Item No. 03 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

(By Video Conferencing)

Original Application No. 60/2021

(With report dated 17.04.2021)

In re: News item published in The Hindu dated 23.02.2021 titled "**Two dead, 5 missing in fire at UPL Plant**"

Date of hearing: 11.06.2021

CORAM: HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE SUDHIR AGARWAL, JUDICIAL MEMBER
HON'BLE MR. JUSTICE M. SATHYANARAYANAN, JUDICIAL MEMBER
HON'BLE MR. JUSTICE BRIJESH SETHI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Respondent: Mr. Raj Kumar, Advocate for CPCB
Mr. Ankit Virmani, Advocate and Ms. Manasi Kumar, Advocate for UPL Ltd.
Mr. R.R. Vyas, RO, GPCB

ORDER

Introduction and procedural history

1. Proceedings have been initiated in the present matter on the basis of the media reports dated 23.02.2021 published in 'The Hindu' under the heading "Two dead, 5 missing in fire at UPL plant".[1] It is reported that fire broke out at 1.35 am on February 23 at UPL Ltd (United Phosphorus Ltd) after a blast and major fire at the company's Jhagadia plant which claimed two lives and injured 26. Five labourers are still missing. The unit was shut since February 5 for a planned annual boiler inspection. The Labour and Employment Department of Gujarat Government issued closure notice to the unit. The unit was directed by

[1] https://www.thehindubusinessline.com/news/national/fire-breaks-out-at-upls-jhagadia-plant-in-gujarat/article33910072.ece

the Gujarat Government to pay ex-gratia compensation to the next of the kin of the deceased workers. The report also gives version of the company that there was no chemical reaction as the plant was shut. Fire may have been caused due to fire/explosion in the solvent which could have been caused due to electric short circuit.

2. The matter was earlier considered on 25.02.2021 and it was found necessary to require status of compliance of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 ("the 1989 Rules") and Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 (The 1996 Rules) with a view to determine steps required to be taken for compensating the victims and restoration of the environment and preventing such occurrences in future. While issuing Notice to the UPL Ltd., Jhagadia, District Bharuch, Gujarat, Director, Industrial Safety and Health (DISH), Gujarat State PCB, CPCB, District Magistrate, Bharuch and the MoEF & CC, the Tribunal constituted a four Member Joint Committee comprising of the CPCB, State PCB, DISH and the District Magistrate, Bharuch. The Tribunal also noticed that in the recent past, 12 other incidents had taken place and it has been found that in most of the cases the safety norms have been breached in operating the industrial activities.

3. The observations in the said order are quoted below:-

> *"2. Above information gives rise to a substantial question of environment relating to compliance of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 ("the 1989 Rules") and Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 (The 1996 Rules), which have been framed under the Environment (Protection) Act, 1986 (EP Act), falling in schedule to the NGT Act, 2010. It is thus necessary to determine the above question and if necessary, award relief under Section 15 of the NGT Act to the victims and for restoration of the environment after determining the liability of the persons engaged in such activity as well as role of the statutory regulators in failing to prevent the*

same. Further question is preventive measures to avoid recurrence of such incidents in future in such activities.

3. Since the report shows that the unit is engaged in manufacture of chemicals attracting Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 ("the 1989 Rules") requiring preparation of onsite and offsite plan and conducting of mock drills and as per law laid down in M.C Mehta v. UoI & Ors.[2], principle of 'Absolute Liability' is attracted in such cases to compensate the victims of such accidents as well as to compensate the environment, ***it is necessary to ascertain the cause of the incident, the extent of damage caused, the extent of compensation required to be paid for damage to the environment as well as for loss of lives, for the injuries and steps required to be taken for preventing any such occurrence in future on the same pattern as the Tribunal has dealt with such accidents in the recent past[3].***

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[2] (1987) 1 SCC 395

[3]

i. Order dated 01.06.2020, relating to incident of gas leak dated 07.05.2020 in **LG Polymers India Pvt. Limited** at Vishakhapatnam, resulting in death of 11 persons and injuries to more than 100, apart from other damage (OA No. 73/2020, In re: Gas Leak at LG Polymers Chemical Plant in RR Venkatapuram Village Visakhapatnam in Andhra Pradesh);
ii. Order dated 03.02.2021, relating to incident dated 03.06.2020 in a chemical factory, **Yashyashvi Rasayan Pvt. Ltd**. at Dahej, District Bharuch, Gujarat resulting in deaths and injuries and other damage (OA No. 85/2020) (Earlier OA 22/2020) (WZ), Aryavart Foundation through its President vs. Yashyashvi Rasayan Pvt. Ltd. & Anr.);
iii. Order dated 06.08.2020, in relation to incident of **oil well blow out on 27.05.2020 at Baghjan in the Tinsukia District of Assam** resulting in deaths, injuries and damage to the environment (OA No. 43/2020(EZ), Bonani Kakkar vs. Oil India Limited & Ors.).
iv. Orders dated 06.07.2020 and 22.12.2020, relating to incident dated 30.06.2020 on account of gas leakage at **Sainor Life Sciences** factory at Parawada in industrial area on the outskirts of Vishakhapatnam (OA No. 106/2020, News item published in the local daily "Economic Times" dated 30.06.2020 titled "Another Gas Leakage at Vizag Factory kills two, critically injures four…");
v. Orders dated 08.07.2020 and 22.12.2020, dealing with the incident dated 01.07.2020 resulting in death of 6 person and injury to 17 due to blast of boiler in **M/s Neyveli Thermal Power Station** (NLCIL), Cuddalore (OA No. 108/2020, News item published in the "Indian Express" dated 01.07.2020 titled "Tamil Nadu Neyveli boiler blast: 6 dead, 17 injured") and;
vi. Orders dated 23.07.2020 and 22.12.2020, in relation to incident of **fire engulfed the chemical plant** of **Visakha Solvents Ltd**, Vizag on 13.07.2020 at Ramky CETP Solvents building in Pharma City resulting in injuries (OA No. 134/2020, News item published on 13.07.2020 in the local daily named "India Today" titled "Massive fire engulf Vizag chemical plant, explosions heard, injuries reported").
vii. Order **dated 18.12.2020**, in relation to incident of **explosion in a plastic recycling factory at Sujapur in Malda on 1.12.2020** resulting in death of six persons, including two minors and serious injuries to four persons (OA No. 272/2020, News item published in the "Times of India" dated 20.11.2020 entitled "Six killed as blast tears through Malda Plastic recycling factory").
viii. Order dated **18.12.2020**, in relation to incident of **methane gas leak in a sugar factory** called Lokenete Bapurao Patil Agro Industries Ltd. in Mohol Taluka of Solapur District, Maharashtra on 21.11.2020 resulting in deaths and injuries and other damage (OA No. 274/2020, News item published in the "Indian Express" dated 23.11.2020 entitled "Maharashtra: Two Killed, eight injured in methane gas leak in sugar factory").
ix. Order dated 08.01.2021, in relation **to Gas Leak in Agro Company** (O.A No. 107/2020, In RE: News item published in the local daily "Indian Express Sunday Express" dated 28.06.2020 titled "Gas Leak in Agro Company Claims life of one")
x. Order dated 18.01.2021, in relation to News item published in Navbharat Times dated 24.12.2020 titled "**Gas leaks in IFFCO Plant**, 2 Officers dead" (O.A No. 04/2020, In re :

4. While directing issuance of notice to the UPL Ltd., Jhagadia, District Bharuch, Gujarat, Director, Industrial Safety and Health (DISH), Gujarat, State PCB, CPCB, District Magistrate, Bharuch and the MoEF & CC by e-mail, we constitute a four-member joint committee comprising of the CPCB, State PCB, DISH and the District Magistrate, Bharuch to give a report to this Tribunal. The nodal agency for coordination and compliance will be the CPCB and the State PCB. The committee may visit the site preferably within next one week and give its report with reference to issues mentioned in para 3 within one month by email at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Support PDF and not in the form of Image PDF. Simultaneously, the report may also be uploaded on the website of the State PCB to enable the concerned stakeholders to access the same and file their response, if any.

5. Except for visit to the site at least once, the Committee will be free to conduct its proceedings online. It will be free to take the assistance from any other expert/organization. The Committee may suitably interact with the stakeholders and, apart from considering the present incident, also consider remedial measures for preventing such incidents in the area or by other establishments even beyond the said area. The Committee may compile information about existence and working of onsite and offsite plans in terms of 1989 Rules and conducting of mock drills and safety SOPs., number of such units in the area and the carrying capacity of the area to sustain the same. Since in the recent past, the Tribunal has dealt with similar issues of industrial accidents resulting in deaths and injuries and Expert Committees in some of such accidents have given reports to this Tribunal, such reports may also be taken into account by the Committee to the extent relevant.

Report of the fact-finding Committee and consideration

4. Accordingly, the Committee has filed its report on 17.04.2021. The report shows that the Committee visited the site, interacted with the personnel of the unit, calculated compensation and assessed the safety preparations of the unit. Based on site visit and deliberations, the Committee has given its findings on factual aspects of cause of the accident and remedial measures by the unit and the regulatory

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News item published in Navbharat Times dated 24.12.2020 titled "Gas leaks in IFFCO Plant, 2 Officers dead")

xi. Order dated 11.02.2021, in relation to accident of toxic gas leak in Rourkela Steel Plant in Orissa" (O.A. No. 09/2021, In re: News item published in The Indian Express dated 07.01.2021 titled "Four workers dead due to toxic gas leak in Rourkela Steel Plant")

xii. Order dated 16.02.2021, in relation to accident of Virudhunagar firecracker factory blast (O.A. No. 44/2021, In re: News item published in The News Indian Express dated 12.02.2021 titled "At least 19 dead in Virudhunagar firecracker factory blast, more than 30 injured")

authorities. The Committee has also made recommendations for safeguards which need to be adopted to prevent such incidents in future.

5. The salient observations, conclusions and recommendations in the report of the Committee are as follows:-

> ***"5.1 Action taken by DISH***
>
> *The officials of DISH received information over telephone at around 02:15 Hrs dated 23/02/2021 regarding the accident at unit-5 of M/s. UPL Ltd, Jhagadia. The officials of DISH reach the site around 03:00 Hrs. DISH arranged additional fire tenders & ambulances from nearby industries located in Jhagadia GIDC & Disaster Prevention and Management Centre (hereinafter referred to as 'DPMC') located at Ankleshwar and Dahej.*
>
> *SDM & DISH has immediately served head-count notice on 23/02/2021 (Copy of the same is in **Annexure - 4**). The reply submitted by the unit is in **Annexure - 5**. As per the reply, total 2 persons reported dead and 5 persons were missing.*
>
> *DISH has also issued a letter on 23/02/2021, directing the unit to close down the manufacturing activities in all plants within the premises. (copy of the same is in **Annexure - 6**)*
>
> *DISH has given breach of law remarks under schedule 19 part (2), Rule 102, para no. 5 of The Gujarat Factory Rules- 1963 dated 05/03/2021 to M/s. UPL Ltd (Unit-5). Based on the submissions by unit, DISH has filed a criminal case against the occupier in the Additional Chief Judicial Magistrate court at Jhagadia (Breach of law remarks by DISH is as **Annexure - 7** and reply by unit in this regard is attached in **Annexure - 8**).*
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> ***5.2 Action Taken by Local Police***
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> *Jhagadia police station has registered the accidental death No. 6/2021 under section 174 of Criminal Procedure Code and prepared detailed 'Panchnama' of accidental location in vernacular language Gujarati dated 23/02/2021 at accident site during 16:30 to 18:30 Hrs. As per 'Panchnama', death of three persons & missing of four persons is reported. The investigation is still under progress.*
>
> ***5.3 Action Taken by GPCB***
>
> *After the accident, a team of officials from GPCB, Ankleshwar reached the place on 23/02/2021 at around 04:15 hrs. The officials of other departments present at the site were; 1) Sub Divisional Magistrate, Jhagadia, 2) Police officials, 3) Officers of DISH, 4) Officials of GIDC, 5) Mamlatdar, Jhagadia.*

- *On reaching the site, visual inspection of the area surrounding the unit was carried out considering the smoke emitted with plume direction and firefighting activity. Considering the prevailing wind direction during the accident from N-NE to S-SW, the GPCB monitored Ambient Air Quality for Volatile Organic Compound (VOC) and Hydrocarbons by a Handy VOC meter in the downwind direction of the location of the accident, which included the village habitation (details included in* ***Annexure-9****). During the monitoring VOC emission in prevailing wind direction was measured having maximum level @ 12.6 ppm. VOC of @ 23.8 ppm was measured outside the premises at the location, North of the CM-257 plant. General hydrocarbon at two locations i.e. near the main gate of the unit and at the back side of the unit i.e. in the downward wind direction it is observed @ up to 5 ppm. Based on these monitoring results, the local authorities i.e. SDM, Jhagadia & DISH decided that evacuation from nearby villages would not be required. The GPCB also monitored Ambient Air Quality with Respirable Dust Sampler (RDS) kept on the terrace of the Police station, located near the premises of the unit during 09:00 Hrs to 17:00 Hrs. on 23/02/2021, which did not show about any alarming situation.*

- *There was generation of contaminated wastewater during the firefighting operations. The contaminated wastewater accumulated in the storm water drains (hereinafter referred to as 'SWD') within the premises of the unit and subsequently, was observed flowing in dry GIDC storm water drain. The contaminated wastewater in the GIDC SWD is observed entering into a kutcha natural drain/trench starting near M/s Lanxess India Pvt. Ltd. and the same was observed to have reached till the portion of the natural drain/trench passing near village Gumanpura. Samples of contaminated wastewater generated during firefighting were collected from various locations within & outside the premises. It was observed that contaminated wastewater did not reach Boridra nalla, where this natural drain/trench leads to. The Boridra nalla is also observed dry. The unit was directed to collect the contaminated wastewater generated during the firefighting, that was accumulated within the premises and also that had flown outside the premises. Based on the instruction, the unit has started lifting wastewater from drains inside the premises and from the natural drain/trench by making a temporary bund in the natural drain/trench passing near Gumanpura Village. The wastewater was lifted, carried through tankers and stored in the guard pond sump near the ETP within the unit's premises. The unit also carried out scraping soil from natural drain at location i.e. near Gumanpura village road Bridge and sent the dredged soil to TSDF site at BEIL Ankleshwar, manifest copy of the same is attached in* ***Annexure - 10****. The unit has submitted photographic evidence for lifting of wastewater and dredging of soil.*

- *GPCB carried out post-monitoring of the accident on 02/03/2021 to verify action taken by the unit. During this visit GPCB visited the affected areas outside the premises (along with representatives from M/s. UPL Ltd (unit-5), Jhagadia) which*

include the route of earlier flowing contaminated wastewater, GIDC SWD leading to the natural drain and Boridra nalla. During the visit the stretch of GIDC SWD and the natural drain was found dry. One soil sample is also collected from above mentioned location (area of dredging) near Gumanpura village road Bridge location for analysis purpose. The detailed post monitoring inspection report along with analysis of sample collected are attached as ***Annexure - 9****.*

- *Based on the inspection report dt: 23/02/2021, the GPCB issued Closure Direction U/s 31 (A) of Air Act on 24/02/2021 (****Annexure - 11*** *) to M/s UPL Ltd (Unit-5) with reference to the accident occurred in CM-257 plant on 23/02/2021 at early morning hours in the unit. The direction also includes interim EDC of Rs. 1 Crore to be paid by UPL LTD (unit-5), which was subsequently paid by the unit on 25/02/2021*

5.4 Cause of accident as reported by the unit

The in-house investigation report submitted by the unit is attached as Annexure-12, wherein based on the list of damaged equipment probable cause of the accident was assessed by the unit. ***It was reported that leakage of brine (Methanol Water Mixture) took place in the reactor R-25001 which might have resulted in the triggering of exothermic reaction and blast in the reactor.*** *The unit has also submitted a list of equipment, materials which were lost due to the accident.*

5.5 Interaction of committee with officials present at the time of accident in the plant/unit.

During the first visit of the joint committee on 04/03/2021, the committee interacted with Shri Vamshi Krishna, night duty officer to get his narration about the accident. He informed that at the time of the blast he was in his controlled room located near the main gate of the unit. In an immediate response, he informed senior officials of the plant about the blast and rushed to the location. According to him, the fire fighters reached the location of the accident within 2 to 3 minutes and started firefighting & rescue activities.

The committee also interacted during the visit on 09/03/2021, with Shri Tejas Borse the shift in-charge of CM-257 plant present for night duty (22/02/2021 – 23/02/2021) on the day of accident. Shri Tejas informed that the plant was on shut down since 05/02/2021 and during the night shift only basic housekeeping was carried out. All the process parameters were under control and at around 01:45 Hrs when he was at the shift in-charge cabin located in the ground floor of the plant, there was a blast however, he could escape from the plant with minor injury. As per his statement, neither knocking nor any indications nor any alert was noticed there prior to the blast.

During the interaction with the firefighting team, present on the day of accident, it was informed by the team that the firefighting team started using fire tender within 4 to 5 minutes however, one of the main fire hydrant line near CM-257 plant was damaged due to blast and hence, the portion was isolated before starting the fire hydrant system. The portion of fire hydrant line located between the plant and tank farm was also not approachable to operate, which had resulted in delayed start of fire hydrant operation.

In addition to above, additional 18 fire tenders from nearby industries & DPMC Ankleshwar and Dahej were used. Moreover, in addition to water about 317 KL of foam was also used for controlling the fire. The fire was controlled at around 6:30 hrs. however, the water hydrant system was kept operational after fire control to cool down the structure till 8:30 hrs on 23/02/2021.

5.6 Probable cause of accident as per the Joint Committee

Based on the above submission of the unit about the accident, various study carried out by the unit for plant CM-257, HAZOP, safety audit report, accident report from DISH, discussion with the representatives of the unit and field visits, the joint committee draws following observations and conclusions regarding cause of accident:

- *The manufacturing process of clethodim was developed in-house by the unit at laboratory level. Studies regarding safety and risk at various stages before converting the lab scale study into kilo-level and pilot-level were not conducted. The reaction conditions maintained in a lab-scale glass reactor cannot be so easily maintained in a plant-scale reactor. The unit has submitted lab scale trial tech-pack documents wherein for an example, the cooling medium used in the laboratory to maintain reaction temp at 5 degree C was chilled water, while the one used in the plant was methanol. An impact / safety aspect of such a change in cooling medium (chilled water to methanol) was not studied during the R&D trials in the laboratory.*

- *It was informed that the basic engineering and detailed engineering of the plant for CM-257 was carried out in-house and was erected and commissioned in October 2020. The reactor has pressure variation from atmospheric reducing to 50 Torr(Vacuum) and temperature variation of 10 to 50 deg centigrade. As per the P&ID submitted by the unit for stage-I, "the P&ID was issued for approval/Engineering on 02/03/2019". Considering the above it is understood that the P&ID and detailed engineering was carried out by the unit for manufacturing of CM-257 in 2019. Later on, it was also explained by the unit that construction of the plant for the production of Clomazone and Mesotrion and was initiated during May 2019, then subsequently by Jan 2020 there was no demand for the said products hence, the plant was converted for the production of clethodim/glufosinate/glyphosate by Change-in-product mix permission which contradicts the submission of the unit regarding the commissioning of plant.*

- *The product developed at R&D stage is further studied and reviewed at various stage like pilot stage and further scale up at design and execution stage for assuring safety during commercial production. During these stages, various data and information are being collected, which require to set design parameters and safety aspects, for engineering design and its execution. Moreover, these data are very essential to design safety instrumentation for the process and are also required for HAZOP study, HAZAN, Qualitative & Quantitative Risk assessment studies and for thermal stability study in case of exothermic reaction. Reports regarding thermal stability, reactivity and other process hazards which may be envisaged at various stages of process is not available with the unit.*

- *HAZOP study has not covered the design data and operation data of this process such as process hazards pertaining to the exothermic reaction, run away reaction, thermal stability of the product at various stages, impact of utility services leakages, reaction between the reactants and the heating/cooling fluid, imbalance of stoichiometric quantities of various reactants in the reactor, deviation from defined storage conditions for various intermediate stages, mal-function of any instruments, chemical stability of the product at various stages like intermediate and finished stage, etc. These may have resulted in oversight of various process hazards which may occur as a dangerous occurrence like explosion, fire etc.*

- *As a part of safety and process requirements, the plant was having a DCS control system with multiple temperature, pressure, and level sensors for different rectors. During discussion* ***it is gathered that there were no distress signals before the blast in the DCS system. It is strange that none of the sensors provided for the R-25001 reaction vessel gave any prior distress signals about increase in levels of temperature or pressure due to leakage of methanol and its reaction with ETB mass which might have resulted in increase in temperature as claimed by the unit.***

- *The unit submitted photographs showing complete damage of the DCS system of CM-257 plant and hence no sensor data could be recovered. Moreover,* ***it was informed that the unit does not have a central DCS centre. Thus, it appears that the systems provided on R-25001 were not adequate in terms of type of sensors, its range, its MOC, DCS data transmission facility to central DCS control etc. Central DCS system, if provided by the unit, would have given very valuable information about changes in the process parameters (temperature, pressure, leakages etc.) which might have occurred resulting in the accident.***

- *The unit informed that the plant was under planned shutdown (due to boiler shutdown) and the reason for keeping the material (about 8.50 MT of ETB) in intermediate stage in the reactor no. R25001 of CM-257 plant was not justified by the unit. The unit has submitted various work permits of the plant as evidence of*

shut down. In general, during planned shutdowns for any chemical industry, it is a general practice that the reactors with products at intermediate stages are safely emptied and stored in safe conditions, depending upon the reactivity study/ instability study etc. and defined Standard Operating Procedures are in place for such shutdown and safe startup activities. However, such a study report or defined ***standard operating procedure (SOP) for safe start-ups and safe shutdown (emergency and planned) are not prepared by the unit****.*

- *The unit has carried out a safety audit from a third party namely M/s Naik & Associcates, Surat. The safety audit report though mentions about the audit carried out for CM-257 plant in page no.08, however, the process detail, manufacturing detail about CM-257 plant is not mentioned in the "Chapter 6 Process and Hazard Information" of the report. Also, detailed about the name of vessel and its location is not mentioned in the report in the section 6.3 - Operational and process hazards with control. As per details of chemical stored in the unit, the actual total stored quantity of toluene, n-Hexane and Methanol exceeds 143 kl (storage permission from PESO to the unit). However,* ***the safety audit report does not mention any observation regarding exceedance in stored quantity beyond permission limits of PESO. Thus, the safety audit carried out by the unit shows gaps and needs to be carried out again by a competent agency, accredited by an Accreditation Board as per Rule 68 j para 9 of the Gujarat Factory Rules, 1963.***

- *The unit has informed that many of the chemicals are recovered and the same will be disposed at Common Facility for incineration. One of such recovered chemicals was ETB stored in Tank T¬25002 at ground level vertically below R-25001. It was informed that entire quantity (about 9000 kg) of ETB was recovered after the accident and emptied and stored in 9 tanks (each of capacity about 1 T). Thus, the blast in the reactor due to trigger of temperature in the reactor where ETB was kept at intermediate stage cannot be justified as ETB stored in T-25002 could survive an explosion and significantly high ambient temperatures without catching fire or explosion.*

- *The committee has also collected design details of R25001 from the unit and using the information provided, an attempt is made to calculate the internal pressure built-up/developed responsible for the blast in such a reactor.*

Calculation of internal pressure required for explosion of the reactor:

Information provided by the unit:
Reactor No. R25001 (Stage I reactor, wherein the blast took place)
Reactor diameter = 2250 mm,
MOC: SS 316L, and
Wall thickness: 12 mm,
Considering the yield strength of SS 316L = 475 MPa (normally 450-500 MPa) and

Causes of pressurization of such reactor and its failure can be due to:

(1) Circumferential stress = pD/2t,
(2) Longitudinal stress = pD/4t, and
(3) Shear stress = pD/4t or pD/8t.

Here, D=diameter of cylinder, p = internal pressure, and t=thickness of wall.

Substituting details of reactor in above equations, the minimum internal pressure found for circumferential stress is 5.07 Mpa (51.7 kg/cm^2). If such minimum internal pressure is considered to be developed in the reactor and resulted in the blast, development of such a high pressure cannot be instantaneous and without any warning signal unless, either the DCS system was bypassed or non-working or the sensors provided were not adequate in terms of range, specification, safe to give the warning signal. Moreover, it was informed that the reactor is equipped with a vent after scrubber and thus it is not convincing that at a very high internal pressure in the reactor, no fumes/liquid/gas got vented through this vent, releasing the internal pressure and preventing the explosion.

Based on above mentioned observations it can be concluded that the probable reason for the accident i.e. leakage of methanol in the intermediate stage and reaction of methanol with ETB as considered by the unit may be logical in terms of reaction chemistry. However, sudden blast in the intermediate stage of reactor, when the reactor was not in operation and that too after about 18 days, without any sign of abnormality in terms of level, temperature or pressure indicators in DCS, indicates ineffectiveness of safety system provided or assessed by the unit for the plant CM-257. Thus, serious lapses in terms of safety study, reactivity study, compatibility test, development of standard operating procedure for planned and emergency shutdown, storing intermediate stage product during shutdown, gaps in HAZOP, safety audit, inadequacy of sensors provided for the reactor might have resulted in the accident.

6. ENVIRONMENT DAMAGE ASSESSMENT

- *The joint committee conducted visits to the unit and affected areas on 04/03/2021 and 09/03/2021. During the visits the committee also inspected the portion of natural drain from where, the unit had dredged soil and collected the samples of soil as detailed below:*

Table 5: Details of samples collected by joint committee on 04/03/2021

Sampling point	
W-1	Small patch of Wastewater observed in natural drain leading to in Gumanpura village (Lat: 21.6741970, Long: 73.1139060)
W-2	Wastewater collected from outside and stored in ETP guard pond of UPL Ltd.
H-1	Soil sample collected near Gumanpura village road bridge (Lat:21.674989, Long:73.113248) at nallah
H-2	Soil sample collected near Gumanpura village road bridge (Lat:21.6741970, Long:73.1139060)
H-3	Soil sample collected near Gumanpura village (Lat:21.6790079, Long:73.1074349)
H-4	Soil sample collected near Gumanpura village road bridge (Lat:21.6723874, Long:73.1165128)
H-5	Reference soil sample near Gumanpura village bridge (21.672544, 73.116402)

Analysis reports of the above mentioned samples collected by the committee are attached as ***Annexure- 9****.*

- *It was informed to the committee that the wastewater during firefighting reached a point up to location H3 (as shown in google image above) falling under revenue land of Gumanpura village area and had not reached to Boridra Nalla. The entire stretch of the natural trench/drain including Boridra nalla was dry before the accident.*
- *During the visit on 04/03/2021, it was observed that the unit had dredged the top layer of the soil in the natural trench/drain passing near Gumanpura village and as reported, 19 MT of contaminated soil was disposed to CHWTSDF, a scientific landfill site. It was also informed that the wastewater was lifted from the bridge on the natural drain near Gumanpura Village by constructing a temporary bund.*
- *The wastewater was transferred to a guard pond inside the premises of the unit. A sample of waste water from the guard pond was also collected during the visit. It was informed that about 3000 kl of wastewater from inside and outside was collected back.*

The soil samples collected from the dredged drain/trench were analysed for various parameters. From the analysis reports of the soil samples, It is found that the TOC in the soil sample varies from 0.0357 to 0.168 gm/kg. The soil sample (H5) was collected as reference from the ramp used by the unit for movement of tankers near Gumanpura village bridge as the same was not yet dredged and disposed off by the unit. Higher concentrations of almost all measured parameters were found in the

sample collected from Location H5 as compared to other soil samples. The unit needs to collect and dispose of the soil from this location to CHWTSDF site.

The analysis result of the sample is provided in Annexure – 9.

The accident was assessed in terms of the damage caused to the environment. Based on the information submitted by the unit about the accident, meteorological data, list of chemicals with quantity lost during accident, analysis of samples and considering the steps taken thereafter, by the unit, the components considered by the committee for calculating damage to the environment are mentioned in the subsequent paragraphs.

The damage caused to the environment is evaluated based on air, water and soil components considering the probable impact, steps taken by the unit to restore the same.

6.1 Meteorological data on 23/02/2021

Actual meteorological data obtained from M/s. DCM Shriram Alkalies Ltd., Jahagdia situated adjacent to the accident site during the period of accident on 23/02/2021, indicates average wind speed is @2.77 km/h, predominant wind direction is from N-NE to S-SW, Avg. Temperature 23 ^{0}C., humidity 52.72 % etc.

Although the prevailing predominant wind direction during the two days period i.e. from the 2223/02/2021, was from West to East, the actual predominant wind direction observed as per the tabular meteorological data for the period during which the fire accident continued i.e. 1:46 hrs to 6:30 Hrs on 23/02/2021 as from N-NE to S-SW direction. Meteorological data on 23/02/2021 is attached in ***Annexure - 14.***

6.2 Air Component

The unit has submitted a list of chemicals with quantity lost due to accident on 23/02/2021 early morning hours. The committee has referred to the methodology adopted for calculation of total quantum of chemicals converted using stoichiometry to various components of all the chemicals which were reportedly lost except for Toluene at various stages and ethanol water mixture. Portion of Toluene is considered burnt and remaining emitted as VOCs from the surface of the flowing water. Accordingly, evaluating damage for air components, two factors were considered i.e. complete combustion of chemicals and emission of VOCs due to toluene.

6.2.1 Estimation of amount of Toluene vaporized

The volatile organic compound such as toluene having low water solubility will be volatilized in air. After the accident, severe smell of toluene was felt by the people at and around the site. The volatility of a volatile organic liquid from a surface depends on vapour pressure of

compound, wind speed, and the ambient temperature. Since the specific gravity of toluene is less than water, the undissolved toluene will float on the surface of water.

The volatility of a volatile organic liquid from a surface may be estimated by the following method.

Organic compound volatilized (kg/h/m^2) = 0.00116xMWxPx$W_{0.625}$ Equation. 1

(Source: Evaporation Rate of volatile liquids, USEPA, 1989)

Where, W = wind speed in ft/min, P = vapor pressure of compound in inch Hg, MW = molecular weight of compound in gram.

Considering a wind speed of 0.5 km/h (27.9 ft/min) near ground surface corresponding to the wind speed of 2.5 km/h at 10 m at the time of accident, vapor pressure of toluene as 28 mm Hg (1.12 inch Hg) at 25 deg C, and molecular weight of toluene = 92 g/mole, equation (1) predicts the rate of toluene volatilization as 0.95 kg/h/m^2, respectively.

Estimation of the total surface area from where volatilization occurred can be obtained by calculating the surface area of drains as under:

1. *Total length of GIDC drains carrying fire-fighting water around unit = 700 m, average width 1.0 m, hence surface area = 700 m2*
2. *Total length of katchcha drains wherein fire-fighting water flowed = 3900 m of average width 1 m, hence surface area = 3900 m^2.*

Thus, total surface area from where toluene can volatilize = 4600 m^2.

Considering toluene volatilization rate of 0.95 kg toluene/h/m^2,

The total mass of toluene volatilized would be 4370 kg/h.

The total time for volatilization is difficult to predict since all the drain surface area does not become occupied at once. The committee has considered 2 hours for estimation of calculating quantum of toluene, which gives amount of toluene volatilized = 8740 kg. Such vapours of hydrocarbon can produce radicals and secondary pollutants in the sunlight which could be potentially hazardous. Thus for combustion calculation remaining quantum of toluene 18260 kg is considered.

- *Combustion of chemicals may have led to generation and release of various gaseous pollutants such as sulfur dioxide (SO2), hydrogen chloride (HCl), oxides of nitrogen (NOx), carbon di-oxide (CO2) etc from the chemicals lost during the blast and subsequent fire in the unit. The moles of chemical compounds were considered to calculate the mass of gaseous emissions as shown in Table below.*

Table 6:Calculation of Gaseous emissions due to combustion of chemicals during the accident

Chemical formula	Quantity Lost	Quantity Considered for calculation, kg	kilo moles	C	N	O	S	Cl	CO2, kg	SO2, kg	NO2, kg	HCl, kg
C6H12OS	8500	8500	64.39	6	0	1	1	0	17000	4121	74	0
C6H15N	112	112	1.60	4	1	1	0	0	282	0	0	0
C2H5SH	1000	1000	16.13	2	0	0	1	0	1419	1032	605	0
C6H13N	1302	1302	13.15	6	1	0	0	0	3472	0	0	0
C7H8	27000	18260	198.48	7	0	0	0	0	61131.9	0	0	0
C16H24O5S	3666	3666	11.18	16	0	5	1	0	7868	715	0	0
C16H24O5S	712	712	2.17	16	0	5	1	0	1528	139	4472	0
C3H6ONCl.H	14000	14000	97.22	3	1	1	1	2	12833	6222	4472	7097
C3H6ONCl.H	14000	14000	97.22	3	1	1	1	2	12833	6222	0	7097
C2H5OH	1500	750	12.10	2	0	1	0	0	1065	0	0	0
Total gaseous emissions in kg									**119431.**	**18452**	**9623**	**14194**

6.2.2 Estimation of Environmental Damage compensation due to release of gaseous emissions

To estimate the damage compensation due to air pollution, the methodology employed by the Committee constituted in case of Yashashvi Rasayan Pvt. Ltd., Dahej (OA NO. 22 of 2020), was adopted. The damage values per ton of SO2, NOX, HCl, and CO2 were taken as (Rs. in Lakh) 2.1989, 2.1729, 0.2189, and 0.0225 per MT of gas, respectively. No such damage value for the release of toluene is available to the best of Committee's knowledge. Therefore, ***considering the risk of production of secondary pollutants in air due to toluene vapour, a damage value of Rs. 2.1989 lakh per MT of toluene vapor (maximum value among SO2, NOX, HCl, and CO2) is taken as damage value of toluene. Based on these Damage values, the total damage cost due to air pollution caused by fire and explosion is estimated as shown in below table.***

Table 7: Estimation of Damage value due to Air pollution caused by fire

Air pollutant, MT	SO2	NOx	HCl	CO2	Toluene vapor
	18.452	9.623	14.194	119.432	8.74

Damage value, Rs. In	2.1989	2.1729	0.2189	0.0225	2.1989
Damage value, Rs. In Lakh	40.57	20.91	3.11	2.69	19.22
Total Damage value, Rs. in Lakh : 86.51					

Thus total amount of Rs. 86.51 lacs is calculated for environmental damages for air component.

6.3 Water and Soil Component

The explosion at UPL caused damage to all the compartments of environment emission/discharge of pollutants. Explosion followed by fire led to combustion of other chemicals and intermediates stored in the plant. The water used for fire-fighting contained foam used for fire fighting and the unburnt chemicals which flowed through GIDC drain from the premises to a point near M/s Lanxess followed by the katchcha drain/trench (after M/s Lanxess) and eventually accumulated on open land as the wastewater reportedly did not reach any natural water bodies (Boridra Nallah).

The committee calculated the firefighting water required and subsequent steps taken by the unit to calculate the damage to the environment for the water component.

6.3.1 Damage to Water Environment

Estimation of the amount of water used for fire-fighting

The unit informed that during fire fighting 18 numbers of 1" diameter and 3 numbers 3" diameter nozzle fire hydrants respectively with water pressure in the hydrant maintained at 6-7 kg/cm^2 were used. Considering co-efficient of discharge "Cd" of fire hydrant nozzles varies between 0.7-0.9 depending on the type of nozzle.

The discharge per nozzle can be given as,

$$Q=Cd\times(\pi/4)x\ D^2\times\sqrt{(2gH)}$$

Where, Q = flow in m^3/sec, D = diameter of nozzle in m, H = water head in m.

Taking value of Cd = 0.8, and water head of 60 m, the flow of water by one 1" (25 mm) and one 3" (75 mm) water hydrant nozzles will be 0.0134 m^3/s (48.24 m^3/h) and 0.121 m^3/s (435.6 m^3/h), respectively. Thus, calculatedly the total water discharged from all the fire hydrants (18 nos. of 1" and 3 nos. of 3" diameter) will be approximately 2175 m^3/h

Considering 6 hours of operation of fire hydrants total amount of water used for fire fighting will be: ~13000 KL (As per the information provided by the unit, the fire hydrants were operated for 6 hours)

GIDC drainage network are blocked for all seasons except monsoon and to monitor the same CCTV camera focused at the drain near M/s Lanxess India Pvt. Ltd. was provided. GIDC has concrete drainage network from the unit till the exit point of the GIDC drain after crossing M/s Lanxess India Pvt. Ltd. The GIDC drain is subsequently meeting an open kachcha drain/trench leading to Gumanpura village area. The committee has obtained CCTV Footage from the M/s Lanxess India Pvt. Ltd.and the time duration when the dry drainage network of GIDC Jhagadia near M/s Lanxess India Pvt. Ltd. has recorded flow, was considered by the committee.

- *It may be seen that the flow started in the GIDC storm water drain at 6 AM (~4 hours after the accident) and continued until 3 PM. The GPCB officers at the time of visit observed that the average flow velocity in the drain was 0.75 – 1.5 m/s and depth of flow 0.2 – 0.4 m. Taking the average width of cross section of water flow as 1 m, and considering average values of water depth and flow velocity, the total quantity of water flowing in the storm water drain would be approx. 10000 KL. As per report prepared by GPCB on 23/02/2021, wherein it is mentioned that the contaminated wastewater from the unit was found flowing downstream to a location in the Gumanpura village but did not reached to Natural Drain Boridra nalla.*

- *Based on instructions of GPCB, the unit later on, blocked the drain and started lifting fire-fighting water from the drain near Gumarnpura village on 23/02/2021. The unit reported that about 3000 KL water was lifted from UPL drains and GIDC drain and stored in the Guard pond within the unit. The water lifting work was reportedly completed on 24/02/2021. Thereafter the unit has started dredging of soil and lifting of soil from the area. The work of soil dredging and lifting was reportedly completed on 25/02/2021. Considering the lifting of 3000 KL runoff water by the unit about 10000 KL of fire-fighting runoff water out of total estimated quantity of 13000 KL, went to the natural drain/trench, further going all the way to Gumanpura village, about 5.7 km away from the unit (as per the Google earth image).*

The unit provided a list of chemicals lost during the accident as shown in Table 1. These chemicals are highly flammable and it was assumed that most of these chemicals would have been burnt during the fire. However, runoff of firefighting water sample collected by GPCB on 23/02/2021 and the sample of wastewater from guard pond collected by the joint committee on 04.03.2021 reveals that the wastewater has concentration of organics in terms of COD (1272-1932 mg/L) in addition to various other monitored parameters.

When fire-fighting water containing such chemicals is released in to natural environment, there are following possible fates of such chemicals

1) *The chemical dissolved in fire-fighting water can percolate in the soil causing land pollution and may contaminate groundwater*
2) *A part of volatile chemicals (such as toluene which is less soluble) volatilized in air and cause air pollution, and*

Considering lifting of firefighting water from natural trench and subsequently dredging of wet soil from the drain/trench and disposal of contaminated soil to CHWTSDF site (about 19 MT wet soil) by the unit, monitoring results of soil samples collected from the drain/trench on 04/03/2021, the committee is in view that the unit has taken possible steps however environmental damage due to spillage of contaminated runoff water cannot be ruled out.

The damage caused and the level of impact due to organic pollutant released is evaluated in monetary terms by the committee by considering two factors

- *the waste of natural resources i.e. fresh water used for fighting and cost of treatment of the wastewater generated as per the prevailing treatment cost as charged by the common effluent treatment plants (CETPs) and*
- *Liability towards the environmental damage due to spillage of contaminated runoff water.*

The total compensation towards environmental damage due to the discharge of fire-fighting water contaminated with hazardous chemicals (approx. quantity 10000 kL, COD 1272-1932 mg/L) is calculated in below table.

Table 8:Calculation of Environmental Damage

Valuation of environmental damages due to release of organic load in the wastewater	=	Rate of freshwater in the Jhagadia GIDC	+	Treatment cost of the contaminated wastewater generated from fire fighting	+	Liability and Remediation Cost in case of a Fire accident leading to spillage of hazardous waste/ contaminated runoff water*
		Rs. 40 per kl x 13000 kl = Rs.5.2 lac (Rs. 40 per kl GIDC water supply charge)	+	Rs.80 per kl x 10,000 kl = Rs.8 lac (Rs. 80 per kl CETP treatment charge for COD concentration of 2000 mg/l)	+	Rs. 120 lakh

**According to the CPCB "Guidelines on Implementing Liabilities for Environmental Damages due to Handling & Disposal of Hazardous Waste and Penalty".*

- *Thus, Total amount of Rs. 133.2 lacs calculated for environmental damages of water and soil component.*

The total cost of Environmental damage compensation due the accident at UPL sums up to Rs. 133.20 lakh (due to the discharge of contaminated fire-fighting water and soil) + Rs. 86.51 lakh (due to the air pollutant) = Rs. 219.71 lakh.

7. COMPENSATION TO DECEASED PERSONNEL

The compensation amount for the personnel who lost their lives due to the unfortunate fire accident on the intervening night of 22nd February and 23rd February 2021, three court cases i.e. "Sarla Verma & Ors. Vs. Delhi Transport Corporation & Anr.", "Sunita Tokas Vs. New India Insurance Co. Ltd." and "Amrit Bhanu Shali & Ors. Vs. National Insurance Co. Ltd. & Ors." to base the calculation for the payment of compensation considering the following components-

1. *Monthly salary of the deceased i.e. gross salary of deceased personnel as per the list provided by the unit.*
2. *Addition to income for future prospect: The committee has considered following criteria referring to the judgement order of Sarla Verma &Ors Vs. Delhi Transport Corporation &Anr., para 11, "In view of imponderables and uncertainties, we are in favour of adopting as a rule of thumb, an addition of 50% of actual salary to the actual salary income of the deceased towards future prospects, where the deceased had a permanent job and was below 40 years. [Where the annual income is in the taxable range, the words 'actual salary' should be read as 'actual salary less tax']. The addition should be only 30% if the age of the deceased was 40 to 50 years. There should be no addition, where the age of deceased is more than 50 years".*
3. *Deduction for personal and living expense: The committee has considered following criteria referring the judgement order of Sarla Verma &Ors Vs. Delhi Transport Corporation &Anr., Para 14, "Having considered several subsequent decisions of this court, we are of the view that where the deceased was married, the deduction towards personal and living expenses of the deceased, should be one-third (1/3rd) where the number of dependent family members is 2 to 3, one-fourth (1/4 th) where the number of dependant family members is 4 to 6, and one-fifth (1/5 th) where the number of dependant family members exceed six" and "Where the deceased was a bachelor and the claimants are the parents, the deduction follows a different principle. In regard to bachelors, normally, 50% is deducted as personal and living expenses, because it is assumed that a bachelor would tend to spend more on himself",*
4. *Multiplier: The committee has considered following criteria referring the judgement order of Sarla Verma &Ors Vs. Delhi Transport Corporation &Anr., para 21, " We therefore hold that the multiplier to be used should be as mentioned in column (4) of the Table above (prepared by applying Susamma Thomas, Trilok Chandra and Charlie), which starts with an operative multiplier of 18 (for the age groups of 15 to 20 and 21 to 25 years), reduced by one unit for every five years, that is M-17 for 26 to 30 years, M-16 for 31 to 35 years, M-15 for 36 to 40 years, M-14 for 41 to 45 years, and M-13 for 46 to 50 years, then reduced by two units for every five years, that is, M-11 for 51 to 55 years, M-9 for 56 to 60 years, M-7 for 61 to 65 years and M-5 for 66 to 70 years"*

5. *Expense towards love & affection*

The committee has referred three cases i.e. "Sarla Verma & Ors. Vs Delhi Transport Corporation & Anr", "Sunita Tokas Vs. New India Insurance Co. Ltd" and "Amrit Bhanu Shali & Ors Vs. National Insurance Co. Ltd. &Ors."

In which the court has taken different view on different cases depending upon the subjective merit of the case for expense towards love & affection.

Table 9: The amount of expense towards love and affection in the above-mentioned cases

Case	Expense towards love & affection
Sarla Verma & Ors. Vs Delhi Transport Corporation & Anr	Rs. 10,000/- (as loss of consortium)
Sunita Tokas Vs. New India Insurance Co. Ltd	Rs. 2,00,000/-
Amrit Bhanu Shali & Ors Vs. National Insurance Co. Ltd. &Ors	Rs. 1,00,000/- (Rs. 50,000/- to each dependent)

The committee is of the opinion to consider the expenses towards love and affection is 200000/-per case.

6. *Expense towards last rites- The committee has referred following three cases as tabulated below and considered Rs. 50,000/- as amount of expense towards last rites.*

Case	Expense towards last rites
Sarla Verma & Ors. Vs Delhi Transport Corporation & Anr	Rs. 5,000/-
Sunita Tokas Vs. New India Insurance Co. Ltd	Rs. 50,000/- (Loss of estate & funeral expense)
Amrit Bhanu Shali & Ors Vs. National Insurance Co. Ltd. &Ors	Rs. 10,000/-

Considering the above methodology the committee calculated the amount for deceased personnel and provided as ***Annexure – 15.*** *The unit has submitted details about the compensation paid to the diseased personnel to the SDM Office.*

Table 10:A comparative table of total compensation assessed by the committee and amount already paid by the unit is shown in table below:

S. N.	Name	Compensation estimated by the committee	TOTAL COMPENSATION ALREADY PAID BY THE UNIT				
			EX-Gratia	GPA	Term Insurance	Workmen Compensation	Total Amount
1	**Late Ketankumar Gevariya**	**61,48,342.90**	**3549000**	**1500000**	**1000000**	**0**	**60,49,000.00**
2	**Late Vanrajsinh Dodiya**	**47,31,523.00**	**3000000**	**1500000**	**1000000**	**0**	**55,00,000.00**
3	**Late Krunal Patel**	**36,34,360.00**	**3000000**	**900000**	**1000000**	**0**	**49,00,000.00**
4	**Lt Nehal Mehta**	**38,32,630.00**	**3000000**	**1300000**	**1000000**	**0**	**53,00,000.00**
5	**Late Kuvarlal Kasdekar**	**16,16,794.00**	**1500000**	**0**	**0**	**954101**	**24,54,101.00**
6	**Late Kamal Panse**	**16,16,794.00**	**1500000**	**0**	**0**	**932986**	**24,32,986.00**
7	**Late Maniram Dhikare**	**16,16,794.00**	**1500000**	**0**	**0**	**938634**	**24,38,634.00**

The unit paid total Rs. 2,90,74,721.00/- and has informed that in addition to the above Gratuity, EDLI and PF are also paid as per rules. Therefore, the committee is of the opinion that ***the unit has already paid compensation under various heads which is more than the compensation calculated by the committee referring the methodology as per orders of various matters of Hon'ble Supreme court of India and Hon'ble NGT except for Late Ketan Kumar Garviya. Therefore, the difference of the amount of Rs. 99342.00/- may be considered by Hon'ble Tribunal as additional compensation to be paid by the unit to the dependent of Late Ketan Kumar Gurviya***

Detailed Information regarding compensation paid by unit to Injured persons are enclosed in ***Annexure- 15****.*

8. CARRYING CAPACITY OF JHAGADIA GIDC

The committee has collected information about existence of various infrastructure facilities in GIDC Jhagadia with respect to number and types of industries, environment management facility, status of onsite and offsite plans in terms of 1989 Rules and mock drills, fire fighting facility, health care facility in the GIDC, details about the list of hazardous chemical storage permission to MAH units in the estate etc. to assess the present capacity in terms of safety of the area.

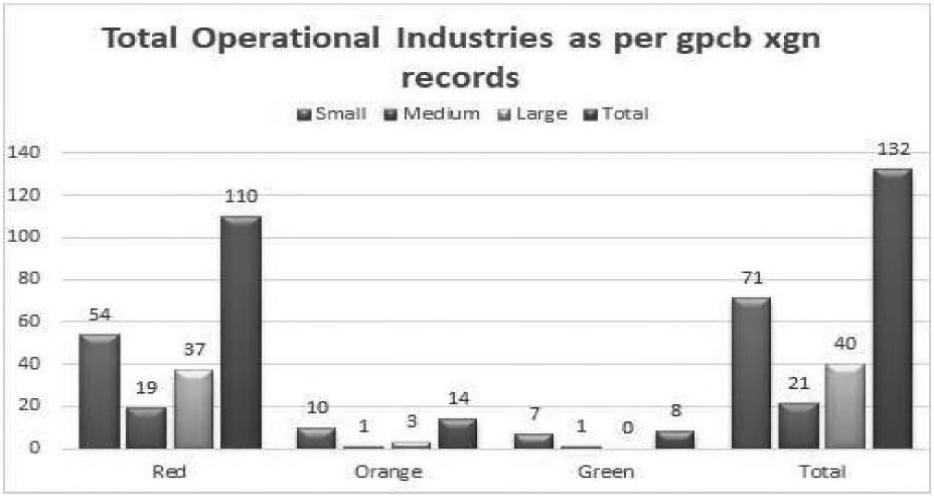
8.1 About Jhagadia Industrial Estate

Jhagadia Industrial Estate is situated in the golden corridor of south Gujarat is developed by Gujarat Industrial Development Corporation (GIDC) in 1993 at Jhagadia, Taluka Jhagadia, Dist. Bharuch. It is one of the largest agglomerations of industrial units and classified as Mega Industrial Estate is spread over an area of 1700 hectares of land divided into 285 plots. As per records of GIDC, out of total spread area about 1300 hectares are allotted. There are a total 285 plots in GIDC, out of which 275 plots are allotted and 10 plots are not allotted. Out of 275 allotted plots, status of 36 plots is under construction, 100 are open plots. The estate is located @ 16 km in north-east direction from Ankleshwar Industrial Area.

As per GPCB record, statistics of operational industries-category and scale wise and operational units are given below Table &graphs

Table 11: Statistics of total operational industries-category and scale wise

Scale → Category	Small	Medium	Large	Total
Red	54	19	37	110
Orange	10	1	3	14
Green	7	1	0	8
Total	**71**	**21**	**40**	**132**



Graphs showing Operational industrial statistics in Jhagadia Industrial Estate (Source: GPCB xgn).

8.2 Details of Present Infrastructure:

8.2.1 Environmental Infrastructure

Wastewater management

Individual industries located at Jhagadia Industrial estates discharges treated wastewater into GIDC drainage network form where it is collected in collection sump at Jhagadia from where it is transferred to Booster Pumping Station at Kantiajal. Booster Pumping Station at Kantiajal also receives wastewater from Final Effluent Treatment Plant (FETP) at Ankleshwar which receives industrial effluent from Ankleshwar and Panoli Industrial estates. Further, mixed effluent (Jhagadia, Anklehwar & Panoli) from collection Sump at Kantiajal, discharge to deep sea through marine outfall.

Air quality monitoring system (NAMP station, CAAQMS)

- *One NAMP station is operated by GPCB for collection of ambient air sampling as per the CPCB guidelines. The station is located at the terrace of Jhagadia Industrial Association (JIA) office in GIDC Jhagadia.*
- *CAAQMS facility is presently not available.*

8.3 Carrying Capacity

Carrying capacity in terms of safety provisions is assessed by the committee by collecting information about the availability and working of onsite and offsite emergency plan, mock drill, safety SOPs, availability of firefighting facility, health care facility in the GIDC, status of Major Accident Hazard (MAH) units in the GIDC Jhagadia etc.

Considering the definition of Major Accident and Major accidents Hazards installation, 11installation in the GIDC Jhagadia are classified as MAH Installation. Definition of Major accident and Major Accident Hazardous Installation is given below.

"Major Accident" means an accident involving loss of life inside or outside the site or ten or more injuries inside and/or one or more injuries outside or release of toxic chemical or explosion or fire of spillage of hazardous chemical resulting in 'on-site' or 'off-site' emergencies or damage to equipments leading to stoppage of process or adverse effects to the environment.

Definition of Major Accident Hazard (MAH) installation

"Major Accident Hazard (MAH) installation" means isolated storage and industrial activity at a site handling (including transport through carrier or pipeline) of hazardous chemicals equal to, or in excess of the

treshold quantities specified in COLUMN 3 OF SCHEDULE 2 and SCHEDULE 3 respectively.

List of MAH Installation in the GIDC Jhagadia is given in table below:

Table 12 : List of MAH Installation in the GIDC Jhagadia

SN	FACTORY NAME	ADDRESS
1	Air Liquid India Holding Pvt Ltd.	Plotno.38/1,GIDC, Jhgadia Dist-Bharuch.
2	Cheme Organic Chemicals.	Plot No. 758,GIDC Estate, Jhagadia,Bharuch.
3	Galaxy Surfactants Ltd.	892,GIDC Jhagadia, Dist-Bharuch.
4	J M Hubar India Pvt Ltd	754 Jhagadia Indl. Estate,GIDC Bharuch 393 110.
5	Klg Organic Ltd.	Plot No.759, GIDC, Jhagadia, Dist. Bharuch.
6	Lanxess India Pvt Ltd	748/2/A,748/3,748/4/A & B GIDC Jhagadia, Dist-Bharuch
7	Panoli Intermediate (India) Pvt. Ltd.	Plot No. 778/1, GIDC, Jhagadia,Bharuch-393 110
8	Saint Gobain Glass India Ltd	36, GIDC Jhagadia , Dist-Bharuch
9	Shriram Alkali & Chemicals (A unit of Dcm Shriram Consolidated) Ltd.	749 GIDC Indl. Estate, Jhagadia, Bharuch-393 110
10	Upl Ltd (Unit-5).	750 GIDC Indl. Estate, Jhagadia, Bharuch-393 110
11	Vardhman Acrylics Ltd.	755 GIDC Mega Estate, Jhaghadia, Dist. Bharuch

Detailed information about the list of hazardous chemicals with maximum storage quantity and availability of fire tenders with MAH unit wise is provided in ***Annexure – 16****.*

Working of Offsite, Onsite emergency plan and Mock drill

As informed by DISH,

- *District offsite plan is prepared for Bharuch District wherein GIDC Jhagadia is part of the plan. Offsite mock drill is one of the mandatory requirements to ascertain the working of the offsite plan as per MSIHC Rule under the chairmanship of Dist. Collector. Offsite mock drill was carried out at Jhagadia GIDC on 10/07/2020 at M/s DCM Jhagadia. The Mock drill was planned and carried out for fire in a hydrogen bank truck. Major aim of mock drills is to record the response time and steps to be taken to minimise the same.*

- *As per the District Off-Site plan, Jhagadia GIDC has Local Crisis Group comprising 14 members (representative from MAH units and other units).*
- *DISH informed that all MAH units have onsite emergency plans and a third party safety audit is also carried out and submitted to DISH by all MAH units in the GIDC. As per the statutory requirement, MAH units has to carry out in house mock drills twice in a year and mock drill reports are to be submitted to DISH. All MAH units regularly submitted mock drill reports to DISH.*

8.4 Present Capacity of GIDC in terms of safety infrastructure

Jhagadia GIDC Estate is growing with lots of new vulnerability of Risk, having more than one hundred thirty active industries spread in almost 1720 hectares of the land. The GIDC is surrounded by villages having almost 50,000 populations in the vicinity of about 10 kms radius. There are total 11 MAH units in the Jhagadia GIDC.

It can be seen that 09 MAH units located in close vicinity and accident in one unit likely to have adverse impact on surroundings and neighbouring units. The MAH units are mutually support each other during any accident in the area. There are only Five MAH units having Fire Tender vehicles with trained fire crew. At present, the available firefighting and allied facilities of the GIDC estate is not adequate even the local fire station of Jhagadia GIDC is also not well equipped and has only one fire tender. The scenario of accident of UPL indicates that the present infrastructure is not enough to handle such types of accident involving fire and explosion. As during the firefighting operation of almost 18 fire tenders from nearby industries of Jhagadia GIDC, from DPMC, Ankleshwar, DPMC-Dahej, GNFC-Bharuch were mobilised in addition to the in-house firefighting capability of the unit.

During the accident at UPL, the injured personnel were given first aid at the health centre of the unit and ambulances were mobilised for taking injured personnel to hospitals Smt. Jayaben Modi Hospital, Ankleshwar, as the area do not have any such facility. The available facilities are in Bharuch and Ankleshwar areas which are almost 25-30 kms away from Jhagadia GIDC estate.

Looking at the above facts, the committee is in the opinion that a review of fire load of individual industries and firefighting facility provided may need to be carried out by concerned authority considering IS13039:2014 and such standards provisions and also to establish a Disaster Prevention and Mitigation Centre (DPMC) type of infrastructure with well-equipped control room with all necessary fire & safety equipment and having trained firefighting staff, rescue workers and first-aiders personnel, deployed round the clock in Jhagadia GIDC, equipped with at least Four Water-cum-foam fire tenders and two HAZMAT vehicles to combat Chlorine and other toxic gas release. In addition to the above, a common water reservoir of adequate capacity with an advanced

pumping system in the area may also be planned. Health care facility is also required to be planned as presently the area is not having any such facility to provide even the primary treatment in case of such accident.

9. CONCLUSION

Hon'ble National Green Tribunal (NGT), Principal bench, New Delhi took up the matter on suo-moto basis in the application no. 60/2021 on 25/02/2021, and constituted a joint committee vide orders dated 25/02/2021 to submit a report on the accident that took place in M/s UPL Ltd. (Unit 5), GIDC Jhagadia on 23.02.2021. The accident took place in the manufacturing plant of the final product namely, Clethodim which is herbicide, in CM-257 plant at M/s UPL Ltd. (Unit 5), GIDC Jhagadia. The blast followed by massive fire in the premises of the unit took place on 23/02/2021 in the reactor (stage I, CM-257 Plant). During the accident, the plant process was under shutdown since 04/02/2021 owing to boiler maintenance and inspection. However, materials at intermediate reaction stages were stored in the different reactors of the plant. The reactor in which the blast took place was having about 8.0 MT of Ethyl Thio Butanol (ETB) which is the first stage intermediate product in the process of manufacturing Clethodim. ***The blast was so massive that it felt like anearthquake in the entire area resulting into death of 07 personnel working in the plant, injury to 53 personnel within the premises, damage of other reactors/tank form containing various chemicals, other infrastructure including the DCS building, sheds of other plants, glass of windows inside the premises of the unit etc****.*

The joint committee visited the unit on 04/03/2021 and again on 09/03/2021. During visit, the committee interacted with some of the concerned officials present on duty on the day of accident in the unit, representatives of the unit, collected various available reports and records from the unit. Referring to the reports prepared by DISH, GPCB and other authorities, action taken by different authorities, information collected & observations in connection with accident following conclusions were drawn by the committee:

- *The plant CM-257 was commissioned by the unit based on its in-house R&D Study, basic and detailed engineering. During such in-house development of products, more focus need to be given in conducting proper safety and stability test at various stages. However, in the plant stage serious lapses in HAZOP study, safety audit, non-availability of SOP for safe shutdown etc. were observed. The unit has not yet been able to identify the root cause of the accident. One of the probable reasons reported by the unit is leakage of methanol in the reactor containing ETB which might have triggered due to exothermic reaction and resulted in the blast. The reaction of methanol with ETB may be logical in terms of reaction chemistry. However, serious lapses in terms of safety study, reactivity study, compatibility test, development of*

standard operating procedure for planned and emergency shutdown, storing intermediate stage product during shutdown, gaps in HAZOP, safety audit, in adequacy of sensors provided for the reactor etc. might have resulted in the accident.

- *Considering the accident as reported in the social media, during manufacturing of similar product in China in 2019 and in the present case, the committee is in of the opinion that* ***detailed various studies w.r.t. the safety aspects as mentioned in the para above, needs to be carried out before reconsidering manufacturing of Clethodim, as there is a lack of information about thermal stability, reactivity at intermediate stages, and safety provisions as observed in the present case.***

- *The unit has submitted safety audit report, as per which, details of chemical stored in the unit, the actual total stored quantity of toluene, n-Hexane and Methanol exceeds 143 kl (storage permission from PESO to the unit). However, the safety audit report does not mention any observation regarding exceedance in stored quantity beyond permission limits of PESO. Moreover, the audit report has various gaps which includes lack of detailed process hazards from CM-257 Plant.* ***Thus, the safety audit carried out by the unit shows gaps and needs to be carried out again by a competent agency, accredited by an Accreditation Board as per Rule 68 j para 9 of the Gujarat Factory Rules, 1963 and restrict the storage of chemicals as per permission from PESO****.*

- *The committee is also of the opinion that the* ***unit needs to review entire safety aspects in terms of SOP, HAZOP study, Qualitative and Quantitative Risk assessment, fire load, etc. as gaps were identified during visits. The unit needs to take required measures to fulfil the gaps identified in the report.***

- *The committee has calculated Environmental Damage cost considering the air, water and soil component. The chemical lost during the accident were converted in terms of pollutants like sulphur-di-oxide, carbon-di-oxide, HCl etc. except a part of toluene considered to be emitted as VOC along with firefighting water. The quantity of firefighting water used is estimated and based on the concentration of COD, the water component is calculated in lieu of loss of natural resources and treatment cost. In addition, t****he liability towards damage in the area is also considered due to spread of contaminated water on soil. Considering above, the total cost of Environmental damage compensation due the accident sums up to Rs. 219.71 lakh which may be considered by Hon'ble Tribunal to be paid by the unit towards Environmental Damage compensation.***

- *The committee calculated compensation for the deceased personnel refereeing various orders of Hon'ble Supreme Court of India and various reports of Hon'ble NGT.* ***The committee is of the opinion that the unit has already paid about 290.74***

lakh towards compensation under various heads which is more than the compensation calculated by the committee except for in case of Late Shri Ketan Kumar Garviya. Therefore, the difference of the amount of Rs. 99,342.00/- may be considered by Hon'ble Tribunal as additional compensation to be paid by the unit to the dependent of Late Shri Ketan Kumar Gurviya.

- *The committee has also identified inadequacies in present infrastructure to combat the major accident scenario in the Jhagadia GIDC. Though it was informed that onsite emergency plan and mock drill is carried out by all 11 Major Accdient Hazardous (MAH) units in the estate as statutory requirement and local crises group is also there in the GIDC as per offsite plan of Bharuch District,* ***the committee is of the opinion that a safety review in terms of fire load of individual industries and firefighting facility provided by them needs to be carried out by concerned authority in compliance to the IS 13039:2014 and other similar standard provisions***.

- *There is an urgent need of infrastructure like Disaster Prevention and Mitigation Centre (DPMC) with well-equipped control room, all necessary fire & safety equipment, trained firefighting staff, rescue workers and first-aiders personnel deployed round the clock in Jhagadia GIDC. The proposed DPMC should be equipped with at least Four Water-cum-foam fire tenders and two HAZMAT vehicles to combat Chlorine and other toxic gas release may be provided in the GIDC. In addition to the above, a common water reservoir of adequate capacity with an advanced pumping system in the area may also be planned.* ***Health care facility is also required to be planned in vicinity of the Jhagadia estate, as presently the area is not having any such facility to provide even the primary health treatment."***

Discussion and directions

6. We have heard learned Counsel for the CPCB, the Project Proponent and the representative of Gujarat State PCB. No one has entered appearance on behalf of the State. Questions for consideration are the cause of the incident and remedial measures, including compensation to the victims and restoration of environment.

Cause of the incident and remedial measures

7. We find that several accidents have recently taken place in the course of industrial activities on account of gas leak, blast, fire etc.. The details of some of such cases have been already mentioned in the earlier

order quoted above including an incident in same District - District Bharuch in a chemical factory Yashyashvi Rasayan Pvt. Ltd. In respect of the earlier incident dated 03.06.2020 in Yashyashvi Rasayan Pvt. Ltd, the Tribunal has dealt with the matter vide order dated 03.02.2021 in *O.A. No. 85 of 2020, Aryavart Foundation through its President v. Yashyashvi Rasayan Pvt. Ltd. & Anr.* in the light of report of the Expert Committee headed by Justice B.C. Patel, former Chief Justice of Delhi High Court. The Tribunal accepted the report of the said Committee which *inter-alia* recommended as follows:-

> "7. *Recommendations to avoid future incidents and other questions are as per the report Mark Annexure 28.*
>
> ***SECTION 8***
>
> ***STEPS REQUIRED TO AVOID SUCH INCIDENT (NATIONALDISASTER MANAGEMENT AUTHORITY)***
>
> *55. The question is how such accidents can be avoided. There is National Disaster Management Authority (NDMA) of the Government of India, which has issued guidelines for Chemical Disasters (Industrial).*
>
> *56. The common causes for chemical accidents, deficiencies, safety management system and human errors are noted. The chemical accidents fire, explosion and/or toxic release were resulting irreversible pain, suffering and death.* ***To minimise such accident and to improve emergency preparedness at all levels, substantial efforts are still required to predict the occurrence of disaster****. (Page xvii)*
>
> *57. It is also stated that it has been realised that* ***effective Chemical Disaster Management (CDM) is possible by the adoption of preventive and mitigation strategies as most chemical disasters are preventable in comparison to natural disasters that are difficult to predict and prevent. Statutory inspection, safety audit and testing of emergency plan, onsite emergency plan, offsite emergency plans, medical emergency plans, information on chemical, technical information have been given importance.***
>
> *xxx……..xxx……xxx*

5. Shortage and training of manpower:

viii. It is necessary to appoint adequate number of Scientists and other officers as well as other staff considering the number of industries so as to effectively monitor the manufacturing units. Shortage of staff is also referred in the report of the Comptroller and Auditor General of India on Environmental Clearances and Post Clearance Monitoring 2016 that there are shortfalls in monitoring of environmental parameters. One of the reasons mentioned in the report is the shortfall/inadequate staff. Considering the numbers of Environmental clearance by MoEF & CC, New Delhi as well as SEIAA Gujarat (No. of ECs issued by MoEF & CC, New Delhi- Approx. 1500 & by SEIAA Approx. 8300 for the state of Gujarat only), the scientific staff in Ministry's regional offices should be strengthened for post EC monitoring at regular intervals. Thus, for having an eye over all the units, the Committee feels that the government should take appropriate steps for appointing adequate staff. The PESO also pointed out the same concerned the Gujarat being most industrialized state having about 40,000 licensed premises covered under various Acts and Rules including 1800 Major Accident Hazards premises, this is one of the pressing problems.

ix. *The manpower of the DISH in the industrial area must be related to the numbers of units in the area. Considering the incident and the quality of the inquiry made by DISH, it is desirable that proper training should be imparted to the officers of the DISH. This will improve the efficiency of DISH.*

6*….xxx……..xxx…….xxx*

7. Management & study:

xiii. HAZOP study direction / instruction must be carried out strictly and regularly by the unit.

xiv. Management to educate the staff on Materials Safety Data Sheet (MSDS) and engineers & operators in the plant must study the same.

7. DCG, Hospitals:

xv. All Industrial Zone/SEZ should have their own Local Crisis Group. The District Crisis Group should give surprise visit to the factories regularly at least once in a quarter and check the operation of factories. At the end of the visit, they should generate a report and submit to the State Crisis Group.

xvi. As per the Chemical Accidents (Emergency, Planning, Preparedness, Response) Rules, 1996, brought out under the Environment Protection Act 1986, it is mandatory to have

State Crisis Group (SCG) and District Crisis Group (DCG) to help the State Disaster Management Authority (SDMA) and District Disaster Management Authority (DDMA) under the Disaster Management Act, 2005 in advisory roles to deal with Chemical Disaster Management (CDM). There is no emergency response centre / disaster management centre within the SEZ. Therefore, the authorities must provide urgently such centers. As the Industry in the instant case failed to report in this behalf there must be a provision for not reporting immediately to the DCG and DDMA or at emergency control room for chemical disasters in the state (as in the instant case it is at Vadodara). The Rule making authority though having prescribed 48 hrs. time limit within which the competent authority is required to be informed but there is no provision for the breach with regard to non-informing immediately or within 48 hrs. (In the instant case it is admitted the report was submitted on 9th June, 2020 against the incident on 3rd June, 2020).

xvii. ***The requirement of a Hospital in an industrial zone or SEZ and particularly industries are engaged in hazardous chemicals is a must. Even Hospitals at distance of 50 kms are general hospitals and not specialised in chemical burns and injuries arising out of accident on account of hazardous materials.***

xviii. *District crisis group must undertake mock drill under off site emergency plan and crisis management in every industrial cluster or SEZ on failure action should be taken against DCG. (In the instant case they were satisfied with mock drill in one place in a district. In the instant case in one district there are more cluster of industries. Therefore, in each cluster an exercise aforesaid is a must – DISH has admitted that such exercise is not carried out in all clusters).*

xix. *As at other places in the state of Gujarat in the industrial clusters, the GPCB has provided tower for air quality monitoring and same is being monitored by the GPCB. Dahej – I & II or the SEZ being an industrial town and factories are particularly engaged in hazardous chemicals, the committee is of the opinion that there should be Continuous Ambient Air Quality Monitoring Systems (CAAQMS) at all strategic locations. So that everyone in that area is aware about the air pollution.*

8. <u>Safety audit:</u>

xx. *For the purpose of auditing the safety,* ***the government must make a panel of safety auditors to inspect the factory independently twice in a year and they should submit their report directly to the DISH. The safety auditor should be made answerable to the government.***

xxi. *The committee is of the opinion that sub-rule (9) of Rule 68(J) of the Gujarat Factories Rules 1963, refers to safety report and safety audit reports, under that Rule sub rule 2 gives a choice to industry to select the auditor for the purpose of the safety audit. The committee of the opinion that the state government be requested to consider the case and particularly*

safety report from independent auditor and to amend the Rule as below:

2). After the commencement of these Rules, the occupiers of both the new and existing industrial activities and isolated storage must be checked by the government through the safety auditor which is accredited by an accreditation board to be constituted by the Ministry of labour, Government of India.

3). The auditor within 30 days of audit shall send the report to the chief inspector with respect to the audit recommendations and which shall be examined by the government within a period of 1 month and the industry shall be directed to carry out within the period specified the recommendation that may be made by the Government in this behalf."

8. In the present case also we find similar recommendations. After consideration of the matter in the above earlier case, the Tribunal issued following directions in the said matter:-

"28. We do not find any tangible objections to the report of the Committee which stand accepted. The recommendations of the Committee need to be duly implemented which needs to be overseen by the statutory regulators. We note that in the recent past the Tribunal has come across the number of incidents of leakage of gases and handling of hazardous chemicals. On investigation, this Tribunal has found that most of the accidents are result of non-compliance of laid down safety norms under the 1989 Rules and the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 [1996 Rules]. There is, thus, need for the establishments handling hazardous chemicals to strictly follow the laid down norms, which need to be overseen by the statutory regulators.

29 to 31xxx……..xxx……xxx

32. ***In view of frequent accidents resulting in deaths and injuries, the Chief Secretaries of all the States/UTs may evolve a mechanism to ensure that the companies dealing with hazardous substance must forthwith pay compensation for deaths and injuries to the victims at least as per Workmen Compensation Act, 1923 wherever applicable or the principle of restitution laid down in Sarla Verma (supra), National Insurance Company Ltd. v. Pranay Sethi, (2017) 16 SCC 680 to the victims either directly or through the District Magistrate.***

33. Conduct of safety audits of all establishments having potential for such accidents may be ensured. All States/UTs

may also ensure availability of healthcare facilities in the vicinity of such establishments. PCB and DM must assess cost of restoration of environment which should be recovered from company and spent on such restoration. The States and UTs in accordance with 1989 and 1996 Rules need to step up vigilance, surveillance and monitoring to avert such accidents. Preparedness to meet such eventualities be ensured. Regular mock drills may be ensured in respect of onsite and offsite emergency plans. We may also refer to the directions issued by this Tribunal to the MoEF&CC and all the States/UTs on the subject of strengthening regulatory and oversight measures, vide order dated 01.02.2021 in OA 837/2018, Sandeep Mittal vs. Ministry of Environment, Forests & Climate Change & Ors."

9. It is thus clear that there are violations in following requisite safety protocols and monitoring and absence of adequate health facilities in the vicinity. Learned Counsel for the Project Proponent fairly stated that the unit in question will follow all the recommendations of the Committee including payment of compensation for the damage to the environment, remedying the inadequacies in the infrastructure and all safety precautions for future. Entire safety aspects will be reviewed in terms of SOP, HAZOP, Qualitative and Quantitative Risk Assessment and other gaps identified by the Committee.

Compensation to the victims and restoration of environment

10. While accepting the report, we note that substantially the compensation assessed has been already paid to the victims. Remaining amount, if any be paid. We further approve the compensation for damage to the environment and the same may be credited to a separate account by the industrial unit for being spent on restoration of the environment by preparing an action plan, to be approved by the State PCB and the CPCB. The plan may focus on developing relevant infrastructure to prevent such accidents and provide relief in case such untoward incident happens. The said step will be apart from other measures suggested by the Committee.

Compliance of recommendations for remedial action

11. We find that it is necessary to require an action taken report to be filed by the Chief Secretary, Gujarat who may hold a joint meeting with District Magistrate, Bharuch, the Director Industrial, Safety, the Member Secretary, State PCB and the GIDC within one month. The Chief Secretary may ensure that all the remedial measures have been adopted in terms of the report and file an action taken report within three months with the Tribunal by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/ OCR Support PDF and not in the form of Image PDF. The Chief Secretary, Gujarat may also issue instructions for requisite safety measures for all other industrial units in the State having potential for such accidents. The action taken report may include status of risk-policies taken by the industries to cover health and safety risks of persons engaged or likely to be affected and compliance of 1989 and 1996 Rules. The action taken report may also mention the remedial measures taken in respect of 11 other units mentioned in the report viz:-

1. Air Liquid India Holding Pvt Ltd.
2. Cheme Organic Chemicals
3. Galaxy Surfactants Ltd.
4. J M Hubar India Pvt Ltd.
5. Klg Organic Ltd.
6. Lanxess India Pvt Ltd.
7. Panoli Intermediate (India) Pvt. Ltd.
8. Saint Gobain Glass India Ltd.
9. Shriram Alkali & Chemicals (A unit of Dcm Shriram Consolidated) Ltd.
10. Upl Ltd. (Unit-5)
11. Vardhman Acrylics Ltd.

12. We also direct CPCB and MoEF&CC in coordination with other concerned authorities to consider issuing appropriate guidelines for conducting safety audits and taking other remedial measures throughout India in the light of present report as well as other recent reports in

respect of industrial accidents so as to prevent such incidents and to save human lives and health.

13. We place on record our appreciation for the task executed by the Committee. CPCB may convey this observation to the members of the Committee. The report of the Committee may be placed on websites of the State PCB and the CPCB for purpose of reference for six months.

The application is disposed of except for considering the action taken report which may be filed in pursuance of the above order.

The same may be put up for consideration on 09.11.2021.

A copy of this order be forwarded to the Chief Secretary, Gujarat, the District Magistrate, Bharuch, the Director Industrial, Safety, the Member Secretary, State PCB, the GIDC, MoEF&CC and the CPCB by e-mail for compliance.

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Sudhir Agarwal, JM

M. Sathyanarayanan, JM

Brijesh Sethi, JM

Dr. Nagin Nanda, EM

June 11, 2021
Original Application No. 60/2021
SN