release size.

Reference for Documentation:

- OGP, Risk Assessment Data Directory, Report No. 434-1, March -2010.
- OGP, Risk Assessment Data Directory, Report No. 434 -4, March -2010.

Assumption No: 06

Subject: Ignition Probability Data

OGP Data Base estimates the ignition probabilities based on 28 mathematical functions drawn from the UKOOA look-up correlation which relates ignition probabilities in air to release rate for typical scenarios both onshore and offshore.

The values presented in OGP relate to "total" ignition probability, which can be considered as the sum of the probability of immediate ignition and delayed ignition.



Table 19 - Total Ignition Probability from OGP

The IP review of ignition and explosion probabilities concludes that, there are too little data to draw any firm conclusions but that "risk assessment approaches based on 30:70 to 50:50

Assumption No: 06

Subject: Ignition Probability Data

split delayed ignition or jet / pool fire: flash fire / explosion are reasonable". Furthermore, it also identifies that, on average, approximately 20% of ignited gas releases result in explosions.

The proposed explosion probability rule set is therefore:

- 50% of all ignitions are immediate resulting in jet/pool fires (F);
- 20% of all ignitions result in explosion (PEX);
- The remainder (30%) of ignitions result in flash fires (1-F-PEX).

Based on the above, the ratio between P (immediate ignition) and P(delayed ignition) is estimated at 50:50. This estimate is supported by the joint industry Ignition Probability Review, which shows that approximately 50% of ignitions occur within a minute or so of the leak commencing.

The immediate ignition probability can be calculated as,

Pimmediate = Ptotal x 0.50, for plant areas where Ptotal is calculated from UKOOA look-up table

Reference for Documentation:

- ERM General Practice
- OGP Risk assessment Data Directory Ignition Probabilities, Report No. 434-6.1, March 2010.

Assumption No: 07

Subject: Meteorological Data

Meteorology:

The consequences of releases of flammable materials into the atmosphere are strongly dependent upon the rate at which the released material is diluted and dispersed to safe concentrations. The local meteorology is therefore important in two respects. First, the wind direction determines whether a release drifts towards or away from vulnerable locations. Second, the actual weather conditions, in terms of wind speed and stability, determines how quickly the plume disperses.

Variation in wind direction defines the apparent orientation of consequences. SAFETI accounts for the different wind directions from the wind distribution probability input and combine the values into the risk calculation. Atmospheric conditions, which include temperature and humidity, are also addressed. Stability classes were finalized as per Pasquill-Gifford Stability Classes as mentioned in CPQRA.

		Day Time			Night Time		
Surface Wind Speed, m/s	Strong	Moderate	Slight	<u>></u> 4/8 Low Cloud	< 4/8 Cloudiness	Heavy Overcast	
<2	А	A-B	В	E	F	D	
2-3	A-B	В	С	E	F	D	
3-4	В	B-C	С	D	E	D	
4-6	С	C-D	D	D	D	D	
>6	С	D	D	D	D	D	

Table 20 - Wind Speed and Pasquill Stability Class (as per CPQRA)

Meteorological Data

Table 21 - Meteorological Data of site

Parameter	Night conditions	Day Conditions
Temperature (°C)	19.6	34.3
Relative Humidity (%)	61	42
Solar Radiation (kW/m2)	0.5	0.5
Wind velocity (m/s)	1.5	3

Wind Rose Data - It is taken from the location Nanded, Maharashtra

Table 22 - Wind Rose Diagram

Wind Distribution	Direction percentage per						num		
	N	NE	E	SE	S	SW	W	NW	Calm
Night	3.00	5.00	3.00	3.00	3.00	15.00	20.00	9.00	39.00
Day	6.00	11.00	4.00	5.00	2.00	12.00	12.00	11.00	37.00

For consequence analysis the lowest wind speed of 1.5 m/s with Pasquill Stability Factor of F shall be considered to arrive conservative dispersion consequence results and average wind speed of 3 m/s with Pasquill Stability Factor of D shall also be considered for analysis.

Reference for Documentation:

Indian Meteorological Database (Year 1961 – 1990)

Assumption No: 08

Subject: Manning/Population Data

Population exposure is very critical for the estimate of the risk resulting from an incident.

For individual risk calculation, people expected to be affected by the hazard are grouped based on their work (e.g. operators, maintenance personnel etc.), which reflects a particular pattern of exposure to major accident hazards. For societal risk calculation, specific population areas are determined and the average number of inhabitants at each population area throughout the year is set as below:

1. Inside Population

S. No	Building Name	Populat	ion details
		Morning shift	Night Shift
1	Reactor and Solution Vessel Area including Hot water operation	3	3
2	Storage Tank Area including scrubber operation and Utility operation (Cooling tower and Chiller)	2	2
3	Blender area including Control Panel	7	7
4	Office	4	1
5	QA & Lab	5	2
6	Security Cabin	2	2
	Total	23	17

Reference for Documentation:

Client Data

Assumption No: 09

Subject: Event Trees

An Event Tree is used to develop the consequences of an event. An event tree is constructed by defining an initial event and the possible consequences that flow from this. The initial event is usually placed on the left and the branches are drawn to the right, each branch representing a different sequence of events and terminating in an outcome. Following Event Trees will be considered for this QRA:

1. Continuous, No Rainout



2. Continuous, with Rainout



QRA STUDY ASSUMPTION REGISTER – ACRYLIC ACID STORAGE TANKS – CHRYSO INDIA PVT. LTD Assumption Register



Assumption No: 10

Subject: Event Outcomes

This section details the possible consequences which may emanate upon loss of containment.

FLASH FIRE

A flash fire occurs when a cloud of vapours/gas burns without generating any significant overpressure. The combustion zone moves through the cloud away from the ignition point. The duration of flash fire is relatively short but it may stabilize as a continuous jet fire from the leak source. An approximate estimate for the extent of the total effect zone is the area over which the cloud is above the LFL.

POOL FIRE

Pool-fire calculations are then carried out as part of an accidental scenario, e.g. in case a hydrocarbon liquid leak from a vessel leads to the formation of an ignitable liquid pool. First no ignition is assumed, and pool evaporation and dispersion calculations are being carried out. Subsequently late pool fires (ignition following spreading of liquid pool) are considered. If the release is bunded, the diameter is given by the size of the bund. If there is no bund, then the diameter is that which corresponds with a minimum pool thickness, set by the type of surface on which the pool is spreading.

Vapour Cloud Explosion (VCE)

A VCE results from the delayed ignition of a flammable cloud formed due to the release of a large quantity of flammable vaporising liquid or gas which burns sufficiently quickly to generate high overpressures (i.e. pressures in excess of ambient). The flame accelerates to sufficiently high velocities to produce significant overpressure. The overpressure resulting from an explosion of hydrocarbon gases is estimated considering the explosive mass available to be the mass of hydrocarbon vapour between its lower and upper explosive limits.

Reference for Documentation:

Guidelines for Developing Quantitative Safety Risk Criteria, CCPS, Second Edition, 2000.

Assumption No: 11

Subject: Impact Criteria – Human Vulnerability

The damage criteria give the relation between extent of the physical effects (exposure) and the percentage of the people that will be killed or injured due to those effects. The knowledge about these relations depends strongly on the nature of the exposure. Physiological/physical effects of the thermal radiation for jet fire or pool fire scenarios and overpressure impact for vapour cloud explosion is discussed below in order to appreciate the damage effect produced.

Table 23 - Thermal Radiation Level Impact Criteria

Heat Radiation KW/m2	Damage to Equipment	Damage to People
4.0		Causes pain if duration is longer than 20 seconds. Blistering is unlikely.
12.5	Minimum energy to ignite wood with a flame; Melts plastic tubing.	First degree burns in ten seconds.1% Fatality in 20 sec, 30% Fatality in 30 seconds.
37.5	Severe damage to plant	100 % Fatality

Table 24 - Overpressure Impact Criteria

Overpressure Ranges (bar)	Mechanical Damage
0.35	Timber framed buildings become uninhabitable, plant items may be overturned, uplift of tanks (0.9 Tilted). There is a 50% chance of a fatality for a person in a building and 15% chance of a fatality for a person in the open. Eardrum damage.
0.21	Storage Tanks uplift (half tilted). Heavy machines (3000 lb) in industrial building suffered little damage; steel frame building distorted and pulled away from foundations,
0.14	Lower limit of serious structural damage, Control House or Substation concrete roof can collapse

Flash Fire:

LFL hazard distances will be reported. A fatality probability of 1 is considered within LFL .

Toxic Gas Release:

Emergency Response Planning Guidelines (ERPG) values shall be used for analysing the Toxic gas dispersion for Acrylic acid.

- ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.
- ERPG-2 is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.
- ERPG-1 is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odour.

Chemical (Cas No)	ERPG-1	ERPG-2	ERPG-3
Acrylic Acid (79-10-7)	1 ppm	50 ppm	250 ppm
Reference for Documentation:			
Reference for Documentation.			
Guidelines for Chemical Process Quanti	itative Risk Analysis	s, CCPS, 1989	
American Industrial Hygiene Associatio	n (AIHA) 2016.		

Assumption No: 12

Subject: Individual Risk Criteria

The level of risk calculated for employees and the general public is studied in two principal areas. Firstly, Individual Risk, which is the level of risk of fatality for specific people, usually defined as individuals within specific groups. The groups are defined by their activities in or around the facilities.

The second area is risk to society, which is a measure of the risk of fatality within the general public.

The process for calculating the levels of risk associated with the facility is:

- Calculate the Location Specific Individual Risk (LSIR) from Major Accident Hazard events using the QRA model
- Define the worker groups and groups of the general public (if any) by their location and movements within the effects zone of the facility
- Calculate Individual Risk figures as LSIR data
- Use the QRA model to calculate societal risk, F-N curve

In order to determine acceptability, the risk results are assessed against a set of risk criteria. The individual risk criteria adopted for this study is based on HSE UK Guideline and is presented below.





Assumption No: 13

Subject: Societal Risk Criteria





Number of Fatalities (N)

Figure 4 - FN Curve Acceptance Criteria for Workers

Gr	oup	Maximum Tolerable Intercept With N=1	Negligible Intercept With N=1	Maximum Tolerable Intercept With N=100	Negligible Intercept With N=100		
Wor	rkers	10-2	10-4	10-4	10 ⁻⁶		
Pu	ıblic	10-3	10 ⁻⁵	10 ⁻⁵	10 ⁻⁷		
Refe	Reference for Documentation:						

UK HSE Criteria

QRA STUDY ASSUMPTION REGISTER – ACRYLIC ACID STORAGE TANKS – CHRYSO INDIA PVT. LTD Assumption Register

Quantitative Risk Assessment

Assumption No: 14

Subject: Software & Database

DNVGL PHAST 8.22 will be used for the Consequence Modelling

DNVGL SAFETI 8.22 will be used for Risk Modelling

Leak v3.3 will be used to estimate Failure Frequency

Explosion Modelling:

In this QRA Study Multi-Energy Model will be used for explosion modelling.

Potential congestion areas will be defined at the plot plan based on the levels of congestion and confinement due to process and non-process units.

Reference for Documentation:

ERM General Practice.

Quantitative Risk Assessment Assumption No: 15 Subject: Report Structure The Structure of Main Report and Appendices is as below: Main Report: Main report will contain following information as a minimum: 1. QRA Executive Summary 2. Brief Facility Description 3. QRA Methodology 4. Inputs for QRA 5. Consequence Assessment 6. Risk Acceptance Criteria 7. Risk Assessment 8. Conclusion, Summary and Recommendations 9. References Following **Appendices** will be provided as a part of QRA Study Report as a minimum: 1. QRA Assumption Register 2. Detailed Consequence Results 3. Overall Plot Plan **Reference for Documentation:**

ERM General Practice.

ANNEXURE B – ISOLATABLE SECTION MARKUP



SS316

PLANT

BUILDING

THOMAS

PH-II

SS316

PLANT

BUILDING

THOMAS

PH-III

SS316

PLANT

BUILDING

THOMAS

PH-III

TYPE

BALL

VALVE

MOC

CS

END

CONN.

RATING

ASA150

SS316

PLANT

BUILDING

THOMAS

PH-II

MOC

LOCATION

SERVICE

MAKE/MFG

REMARKS

SS316

PLANT

UII DIN

THOMAS

PH-II

GURUKRUPA ENGO

SS316

PLANT

BUILDING

THOMAS

PH-III

PTFE

PLANT

BUII DING

THOMAS

DELLMECC

PH-II

PTFE

PLANT

PH-III

BUILDING

THOMAS

NO.

R-RESTAB

C-CHRYSO

ASA 150

2 ASA 300

3 ASA 800

1

SCALE

6	24.10).2019	REVISED AS	s per dis	SC. WITH	MR. AM ON 24.10.201	9	SIDDHANT	SS	PTB		
5	19.07	7.2019	REVISED AS	/ISED AS PER MAIL DATED 18.07.2019 SIDDHANT						PTB		
4	12.07	7.2019	REVISED AS	EVISED AS PER DISC. WITH MR. FB & MR. AM ON 09.07.2019				SIDDHANT	SS	PTB		
3	27.04	4.2019	REVISED A	EVISED AS PER DISC WITH MR. F.B. ON 03.04.2019			SIDDHANT	SS	PTB		٦	
2	30.03	3.2019	REVISED A	EVISED AS PER DISC WITH MR. A.M ON 28.03.2019				SIDDHANT	SS	PTB		
1	22.12	2.2018	REVISED /	ISED AS PER DISC ON 17.12.2018 SIDDHANT					SS	PTB		
0	14.12	2.2018	FOR STUD	DY & COM	MMENTS			SIDDHANT	SS	PTB		
REV.	DATE	-	DESCRIF	PTION				DRAWN	CHECKED	APPROVE	ED	
CLIEN	т		CHRYSO INDIA PVT LTD. E-72. ADDITIONAL PATALGANGA INDUSTRIAL AREA, TAL-KHOPOLI, DIST-RAIGAD EMAIL : -				6	3				
ENGIN CONS	ENGINEERING MULUND(W), MUMBAI-80 CONSULTANTS PH. NO 022, 25611291, 022, 25613136 ptbhusari@gmail.com				_	_						
				TITLE :	P&ID STO	FOR RAGE & TRA	NSFFR					
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ANNEXURE VII SITE LAYOUT PLAN

ANNEXURE VII

SITE LAYOUT PLAN



ANNEXURE VIII A TREES PLANTED AS PART OF GREENBELT PLANTATION

Greenbelt Development:

A Green belt of approx. more than 3000 m² is being developed in a plot OS-09 adjacent to west side of existing Plot E-72 of Chrsyo India Private Limited. Total area of plot-09 is 6925 m² area. Total 355 trees were planted in the spring of 2021. Approx. 12 m width was developed at the periphery of plot OS-09 for green belt plantation. Before starting the construction work, Chryso India Private Limited started plantation work for green belt all along the boundary of plot OS-09. The developed green belt acts as a buffer zone in plot OS-09.

The plants add beauty and act as sink for carbon dioxide and will reduce the physical impact outside the premises, in case of any on-site emergency.

A list of all the surviving plants in the green belt plantation around the Chryso India Private Limited site is appended below:

Sr. No.	Description of plants	Zone-1 (East Side)	Zone-2 (South Side)	Zone-3 (West Side)	Zone-4 (North Side)	Total
1	Areca Palm	35	10	35	20	100
2	Ashoka	35	10	35	20	100
3	Kadu Neem	6	4	6	4	20
4	Spathodia	3	1	4	2	10
5	Karanj	15	5	15	5	40
6	Peltoforam	6	4	6	4	20
7	Gulmohar	3	2	3	2	10
8	Raintree	3	2	3	2	10
9	Taman	3	2	3	2	10
10	Kanchan	6	4	6	4	20
11	Vad	3	2	3	2	10
12	Peepal	1	1	2	1	05
	Total	119	47	121	68	355

PLANTATION STATUS AS ON 5th JUNE 2021

Naturally growth of Trees (not planted by Chryso) - Jambool & Mango each 01.

ANNEXURE VIII B PHOTOGRAPHS OF THE PLANTATION

ANNEXURE VIII B – Photographs of Greenbelt





Plantation under progress in MIDDC Plot No. OS-9

ANNEXURE IX CER REPORT



CER Report for Chryso India Private Limited

Chryso India Private Limited

Draft Report

31 May 2021

Project No.: 0575970

www.erm.com



The business of sustainability

Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: Thistable must NOT be removed from this document.
Document title	CER Report for Chryso India Private Limited
Document subtitle	Draft Report
Project No.	0575970
Date	31 May 2021
Version	1.0
Author	ERM India Private Limited
Client Name	Chryso India Private Limited

Document	history					
				ERM approval to is		
Version	Revision	Author	Review ed by	Name	Date	Comments
Draft	1.0	Rashmi Dutta	Neetu Nigam	Debanjan Bandyopadhyay	31.05.2021	Text

Signature Page

31 May 202131 May 2021

CER Report for Chryso India Private Limited

Draft Report

Name: Debanjan Bandyopadhyay Job title: Partner In Charge Name Neetu Nigam Job title Principal Consultant

ERM India Private Limited

3rd Floor, Building.10B, DLF Cyber City Gurgaon, NCR – 122002 Telephone: +91 124 4170300

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1. CORPORATE ENVIRONMENTAL RESPONSIBILITY

1.1 **Project Context**

Chryso India Pvt. Ltd. is located at Plot No, E-72, Maharashtra Industrial Development Corporation (MIDC) Additional Patalganga village Karade (Budruk), Taluka Panvel of District Raigad in the state of Maharashtra. Company has an operational unit having capacity of 60,000 metric tons per month (MT/M) of Cement Admix and Cement Grinding Aid (through blending and mixing activity only) which falls under Micro, Small & Medium Enterprises (MSME) category. The current operations does not fall under EIA Notification, 2006 and Environment Clearance (EC) was not required.

Now the company proposes for expansion of manufacturing facility in the same premises within the existing shed to manufacture one of its current key raw material namely acrylic co-polymer. The proposed activity falls under item no. 5f (B category) of schedule of EIA Notification, 2006, as amended and required Environmental Clearance (EC) from Ministry of Environment, Forest and Climate Change (MoEF&CC). Accordingly, Chryso has received EC from MoEF&CC via F.No. IA-J-11011/253/2019-IA(II)I dated 14th July 2020.

As per compliance condition (X) of the EC letter, at least 2.5% of the Project Cost shall be allocated towards Corporate Environment Responsibility (CER) and the CER amount shall be spent within a period of three (03) years in the nearby villages as per the socio economic study.

In order to comply with the EC condition, Chryso had carried out a need based assessment study in the nearby villages and prepared a draft CER plan (this report).

1.2 stakeholder interaction

The key stakeholders identified for the decision making of the CER activities includes

District Collector (DC), Raigad;

Maharashtra Industrial Development Corporation (MIDC), Patalganga;

Gram Panchayat of nearby villages- Karade Khurd and Karade Budruk; and

Local community.

A meeting with District Collector, Raigad and MIDC, Patalganga division was undertaken on 1st December 2020. The purpose of these meetings were two folds - to discuss the present socioeconomic status in the nearby villages and seeking suggestion on the activities that can be included in CER plan. Following focus areas were suggested for CER activities:

Government primary schools; and

Education and health & sanitization.

2. NEED ASSESSMENT STUDY

This section outlines the details of need assessment study conducted in the nearby villages with focus on government primary schools.

2.1 Selection of Villages

The Project land primarily belongs to village Karade (Budruk) located at ~750 m aerial distance in east direction of Project site. Another village present in the vicinity of Project site is Karade Khurd, located at ~400 m aerial distance in west direction of Project site. Hence, these two village were selected for carrying out the need assessment study.

Figure 2.1 Map showing locations of Villages selected for Need Assessment Study



2.2 Site Visit

A site visit was undertaken to the government primary schools in Karade Khurd and Karade Budruk villages on 11th December 2020. Consultations were held with available school staff – principal and teachers. Concerns/issues raised by school staff during interaction are listed in table below.

S. No.	Karade Khurd	Karade Budruk
Α.	School Features	
1.	Name of School- Government Zila	Name of School- Ananddai Government Zila Parishad
	Parishad School, Karade Khurd, Tal.	School, Karade Budruk, Tal. Panvel, District Raigad.
	Panvel, District Raigad.	
2.	The school is up to 4th standard .	The school is up to 7th standard .
3.	The school has three ground level small	The school has two buildings- one double storey building
	buildings.	and one ground level building.
4.	The school has a village temple and a	The school has a village temple present between the two
	village pond adjacent to it.	buildings of the school.
5.	One building of school was new ly	Tw o Companies, viz. Cipla Limited and Balaji Formalin
	constructed by Gram Panchayat under 14 th	Pvt. Ltd. had provided grant to the double storey school
	Finance Commission Grant during FY 2019-	building in year 2009 and 2017 respectively and this
	2020.	building was in good shape.
B.	Key Observations	

Table 2.1	Summary	of Consultations	during Need Assessmen	t Study
-----------	---------	------------------	-----------------------	---------
S. No.	Karade Khurd	Karade Budruk		
--------	--	---		
1.	The <i>fencing</i> of the school is damaged. The	Damaged and dirty toilets - as reported by female		
	school has a village pond adjacent to the	teacher, condition of toilets was that bad that girls don't		
	school and broken fencing impose safety	use the toilets and in case of need go back home.		
	risks to the students.			
2.	The toilet doors were damaged and toilets	Kutcha classrooms and broken roofs – as reported by		
	w ere dirty.	teachers that during monsoon, it becomes difficult to take		
		class in the classrooms.		
3.	The ground surface of the school was	It was also reported that students are leaving school		
	kutcha with uneven levels.	because of lack of required infrastructure.		
4.	There were no sport infrastructure in the	The sport infrastructure in the ground was in bad shape.		
	school ground.			

Source: Observations during site visit

Figure 2.2 Photographs of Primary Schools visited during Need Assessment Study

Karade Khurd	
View of toilets	View of damaged fencing
View of the pond adjacent to the school	View of the uneven ground surface with
Karada Budruk	DIOKEN LIIES
Narade Budruk	



2.3 Identified Areas of Improvement

Based on the initial need assessment (site visit and discussion with school staff), following areas were identified for improvement in the two government schools in the villages visited during need assessment study.

S. No	Name of School Village	Identified Areas for Improvement
1	Karade Khurd	 Renovation of toilets Sanitization material Fencing of school Beautification of pond Sport infrastructure
2	Karade Budruk	 Renovation of toilets with water facility Renovation of classrooms Sanitization material Sport infrastructure

Table 2.2 I dentified Areas for Improvement

2.4 Proposed CER Activities

For better utilization of the CER fund, and to serve better, it has been proposed that CER budget would be utilized for improving the infrastructure of the school building in village Karade Budruk. It is also to be noted, that the industry/Project lies in the ambit of administrative boundary of Kharade Budruk. Proposed CER activities are presented in Table below.

S. No	Name of School	Proposed CER Activities		
1	Ananddai Government Zila Parishad School,, Karade Budruk	 Renovation of toilets with provision water facility Renovation of classrooms Sanitization material 		

Table 2.3 **Proposed CER Activities**

2.5 **Budget Allocation and Timeline**

As mentioned in Section 1.1, mandatory budget allocation for CER is 2.5% of the Project Cost (7.8 Crores) which comes out to be 19.5 Lakhs.

Timelines and Budget 2.5.1

As per EC compliance condition, CER budget is to be spend in a period of 3 years. Proposed timeline is as presented below.

Table 2.4	Financial year wise CER fund allocation	

S. No	Financial Year	Proposed CER budget (Lakh)
1.	FY 2021-2022	*
2.	FY 2022-2023	11
3.	FY 2023- 2024	8.5
Total Amount		19.5

* Fund allocated for year 2021-2022 was not utilized because of COVID pandemic.

3. CER IMPLEMENTATION

3.1 Selection of Implementation Agencies

Contractor for undertaking work proposed under CER will be engaged by the Project Proponent directly. CER implementation work will be undertaken in coordination with school management, MIDC Patalganga and Gram Panchayat, as required.

3.2 Monitoring

Chryso, Head Office and Patalganga site management will monitor progress of CER activity, annually.

3.3 **Reporting**

Report on progress of CER activities will be submitted to following government agencies:

Ministry of Environment & Forest and Climate Change (MOEF&CC), Maharashtra Pollution Control Board (MPCB) and Environment Department of Maharashtra as a part six monthly EC compliance report; and

District Collector, Raigad on annual basis.

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ERM India Private Limited

3rd Floor, Building.10B, DLF Cyber City Gurgaon, NCR – 122002 Telephone: +91 124 4170300

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ANNEXURE X FIRE FIGHTING PROVISION IN CHRYSO, PATALGANGA UNIT

ANNEXURE X

Fire Fighting System Details

We, **Chryso India Private Limited**, Plot No. E-72, Additional Patalganga Industrial Area, Karade Budruk, Taluka Panvel, District Raigad-410220. have well maintained firefighting system as per TAC, IS 13039 and as required under the provision of the Maharashtra Fire Prevention and Life Measures Act, 2006 (Mah. Sub-rule (3) of rule 4 – 2009). Maintenance is carried out an approved agency M/s Sai Industries, Mumbai.

The details of firefighting system are as follows:

- 1. Three nos. of firefighting pumps which include Jockey pump, Main Electrical Pump & Diesel Pump which is in Auto-mode.
- 2. Fire hydrant points, hydrant hose reel, fire alarm system with manual call point, smoke detectors, heat detectors, beam detectors, different types of fire extinguishers, etc. are in good & operational conditions.

Sr. No.	Item Description	Quantity
1	Main Hydrant Pump, 50 HP, Make : Kirloskar (1800 LPM & 70 m Head)	01 No.
2	Diesel Engine Pump, 50 HP, Make : Kirloskar (1800 LPM & 70 m Head)	01 No.
3	Hydrant Jockey Pump, 10 HP, Make : Kirloskar (180 LPM & 70 m Head)	01 No.
4	Fire Hydrant Panel	01 No.
5	Fire hydrant Points	10 Nos.
6	Hydrant Hose Reel (Plant and office)	11 Nos.
7	Single Door Hose Box	10 Nos.
8	RRL Canvas Hose Pipe	10 Nos.
9	01 Loop Addressable Fire Alarm Panel	01 No.
10	Addressable Heat Detector (Office)	01 No.
11	Addressable Smoke Detector (Office, Lab, transformer room, Control	15 Nos.
	room and MCC & PCC room)	
12	Addressable Multi Detector	06 Nos.
13	Addressable Manual Call Point (Inside plant)	06 Nos.
14	Convectional Flasher Hooter (Inside plant)	06 Nos.
15	ABC Type Fire Extinguisher 04 kgs capacity (Inside plant)	02 Nos.
16	ABC Type Fire Extinguisher 06 kgs capacity (Inside plant)	13 Nos.
17	CO2 Type Fire Extinguisher 4.5 kgs capacity (Inside plant near to electric equipment)	09 Nos.
18	Mechanical Foam Type Fire Extinguisher 50 Itrs capacity (Storage tank area)	02 Nos.
19	Mechanical Foam Type Fire Extinguisher 9 Itrs capacity (Storage tank area)	02 Nos
20	Clean Agent Type Fire Extinguisher 06 kgs capacity	01 No.
21	Four Way Fire Brigade Inlet (At main entrance and exit gate)	02 Nos.
22	Foam Sprinkler system for Thomas storage Tank area (Automatic with	01 No.
	Deluge Valve with foam tank capacity of 300 ltr)	
23	Automatic Water Sprinkler system For Hot Water Room	01 No
24	Beam Detector (Inside plant at storage rack and storage tank area)	04 Nos.
25	Foam Trolley – 120 Itrs capacity (Hot water room)	01 No.
26	Sand Bucket (Outside plant)	12 No

Environmental Monitoring Report

Environmental monitoring was carried out in and around Chryso facility to understand the environmental performance of the facility and quality of the ambient environment. The scope of the environmental monitoring is provided in *Table 1.1*.

Sr.No.	Environmental Attribute	No. of	Frequency	Limits/standards	Remarks
		Locations			
1	Ambient Air Quality	-			
	PM10	3	24 hourly, twice a	100 µg/m3	Ambient Air
	PM2.5		week for one	60 µg/m3	Quality (AAQ)
	Oxides of Nitrogen (NOx)		week on quarterly	80 µg/m3	monitoring will
	Sulphur dioxide (SO2)		basis	80 µg/m3	be conducted in
					and around the
				00 / 0	project site.
	Carbon monoxide (CO)	3	8 hourly, twice a	02 mg/m3	
			week for one		
			week on quarterly		
			Dasis		
	Ozone			100 µg/m3	
	Lead	1	24 hourly, twice a	1 µg/m3	
	Ammonia	1	week for one	400 µg/m3	
	Benzene	1	week once a year	5 µg/m3	
	Benzo-α-Pyrene	1		1 µg/m3	
	Arsenic	1		6 ng/m3	
	Nickel	1		20 ng/m3	
2	Soil Quality			[
	Particle size distribution,	2	On six monthly	No Indian	Soil samples
	texture, pH, electrical		basis	standards	will be collected
	conductivity, cation			available.	from in and
	exchange capacity,				around the
	Sodium Absorption Ratio				project site.
	(SAR), permeability, water				
	holding capacity, porosity,				
	phoenbates alkali metals				
	heavy metals				
3	Noise Levels	3	On six monthly	Industrial area -	Noise levels will
U		0	basis	75 dB(A)	be monitored on
				Commercial Area	hourly basis for
				- 65 dB(A)	24 hours using
				Residential Area -	continuous
				55 dB(A)	noise
				Silence Zone 50	monitoring
				dB(A)	equipment in
					and around the
					project site.
4	DG set monitoring				

Table 1.1 Environmental Monitoring Plan

		r			
Sr.No.	Environmental Attribute	No. of	Frequency	Limits/standards	Remarks
		Locations	-		
	SO ₂	Stack of 1 X	Once on a	30.13 kg/day	Stack of DG set
		250 kVA DG	quarterly basis		should be
		sets			properly
					secured,
					access to the
					stacks must be
					present,
					monitoring port
					should be
					present
	Noise level with and		Once on a	Insertion loss of	Spot noise
	without acoustic enclosure		quarterly basis	25 dB(A) and	monitoring.
				more	Once in every
					quarter.
5	STP	Outlet point	On six monthly	>100 mg/l	
	Suspended Solids	-	basis	>100 mg/l	
	BOD (3 days at 27°C)				
6	ETP				
	pН	Inlet and	Before	>5.5	At the inlet and
	Suspended Solids	Outlet point	discharging	>100 mg/l	outlet/discharge
	BOD (3 days at 27°C)			>100 mg/l	point after
	COD			>250 mg/l	treatment
	Oil and grease			>10 mg/l	
	TDS			>2100 mg/l	
	Sulphates			>1000 mg/l	
	Chlorides			>600 mg/l	
7	Surface water bodies				
	pH, DO, BOD, Free	2	On six monthly	CPCB Guideline	Surface water
	Ammonia, Electrical		basis	for Designated	samples will be
	Conductivity, Sodium			best use of	collected from in
	absorption ratio, Boron,			surface water	and around the
	Faecal coliform, Total			attached herewith	project site.
	faecal coliforms				

The environmental monitoring was carried out in 1st week of October 2023 by a MoEFCC recognized laboratory. The environmental monitoring location map is provided in *Figure 1*.



Figure 1. Environmental Monitoring Location Map

Results of Environmental Monitoring

A summary of the results of the environmental monitoring is summarized below and the results in details are provided in the subsequent sections.

Ambient Air

All the 12 parameters monitored in the ambient air for two consecutive days (04/10/2023 and 05/10/2023) at 3 locations (near tanker loading area, near main gate and near ETP) were analysed. The result of the parameters monitored has been discussed in context of compliance to National Ambient Air Quality Standards (NAAQS)¹ and the results were discussed below:

- PM₁₀: The average concentration of PM₁₀ in the monitoring stations ranged between 56.59 and 61.24 μg/m³. The average concentration of PM₁₀ values at all stations were found to be in compliance to the NAAQS value of 100 μg/m³.
- PM_{2.5}: The average concentration of PM_{2.5} in the monitoring stations ranged between 24.89 and 28.47 μg/m³. The average concentration of PM_{2.5} values at all stations were found to be in compliance to the NAAQS value of 60 μg/m³.
- SO₂: The average concentration of SO₂ in the monitoring stations ranged between 21.92 and 26.88 μg/m³. The average concentration of SO₂ values at all stations were found to be in compliance to the NAAQS value of 80 μg/m³.
- NO₂: The average concentration of NO₂ in the monitoring stations ranged between 29.51 and 35.14 µg/m³. The average concentration of NO₂ values at all stations were found to be in compliance to the NAAQS value of 80 µg/m³.
- CO: The 8-hour average concentration of CO in the monitoring stations ranged between 0.9 and 1.05 mg/m³. The average concentration of CO values at all stations were found to be in compliance to the NAAQS value of 2 mg/m³.
- Lead: The average concentration of lead in the monitoring stations ranged between 0.08 and 0.1 μg/m³. The average concentration of lead values at all stations were found to be in compliance to the NAAQS value of 1 μg/m³.
- Ozone: The 8-hour average concentration of ozone in the monitoring stations ranged between 11.02 and 11.8 µg/m³. The average concentration of ozone values at all stations were found to be in compliance to the NAAQS value of 100 µg/m³.
- Ammonia: The average concentration of ammonia in the monitoring stations ranged between 13.08 and 16.19 μg/m³. The average concentration of ammonia values at all stations were found to be in compliance to the NAAQS value of 400 μg/m³.
- Benzene: The average concentration of benzene in all the monitoring stations were found to be below the limit of detection.
- Benzo Pyrene: The average concentration of Benzo Pyrene in all the monitoring stations were found to be below the limit of detection.
- Arsenic: The average concentration of arsenic in all the monitoring stations were found to be below the limit of detection.
- Nickel: The average concentration of nickel in the monitoring stations ranged between 7.13 and 9.16 μg/m³. The average concentration of nickel values at all stations were found to be in compliance to the NAAQS value of 20 μg/m³.

Average values of all the air parameters in all the monitoring stations were found to be within the limits of NAAQS.

¹ http://www.moef.nic.in/sites/default/files/notification/Recved%20national.pdf

Stack Emissions from DG sets

Suspended Particulate Matter, Sulfur Dioxide and Oxides of Nitrogen was measured from stack emissions from two Diesel Generator sets of 250 KVA each. The results of the stack emissions are given below:

- Suspended Particulate Matter (SPM): The SPM concentration from stack emission were 28.3 and 33.7 mg/Nm³ which were found to be in compliance to the MPCB and CTO value of 150 mg/Nm³.
- Sulphur Dioxide (SO₂): The SO₂ concentration from stack emission were 0.46 kg/day or 114.8 and 0.48 kg/day or 122.3 mg/Nm³ which were found to be in compliance to the MPCB value of 2.40 kg/day.
- NOx: The NOx concentration from stack emission were 32.5 and 33.6 mg/Nm³.

Stack Emissions from Hot Water Stack

Suspended Particulate Matter, Sulfur Dioxide and Oxides of Nitrogen was measured from Hot Water Stack. The result of the emission from Hot Water Stack is given below:

- Suspended Particulate Matter (SPM): The SPM concentration from Hot Water Stack emission was 24.8 mg/Nm³ which was found to be in compliance to the MPCB and CTO value of 150 mg/Nm³.
- Sulphur Dioxide (SO₂): The SO₂ concentration from Hot Water Stack was 1.58 kg/day or 69.7 mg/Nm³ which was found to be in compliance to the MPCB value of 30.13 kg/day.
- NOx: The NOx concentration from stack emission was 31.4 mg/Nm³.

Scrubber Emissions

The result of the acid mist from scrubber emission is given below:

 Acid Mist: The acid mist from scrubber emission was 3.9 mg/Nm³ which was found to be in compliance to the MPCB of 35 mg/Nm³.

Ambient and Work Place Noise levels

Ambient and work place noise level was measured during day time and night time on 04/10/2023. The ambient noise level was monitored at four cardinal directions at the periphery of the facility. It was observed that the ambient noise levels ranged between 59.6 dB(A) and 62.3 dB(A) during daytime and between 52.5 dB(A) and 55.2 dB(A) at night time.

Work place noise was measured at shop floor area and near Effluent Treatment Plant (ETP). The noise level at the work place ranged between 65 and 66.4 at daytime and 56.9 dB(A) and 59.2 dB(A) at night time. The work place noise were found to be complying with the daytime and nighttime noise limit of MPCB.

Insertion loss due to acoustic enclosure on DG set

The insertion loss due to acoustic enclosure on 2 X 250 KVA DG sets ranged between 25.5 dB(A) to 26.1 dB(A).

Soil Quality

Physical and few chemical parameters of the soil sampled from two locations within the facility was sampled and analysed. Since the soil quality is not used for agricultural activities the soil quality was not inferred with respect to soil fertility. The results of the primary soil monitoring are discussed below:

<u>pH</u>: Soil acidity has a correlation with the availability of nutrients in terms of their deficiency and toxicity. A soil having pH less than 6.5 is considered as acidic. The pH of the soil samples was found to be varying from slightly alkaline to neutral as the pH values were 7.28 and 7.34.

 <u>Texture and Electrical Conductivity</u>: Texture is an expression to indicate the coarseness or fineness of the soil as determined by the relative proportion of the various sized primary particles in the soil mass. The textures of the collected soil samples were found to be silt clay.

The EC values of the soil samples were 121.6 and 123.5 μ s/cm. For a productive soil, the electrical conductance (EC) should be < 1000 μ s/cm.

- <u>Bulk Density</u>: The bulk density of the soil samples were 0.969 and 0.974 gm/ml. Bulk density must be less than 1.5 gm/cc for optimal movement of air and water².
- <u>Water holding capacity and CEC</u>: Water holding capacity of the soil samples are 52.6% and 55.4% respectively and CEC values of the soil samples are 8.4% and 8.8% respectively.
- <u>Nitrate and Phosphate</u>: Nitrate values of the soil samples are 2.4 and 2.7 mg/kg and Phosphate values of the soil samples are 0.00060% and 0.00063%.
- Sodium Adsorption Ration (as SAR): Sodium Adsorption Ratio (SAR) values of the soil indicate the sodicity hazard of soil. The presence of high levels of exchangeable sodium in the soil may possibly cause dispersion of soil particles which lead to the replacement of calcium and magnesium (major cations) adsorbed in the soil. It affects the soil through deterioration of soil structures and water infiltration properties.

SAR of the soil samples are 0.59 to 0.63 i.e. below 6, which is considered to be suitable for irrigation³.

<u>Metals:</u> Heavy metals such as Copper (2.123 and 2.336 mg/kg), Lead (0.317 and 0.321 mg/kg), Zinc (7.4 and 7.7 mg/kg) and Total Chromium (1.264 and 1.321 mg/kg) were detectable in the soil of the study area. Cadmium (<0.001 mg/kg) and Mercury (<0.001mg/kg) concentrations were found to be below detectable limit. The concentration of all the heavy metals in the soil samples were much below the soil remediation intervention values specified in Dutch Soil Remediation Circular.</p>

Surface water

Grab samples were collected from Shree Garmata Aai Mandir Lake Karade Khurd and from Patalganga River. The results of the primary surface water monitoring are discussed below:

- pH The pH value of the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 7.80 and 7.43 respectively.
- Dissolved Oxygen (DO)–DO concentrations of the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 1.9 and <1 mg/l respectively.
- Biochemical Oxygen Demand (BOD) The concentration of BOD of the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 15 and 24 mg/l respectively.
- Electrical Conductivity Electrical Conductivity values of the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 453 and 318 µs/cm respectively.
- Ammonia The concentration of Ammonia of the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 0.9 and 6.86 mg/l respectively.

² Hunt, N. and Gilkes, B. (1992) Farm Monitoring Handbook.

³ http://iv.ucdavis.edu/files/24409.pdf

- Sodium Absorption Ratio (SAR) Sodium absorption ratio for the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 1.94 and 1.82.
- Boron- Boron concentrations of the water samples collected from Shree Garmata Aai Mandir Lake Karade Khurd and Patalganga River were 0.35 and 0.17 mg/l respectively.
- Coliform bacteria–the load of Fecal coliform was lowest in Shree Garmata Aai Mandir Lake Karade Khurd i.e. 7.8 MPN/100 ml and highest in the Patalganga River i.e. 13 MPN/100 ml.

A comparison with the limits specified in the designated best use water quality criteria by CPCB suggests that the surface water sample collected from Gavdevi Lake can be classified as Class D i.e. propagation of Wild life and Fisheries. water can be used for Irrigation, Industrial Cooling, Controlled Waste disposal (Class E of Designated Best Use Category of CPCB).

Wastewater Discharges

STP

The result of the sewage water monitoring is discussed below:

- pH The pH value of the sewage water sample was 7.12.
- Biochemical Oxygen Demand (BOD) The concentration of BOD (3 day) in the sewage water sample was 24 mg/l which is lower than the MPCB limit of 100 mg/l and also within the CTO limit of 30 mg/l.
- Suspended Solids at 105 °C (SS) suspended solids in the sewage water sample was 15 mg/l which is lower than the MPCB limit of 100 mg/l.

ETP

Raw water sample in the ETP was collected for analysis. The result of the raw water sample is discussed below:

- pH The pH value of the raw water sample was 6.59
- Biochemical Oxygen Demand (BOD) The concentration of BOD (3 day) in the raw water sample was 39000 mg/l.
- Chemical Oxygen Demand (COD) The concentration of COD in the raw water sample was 116368 mg/l.
- Total Suspended Solids at 105 °C (TSS) TSS in the raw water sample was 98 mg/l.
- Total Dissolved Solids at 180 °C (TDS) TDS in the raw water sample was 8411 mg/l.
- Oil & Grease oil & grease in the raw water sample was 7 mg/l.
- Chloride Chloride concentration in the raw water sample was 849.87 mg/l.
- Sulphates Sulphates concentration in the raw water sample was 3150 mg/l.

Water sample after treatment in the ETP was collected for analysis. The result of the treated water monitoring is discussed below:

- pH The pH value of the treated ETP sample was 3.80 which is complying with the MPCB pH.
- Biochemical Oxygen Demand (BOD) The concentration of BOD (3 day) in the treated ETP sample were 11400 mg/l which is higher than the MPCB limit of 100 mg/l.
- Chemical Oxygen Demand (BOD) The concentration of COD in the treated ETP sample were 34079 mg/l which is higher than the MPCB limit of 250 mg/l.
- Total Suspended Solids at 105 °C (TSS) TSS in the treated ETP sample was 26 mg/l which is lower than the MPCB limit of 100 mg/l.
- Total Dissolved Solids at 180 °C (TDS) TDS in the treated ETP sample was 7819 mg/l which is higher than the MPCB limit of 2100 mg/l.
- Oil & Grease oil & grease in the treated ETP sample was <0.1 mg/l which is lower than the MPCB limit of 10 mg/l.

- Chloride Chloride concentration in the treated ETP sample was 3834.53 mg/l which is higher than the MPCB limit of 600 mg/l.
- Sulphates Sulphates concentration in the treated ETP sample was 38 mg/l which is lower than the MPCB limit of 1000 mg/l.



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TEST REPORT

Doc No : GLPL/QF/7.8/02

Test Report No.	GA/23/10	/85 Test Reg	oort Date	11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA INDUSTRIAL AREA, KARADE BUDRUK, TALUKA PANVEL, DIST RAIGAD - 410 220.			RIAL AREA, 0 - 410 220.
Letter Ref / Date	- Page No. 1 c			1 of 1
Sampling Done By	GLPL	Sample Received on	06	/10/2023
Sampling Plan	GLPL/QF/7.3/06	07/10/202	3 To 09/10/2023	

SAMPLING DETAILS - STACK EMISSION

Stack Attached to	D. G. Set No. 1 250 KVA
Stack Dimension [mm]	100
Date of Sample collection	04/10/2023
Time of Sampling [Hrs]	12:40
Temperature of flue gas [°C]	142
Average flue gas velocity [m/s]	8,3
Average volume of flue gas discharged [Nm³/hr]	168

ANALYSIS REPORT :

Parameters	Units	Results	M.P.C.B. Limits	Sampling & Analysis Methods	
TPM / SPM	mg/Nm ³	33,7	150.0	IS 11255 (Part I) 1985	
0.000	mg/Nm ³	114.8			
Sulphur Dioxide	Kg/day	0.46	2.40	IS 11255 (Part II) 1985	
NOx	mg/Nm ³	33.6	Not Specified	IS 11255 (Part VII) 2005	

End

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/02

Test Report No.	GA/23/10/86 Test		eport Date	11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA INDUSTRIAL AI KARADE BUDRUK, TALUKA PANVEL, DIST RAIGAD - 410			
Letter Ref / Date	Page No.			of 1
Sampling Done By	GLPL Sample Received or		06/	10/2023
Sampling Plan	GLPL/OE/7 3/06	Applysic Period	07/10/2023	Te 00/40/0000

SAMPLING DETAILS - STACK EMISSION

Stack Attached to	D. G. Set No. 2 250 KVA		
Stack Dimension [mm]	100		
Date of Sample collection	04/10/2023		
Time of Sampling [Hrs]	13:20		
Temperature of flue gas [°C]	148		
Average flue gas velocity [m/s]	8.2		
Average volume of flue gas discharged [Nm3/hr]	165		

ANALYSIS REPORT :

Parameters	Units	Results	M.P.C.B. Limits	Sampling & Analysis Methods	
TPM / SPM	mg/Nm ³	28.3	150.0	IS 11255 (Part I) 1985	
Sulphur Dioxide	mg/Nm ³	122.3		IS 11255 (Part II) 1985	
	Kg/day	0.48	2.40		
NOx	mg/Nm ³	32.5	Not Specified	IS 11255 (Part VII) 2005	

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TEST REPORT

Doc.No : GLPL/QF/7.8/02

Test Report No.	GA/23/10	187 Test Rep	oort Date	11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA INDUSTRIAL ARI KARADE BUDRUK, TALUKA PANVEL, DIST RAIGAD - 410 2			
Letter Ref / Date	- Page No.			1 of 1
Sampling Done By	GLPL Sample Received on		06	10/2023
Sampling Plan	GLPL/QF/7.3/06	Analysis Period	07/10/2023	3 To 09/10/2023

SAMPLING DETAILS - STACK EMISSION

Stack Attached to	Hot Water Stack - Revomax	
Stack Dimension [mm]	300	
Date of Sample collection	04/10/2023	
Time of Sampling [Hrs]	11:10	
Temperature of flue gas ["C]	71	
Average flue gas velocity [m/s]	4.3	
Average volume of flue gas discharged [Nm ³ /hr]	948	

ANALYSIS REPORT :

Parameters	Units	Results	M.P.C.B. Limits	Sampling & Analysis Methods	
TPM / SPM	mg/Nm ³	24.8	150.0	IS 11255 (Part I) 1985	
Sulphur Dioxide	mg/Nm ³	69.7		IS 11255 (Part II) 1985	
	Kg/day	1.58	30.13		
NOx	mg/Nm ³	31.4	Not Specified	IS 11255 (Part VII) 2005	

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TEST REPORT

Doc.No: GLPL/QF/7.8/02

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GA/23/10/	88 Test Report I	Date 11/10/2023	
M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA INDUSTRIAL A KARADE BUDRUK, TALUKA PANVEL, DIST RAIGAD - 410			
- Page No.		1 of 1	
GLPL	Sample Received on	06/10/2023	
GLPL/QF/7.3/06	Analysis Period	07/10/2023	
	GA/23/10/ M/S. CHRYSO INDIA PLOT NO. E-72, AD KARADE BUDRUK, GLPL GLPL GLPL/QF/7.3/06	GA/23/10/88 Test Report Of M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA IN KARADE BUDRUK, TALUKA PANVEL, DIST F — Page No. GLPL Sample Received on GLPL/QF/7.3/06 Analysis Period	

SAMPLING DETAILS - SCRUBBER EMISSION

Stack Attached to	Scrubber		
Stack Dimension [mm]	250		
Date of Sample collection	04/10/2023		
Time of Sampling [Hrs,]	11:50		
Temperature of flue gas ["C]	34		
Average flue gas velocity [m/s]	3.3		
Average volume of flue gas discharged [Nm³/hr]	566		

ANALYSIS REPORT :

Parameters	Units	Results	M.P.C.B. Limits	Sampling & Analysis Methods
Acid Mist	mg/Nm ³	3.9	35.0	GLPL/SOP/SE/10 : 2014

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TEST REPORT

Doc.No : GLPL/OF/7,8/03

Test Report No.	GA/23/10	/89 Test Re	port Date	11/10/2023		
Customer Name and Address	M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA INDUSTRIAL AREA, KARADE BUDRUK, TALUKA PANVEL, DIST RAIGAD - 410 220.					
Letter Ref / Date	Page No. 1 of 1					
Sampling Done By	GLPL Sample Received o		06/	10/2023		
Sampling Plan	GLPL/QF/7.3/06	Analysis Period	07/10/2023	To 11/10/202:		

SAMPLING DETAILS - AMBIENT AIR MONITORING :-

Sampling Location	Near Main Gate Area				
Date of Sampling	04/10/2023				
Time of Sampling (Hrs)	10:20				
Duration of Sampling [Hrs]	24				
Ambient Temperature [°C]	Min. 25		Max.	34	
Relative Humidity [%]	Min.	45	Max.	78	
Latilude	N - 18"52'35"	Long	itude	E-73'09'49'	

ANALYSIS REPORT :-

Parameters	Unit	Results	N.A.A.Q.S.	Sampling & Analysis Methods
PMio	µg/m³	60.21	100.0	1S 5182 (Part XXIII) 2006
PM2.6	µg/m³	27.33	60.0	IS 5182 (Part XXIV) 2019
SO;	µg/m ³	28.55	80.0	IS 6182 (Part II) 2001
NO ₂	µg/m ³	36:29	80.0	IS 5182 (Part VI) 2000
CO	mg/m ³	1,14	2.0 for 8 Hrs.	IS 5182 (Part X) 1999
Lead	µg/m ³	0.12	1.0	IS 5182 (Parl XXII) 2004
Ozone	µg/m ³	12.91	100.0 for 8 Hrs.	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 411 2016
Ammonia	hð\w ₃	17.75	400.0	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 401 2016
Benzene	µg/m ³	< 1.0	5.0	IS 5182 (Part XI) 2006
Benzo Pyrene	ng/m ³	< 0.1	1.0	IS 5182 (Part XII):2004
Arsenic	ng/m ³	< 0.4	6.0	IS 5182 (Part XXII) 2004
Nickel	ng/m²	7.76	20.0	IS 5182 (Part XXVI) 2020

*N.A.A.Q.S. - National Ambient Air Quality Standards

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/03

Test Report No.	GA/23/10/	90 Test Rep	ort Date	11/10/2023	
Customer Name and Address	M/S. CHRYSO INDIA P PLOT NO. E-72, ADD BUDRUK, TALUKA P/	NDIA PRIVATE LIMITED , ADDITIONAL PATALGANGA INDUSTRIAL AREA, H KA PANVEL, DIST RAIGAD - 410 220.			
Letter Ref / Date		- Page No. 1			
Sampling Done By	GLPL	Sample Received on	DE	/10/2023	
Sampling Plan	GLPL/QF/7.3/06	Analysis Period	07/10/202	3 To 11/10/2023	

SAMPLING DETAILS - AMBIENT AIR MONITORING :-

Sampling Location	Near Tanker Loading Area				
Date of Sampling	04/10/2023				
Time of Sampling [Hrs]	10:50				
Duration of Sampling [Hrs]	24				
Ambient Temperature [°C]	Min. 25 Max. 3				
Relative Humidity [%]	Min. 45 Max.			78	
Latitude	N - 18°52'34" Longitude E - 73			E - 73"09'49"	

ANALYSIS REPORT :-

Parameters	Unit	Results	"N.A.A.Q.S.	Sampling & Analysis Methods
PMis	µg/m ³	55.19	100.0	IS 5182 (Part XXIII) 2006
PM2s	µg/m ³	24.42	60,0	IS 5182 (Part XXIV) 2019
SO ₂	hð/w ₂	20.65	80,0	IS-5182 (Part II) 2001
NO ₂	µg/m ³	28.42	80.0	IS 5182 (Part VI) 2006
co	mg/m ³	0.99	2.0 for 8 Hrs.	IS 5182 (Part X) 1999
Lead	µg/m ³	0.08	1.0	IS 5182 (Part XXII) 2004
Ozone	hðiulg	10.22	100.0 for 8 Hrs.	ISC Method of Air Sampling & Analysis 3rd Edition. Method 411 2016
Ammonia	hð\w ₂	11.58	400.0	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 401 2016
Benzene	µg/m ³	< 1.0	5.0	IS 5182 (Part XI) 2006
Benzo Pyrene	ng/m ³	< 0.1	1.0	IS 5182 (Part XII):2004
Arsenic	ng/m ³	< 0.4	6.0	IS 5182 (Part XXII) 2004
Nickel	ng/m ³	5.63	20.0	IS 5182 (Part XXVI) 2020

"N.A.A.Q.S. - National Ambient Air Quality Standards

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/03

Test Report No.	GA/23/10/	91 Test Repo	ort Date	11/10/2023	
Customer Name and Address	M/S. CHRYSO INDIA F PLOT NO. E-72, ADD BUDRUK, TALUKA PA	PRIVATE LIMITED ITIONAL PATALGANGA IN ANVEL, DIST RAIGAD - 4	AREA, KARADE		
Letter Ref / Date		- Page No. 1 of			
Sampling Done By	GLPI.	Sample Received on	0	6/10/2023	
the second data and the second s					

SAMPLING DETAILS - AMBIENT AIR MONITORING :-

Sampling Location	Near Effluent Treatment Plant				
Date of Sampling	04/10/2023				
Time of Sampling [Hrs]	10.35				
Duration of Sampling [Hrs]	24				
Ambient Temperature [ºC]	Min. 25 Max.				
Relative Humidity [%]	Min. 45 Max.			78	
Latitude	N - 18"52"32" Longitude E			E - 73°09'49"	

ANALYSIS REPORT :-

Parameters	Unit	Results	"N.A.A.Q.S.	Sampling & Analysis Methods
PMito	µg/m ³	59.26	100.0	IS 5182 (Part XXIII) 2006
PM2.5	µg/m ³	26.00	60.0	IS 5182 (Part XXIV) 2019
SO ₂	µg/m ³	23,96	80.0	IS 5182 (Part II) 2001
NO ₂	µg/m ^o	33.19	80.0	IS 5152 (Part VI) 2006
CO	/mg/m ³	0.96	2.0 for 8 Hrs.	IS 5162 (Part X) 1899
Lead	µg/m ³	0.09	1.0	IS 5182 (Part XXII) 2004
Ozone	hð/wy	9.68	100.0 for 8 Hrs.	ISC Method of Air Sampling & Analysis 3rd Edition. Method 411 2016
Ammonia	hð\u _y	16.96	400.0	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 401 2016
Benzene	µg/m ³	< 1.0	5.0	IS \$182 (Part XI) 2006
Benzo Pyrene	ng/m ³	< 0.1	1.0	IS 5182 (Part XII):2004
Arsenic	ng/m ²	< 0.4	6.0	IS 5182 (Part XXII) 2004
Nickel	ng/m ³	6,08	20.0	IS 5182 (Part XXVI) 2020

"N.A.A.Q.S. - National Ambient Air Quality Standards

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/04

Test Report No.	GA/23/10/92 Test Report Da		11/10/2023	
Customer Name and Address	M/S. CHRYSO INDIA PRIVATE LIMITED PLOT NO. E-72, ADDITIONAL PATALGANGA INDUSTRIAL ARE KARADE BUDRUK, TALUKA PANVEL, DIST RAIGAD - 410 22			
Letter Ref / Date		Page No.	1 of 1	
Sampling Plan	GLPL/QF/7.3/06	Measurement Done By	GLPL	

AMBIENT NOISE LEVEL MEASUREMENT :

Date of Measurement	04/10/2023	
Test Method	IS 9989 Year 1981]

-	LOCATION	NOISE LE	VEL dB (A)
Sr. No.		DAY TIME 10:30 HRS.	NIGHT TIME 22:40 HRS.
01	East Side	62.3	52.5
02	West Side	59.6	54,7
03	South Side	60.3	55.2
04	North Side	61.1	54.0
05	Shop Floor Area	65,0	59.2
06	Effluent Treatment Plant Area	66.4	56.9
	M.P.C.B. LIMITS	75.0	70.0

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For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/05

Test Report No.	GA/23/10/93	Test Report Date	11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA PRIV PLOT NO. E-72, ADDITIO KARADE BUDRUK, TALU	ATE LIMITED NAL PATALGANGA INDUST KA PANVEL, DIST RAIGAD	RIAL AREA, - 410 220.
Letter Ref / Date		Page No.	1 of 1
Sampling Plan	GLPL/QF/7,3/06	Measurement Done By	GLPL
		and the second	and the second se

NOISE LEVEL MEASUREMENT :-

Date of Measurement	04/10/2023
Time of Measurement (Hrs.)	12:45
Test Method	IS / ISO 8528 (Part X) 1998

NEAR D. G. SET NO. 1 (250 KVA) :-

Sr. No.	Sampling Location	Noise L	(A)	
	0.5 Meter Away from D.G. Set	0.5 Meter Away Acoustic Door Open		Insertion Loss
		(X)	(Y)	(X - Y)
1.	East	98.2	72.3	25.9
2.	West	98.0	72.5	25.5
3.	South	97,1	71.4	25.7
4.	North	97.4	71.6	25.8
			MPCB Limit (X - Y)	> 25.0

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For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/05

Test Report No.	GA/23/10/94 Test Report Da		11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA PRIV PLOT NO. E-72, ADDITIO KARADE BUDRUK, TALU	ATE LIMITED NAL PATALGANGA INDUST KA PANVEL, DIST RAIGAD	RIAL AREA, - 410 220.
Letter Ref / Date	++	Page No.	1 of 1
Sampling Plan	GLPL/QF/7.3/06	Measurement Done By	GLPL

NOISE LEVEL MEASUREMENT :-

Date of Measurement	04/10/2023		
Time of Measurement (Hrs.)	13:25		
Test Method	IS / ISO 8528 (Part X) 1998		

NEAR D. G. SET NO. 2 (250 KVA) :-

Sr.	Sampling Location	Noise L	Noise Level Measurement in dB(A)				
No.	0.5 Meter Away	Acoustic Door Open	Acoustic Door Closed	Insertion Loss			
	from D.G. Set	(X)	(Y)	(X - Y)			
4.	East	98.6	73.0	25.6			
2.	West	98.5	72.4	26.1			
3.	South	97.3	71.5	25.8			
4.	North	96.8	71.3	25.5			
			MPCB Limit (X - Y)	> 25.0			

End

For GADARK LAB PVT. LTD.

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AUTHORISED SIGNATORY [KAILAS V. CHITALKAR]

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TEST REPORT

Doc.No : GLPL/QF/7.8/03

Test Report No.	GA/23/10/95 Test Re		Report Date	11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA F PLOT NO. E-72, ADD BUDRUK, TALUKA P/	NDUSTRIAL A	REA, KARADE	
Letter Ref / Date	-	Page No.		1 of 1
Sampling Done By	GLPL	Sample Received on	06	5/10/2023
Sampling Plan	GLPL/QF/7.3/06	Analysis Period	07/10/202	3 To 11/10/2023

SAMPLING DETAILS - AMBIENT AIR MONITORING :-

Sampling Location	Near Tanker Loading Area			
Date of Sampling		05/10/2	023	
Time of Sampling [Hrs]	11:40			
Duration of Sampling [Hrs]	24			
Ambient Temperature [°C]	Min. 26 Max.			36
Relative Humidity [%]	Min. 42 Ma		Max.	78
Latitude	N - 18*52'34" Longitude		itude	E - 73"09'49"

ANALYSIS REPORT :-

Parameters	Unit	Results	"N.A.A.Q.S.	Sampling & Analysis Methods
PM10	µg/m ³	58.00	100.0	IS 5182 (Part XXIII) 2006
PM2.5	µg/m ³	26.41	60.0	IS 5182 (Part XXIV) 2019
SO2	µg/m ²	23.19	80.0	IS 5182 (Part II) 2001
NO ₂	pg/m ³	30.61	80.0	IS 5182 (Part VI) 2006
CO	mg/m ³	1.12	2.0 for 8 Hrs.	IS 5182 (Part X) 1999
Lead	hð/wg	0.09	1.0	IS 5182 (Part XXII) 2004
Ozone	hð/w ₃	11.83	100.0 for 8 Hrs.	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 411 2018
Ammonia	hð\urg	14.58	400.0	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 401 2016
Benzene	µg/m ³	< 1.0	5.0	15.5182 (Part XI) 2006
Benzo Pyrene	ng/m ³	< 0.1	1.0	45 5182 (Part XII) 2004
Arsenic	ng/m ³	< 0.4	6.0	IS 5182 (Part XXII) 2004
Nickel	ng/m ³	8.64	20.0	1S 5162 (Part XXVI) 2020

*N.A.A.Q.S. - National Ambient Air Quality Standards

For GADARK LAB PVT, LTD,

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4. Test Results retule only to the conditions prevailing at the time of sampling.

5. Customer complaint register is available at laboratory.



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TEST REPORT

Doc.No : GLPL/QF/7.8/03

Test Report No.	GA/23/10/9	6 Test Repo	rt Date	11/10/2023	
Customer Name and Address	M/S. CHRYSO INDIA F PLOT NO. E-72, ADDI BUDRUK, TALUKA PA	PRIVATE LIMITED TIONAL PATALGANGA IN ANVEL, DIST RAIGAD - 4	DUSTRIAL	LAREA, KARADE	
Letter Ref / Date	-	Page No.		1 of 1	
Sampling Done By	GLPL	Sample Received on		06/10/2023	
Sampling Plan	GLPL/QF/7.3/06	Analysis Period	07/10/20	023 To 11/10/2023	

SAMPLING DETAILS - AMBIENT AIR MONITORING :-

Sampling Location	Near Effluent Treatment Plant			
Date of Sampling		05/10/2023		
Time of Sampling [Hrs]	11:25			
Duration of Sampling [Hrs]	24			
Ambient Temperature [*C]	Min.	26	Max.	36
Relative Humidity [%]	Min. 42 Ma		Max.	78
Latitude	N - 18°52'32" Longitude		e	E - 73*09'49"

ANALYSIS REPORT :-

Parameters	Unit	Results	*N.A.A.Q.S.	Sampling & Analysis Methods
PM ₁₀	µg/m³	56.25	100.0	IS 5182 (Part XXIII) 2008
PM25	µg/m ³	23.79	60.0	IS 5182 (Part XXIV) 2019
SO2	µg/m ^s	26.44	80.0	#S 5182 (Part II) 2001
NO2	µg/m ³	31.68	80.0	IS 5182 (Part VI) 2006
co	mg/m ³	0.99	2.0 for 8 Hrs.	IS 5182 (Part X) 1999
Lead	µg/m ³	0.10	1,0	(5 5182 (Part XXII) 2004
Ozone	hðlw3	12.37	100.0 for 8 Hrs.	ISC Method of Air Sampling & Analysis 3* Edition Method 411 2016
Ammonia	hðíuu ₂	15.42	400.0	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 401 2016
Benzene	µg/m ³	< 1.0	5.0	IS 5182 (Part XI) 2008
Benzo Pyrene	ng/m ³	< 0.1	1.0	15 5182 (Part XII) 2004
Arsenic	^c m\gn	< 0.4	6.0	45 5182 (Part XXII) 2004
Nickel	ng/m ³	8.28	20.0	IS 5182 (Part XXVI) 2020

"N.A.A.Q.S. - National Ambient Air Quality Standards

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc.No : GLPL/QF/7.8/03

Test Report No.	GA/23/10/97 Test Repo		ort Date	11/10/2023
Customer Name and Address	M/S. CHRYSO INDIA F PLOT NO. E-72, ADDI BUDRUK, TALUKA P/	PRIVATE LIMITED ITIONAL PATALGANGA IN ANVEL, DIST RAIGAD - 4	DUSTRIAL AN	REA, KARADE
Letter Ref / Date	-	Page No.	-	1 of 1
Sampling Done By	GLPL	Sample Received on	06	10/2023
Sampling Plan	GLPL/QF/7.3/06	Analysis Period	07/10/2023	To 11/10/2023

SAMPLING DETAILS - AMBIENT AIR MONITORING >

Sampling Location	Near Main Gate Area			
Date of Sampling		05/10/202	3	
Time of Sampling [Hrs]	11:10			
Duration of Sampling [Hrs]	24			
Ambient Temperature [°C]	Min. 26 Max.			36
Relative Humidity [%]	Min.	70		
Latitude	N - 18"52'35" Longitude		ide	E - 73"09'49"

ANALYSIS REPORT :-

Parameters	Unit	Results	*N.A.A.Q.S,	Sampling & Analysis Methods
PMio	ug/m ³	62.28	100.0	IS 5182 (Part XXIII) 2006
PM2.5	µg/m ³	29.61	60.0	IS 5182 (Part XXIV) 2019
SO ₂	µg/m ³	25.21	80.0	15 5182 (Part II) 2001
NO ₂	pg/m ³	34.00	80.0	(\$ 5182 (Part Vi) 2005
CÓ	mg/m ³	0.93	2.0 for 8 Hrs.	IS 5182 (Part X) 1999
Lead	µg/m ³	0.11	1.0	IS 5182 (Part XXII) 2004
Ozone	µg/m ³	10.76	100.0 for 8 Hrs.	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 411 2016
Ammonia	hð(m ₂	13.88	400.0	ISC Method of Air Sampling & Analysis 3 rd Edition, Method 401 2016
Benzene	µg/m ³	< 1.0	5.0	IS 5182 (Part XI) 2006
Benzo Pyrene	ng/m ³	< 0.1	1.0	IS \$182 (Part XII):2004
Arsenic	ng/m ³	< 0.4	6.0	IS 5182 (Part XXII) 2004
Nickel	ng/m ³	10.57	20.0	IS 5182 (Part XXVI) 2020

"N.A.A.Q.S. - National Ambient Air Quality Standards

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc. No: GLPL/QF/7.8/01

Test Report No.	GW/0/23/2755	Report Date	10/10/2023		
Customer Name and Address	M/S. CHRYSO INDIA PLOT NO-E - 72, ADD KHARDE BUDRUKH, DIST - RAIGAD, MAH	PVT. LTD. NTIONAL PATALGANG/ TAL – PANVEL, IARASHTRA, INDIA.	A INDUSTRIAL AREA.VILL-		
Letter Ref/Date	Trans.				
Lab Reference No.	GW/0/23/2756 Page No.		1 of 1		
Sampling Done By	GLPL On 04/10/2023	SLPL On 04/10/2023 Sample Received on			
Sample Submitted by	GLPL	Analysis Period	05/10/2023 To 10/10/2023		
Sample Description	Raseswar Mandir Wate 100 ml in glass bottle.	er Sample (Pataiganga Ri	iver), 1 lit in plastic bottle and		

ANALYSIS REPORTS:

Parameters	Units	Test Result	Methods
рH		7.43	APHA 4500 H*
BOD 3 days 27°C	mg/itr	24	IS 3025 (Part 44)
Dissolved Oxygen	mg/itr	< 1.0	APHA 4500-0 C
Ammonia	mg/ltr	6.86	APHA 4500 NH
Electrical Conductivity	µS/cm	318	APHA 2510 B
Sodium Absorption Ratio (SAR)		1.82	Calculation
Boron	mg/ltr	0.17	APHA 4500 B - B
Fecal Coliform	/100ml	13	APHA 9221 E

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TEST REPORT

Doc. No. GLPL/QF/7.8/01

Test Report No.	GW/0/23/2757	Test Report Date	10/10/2023			
Customer Name and Address	M/S. CHRYSO INDIA PVT. LTD. PLOT NO-E - 72, ADDITIONAL PATALGANGA INDUSTRIAL AREA.VI KHARDE BUDRUKH, TAL - PANVEL, DIST - RAIGAD, MAHARASHTRA, INDIA.					
Letter Ref/Date						
Lab Reference No.	GW/0/23/2757	toft				
Sampling Done By	GLPL On 04/10/2023	Sample Received on	05/10/2023			
Sample Collected by	GLPL	Analysis Period	05/10/2023 To 10/10/2023			
Sample Description	Cooler Water Sample From Canteen, 1 lit in plastic bottle & 100 ml in glass bottle.					

ANALYSIS REPORTS:

Parameters	Units Test R	Test Result	Specification Range as per IS 10500 : 2012		Methods
			Requirement Acceptable Limit	Permissible Limit in the Absence of Alternate Source	
pH		7.57	6.5 - 8.5	No Relaxation	AFHA 4500 H ⁺
Turbidity	NTU	0.3	1.0 Max	5.0 Max	APHA 2130 B
Total Hardness as CaCO ₀	mgñtr	70	200.0 Max	600.0 Max.	APHA 2340 C
Calcium	mg/ttr	15:23	75.0 Max.	200.0 Max	APHA 3500 Ca B
Magnesium	mgiltr	7.30	30.0 Max	100.0 Max.	APHA 3500 Mg B
Chlorides	ng/lar	11,13	250.0 Max.	1000,0 Max.	APHA 4500 CI- B
Sulphafes	mg/ifr	5.25	200.0 Max.	400.0 Max	APHA 4500 SO42 E
Alkalinity	-migritr	42.78	200.0 Max	600.0 Max.	APHA 2320 B
Total Dissolved Solids at 160°C	mg/itr	121	500.0 Max.	2000.0 Max.	APHA 2540 G
lipn	rng/ltr	0.052	T.0 Max.	No Relaxation	APHA 3120 B
BACTERIOLOGICAL TEST :					
E. Coll	/ 100 mil	Absent	Shall not be de	electable (Absent)	IS 15185 : 2016
Total Coldorm Sacteria	/ 100 mi	Absent Shall not be detectable (Absent)		IS 15185 2016	
REMARK: - The Water san	nple is Pot	able as per IS	s 10500 : 2012	in respect of abov	vé tests.

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc. No: GLPL/QF/7.8/06

Test Report No.	GS/23/2351	Report Date	14/10/2023			
Customer Name and Address	M/S. CHRYSO INDIA PVT. LTD. PLOT NO-E - 72, ADDITIONAL PATALGANGA INDUSTRIAL AREA,VILL-KHARDE BUDRUKH, TAL – PANVEL, DIST – RAIGAD, MAHARASHTRA, INDIA.					
Letter Ref/Date	ine					
Lab Reference No.	GS/23/2351 Page No. 1 of 1					
Sampling Done By	Customer Sample Received on 05/10/2023					
Sample Submitted by	Customer Analysis Period 05/10/2023 To 14/10/2					
Sample Description	Soil Near Hot Water Generator					

ANALYSIS REPORTS:

Units	Test Results	
	7.28	_
	Silt Clay	_
µS/cm	121.6	_
gm/ml	0.974	_
%	55.4	_
%	8.8	
%	0.00050	_
%	33.1	
mg/kg	2.4	
mg/kg	1.264	_
mg/kg	2.336	
mg/kg	< 0.001	-
mg/kg	0.321	
mg/kg	< 0.001	_
mg/kg	7.7	-
mg/kg	< 0.001	_
	0.59	_
		_
%	7.8	
%	41.3	-
%	50.8	-
	Units -	Units Test Results 7.28 Silt Clay µS/cm 121.6 gm/ml 0.974 % 55.4 % 0.00060 % 0.00060 % 33.1 mg/kg 2.4 mg/kg 2.336 mg/kg 0.001 mg/kg 0.321 mg/kg 7.7 mg/kg 7.7 mg/kg 7.7 mg/kg 7.7 mg/kg 7.7 mg/kg 7.7 mg/kg 7.8 % 7.8 % 50.8

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TEST REPORT

Doc. No: GLPL/QF/7.8/06

Test Report No.	GS/23/2352	Report Date	14/10/2023			
Customer Name and Address	M/S. CHRYSO INDIA PVT. LTD. PLOT NO-E - 72, ADDITIONAL PATALGANGA INDUSTRIAL AREA,VILL-KHARDE BUDRUKH, TAL - PANVEL, DIST - RAIGAD, MAHARASHTRA, INDIA.					
Letter Ref/Date						
Lab Reference No	GS/23/2352 Page No. 1 of 1					
Sampling Done By	Customer	Sample Received on	05/10/2023			
Sample Submitted by	Customer Analysis Period 05/10/2023 To 14/10/20					
Sample Description	Soil Near Tanker Loading Area					

ANALYSIS REPORTS:

Parameters	Units	Test Results
pH		7.34
Texture	-	Silt Clay
Electrical Conductivity	µS/cm	123.5
Bulk Density	gm/ml	0.969
Water Holding Capacity	%	52.6
Cation Exchange Capacity	96	8.4
Phosphates	%	0.00063
Permeability	95	35.2
Nitrates	mg/kg	2.7
Total Chromium	mg/kg	1.321
Copper	mg/kg	2,123
Cadmium	mg/kg	< 0.001
Lead	mgikg	0.317
Mercury	mg/kg	< 0.001
Zinc	mg/kg	7.4
Boron	mg/kg	< 0.001
Sodium Absorption Ratio	***	0.63
Particle Size Distribution		
Sandy	%	7.2
Silt	%	41.5
Clay	%	50.6

For GADARK LAB PVT. LTD.

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TEST REPORT

Doc. No: GLPL/QF/7.8/01

Test Report No.	GW/0/23/2752	Report Date	10/10/2023			
Customer Name and Address	M/S. CHRYSO INDIA PVT. LTD. PLOT NO-E - 72, ADDITIONAL PATALGANGA INDUSTRIAL AREA,VILL-KHARDE BUDRUKH, TAL - PANVEL, DIST - RAIGAD, MAHARASHTRA, INDIA.					
Letter Ref/Date						
Lab Reference No.	GW/0/23/2752	Page No.	1 of 1			
Sampling Done By	GLPL On 04/10/2023	Sample Received on	05/10/2023			
Sample Collected by	GLPL	Analysis Period	05/10/2023 To 10/10/2023			
Sample Description	ETP Raw Water Samp	le, 1 lit in plastic bottle				

ANALYSIS REPORTS:

Parameters	Units	Test Result	Methods
РH	÷	6.59	APHA 4500 H*
COD	mg/itr	116368	APHA 5220 B
BOD 3 days 27°C	mg/ltr	39000	IS 3025 (Part 44)
Total Suspended Solids at 105°C	mg/ltr	98	APITA 2540 D
Cill & Grease	mg/ttr	7.0	APHA 5520 D
Total Dissolved Solids at 180°C	mg/ltr	8411	APHA 2540.C
Chlorides	mg/tr	849.87	APHA 4500 CH
Sulphates	mg/ltr	3150	APHA 4500 SO42- E

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TEST REPORT

Doc. No: GLPL/QF/7.8/01

Test Report No.	GW/0/23/2753	Report Date	10/10/2023			
Customer Name and Address	M/S. CHRYSO INDIA PVT. LTD. PLOT NO-E - 72, ADDITIONAL PATALGANGA INDUSTRIAL AREA,VILL-KHARDE BUDRUKH, TAL - PANVEL, DIST - RAIGAD, MAHARASHTRA, INDIA.					
Letter Ref/Date						
Lab Reference No.	GW/0/23/2753 Page No. 1 of 1					
Sampling Done By	GLPL On 04/10/2023	Sample Received on	05/10/2023			
Sample Collected by	GLPL	05/10/2023 To 10/10/2023				
Sample Description	ETP Treated Water Sample, 1 lit in plastic bottle					

ANALYSIS REPORTS:

Units	l est Result	Specification Range as per MPCB Limits	Methods
	3.80	5.5 To 9.0	APHA 4500 H*
mg/ltr	34079	250 Max.	APHA 5220 B
mg/ltr	11400	100 Max.	IS 3025 (Part 44)
mg/ltr	26	100 Max	APHA 2540 D
mg/itr	< 0.1	10 Max	APHA 5520 B
mg/ltr	7819	2100 Max.	APHA 2540 C
mg/ltr	3834.53	600 Max.	APHA 4500 CI
mg/itr	38	1000 Max;	APHA 4500 SO42: E
	Units mg/ltr mg/ltr mg/ltr mg/ltr mg/ltr mg/ltr mg/ltr mg/ltr	Units Lest Result 3.80 mg/ltr 34079 mg/ltr 11400 mg/ltr 26 mg/ltr 26 mg/ltr 7819 mg/ltr 3834.53 mg/ltr 38	UnitsLest ResultSpecification Range as per MPCB Limits3.805.5 To 9.0mg/ltr34079250 Max.mg/ltr11400100 Max.mg/ltr26100 Max.mg/ltr26100 Max.mg/ltr26100 Max.mg/ltr78192100 Max.mg/ltr3834.53600 Max.mg/ltr381000 Max.

End

For GADARK LAB PVT. LTD.

31 aprilla AUTHORISED SIGNATORY

AUTHORISED SIGNATORY [SACHIN B. GOANKAR]



CHECKED BY

Note:

- 1. Results relate only to the sample/s tested, only in case of samples submitted by customer & not drawn by GLPL.
- 2. Test Report shall not be reproduced except in full, without written approval of the laboratory.
- 3. Samples will be preserved for a period 15 days from the delivery of Test Report.
- 4. Customer complaint register is available at laboratory.



INDUSTRIAL ANALYSTS & CONSULTANTS

LAB.: H-54, Additional M.I.D.C. Kudal, Taluka - Kudal, District - Sindhudurg - 416 525, Tel : (02362) 223519 • E-mail : info@gadars in • Wahsite - www.gadark.in

OFF.: 15. Hindustan Kohinoor Industrial Complex, L.B.S. Marg, Vikhroll (West), Mumbai - 83. Tel.: (022) 2577 7069 / 2577 7070 / 2085 0091 • +91 93213 12367

TEST REPORT

Doc. No: GLPL/QF/7.8/01

Test Report No.	GW/0/23/2755	Report Date	10/10/2023
Customer Name and Address	M/S. CHRYSO INDIA PLOT NO-E - 72, ADD KHARDE BUDRUKH, DIST RAIGAD, MAH	PVT. LTD. ITIONAL PATALGANG TAL - PANVEL, ARASHTRA, INDIA.	A INDUSTRIAL AREA, VILL-
Letter Ref/Date	-		
Lab Reference No.	GW/O/23/2755	Page No.	1 of 1
Sampling Done By	GLPL On 04/10/2023	Sample Received on	05/10/2023
Sample Submitted by	GLPL	Analysis Period	05/10/2023 To 10/10/2023
Gample Description	Shree Garmala Aa Ma mi in glass bottle.	ndır Lake Karade Kinurd	1 lit in plastic bottle and 100

ANALYSIS REPORTS:

Parameters	Units	Test Result	Methods
pН		7.80	APHA 4500 H*
BOD 3 days 27°C	mg/ltr	15	IS 3025 (Part 44)
Dissolved Oxygen	mg/ltr	1.9	APHA 4500-0 C
Ammonia	mg/ltr	0.9	APHA 4500 NH3
Electrical Conductivity	µS/cm	453	APHA 2510 B
Sodium Absorption Ratio (SAR)		1.94	Calculation
Boron	mg/ltr	0.35	APHA 4500 B - B
Fecal Coliform	/100ml	7.8	APHA 9221 E

For GADARK LAB PVT. LTD.

Seavula

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Note:



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1. Results relate only to the sample/s tested, only in case of samples submitted by customer & not drawn by GLPL.

2. Lest Report shall not be reproduced except in full, without written poproval of the laboratory.

- 3. Samples will be preserved for a period 15 days from the delivery of Test Report.
- Customer complaint register is available at laboratory.


GADARK LAB PVT. LTD.

INDUSTRIAL ANALYSTS & CONSULTANTS

LAB.: H-54, Additional M.I.D.C. Kudal, Taluka - Kudal, District - Sindhudurg - 416 525 Tel. : (02362) 223519 • E-mail : info@gedark in • Website : www.gedark.in

OFF.: 15, Hindustan Kohinoor Industrial Complex, L.B.S. Marg, Vikhroll (West), Mumbai - 83, Tel.: (022) 2577 7059 / 2577 7070 / 2085 0091 • +91 93213 12367

TEST REPORT

Doc. No: GLPL/QF/7.8/01

	1					
Test Report No.	GW/0/23/2754	Report Date	10/10/2023			
Customer Name and Address	M/S. CHRYSO INDIA PVT. LTD. PLOT NO-E - 72, ADDITIONAL PATALGANGA INDUSTRIAL AREA,VILL-KHARDE BUDRUKH, TAL - PANVEL, DIST - RAIGAD, MAHARASHTRA, INDIA.					
Letter Ref/Date						
Lab Reference No.	GW/0/23/2754	Page No.	1 of 1			
Sampling Plan	-	Sampling Method				
Sampling Done By	GLPL on 04/10/2023	Sample Received on	05/10/2023			
Sample Collected by	GLPL	Analysis Period	05/10/2023 To 10/10/2023			
Sample Description	STP Outlet Water Sample, 1 lit in plastic bottle					

ANALYSIS REPORTS:

Parameters	Unita	Test Results	Specification Range as per MPCB Limits	Methods
pН	-	6.57	-	APHA 4500 H*
BOD 3 days 27°C	mg/itr	25	30 Max.	IS 3025 (Part 44)
Suspended Solids at 105°C	mgAlr	48	100 Max.	APHA 2540 D

End

For GADARK LAB PVT. LTD.

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Note:

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- 2. Test Report shall not be reproduced except in full, without written approval of the laboratory.
- 3. Samples will be preserved for a period 15 days from the delivery of Test Report.
- 4. Gustomer complaint register is available at laboratory.

ANNEXURE XII TRAINING RECORD ON HEALTH AND SAFETY

18:25: 12:25 m

1	CHRYSC	INDIA PVT LTD		e	
CHR7S	Pāla	lganga, Reigid			
-	Document little:	I raining Attendance Sh	ci·i		
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TRAISING	Mochdonil - Tho	mas legtage	21	1+1	
TRANSING GLOGE INATO W NO BE CONSILEUTION		TO BE DONE BY			
KULATED SAULTS					
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	PAR	HEIPANTS DE LAU S			
SR, NOT	SAMP OF THE PARTICIPANTS	PESSINATION	SIGNATURE	10/Gerterrener-	
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2.	Jaydeep PENan	at obtacon	Servis -		
3	Ketan Shigwan	QL Executive	Phiquan		
4.	VIJUY Prosterwoone	prod open	villen		
5.	Gaura - Sinde	Paped Erec	apple		
6.	portan Agalan	Si-creative of 1	k.		
- 1	Hishay mhatee	Prod-OPty	Munumy		
8	Rappit Milun	locur-	Thi		
- 1.	Kuju Thombore	Ass- Mager- 63	TE		
11	Change Albert	H.D.M	N.S.		
12 1	Hari n'agleld.	FI DITU	Mari I	5	
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	Document Title: 1	raining Attendance SI	heet	in a state of the	
51 ART 114 11	2284/2023	DEATION	Plant	TOTAL HOURS 14	
END DATE	1271112023	TRAINLE NAME	Hommit	Pard .	
TRAINING TOPICS	Muchedrill - Thomas	1 Laterse-			
TAADON EFFECTIVENTS TO BE COSDUCTION		TO BE DONE BY			
RELATED SKILLS					
Company	1 4 an work ander sapervision	2 = Can work mdependently	4 Advanced	4 I spirt & Cair train	
	PAR	DEIPANTS DETAILS			
SR 803	WAMP OF THE PARTS (PANTS	DESIGNATION	NERNATHIRE	Effectivences	
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12	mondes Bhois	-	Ø.		
13	Hasichand Rhart	1 -	512-15		
19	Nishaut Kedani	LAB	acto		
00	Raj wash	lan	R.M. unat		
21 0	Sanjay Holam	Capa	SBHEIDENT.		
22 N	larcen wage	Lub	Nemeth		
23 N	lardon Telange	Officer and	friandar		
24 7	Trished Madme.	ETP	ma		
4 2	Swappel Grankua	1. forKlift	Stander	0	
26 Pro	Hhmsh Sawant -	FITOF 1	Butnowshi		
12- 4	asshed Hindde	HIK	+65		
88 A	sit Galtar	3125	EGY.		
2 B	withan Caliance	Tast	Jalas		
34 3	hosale	Fostchitt AMC	Blushes		

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10:30 to 11.30 Hs.

	CHRYSC	INDIA PVT LTD		ALASKIN PATRONIC ME		
CHRYSC	Pado	Putniganga, Raigad				
	Document Fitles	Training Attendance Sh	Contraction of the second			
STARTDATE	27/11/23	DECATION	Plant	TOTAL HERDRY 1 h		
ENDUAD	23/11/23	TRAININE WAR	Hemout	Patel		
TRAINING	On site Emergen	y Plan	1			
ERAINING DEE TOTAL 25- D BE ONDOCTUDOL =		TO IN DOUL IN				
ELATED: KILLS						
) n=so: stampoor	 Carcontric undersupervision 	2 = Can work (independently	> Advanced	4 Experies 6 on train		
	PAR	DETPANTS DETAILS				
147 14	NAME FOR THE PARTICIPANDS	DESIGNATION	SERVATORE	P. Sectoremus-		
1-1	Anil saller	Asei Morney	Boh			
2	Jaydeep Pawow	al officer	- www			
3 1	ketan Shigwan	or Executive	Theneway			
4 V	juy Pontawone	prod opinities	million			
5-10	Lawren shindle	Prod Enre C	q12			
6 6	rom/an Azalance	St-czawhie BE	8			
7.	Krupist prher	letters }	XF			
8	Kaje Thulene	Ass mayer T	2gt			
3+	Eliasast Affred	A.D.M	fine			
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11 14	andor Telonge	production off.	franca.			
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	CHRYSO	INDIA PVT LTD		(1.50) (01.70) + 1.00 (044) -
CHR750	l'arai	the best		
Document Title: Tr		Fraining Attendance Sh	reet	Sumpley (State
START (20.17	27/11/23	LOCATION	Plat	TTILA HIKIRS 1 6
NDDAT	22/11/23	TRAINER NAME	hemant	Paty
OPES	on-site Emargency	Play		
EAINING TECTIVESEN BE INDICTIVES		70 BE [3080 /85		
SLA16D 011.8				
) II – Sau Competent	1 = Can work under supervision	2 Can work independently	. Advanced	4 = lixpert & Can uni
	PAR	DEIPANTS DETAILS		
8R.87}	VIME OF THE PARTICIPAMIN	DESIGNATION	SRINATURE	1 (Epstiveness
15	Naroh wagh	LaB	Nametha	
16 9	Sourious Hiron	Capa	SBHERRY	
TRE	athmesh Survent	Maint Helpe	Prestamosh	-
18 -	Swalled Souikener	1. Porklift	Erocoptil	
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ZAA	mis poheabre.	Prod. open	shie	
22 He	rished Hindole	HIK	dain.	
123 40	ganon phage	FR. driver	THE	
24 R	ay Wagh	SC (astell	~ R.N.Wash	
25 M	andar Khoiz	Mathadi	Ø	
26 7	lishont kedari	QC. lashe	put Difet	
297 1	landrandor Bhgsat	Mathadi	SRUG	
28 K	ashinath Wast	-	KH.V.	
29. 13	hushen Lane	Frasminent	salvene	

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	CHRYSO	INDIA PVT LTD		IN THE RECEIPTION OF THE PROPERTY OF
CHRY50	Patal	ganga, Raigad		ten No ()
_	Document Title: T	raining Attendance Sh	eet	hump13e 17 65 2103
START DATE	17/11/2023	LOCATION	Patalsansa	TOTAL HOURS 301
END DATE	13/11/2023	TRAINER NAME	Hemant Pr	1.7
FRAINING FOPICS:	Battery operate	I pallet	touck / tor	very operat
TRAINING TYLCTIVENESA TO RE TONDUSTED UN	0. *	TO BE DONE BY		1 8-2
ELATED RULS				
0 - Not Comprision	1 - Can work under supervision	2 = Can work independently	3 = Advanced	4 = Expert & Can train
	PAR	HCIPANTS DETAILS		
\$\$.NO	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness
1	Vijay Partavane	pried offereter	vipuers	
2-	AKShay Mholir	-11-	tamiling	11. gones
3	Kalpesti Godge	_11-	And	
4-	Mandar Telarge	Officer prod	tructor	
5	Pranit Mali	Bed operation	That	
6.	Satish Patil	Helper	Sandon	
7	Krushna Godge	-1-	Khir	
8	Sanjay Hilam	-1-	SBfilm.	
1 9.	brathmigh Savant	Fiter	Birthomes D.	
10. 1	Sharat Aghan	Hulper	Q. 6 vet	
11.	Har Nirguda	-1-	Har,	
12- 0	rawraw shindle	Prod Exte	guint	
13- 18	husbon Lehane	Maunt Exec	- Aplace	
151 1	rishy mutre	ErP	Fores	
15- 9	ajanan Dhays	FLK dura	Call	

martin 23

1430 to 15.30.

	CHRYSO	INDIA PVT LTD		Der Son Brighten Haberbeiten
CHRYSO	Patal	No. No. 11		
	Document Tifle: 1	taliate (FEFSER		
START DATE	371.5123	LOCATION	Conf. Paul	TOTAL HOURS 1 12
END DATE	3.4 -123	TRAINER NAME	Hemand	Patr
TRAINING FOPICS	Personal Protections	e Equipme	15	
TRAINING THECTIVENESS TO BE CONDUCTION		TO BE DONE BY		
KELATED KILLS				
0 Not competents	1 = Can work under supervision	2 - Can work independently	3 = Advanced	4 = Expert & Can train
	PAR	TICIPANTS DETAILS		
SR. 300	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness
1	Gaunar Hi Shinde	Prod" Exec	Alende	
2	Amix mpostre-	prod - oper.	Anie	
3	Pranit mali	Proj - OPen -	Arrel	
4	Kalpesy bradge	-11-	Aw >	
5 .	Jaydeep Pawar	QC Officer	Hainsa	4
6	Sangar Tarde	mathadi	2-17THIZ	Ş
2	Rashid Palol	mathanti	Flienthe	
8 1	Bames R. Mharre	RC-Edicusive	Thee	
19 5	Susaiphil Gaibar	Q.C. offren	(Pott -	
		-		
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HR Manager

	CHRYSO IN	DIA PVT LTD		Des Sent HELPATE SHERT METERS
CHRYSO	Patalga		B401507.04	
	Document Title: Tra	ining Attendance Sh	francial class 7 1400 3022	
START DATE	20106/2023	LOCATION:	Patalgem	SECTAL HOURS QU M
END DATE		TRAINER NAME	0	0
TRAINING. TOPICS:	PEATS & salety he	imess tor	ining	
TRAINING LITTO TIVENESS TO BP CONDUCTED ON		TO BE DONE BY	0	
RELATED SKILLS				
0 - Nol competent	1 Can work under supervision	2 = Cain work independently	3 - Advanced	4 - Expert & Can train
	PARTH	CIPANTS DETAILS		
SR NO.	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness
01-	Keshinath Wash	Mathadi		KHW
12	Manya Mirginda		-	11/4/ 17218
B	Resid Pater	_0		124-19
024	Sanjay Tayale	<u> </u>		श्रीतप्रसाग्रद
05	Hanishebardra Bhand	tim		Roul
0.6	Ramesh- Dakodz	- site -		21121
07	Mandale Shoriz	-		Ba
08	Gayanan Dhage	Firdnive	2	Solut
09	- V	1		
10-				
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12				
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15				

	CHRYSO II	NDIA PVT LTD		by her prawn menning de	
CHRAZ	2 Patalga	Patalgaryss, Raogad			
	Document Title: Training Attendance Sheet munde (10) intr				
START DATE	2610612028	LOCATION.	Admixture	TOTAL HOURS 20 M	
END.DATE	26/06/2023	TRAINER NAME	Rahul P	Joehmuldh	
TRAINING TOPICS	USE OF Cut Resistor	ice handal	over while	e warking to	
PRAINING PERCITATIONS O BE ONDUCTED ON	06106/2003	TO BE DONE BY	Rahw	Deshmulich.	
ELATED KHAS					
0 - Not ompetiant	1 7 Can work under supervision) = Can work independently	$\Xi = Advanced$	4 - Expert & Can Isain	
	PARTI	CIPANTS DETAILS			
SR 187	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness	
10	Kalpesh Godge	operater	Sul		
2	Visay Pantawane	- 14	willowf-		
3,	Akshay Mhatre		Kunnt		
4.	Bhanat Agan	Helpers	Ruise		
5.	Hari Nirguda.	Helper	witink		
6.	Krushna Gadge	Helpers	Vial		
7.	Jagdish Kondilleer	Helper,	Perdythente		
	aliber				
	NYMADAN				

	CHRYSO I	NDIA PVT LTD		Ber Silling PATLANDINGTON
CHRYSC	Pátalga	Bey this wi		
	Document Title: Tr	aining Attendance Sh	cet	Residence Fille daily
START DATE	21 06123	LOCATION	Patalgeman	STOTAL HOURS ROM
END DATE	21/06/23	TRAINER NAME	Henront	Patil
TOPICS	P. P.AJ & Salely	Morness.	T UP & Prive	1.7
TRAININO EPRECTIVENESS TO BE CONDUCTED ON		TO BE DONE BY		
RELATED SKILLS				
o Not Competent	1 = Can work under supervisien	2 = Can work independently	3 Advanced	4 - Expert & Can train
	PARTI	CIPANTS DETAILS		
SR. NO.	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness
01	Viery Pantawane	Toron of paron	Villenges	
2	Mitkymis Yadan	Onnez	25269 1	MH 04-LE 6642
B	Trished Mhatre	ETP oper	Frite	
54	Hori Ningude	Plant Kelge	L HART NISSE	la.
05	Protice chart	mantallege	Rat	
06	Buliam Mhitse	114 she pie	SP-1	
07	Krishna Godge	Plant helpe	Ltdel	
08	Mahresh Mhalike	Sy Plant o piet	Massi	
003	Atshay Mhadae	Plant Oppicite	N training	
10	Gaundo shunde	Prud Exec	and the	
11	Kalpest Gadge	Plan T oppos	in And	
12			0.	

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	CHRYSO	INDIA PVT LTD		DWINGCOM PATIENTIATION
CHRYSO	Pataj	Key The VI		
	Document Title: 1	humb.01; 1740-2022		
START DATE	04/07/2023	LOCATION	Patt	TOTAL HOURS 30 mi
IND DATE		TRAINER NAME	Gastron Shin	de
RAINING OPICS:	Safety Belt where u	cer CReparchman) training	
RAINING PERCEIVERED O RE CNEW (JED CN	0	TO BE DONE BY	1	
ELATED KILLS				
Competen	i - Can work under supervision	2 = Can work Independently	3 = Astvancert	4 = Experi & Can train
	PAR	TICIPANTS DETAILS		
SR NO	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Filioctiveness
1	the shull Mhalve	ETP oper	Frank	
2	Knushna Gadaja.	Brod	2 A	
3.	Pitshay Mhatre	Administer Ope	tount	
4	Jegdish Kordilkan	Frod	Pordition	
5.	Noresh wash	Lah Relpon	Navesh	
5.	Balizan Muha	and sulper	Bilizati	
7	Pahul Destmiller	Prod. CRAR.	Salist.	
8	Shorat Aghan	Prol" Hulper	(and	
_				-
	Obstite			

CHRYSO	CHRYSC	INDIA PVT LTD		De los materialmentes
	Patalganga, Raigad			Rep. Soc. Inc.
	Document Title:	Document Title: Training Attendance Sheet		
STARTDATE	19/07/23	LOCATION:	Patalger	ANAL HOURS
END DATE	1710723	TRAINER NAME	Hemont	Patil
RAINPOG OPICS:	New Miss & ets no	eporting.	Low orp	4
RAININO PPECTIVIDESS Q RE ONDUCTED-UN		TOBEDONEBY		
FI ATED KILLS				
0 + Not Competent	I = Can work under supervision	2 - Can work independently	3 = Advanced	4 = Expert & Can train
	PAR	UICIPANIS DETAILS		
SR NO	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness
1	Vilay Tachay	LOPISTIC EX	By	
2	Kuipesy Gradge	Plant Orna	as Fit	
3-	Gaurav. Shinde	Prod" Exec	du.	
4 -	Shutha labore	maint Exec	stator	
5. 1	Rahul Deshmulch	Prod. OPPux	pahul.	
6	Akshay mhatee	Plant Operator	Amunit	
2-	Knimig R. Mhuss	OR Exicusive	tim	
8	Royu Thomson	Asso Manager (ug)	Rate	
9 1	Nahesh Walisheti	Sor plant Mingr	mont	
				-
	180			

2MRday Markey

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	O Pataiga	nga. Raigad		80~ 246 M fund the PT 03-2002	
	Document Title: Tra	ining Attendance Sh	eet		
START DATE	310102120R	LOCATEN	Ca.P. A.C.L	Increase and the second	
NDDATE	21,1,222,00	TP AINED GALIC	Manager A	Patel In	
RAINING	Tixe safety (Bre	vention	& motec	tion)	
RAINING PECTIVENESS D BE DNDE PEED ON	1 100	TO BE DONE BY			
ELATED KILLS					
0 = Nor compotents	1 = Pan work under supervision	2 = Can work independently	3-Advanced	4 - Espert & Can utalei	
	PARTIC	IPANTS DETAILS			
SR NO	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness	
01	Akshay c mhatee	prod. Operato	r tannit		
02	Viley . M. Judhen	LOBISHIC FX	Rent		
03	Vilay, T. Pantavome	prod operator	vixung		
04	- Shushen R. Labore	FRETINST	Salos		
15	Gaurray. H. Shinde	Prod" Exe	Gillert		
06 1	Sanderh Jaiks	sx cre officer	thi.		
5	Kulpesh Unadat	Prod OPeral	on tal		
04	Rahul Destmuch	Prov off.	talist		

2nd

HR Manager

Course la	CHRYSO	INDIA PVT LTD		Participant Internition
CHRYSO	Paralg	angu, Raigad		Ber for He
	Document Title: Ti	raining Attendance S	heet	timertik (1973)
START DATE	27/08/23	LOCATION:	Patalam	TUTAL HERES 7 61
END DATE	22106123	TRAINER NAME	Hemand	Detil
TRAINING TOPICS	PFAS & safely He	amens trai	hing .	1 4 4 2
IRAINING 1998 TUVENESS 1078E IONDI (TED LW	•	TO BE DONE BY	0	
RELATED				
Competent	1 – Can work under supervision	2 Can work independently	3 = Advanced	4 - Expert & Cast train
	PART	ICIPANTS DE TAILS		
SR NO.	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Fiffectivectimes
U	Krymit & mhat	per-trian	the	
2)	Sandesh Joshi	QC. SR officer	the	
37	Nishend Kederi		alecting	
4)	Jaydeep Pawar	Oc. Officer	Joyusas	
5)	Ketan Shigwan	Exe. 9C	Terriquiono	
6	Naresh Wagh		Newery	
7)	Eghny Deshninkh	frod. OKKI	Palint	
8)1	kunar kathadi	Prices	(A)	
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10)	Starko Pavon.		Souths	
117 6	di wash		Rinkwagh	
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	CHRYSO IN	DIA PVT LTD		In SIGNATURATION	
CHRYSO	Patalgan	ga, Raigad		mec the III	
	Document Title: Training Attendance Sheet			anna) (in 17 19 2)22	
START DATE	06/09/2023	LOCATION.	Conf.	TUTAL HOURS 30M	
END DATE	0610912023.	TRAINER NAME	Hemant Pat	Del	
TRAINERS TOPICS	Material spillage	& couby	, sale ossi	pos-l	
FRAINING FRECTIVIOUSS TO BE CONDUCTED IN		TO BE DONE BY			
RELATED					
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	PARTIC	IPANTS DETAILS			
SR NO.	NAME OF THE PARTICIPANTS	DESIGNATION	SIGNATURE	Effectiveness	
01.	Gaurov. Shindle	Rud" Exerc	Elilue		
02 :	Shushen Latre	Exec tost	Balice		
3 F	lahul Deshmulan	Prod okei	galey.		
04 1	Mahesh Mhatve	Sv Plant openation	My.		
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24.012

HR Manager

ANNEXURE XIII RECEIPT OF LETTER TO MIDC STATING ACCORDANCE OF EC TO EXPANSION PROJECT, CHRYSO PATALGANGA



17ate: 11.17.2020

To,

Deputy Engineer (SPA) Patalganga Subdivition MIDC Panyel District Raigad

Subject: M/s Chryste India Private Lunited located at Plot no.8-72, MIDC Patalganga, Karade (Budruk), Taluka Panwel, District Ratgad- Environmental Clearance

Reference: Environmental Clearance (F.No. IA-J-11011/253/2019-IA II (II)) dated 14.07.2020 issued by MoEPCC, Gove of India

Dear Sir, With reference to above mentioned subject, please find attached herewith the copy of Environmental Clearance for our project for your reference and records.

Kindly acknowledge the same.

Thunking you. Yours Sincerely.

For Chryse India Private Limited

Authorized Signatory



Enclosurer Copy of Environmental Clearance

2020.

Received Date Office of Deputy Engineer / SPA MIDC. Sub-Div. Patalgange

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ANNEXURE XIV A COPY OF THE AD VERTISEMENT OF THE STATING ACCORDANCE OF EC TO CHRYSO IN NATIONAL DAILIES

Advertisement of Environmental Clearance in "The Times of India" (Mumbai/Navi Mumbai Edition) on) October 9, 2020



Advertisement of Environmental Clearance in "Mumbai Times" (Mumbai/Navi Mumbai Edition) on October 9, 2020

