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DEEPAK NITRITE LIMITED

Ref. No.: DNL/TCD/AMP/2017-18/010 May 15, 2017

Ministry of Environment and forests and Climate Control,
Room No. 236, Vayu Wing, 2nd Floor
Indira Paryavaran Bhavan,
Jorbaug Road,
New Delhi 110003

Dear Sir,

Attn : Shri Yogendra Pal Singh - Member Secretary (Industry -2)

Subject : Minutes of meeting of 23rd EAC (Industry-2) for our proposed modernization cum Change in product mix proposal discussed under item no 23.9.2.

Ref of : Additional details are sought by concerned Member Secretary after consideration Proposal in 23rd EAC Meeting (J- 11011/367/2016-IA.II (I))

With reference to the above subject, our proposal was discussed in the 23rd meeting of EAC on 05th May 2017. After deliberation, the Committee sought following additional information:

Sr. No.	Observations	Compliance
1.	Risk assessment to be done by 3D model.	Details report attached as annexure no. I
2.	Report on Prediction of Ground Level Concentrations of Air Pollutants to be submitted	Attached annexure no. II
3.	List of pollution control equipments w.r.t. each pollution source to be submitted.	List of pollution control equipment w.r.t. each source is attached annexure no. III
4.	Commitment to not store locally available raw materials more than 3 days.	Agreed and confirmed. Commitment letter is attached as annexure no IV.
5.	Make an ESR plan for 5 years @ 5 % of the project cost with the consultation of nearby villagers.	Details on ESR plan, attached annexure no V.

In view of above, we request you to consider our proposal for recommendation for appraisal of EIA in upcoming meeting of EAC.

Thanking you,

Yours Faithfully

For Deepak Nitrite Limited

DEEPAK NITRITE LTD. TALOJA CHEMICAL DIVISION TALOJA

Authorised Signatory

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Tel.: +91 - 22 - 2741 1125 / 26 / 27 Fax : +91 - 22 - 2741 0695 Website : www.deepaknitrite.com
Regd. Office : 9/10, Kunj Society, Alakapuri, Vadodara - 390 007. Tel.: +91 - 265 - 233 4481 Fax : +91 - 265 - 233 0994
(AN ISO 9001 : 2008 & ISO 14001 : 2004 Certified Company)

Annexure –I

Risk assessment to be done by 3D model

Pune, India – 07.06.2017
Ref. No.: Gexcon-17 -F00031-RA-01
Rev.: 00

GEXCON

REPORT

Consequence Analysis Studies

Deepak Nitrite Limited, Roha, Taloja

Client	Author(s)
Deepak Nitrite Limited, Roha	Ajey Walavalkar, Yogesh Gawas

Document Info

Author(s)

Ajey Walavalkar, Yogesh Gawas

Classification

Confidential (F)

Title

Consequence Analysis Studies – Deepak Nitrite, Roha

Extract

This report describes consequence analysis using computational fluid dynamics (CFD) technology for worst case release scenarios of accidental hydrogen release and subsequent explosion of the dispersed gas cloud at Deepak Nitrite Limited's facility at Roha.

To capture worst case release scenario, catastrophic failure of hydrogen cylinder containment with high rate of gas release was simulated with varying release directions and varying wind conditions. The resulting gas clouds were then tracked and worst cases of gas clouds were ignited to calculate resulting overpressures on various structures. Overpressures of the order of 0.3 bar can be seen in such catastrophic failure scenarios in regions where there is possibility of human presence.

Project Info

Client

Deepak Nitrite Limited, Roha

Clients ref.

Mr. Shailesh Raval

Gexcon Project No.

00031

Gexcon Project Name

DeepakNitriteRoha

Revision

Rev.	Date	Author	Checked by	Approved by	Reason for revision
00	07.06.2017	Ajey Walavalkar	Yogesh Gawas	Rajendra Narkhede	Draft version for upload

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Table of Contents

1 Background

The work described in this report is the results of an enquiry from Deepak Nitrite Limited concerning the consequence analysis of possible accidental releases of various flammable and explosive chemicals at their Roha and Taloja facilities.

Deepak Nitrite Limited shared with Gexcon India the report of QRA studies conducted for both Roha and Taloja sites. These QRA studies were conducted using consequence modelling tools that provide the consequence predictions based on simple analytical methods and typically fail to incorporate effects of obstructions and congestions present at the site. The 3D effects can be significant in the physics that governs the development of vapour clouds as well as in resultant overpressures from explosion of such vapour clouds. These 3D can result in significantly different overpressures in consequence analysis if the presence of obstructions and congestion are significant at the site. Figures 1-1 and 1-2 were shared by Deepak Nitrite with Gexcon India to estimate which locations and which sites can potentially observe this pronounced effect on overpressures due to obstructions and congestions.

Based on level of hazards present, it was decided to focus only on the hydrogen release accidents as hydrogen is one of the most flammable gases present on both the sites. After review of the plot plans as shown in figures 1-1 and 1-2, it was decided by Gexcon India that for the hydrogen accident release, the consequence results from simple analytical methods of analysis for Taloja site are unlikely to change significantly due to 3D effects. Following are the reasons behind the decision:

1. Work done with PHAST with the assumption of releasing toward the open part of the weather cladding, (the area around doesn't seem very congested and relatively open).
2. When releasing downward, the complex shape of the resulting flammable gas cloud could be significantly better handled with FLACS 3 D modelling, and so will be the associated explosion consequences (congestion and confined levels captured as in reality).
3. When releasing upward or toward any directions inside the weather shade area (most likely impinging), the hydrogen will quickly rise and accumulate below ceiling. Ceiling is tilted and structural assembly has openings towards upper ends which will allow gas to escape and prevent significant accumulation.
4. The protective shed is relatively open, allowing for natural ventilation.
5. Gexcon India evaluate that 3D modelling is not required for Taloja plant.

The Gexcon team was also provided with Roha plant layout and concluded to carry out 3D modelling at Roha plant due to congestion and Hydrogen storage area is surrounded by Hydrogenation plant at North, Nitration plant at west and Utility block at east.

This is because, as can be seen from figure 1-1, at Taloja site, the hydrogen leak locations are in regions that have very little obstructions to the flow. They are also present near the boundary of the plant. For the Roha site, it was thought that the location of hydrogen leak being surrounded by various buildings, the 3D effects can result in different overpressure values than predicted by simple analytical methods.

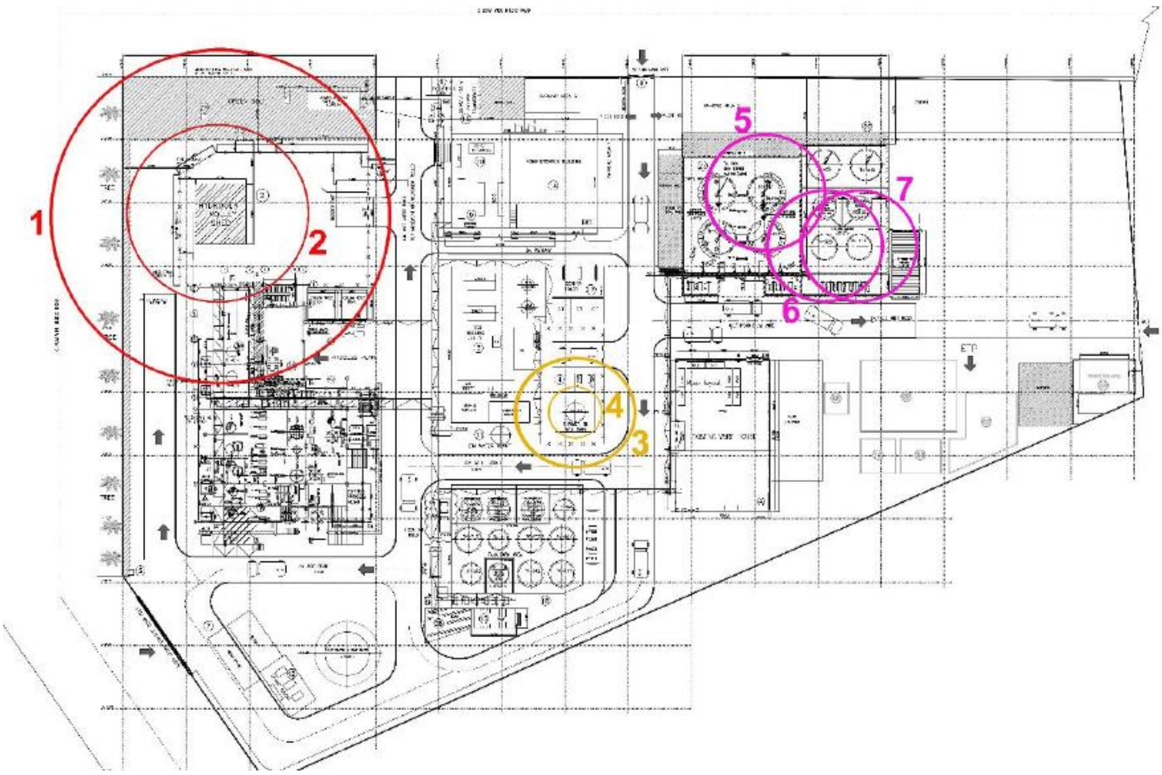


Figure 1-1: Layout at Deepak Nitrite, Taloja site with consequence results mapped on the layout.

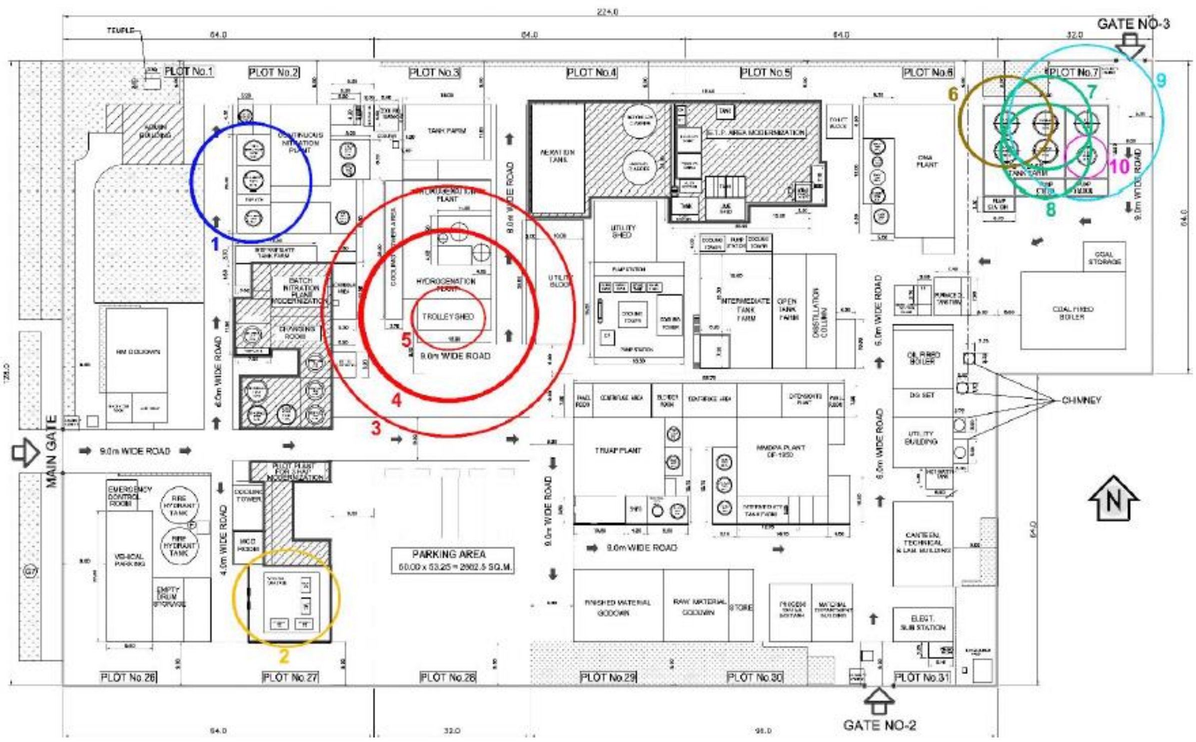


Figure 1-2: Layout at Deepak Nitrite, Roha site with consequence results mapped on the layout.

Since the scope of this work is limited to 3D CFD consequence analysis of worst case accidental hydrogen release and subsequent explosion, rest of the QRA study along with its findings for both Roha and Taloja sites should be followed.

1.1 Outline

Chapter 2 describes the implemented geometry and the setup of the FLACS simulations, including a brief description of the variables chosen. Chapter 3 presents the results from the simulations. The worst-case explosion scenario was performed. Chapter 4 summarizes the main conclusions. The photographs of the Roha site shared by Deepak Nitrite are used as reference to create the 3D geometry. These are provided in Appendix A.

2 FLACS Simulations

All simulation results presented in this report are obtained with the CFD code FLACS version 10.5R1.

This chapter describes the implemented geometry and the scenario investigated in the FLACS simulation.

2.1 Geometry and grid

Based on the plot plan provided (figure 1-2), a suitable region of interest from this plan was selected to be included in the CFD simulations. Figure 2-1 shows the region selected for simulations marked by green lined boundary. Within this boundary, the buildings and structures marked by green dot were included in the simulation geometry. Due to unavailability of the 3D CAD model and limited time available for the project, an approximate representative model of the buildings in this region was implemented in CASD. The implemented geometry was based on drawings/photographs and other details provided by Deepak Nitrite Limited, Roha. These photographs are provided in Appendix A.

Figure 2-2 to Figure 6 illustrate the implemented model of the various buildings, and structures like the trolley shed, truck and hydrogen cylinders.

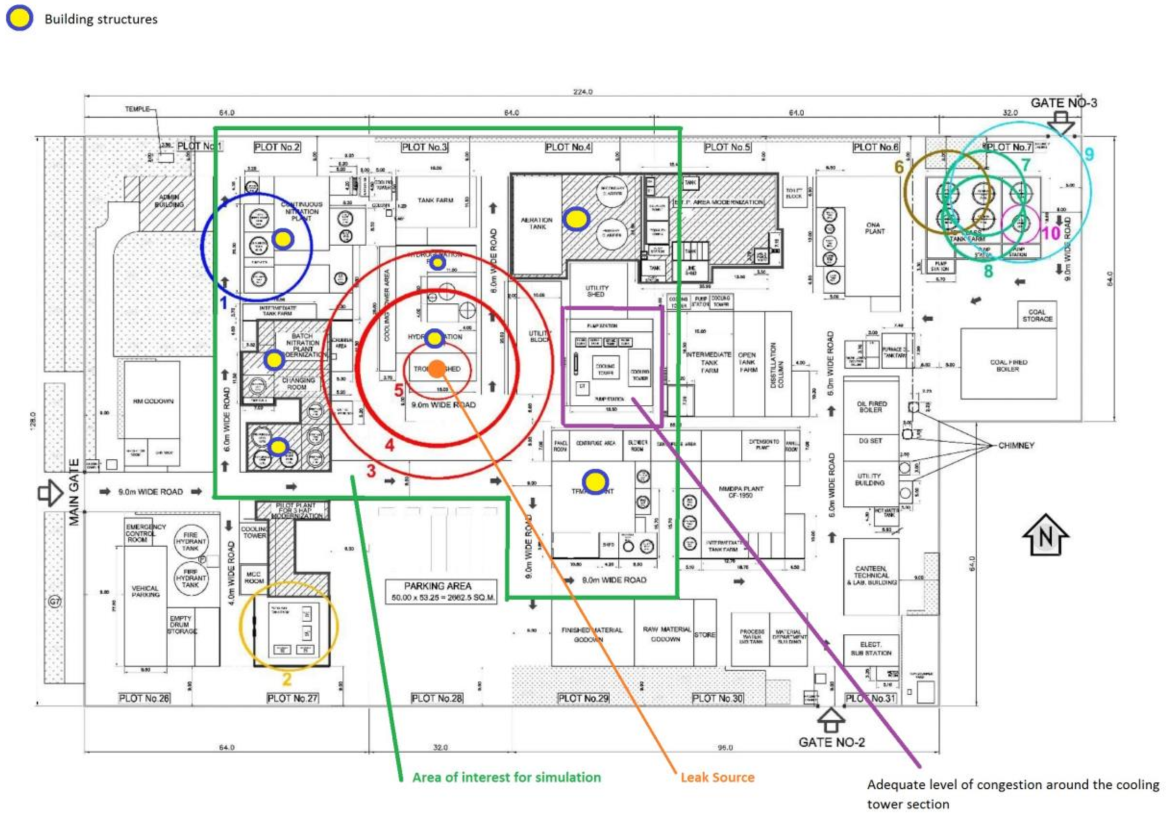


Figure 2-1: Selected domain extents and buildings to be represented in the CFD model.

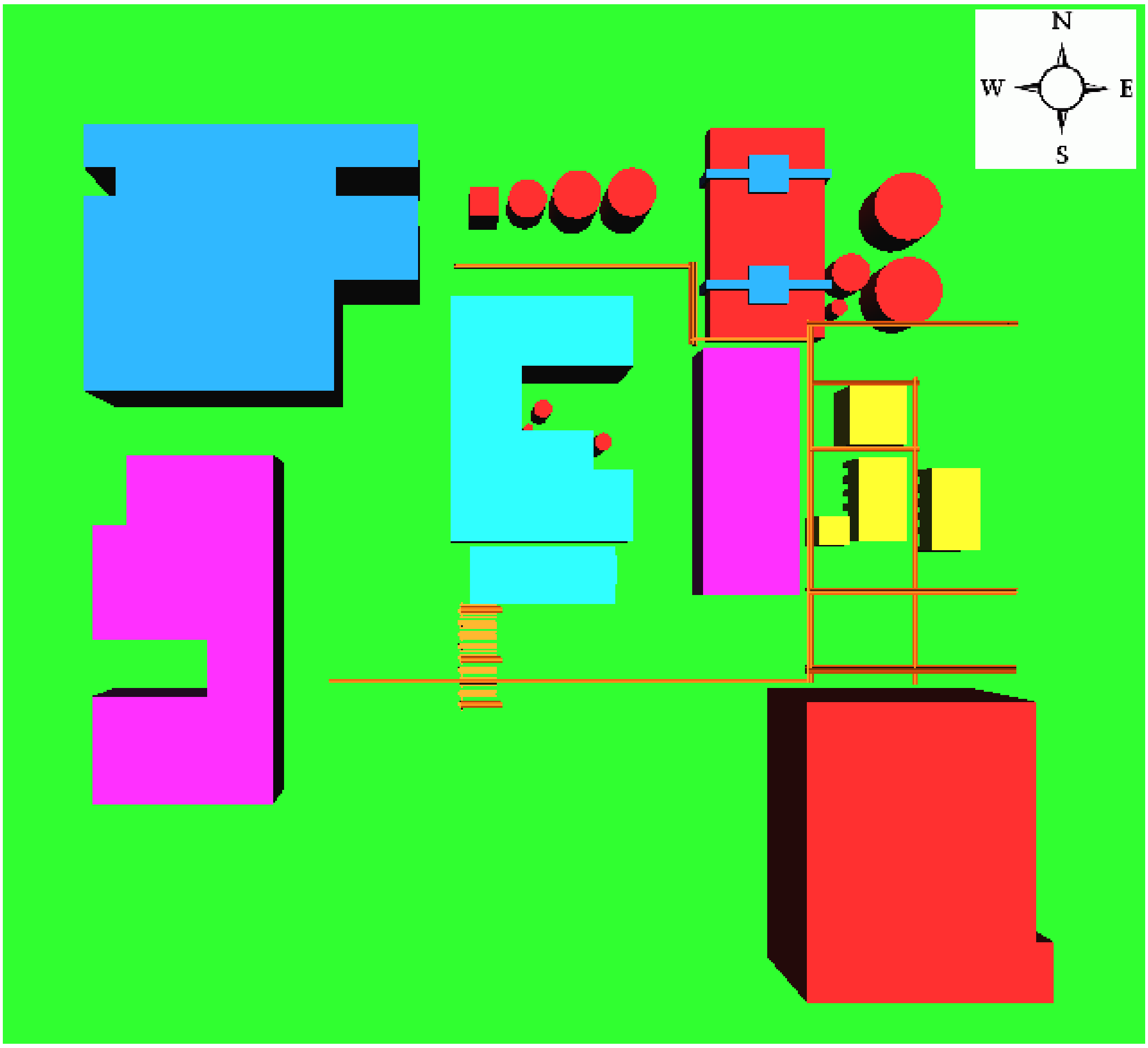


Figure 2-2: Top view of the simulation domain

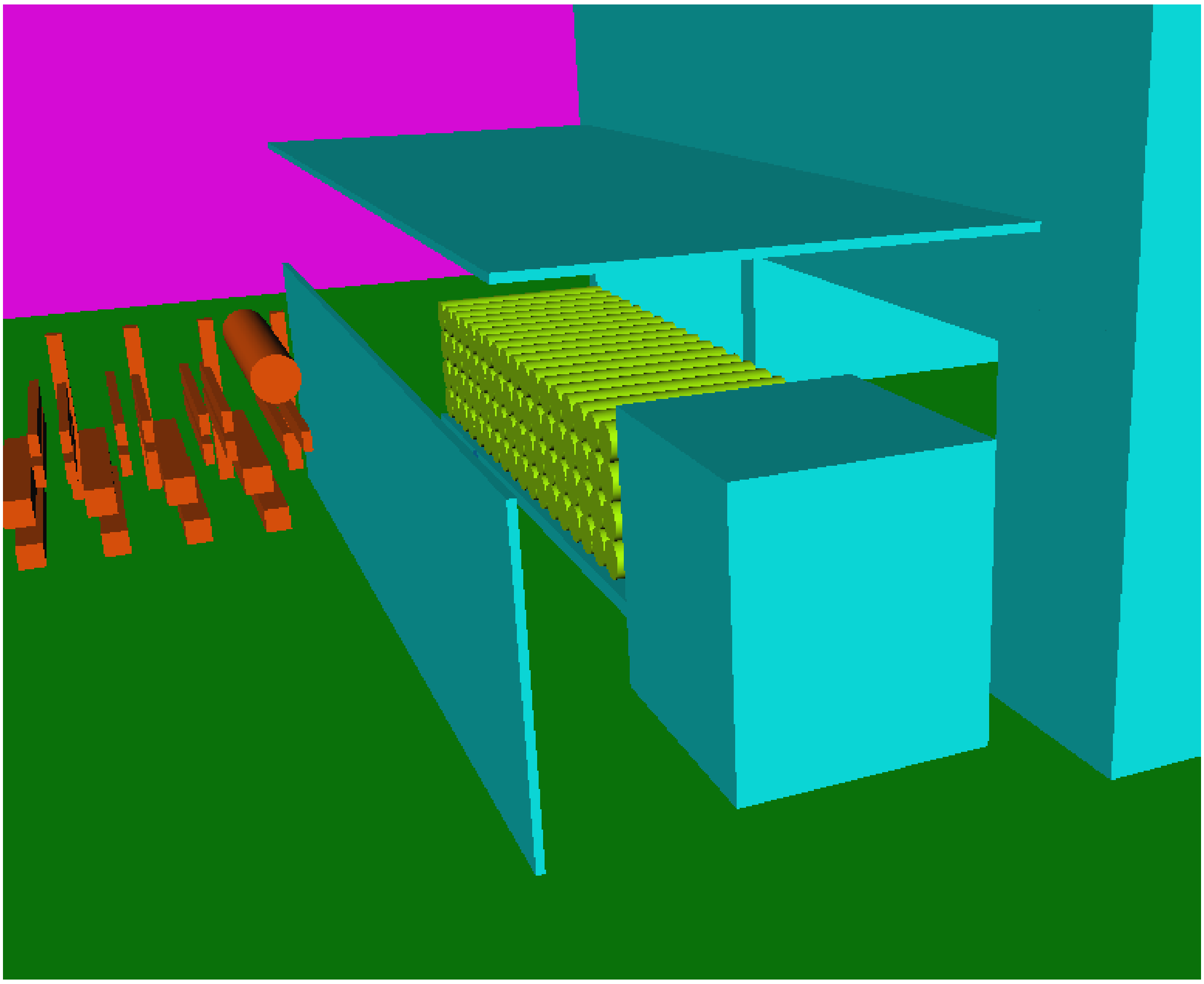


Figure 2-3: Close up view of the trolley shed and the truck

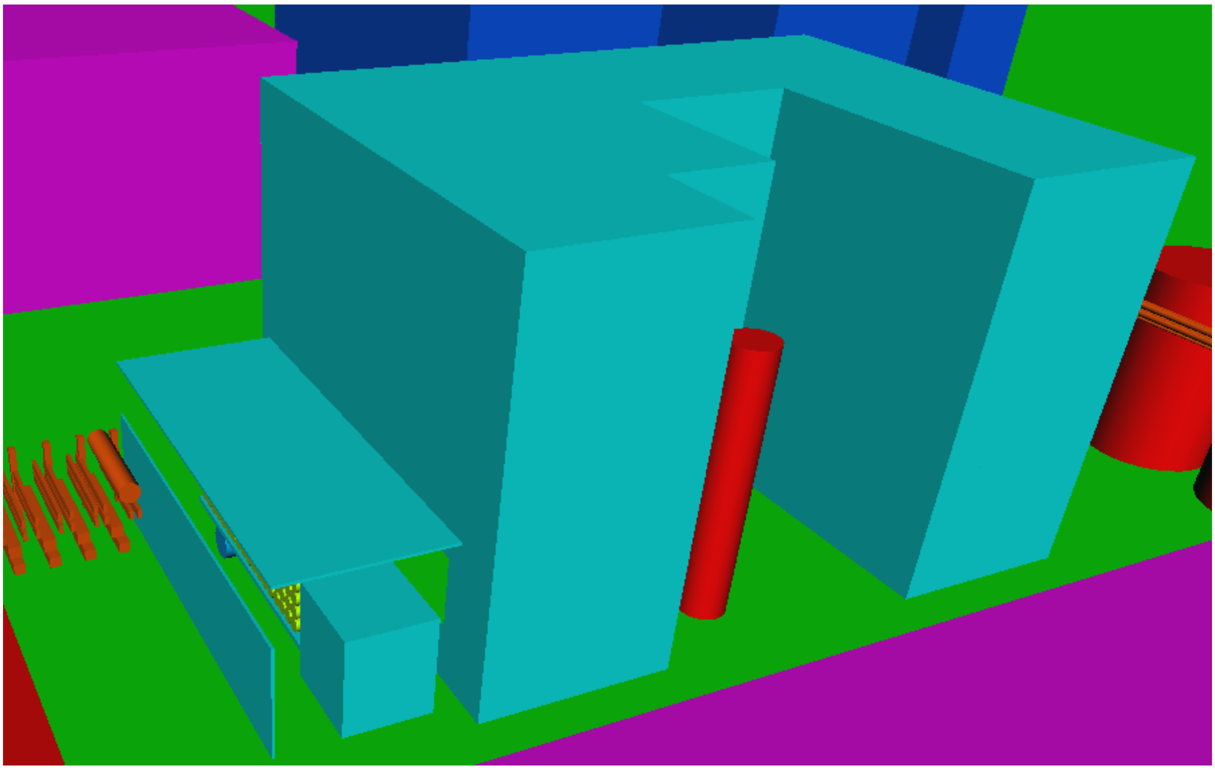


Figure 2-4: Close up view of the hydrogenation building

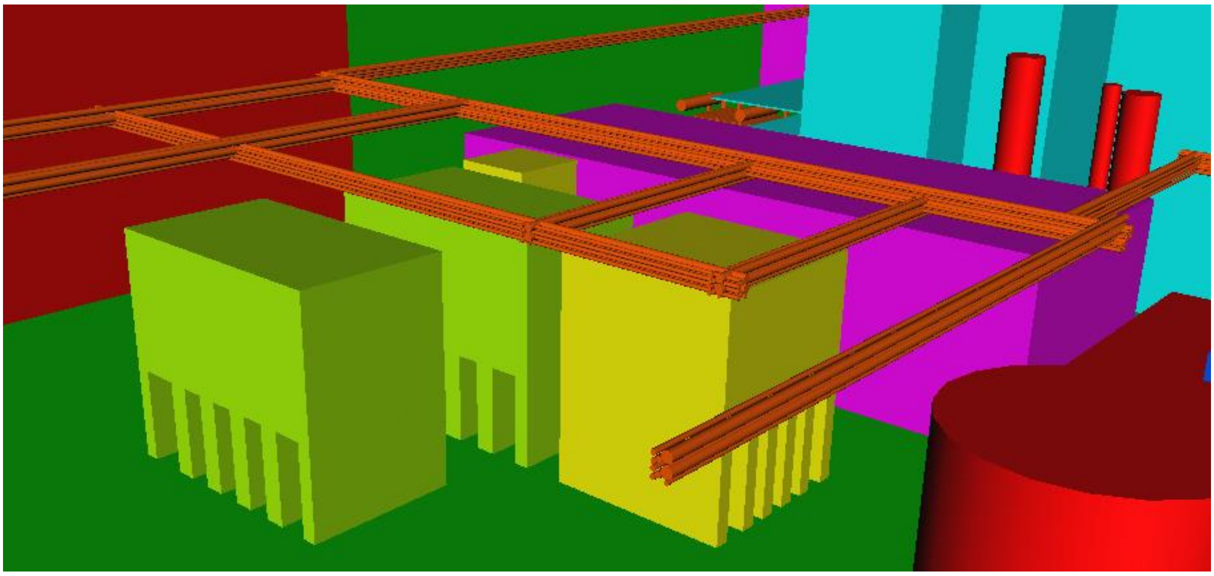


Figure 2-5: Close up view of the cooling towers and pipe racks

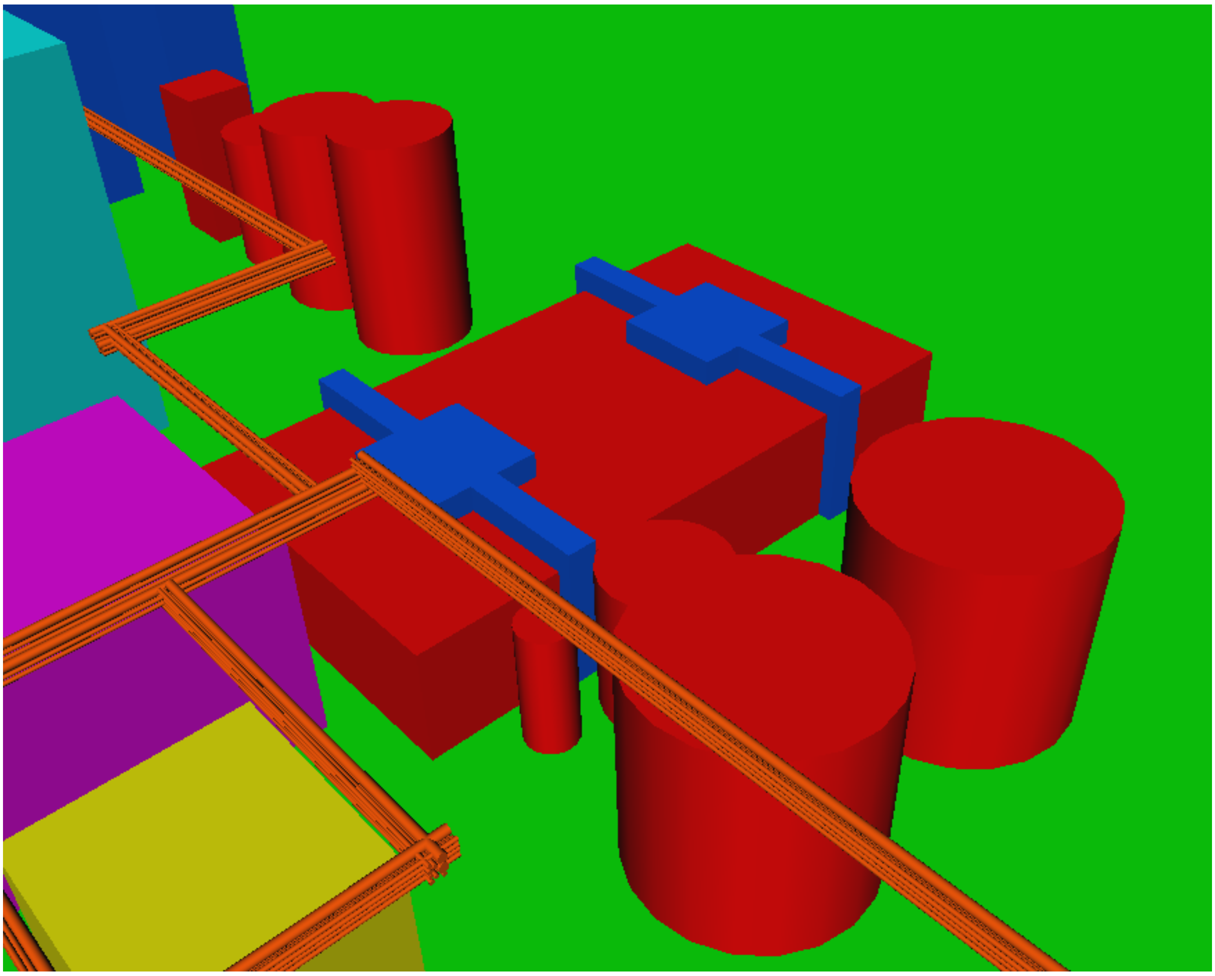


Figure 2-6: Close up view of the aeration tanks

For the above depicted geometry, a suitable computational mesh (grid) was created. Due to physics involved in dispersion and explosion, two different meshes are required for these two simulations.
For dispersion simulations, mesh resolution was kept fine to resolve the near field gradients near the leak location and was stretched in the far from leak regions. For the explosion simulations, a finer but more uniform mesh was deployed. Figure 2-7 and Figure 2-8 below show these two meshes. The dispersion mesh has resolution of about 0.3 m near the leak and stretches out to 1 m away from the leak. The explosion mesh is nearly uniform with resolution of 0.25 m everywhere.

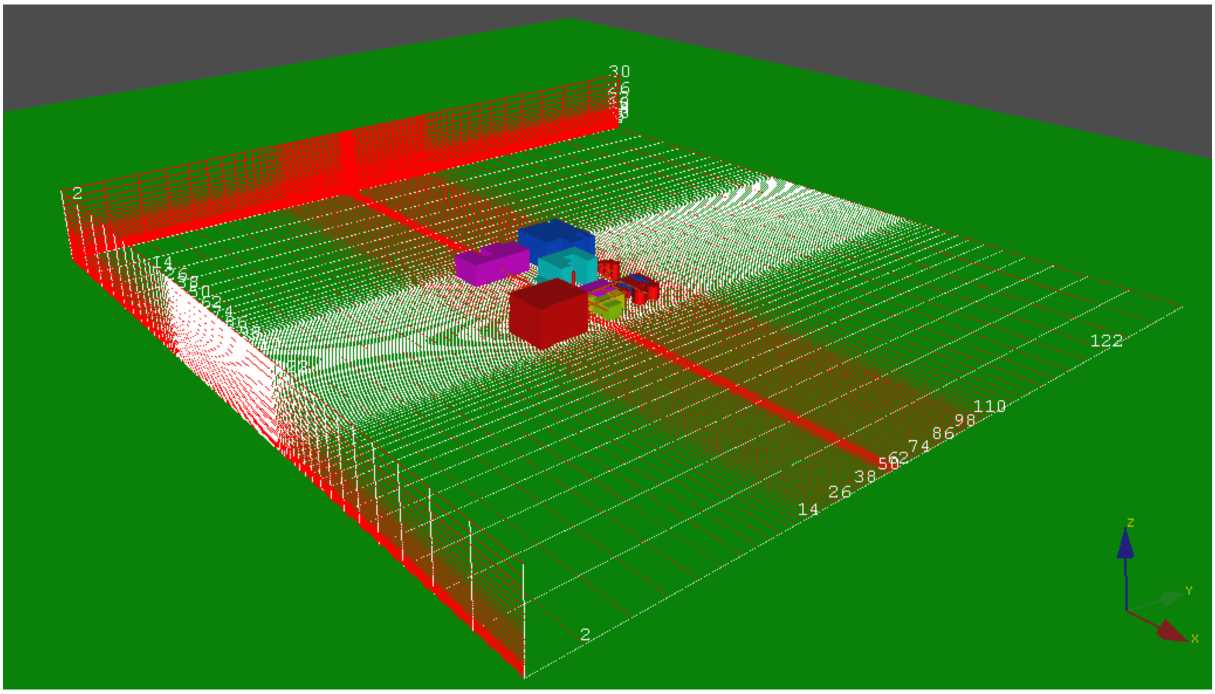


Figure 2-7: Mesh for dispersion simulation

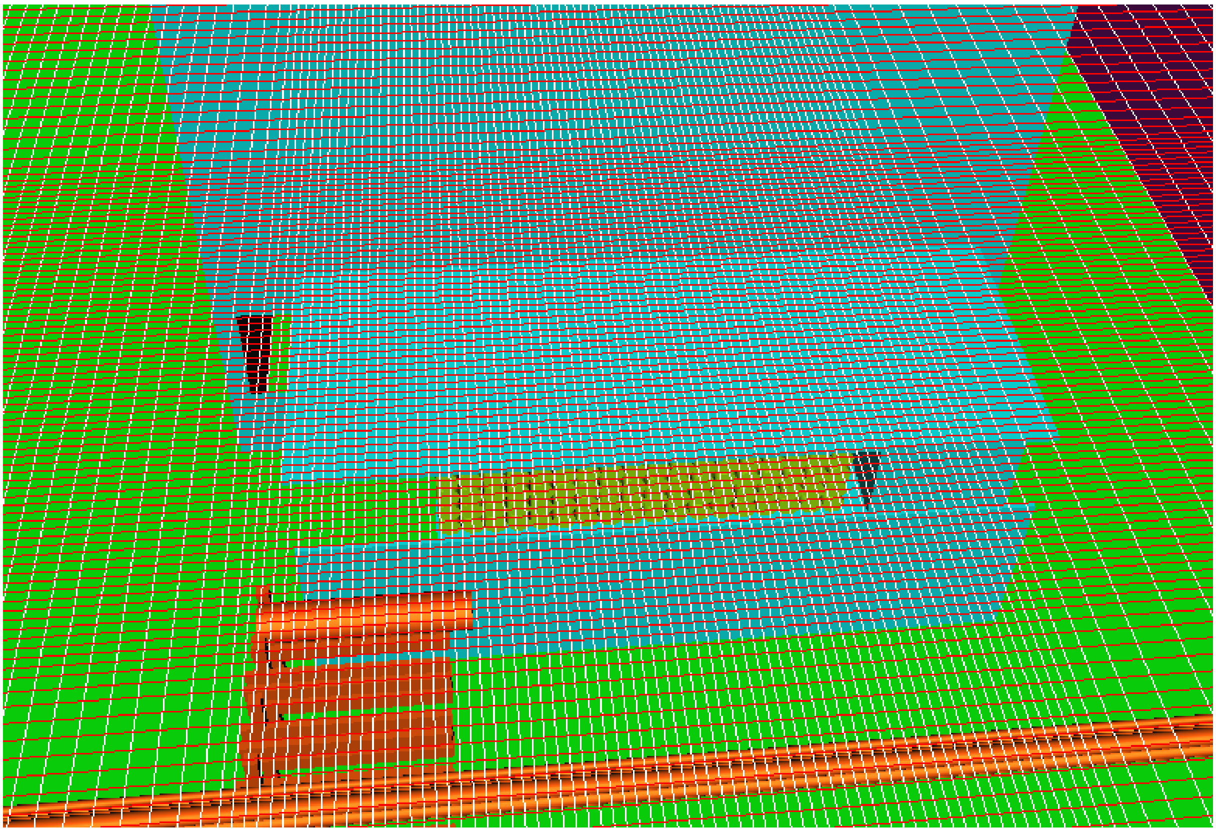


Figure 2-8: Cubical Mesh for explosion simulation

2.2 Simulation scenario

A catastrophic containment failure scenario was selected for the simulation. The catastrophic failure release of hydrogen near the truck was taken as release of 40 kg of hydrogen in 10 s. The flow was taken to be a sonic choked flow coming out of the leak. The outlet pressure and temperature were taken to be atmospheric.
A low wind condition of 1.5f was considered as worst case scenario. Various wind directions such as along the flow, across the flow were considered. The leak release directions were also chosen so as to develop a scenario that will build the vapour cloud inside the hydrogenation building or near the utility block where presence of personnel or equipment is possible.

Table 2-1 lists the three simulations and the input wind directions and the release directions for these three simulations.

Case Number	Release Direction	Wind Direction
1	Eastward	Eastward
2	Northward	Northward
3	Northward	Eastward

The initial dispersion simulations were run till the vapor cloud sizes were stabilized and then were dispersed via ventilation. The vapour cloud size were then used to develop ideal cloud of that size to start the explosion simulation. The ignition point for the explosion simulation was always taken at the centre of the cloud.

3 Results

This chapter presents an overview of the results for the scenario mentioned in chapter 2.

Plot description

Simulated data are collected and presented in three types of plots, scalar, 2D cut plane plots and 3D volume plots. Scalar plots show the development of a variable for every calculation, 2D cut plane plots show the variable value for every grid cell (in the selected 2D plane) at selected times and 3D volume plots show the boundaries where the value is between a lower and upper limit.

Scalar plots have been used to present the simulated cloud size development. 2D cut plane plots have been used to illustrate the hydrogen mole fraction distribution in several locations in the plant.

3D volume plots have been used to show the flame propagation in the plant for the explosion simulations.

3.1 Results from the dispersion simulations

The leak is taken to be at the center of the truck bed. The leak starts at simulation time of 10 seconds and ends at time of 20 seconds. From then on, the cloud disperses due to wind ventilation.

3.1.1 Case 1 Dispersion Results

Figure 3-1 shows the scalar plot of cloud build up for case 1.

As can be seen from the plot, the total volume of the stoichiometric vapor cloud reaches around 472 m^3 in about 10 seconds after the release begins. In this case the release is in eastward direction and the wind is also in the eastward direction. The hydrogen jet impinges on the front of the truck bed and then spreads around the sides of the bed. Some of the hydrogen gas is seen to be leaking into the hydrogenation building in figure 3-2 and figure 3-3

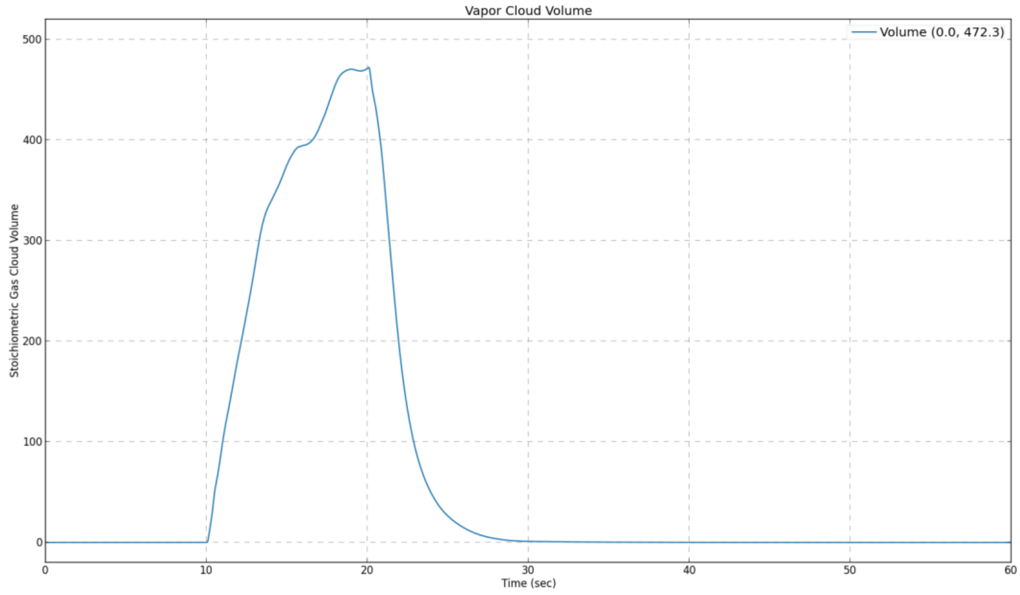


Figure 3-1: Development of vapor cloud with time

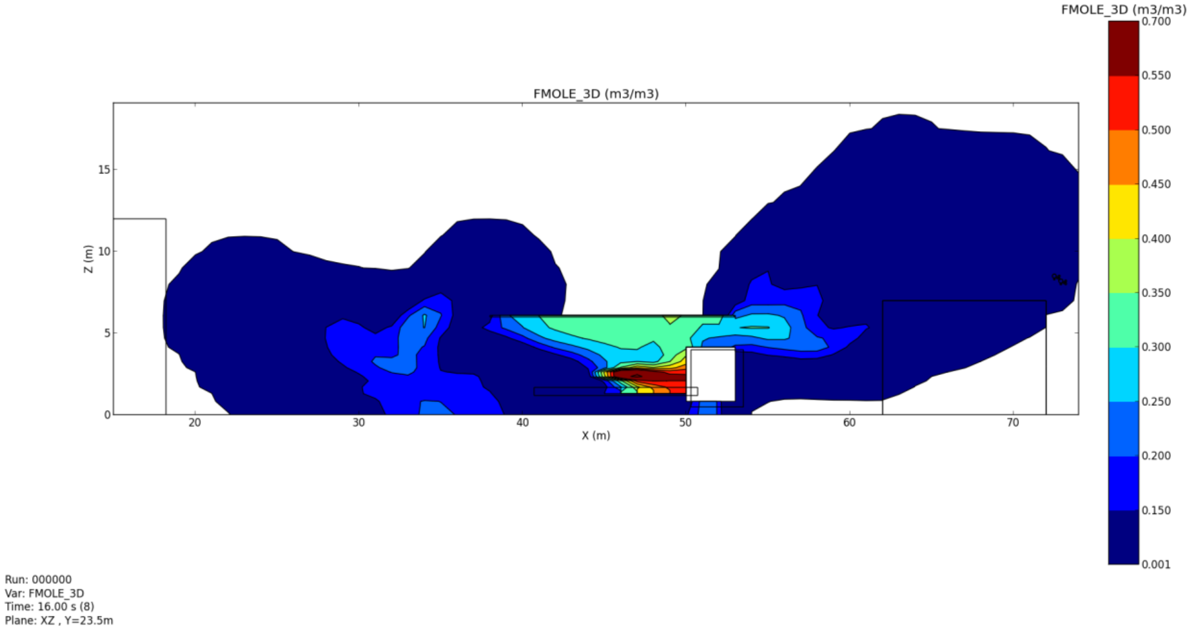


Figure 3-2: Hydrogen mole fraction along central plane across the plant at 16 second simulation time.

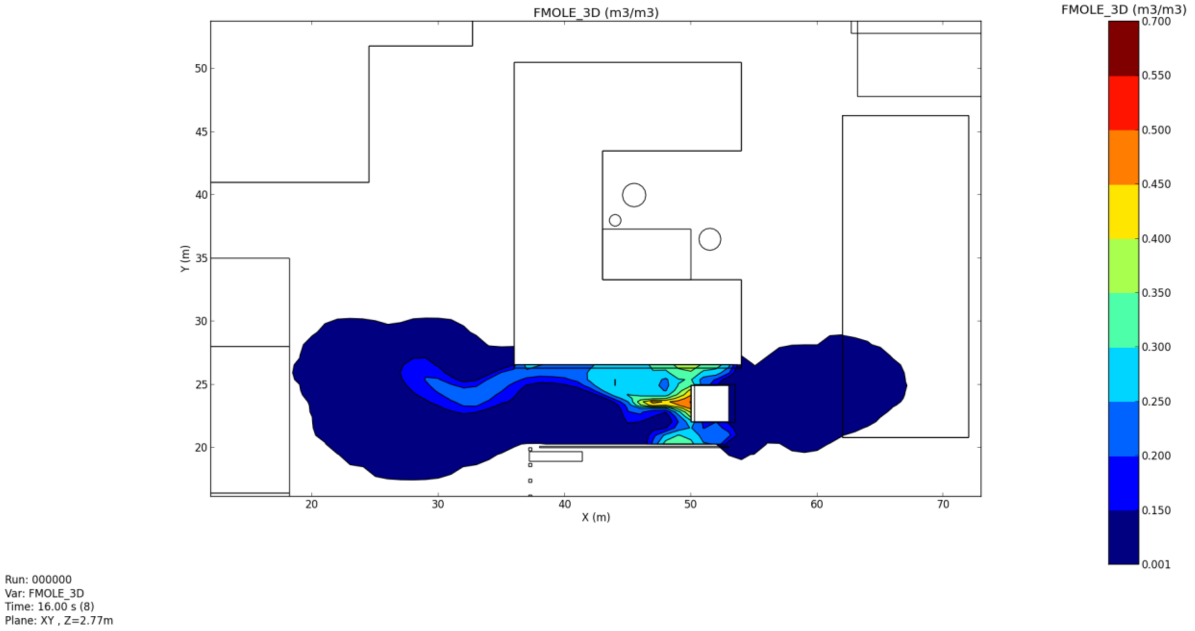


Figure 3-3: Top view of hydrogen mole fraction along central plane across the plant at 16 second simulation time

3.1.2 Case 2 Dispersion Results

Figure 3-4 shows the scalar plot of cloud build up for case 2

As can be seen from the plot, the total volume of the stoichiometric vapor cloud reaches around 787 m^3 in about 10 seconds after the release begins. In this case the release is in northward direction and the wind is also in the northward direction which assists the development of the vapor cloud inside the hydrogenation building. This vapor cloud present inside the hydrogenation building can be seen clearly in figure 3-5 and figure 3-6

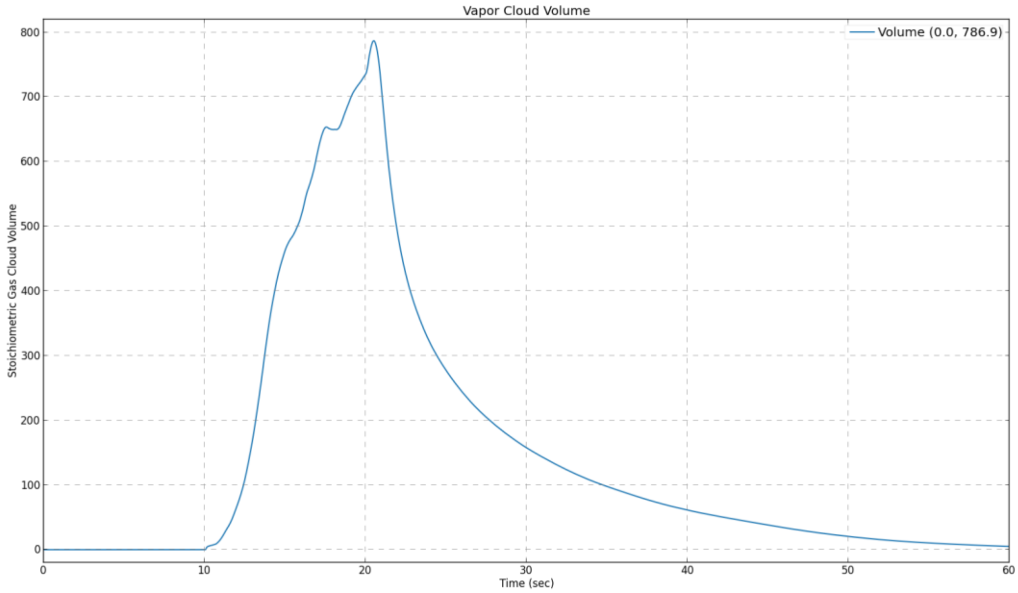


Figure 3-4: Development of vapor cloud with time

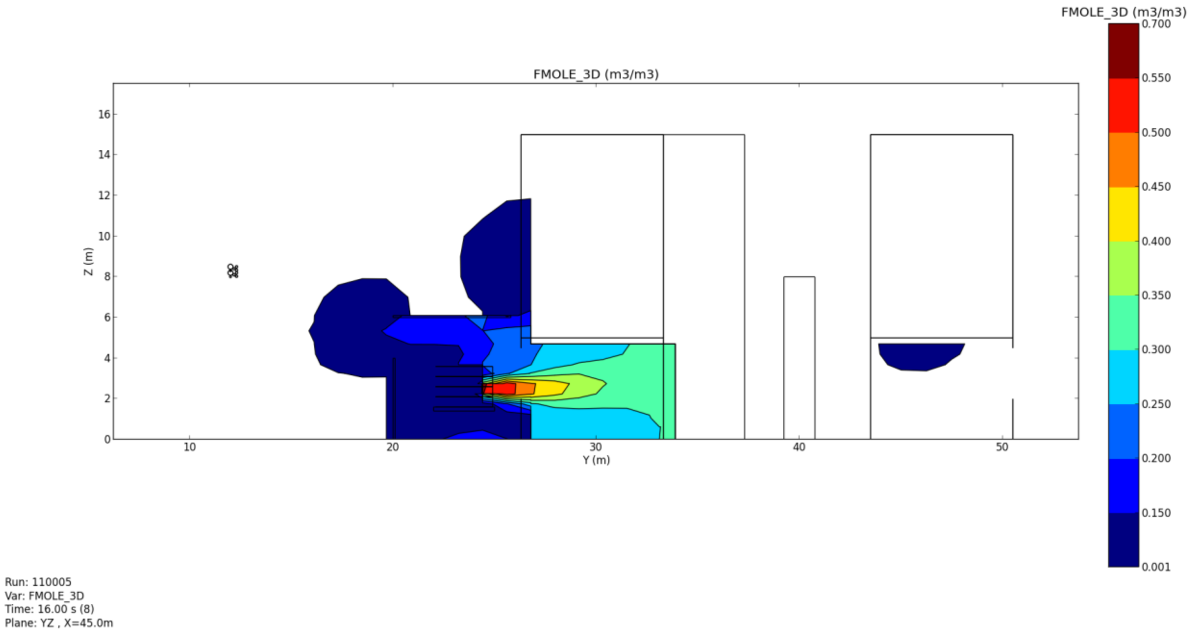


Figure 3-5: Hydrogen mole fraction along central plane across the plant at 16 second simulation time.

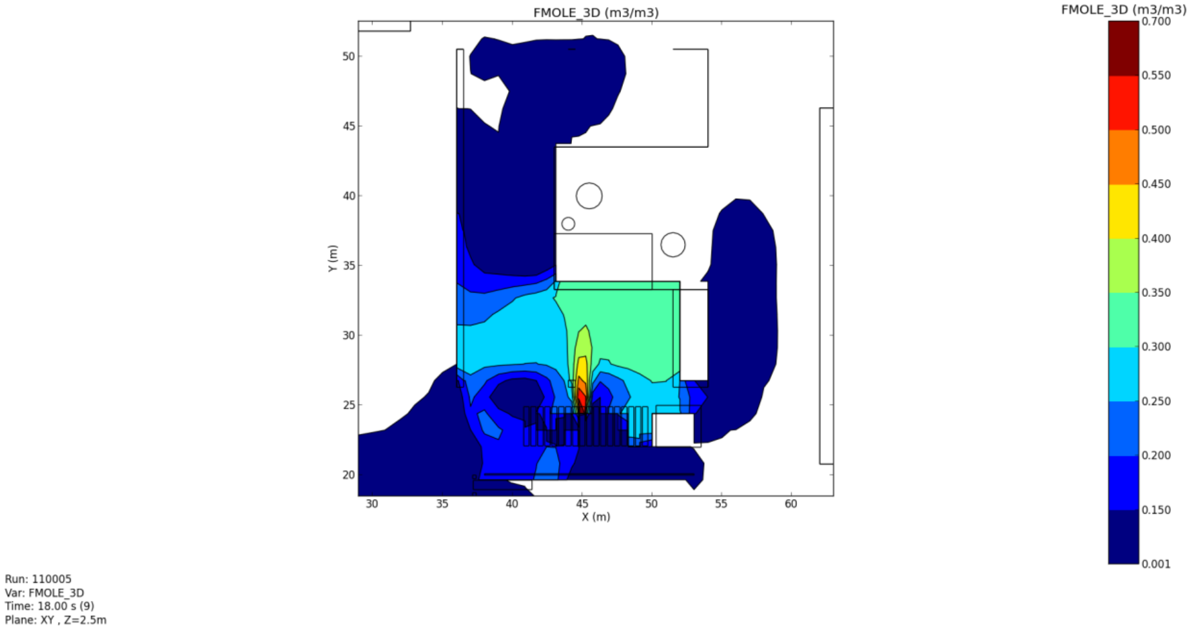


Figure 3-6: Top view of hydrogen mole fraction along central plane across the plant at 16 second simulation time

3.1.3 Case 3 Dispersion Results

Figure 3-7 shows the scalar plot of cloud build up for case 3.

As can be seen from the plot, the total volume of the stoichiometric vapor cloud reaches around 783 m^3 in about 10 seconds after the release begins. In this case the release is in northward direction where as the wind is in easterly direction. However, the wind velocity is not significant hence we do not see a significantly different cloud from that in case 2. As there is an opening in the hydrogenation building where the gas can enter, the cloud builds up inside of the building, as can be seen from figure 3-8 and figure 3-9.

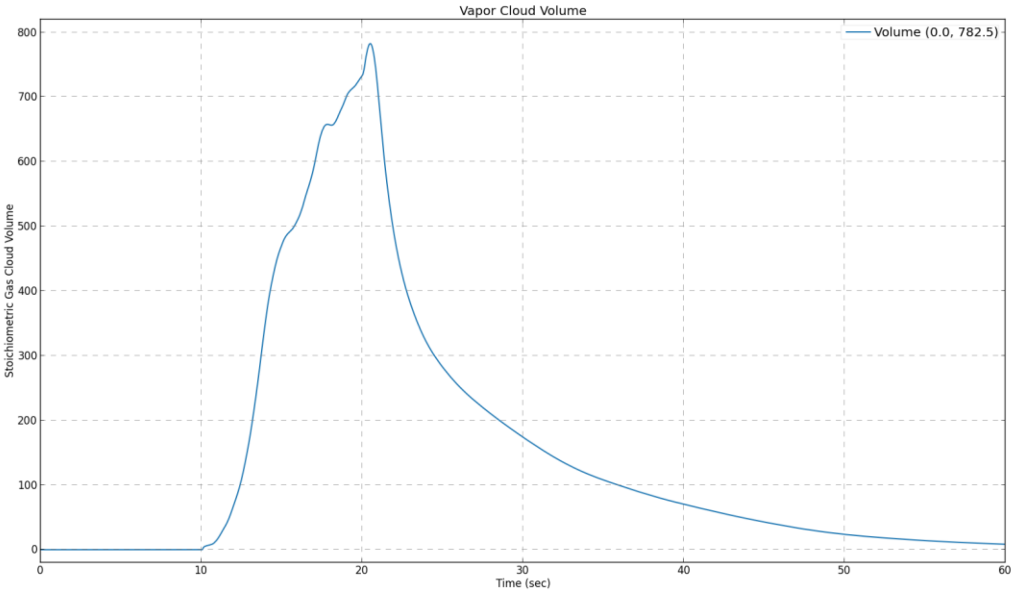


Figure 3-7: Development of vapor cloud with time

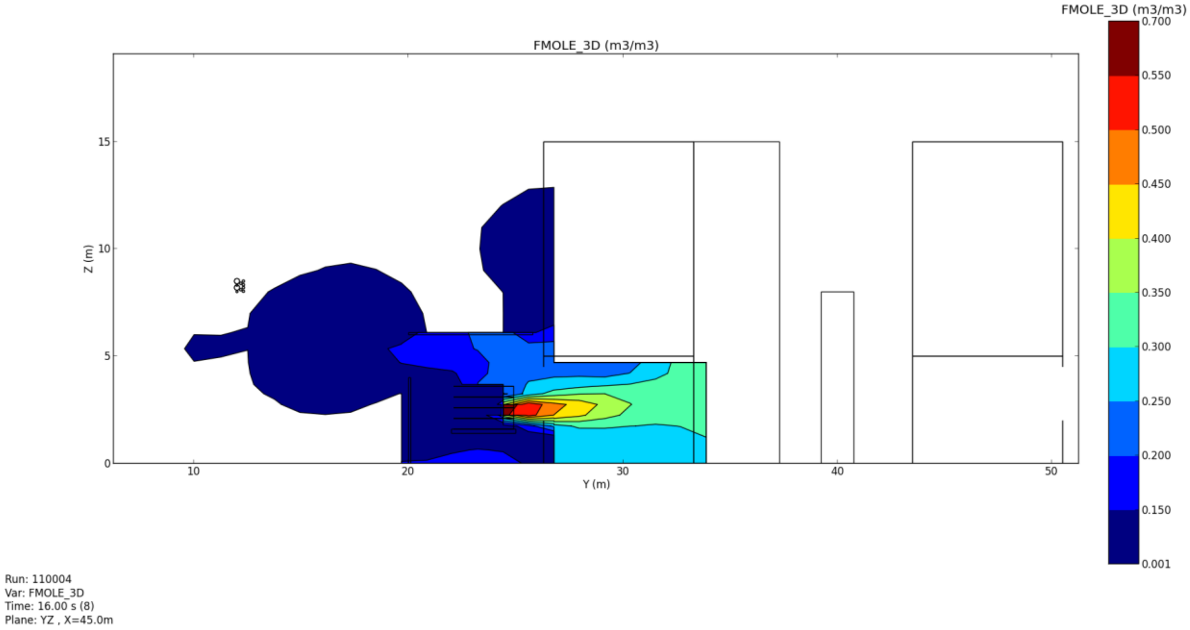


Figure 3-8: Hydrogen mole fraction along central plane across the plant at 16 second simulation time.

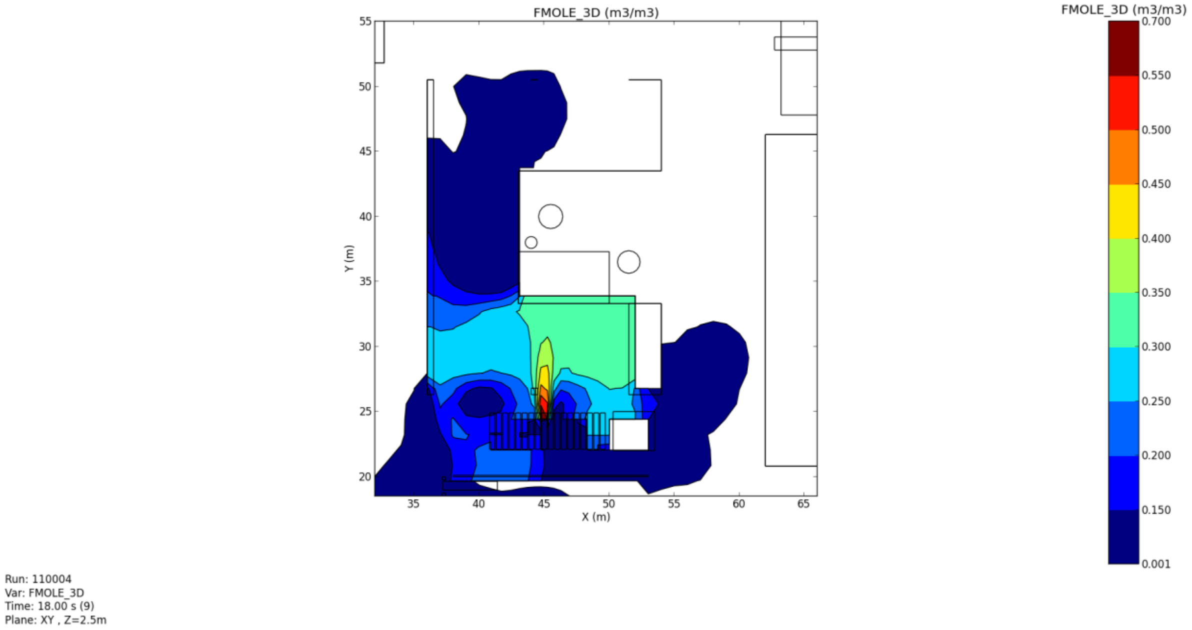


Figure 3-9: Top view of hydrogen mole fraction along central plane across the plant at 16 second simulation time

3.2 Results from the Explosion Simulations

The vapor clouds obtained from the dispersion results shown above were ignited at the center of the cloud in the explosion simulations. The time of simulation is reset to zero so the time stamp seen in the explosion plots is indicating time from ignition.

A typical explosion front, represented by products of combustion is shown in figure 3-10 below.

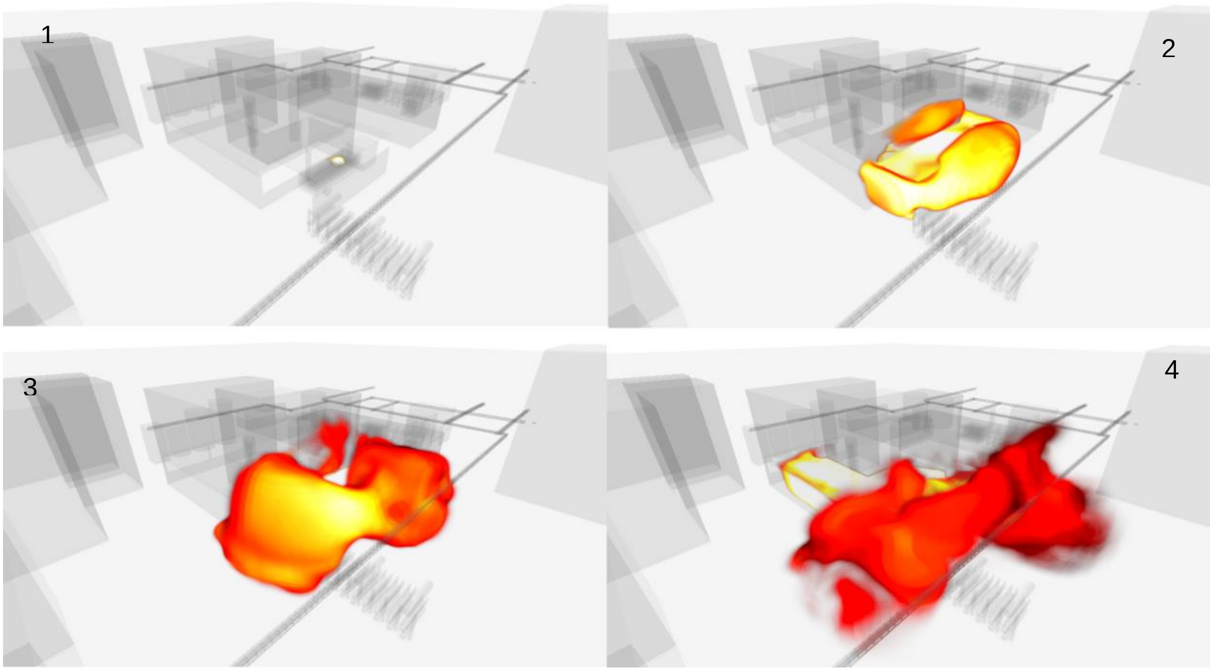


Figure 3-10: Typical evolution of explosion front for the vapor cloud explosion

3.2.1 Case 1 Explosion Results

In this eastward release case, some parts of the clouds enter the utility building on the east. This vapor cloud when exploded will generate flames inside the utility building. The maximum overpressure seen in this case is about 0.1 bar. As seen in Figure 3-11, the pressure wave does reach inside the utility building but the maximum overpressure is seen in the hydrogenation building. Figure 3-12 shows 3D view of the building with overpressures on various walls. From figure 3-13, it can be seen that the explosion front enters the utility building as well.

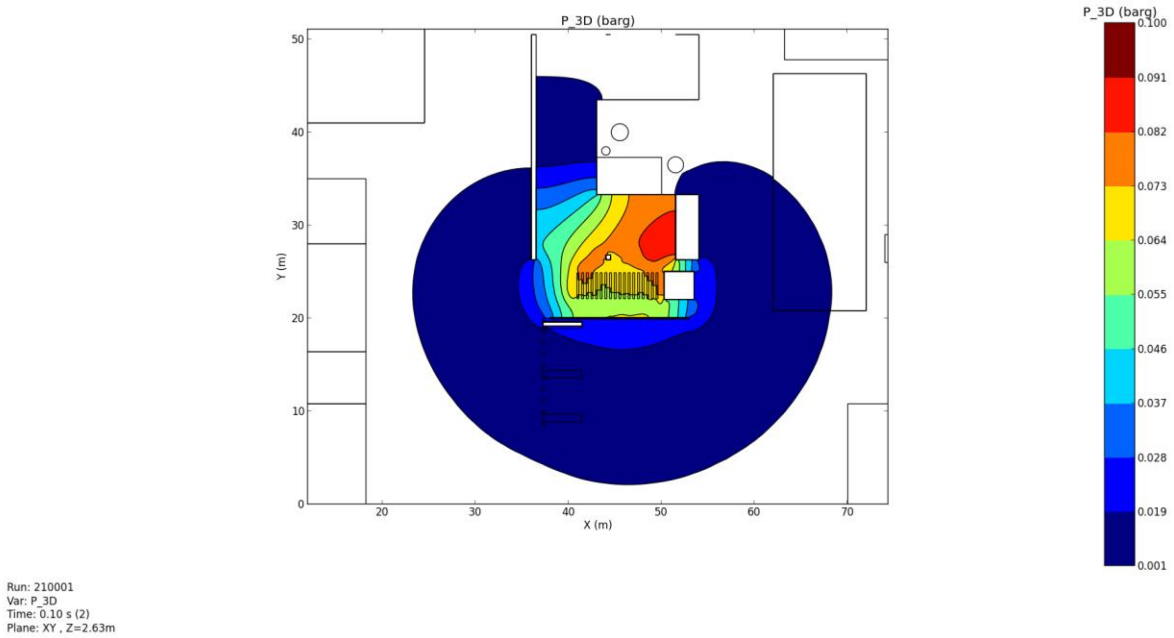


Figure 3-11: Overpressure contours from explosion as viewed from top

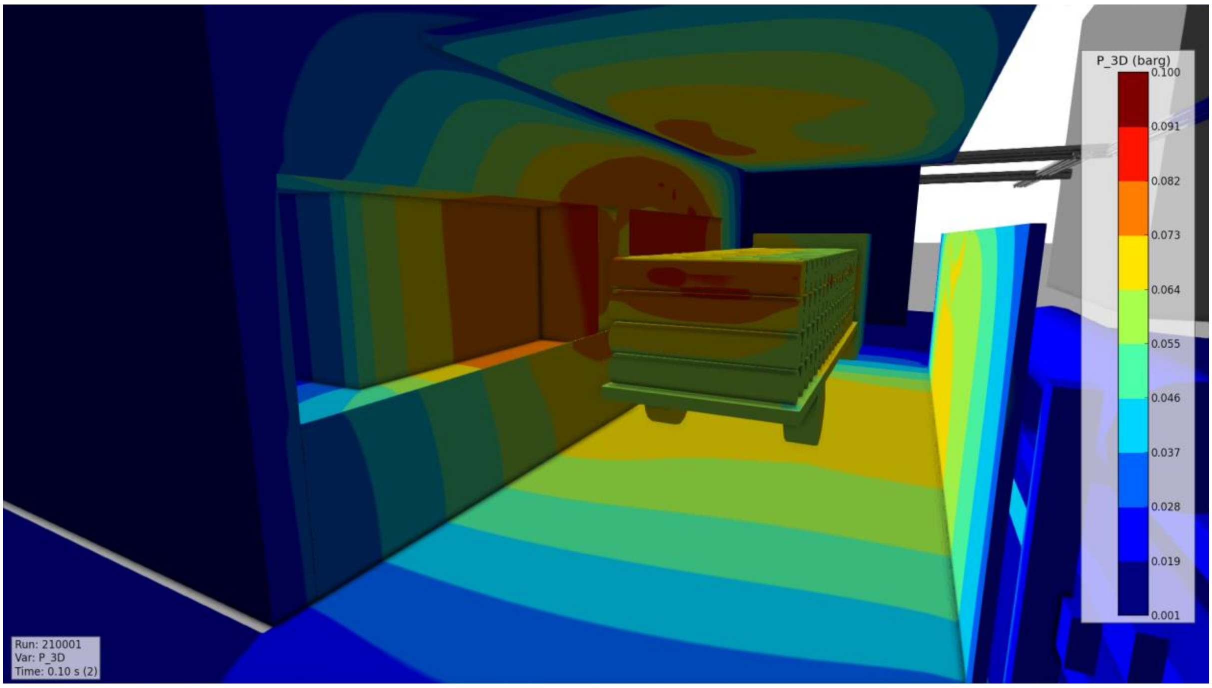


Figure 3-12: Overpressure contours from explosion on various walls of the hydrogenation plant building

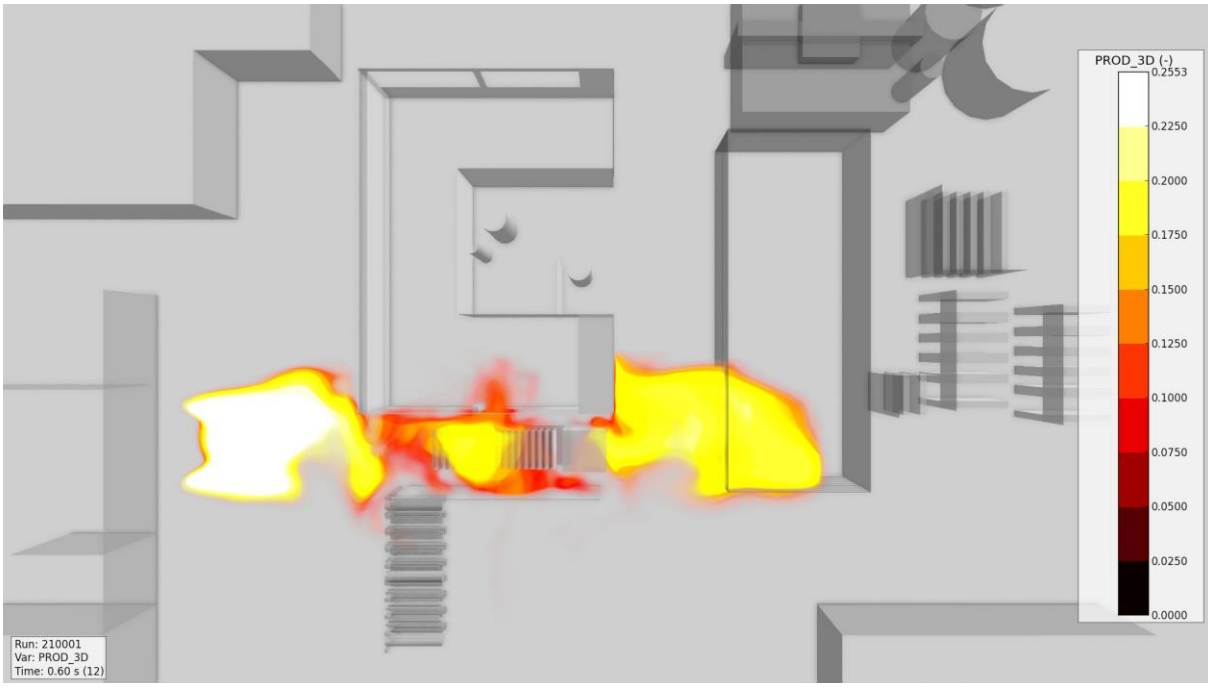


Figure 3-13: Fires from explosion enter the utility building as seen from top view

3.2.2 Case 2 Explosion Results

With the northward release of the hydrogen jet, the gas enters the hydrogenation plant building easily and forms a vapor cloud of approximately 780 m^3 inside the building. When ignited inside the building, the explosion spreads through the building and causes maximum overpressure of about 0.25 bar on the building walls. Figure 3-14 to figure 3-16 show the explosion wave inside the hydrogenation plant building.

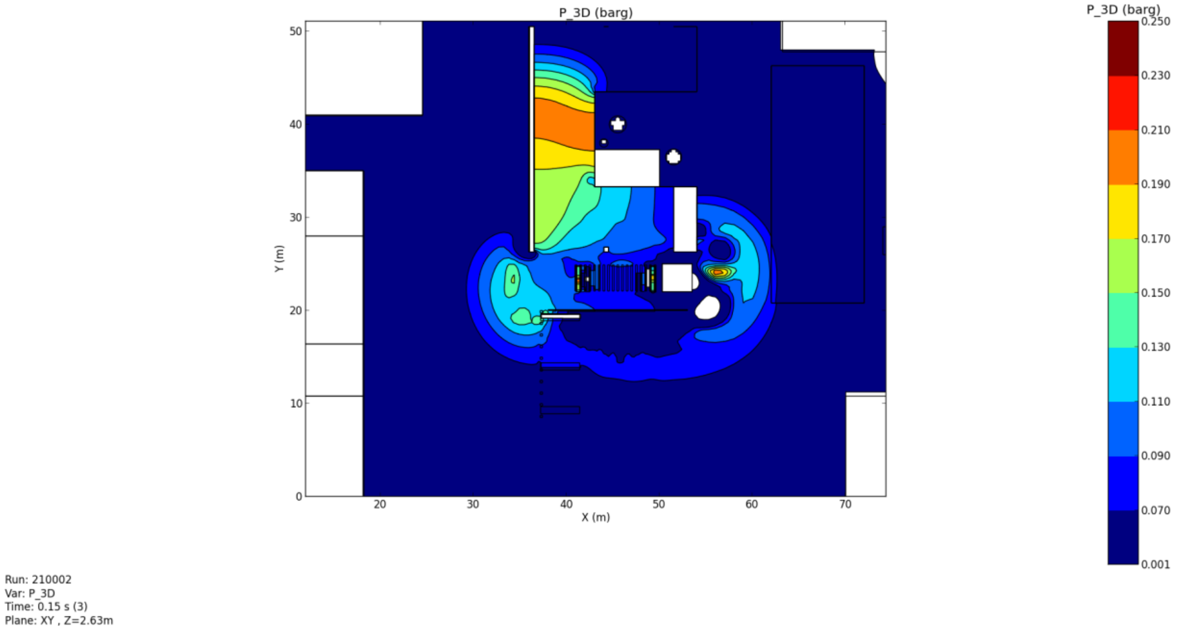


Figure 3-14: Overpressure contours from explosion as viewed from top

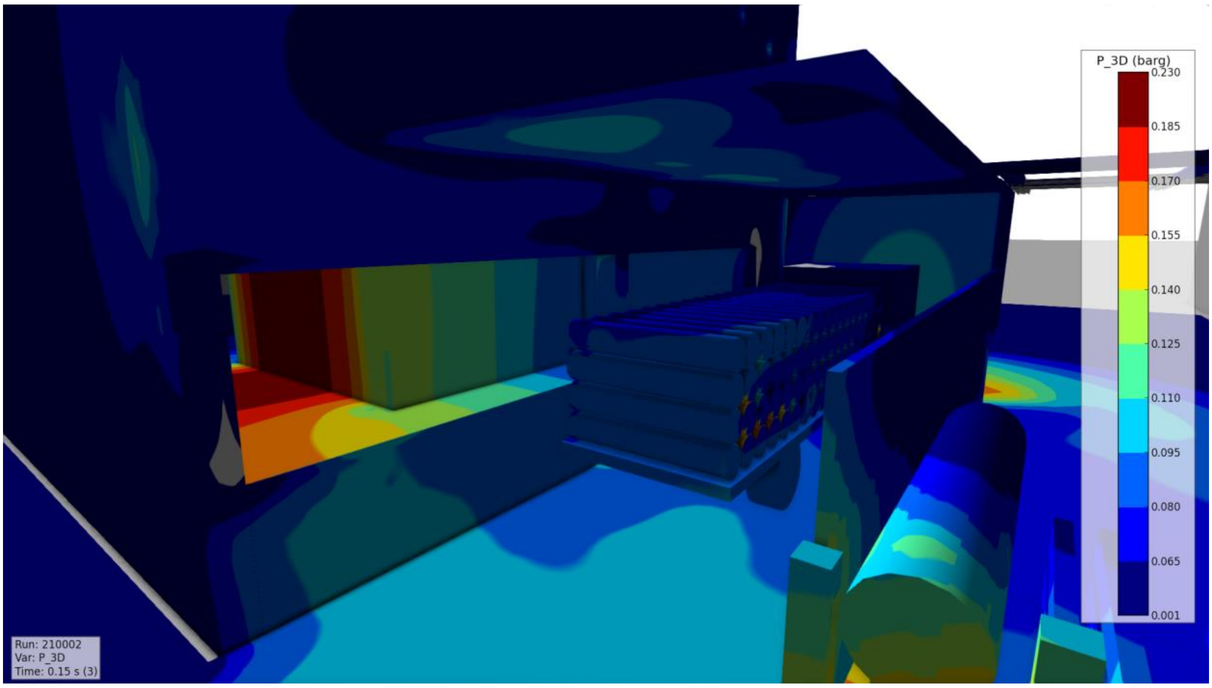


Figure 3-15: Overpressure contours from explosion on various walls of the hydrogenation plant building

Figure 3-13: Explosion front as seen from top view

3.2.3 Case 3 Explosion Results

3.3 Analysis and discussion

The

4 Conclusion

This report describes CFD simulations.

A 1 Appendix A

Following photographs were shared with Gexcon India by Deepak Nitrite. These were used as reference to build the plant geometry in the domain of interest.


PLANT-CHANGING
ROOM
PLANT HEIGHT-10 MTR


PLANT- COOLING TOWER
PLANT HEIGHT- 6 MTR


PLANT- HYDROGEN TROLLEY AREA
PLANT HEIGHT - 4.5 MTR
TATA


PLANT - UTILITY BLOCK
PLANT HEIGHT - 7 MTR

Annexure-II

Report on Prediction of Ground Level Concentrations of Air Pollutants

Prediction of
Ground level Concentration

at

Deepak Nitrite Pvt.Ltd.

Plot Nos K-9, K-10 Taloja MIDC –
Maharashtra state

A. Introduction :

Deepak Nitrite Ltd Proposed modernization project of Manufacturing Synthetic organic chemicals and allied products at Taloja MIDC, Maharashtra.

Location of sources of air pollution

- The project site is situated in Taloja MIDC. It is a notified industrial area where several chemical industries are in operation.
- Following heating units have been installed for use in this unit:
- Two nos steam boilers, one of 5 TPH and other 4 TPH steam generation capacity.
- One no. Thermopac of 2 Lac Kcal/hr capacity.
- One no. of 750 KVA DG set..
- Fuel used is FO for boilers and HSD for DG sets.
- DG set will be operated in case of emergency only.

B. Stack & Fuel details

Stack attached to	**Boiler**	**Boiler**	**Thermopac**	**DG**
Capacity	**5 TPH**	**4 TPH**	**2 Lac Kcal/hr.**	**750 KVA**
Fuel type	FO	FO	FO	HSD
Fuel qty. kg/day	2665	2490	220 kg/hr	15 lit/d
MOC	MS	MS	MS	MS
Shape	Round	Round	Round	Round
Flue gas Rate m^3/s	1.47	1.03	0.66	--
Velocity of flue gas	5.21 m/s	3.37 m/s		NA
Height m (above ground level)	32	32		17.5
Stack Dia.	0.60 m.	0.80 m.		0.15 m.
Temp. of flue gas ^{0}K	473	473		433

C. Emissions to atmosphere.

	5 TPH Boiler	4 TPH Boiler	Thermo pac	DG set -750 KV
Fuel used	F.O.	F.O.	F.O.	HSD
Fuel consumption	112 kg /hr	104 kg /hr	220 kg /hr	135 kg/hr
Sulphur content	4 %	4 %	4 %	1%
Total SO_2	9.0 kg/hr	8.2 kg/hr	17.6 kg/hr	2.7 kg/hr
Total NO_x	5 kg/	5 kg/hr	8.50 kg/hr	2.0 kg/hr

D. Operation schedule –

- 4 TPH boiler and 2 Lakh Kcal/hr Thermo Pack are operated continuously. 5 TPH boiler is operated only during a particular product manufacturing.
- DG set of 750 KVA rating shall be put into operation only during emergency. As unit has duel connection for power supply D G operation is usually not required..

E. Air estimation:

Prediction of incremental concentration of air pollutant is done for both 5 TPH and 4 TPH boilers working along with 2 Lakh Kcal/hr Thermo pack. This will give the worst of case emissions.

Air quality estimations is done with Plausibility approach using Gaussian Plume Model. Prediction of air quality under given emission conditions is needed to check whether the actual concentrations of SPM and SO_2 shall not be exceeding the Ambient Air Quality Standards prescribed by CPCB.

Plausibility approach using Gaussian Plume Model (GPM**)**

Prediction of pollutant concentrations can be made by suitable air quality model. Application of such model requires in addition to emission data, proper meteorological data i.e. simultaneous wind speed, direction and cloudiness data. In most of the cases such data is not available.

Under such condition it is possible to use **plausibility approach model** to obtain maximum possible impact from the unit. This impact level can be used in the design and also for setting operating limits.

Input parameters are so chosen by taking into consideration their plausibility of occurrence such that the model gives the maximum impact.

a. Determination of critical wind speed

Wind speed affects the GLC in two ways in the model, one directly and other through plume rise. One hour average GLC values are determined for standard distances (100 m.to 20 km), for six stability classes (A- F).

From these values Critical windspeeds foreach stability classes are determined which gives maximum concentration value for that wind speed.

b. Use of critical wind speeds to determination of max. GLC

Based on the maximum one hour GLC values estimated with these critical wind speed for six stability classes and selecting worst condition, ie. Assuming plausibility of occurrence of different stability conditions in hours, during day time and night time, 24 hour average values are worked out.

c. Maximum value

This value represents the maximum under worst condition which shall not exceed at any time.

E. One hour average Centre line GLC of pollutant:

Gaussian Plume Model: (GPM)

For determining one hour average concentration values Gaussian Plume Model (GPM) is used.

The model is based on four basic assumptions:

- The solution is time variant;
- Wind speed is not a function of position;
- Diffusivities are not a function of position
- Diffusion in downwind direction is insignificant;

Despite these assumptions GPM is still a workhorse for dispersion calculations. One hour average pollutant concentration [Centre line ground level] = $\mathbf{C_{x,0,0}}$

$$\mathbf{C_{x,0,0} = [\ Q / (\ \Pi \times SY \times SZ \times U_H\ )\ ] * [\ Exp\ (- H^2\ / 2 \times SZ^2\ ]}$$

Where,

Q = Emission Rate of Pollutant in µg / sec

U_H = Ave. wind speed in m / sec at H

SY = Standard Deviation of plume conc. in Horizontal direction in m.

SZ = Standard Deviation of plume conc. in Vertical direction in m

H = Effective Stack Height in m. = h + Δ h.

h = Physical stack height in m.

Δ h = Plume Rise in m.

Plume Rise:

The flue gas pressure for boiler is low and flue gas velocity is also low, hence the plume rise for the stacks of 5 & 4 TPH boilers are negligible. Hence not considered for model.

Averaging time correction:

Averaging time correction factor for converting one hour concentration to 24 hour = 0.40

24 hr average = [Sum of one hour average. concentration / 24] x 0.4

Max. Emission values taken for application of Air Quality Model:

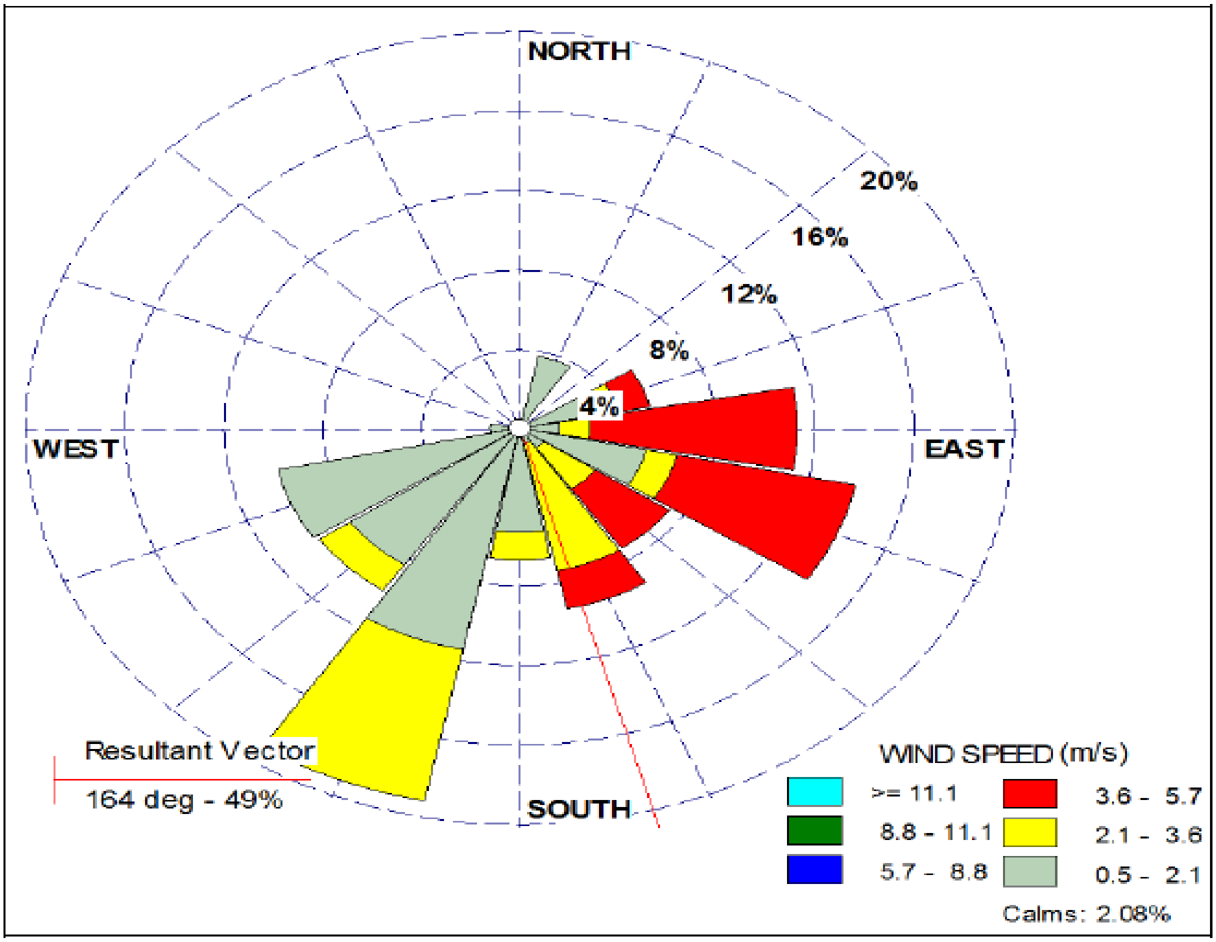
Pollutant	5 TPH boiler	4 TPH Boiler + Thermopac
SO_2	0. 216 TPD	0.620 TPD
NO_2	0.12 TPD	0.32 TPD

Receptor points and Villages within 10 Km. radius:

Sr. No.	Location	Code	Distance from site (Km)	Direction
1	Near Main Gate	A1	400 m	S
2	Padghe Village	A2	1.8	S
3	Navade Village	A3	2.7	SW
4	Papdipada Village	A4	4.2	NW

5	Vakadi Village	**A5**	**7.0**	**SE**
6	Harigram Village	**A6**	**5.6**	**SE**
7	Vavanje Village	**A7**	**4.7**	**NE**
8	Burdul Village	**A8**	**6.3**	**N**

E.8 Wind Rose Diagram:



E.9. Wind Data ---

From the met data obtained for three months, prominent occurrence wind speed & prominent direction is deduced and given in the below tables.

Percentage of time wind speed and direction occurrence.

a. During study period ---Frequency of wind in %

Wind Speed m/s	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	Total
0.5-2.1	**4**	**-**	**2**	**1**	**5**	**1**	**--**	**5**	**12**	**8**	**10**	**48**
2.1-3.6	**-**	**-**	**2**	**1**	**1**	**3**	**7**	**2**	**7**	**2**	**-**	**25**
3.6-5.7	**-**	**-**	**2**	**9**	**8**	**3**	**3**	**-**	**-**	**-**	**-**	**25**
5.7-8.8	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**00**
Calm	**02**											**02**
Total	**4**	**-**	**6**	**11**	**14**	**7**	**10**	**7**	**19**	**10**	**10**	**100**

1. From the wind rose diagram, it is clear that the predominant wind direction is in the sector SSW to NNE i.e, 19 % of the time wind is coming from this sector.
2. Other predominant wind direction noticed is from ESE to WNW.(14%)
3. Following table shows the

" **frequency of receipt of plume at the receptors:"**

Receptor	Plume Dir^{n} or Receptor Dir^{n} w.r.t. stack	Wind Dir^{n}	% time pollutant received
Navada Village	SSW	NNE	19 %
Papdipada Village	ESE	WNW	14%
Remaining receptors shall be receiving plume very less time hence the rise is not significant.			

E. **Maximum values of** Ambient Air Quality parameters observed for Three months Air Quality Data within 10 km radius.

[**December 2015, January 2016, February 2016]**

Sr. NO.	[A1]	[A2]	[A3]	[A4]	[A5]	[A6]	[A7]	[A8]
Location	**Main gate**	**Padghe**	**Navade**	**Papdipada**	**Vakadi**	**Harigram**	**Vavunje**	**Buyrdul**
PM 10(μg/m^3)	64.20	64.0	64.50	61.20	48.20	55.00	52.80	58.40
PM2.5 (μg/m^3)	35.50	25.80	32.40	26.30	13.00	22.09	18.50	25.00
SO_2 (μg/m^3)	3.32	2.80	**3.80**	**2.25**	1.58	0.88	0.88	0.88
NOx (μg/m^3)	3.00	1.68	1.58	1.80	0.35	0.28	0.22	0.26

Note-1 : Values of PM_{10} and $PM_{2.5}$ do not represent effect due to DNL boilers which are furnace oil fired.

Note -2 since the readings were taken when unit was in operation the above values represent values with incremental concentration of pollutants.

F. Anticipated rise in SO_2 and NOx emissions if only 5 TPH Boiler is operated (calculated values) :

Results of GPM model for incremental concentration of SO_2, NO_2 at Villages within 10 km radius.

(With stack with No Plume rise)

Sr. No.	Receptor	SO_2 μg/m3	NO_2 μg/m3
1	**Near Main Gate**	**14.15**	**7.86**
2	**Padghe Village**	**4.34**	**2.41**
3	**Navade Village**	**2.47**	**1.37**
4	**Papdipada Village**	**1.31**	**0.73**
5	**Vakadi Village**	**0.62**	**0.37**
6	**Harigram Village**	**0.86**	**0.48**
7	**Vavanje Village**	**1.11**	**0.62**
8	**Burdul Village**	**0.72**	**0.40**

F: Anticipated rise in SO_2 and NOx emissions if 4 TPH Boiler + Thermopac are operated (calculated values) :

Results of GPM model for incremental concentration of SO_2, NO_2 at Villages within 10 km radius.

(With stack with No Plume rise)

Sr. No.	Receptor	SO_2 µg/m3	NO_2 µg/m3
1	Near Main Gate	40.75	20.97
2	Padghe Village	12.50	6.43
3	Navade Village	7.11	3.66
4	Papdipada Village	3.76	1.93
5	Vakadi Village	1.78	0.91
6	Harigram Village	2.47	1.27
7	Vavanje Village	3.19	1.64
8	Burdul Village	2.08	1.07

F.3. DG Set --

F. 3.1 Results of GPM model for incremental concentration of SO_2, NO_2 at Villages within 10 km radius.

<table>
<tr><th>Sr. No.</th><th>Receptor</th><th>$PM_{2.5}$ µg/m3</th><th>PM_{10} µg/m3</th><th>SO_2 µg/m3</th><th>NO_2 µg/m3</th></tr>
<tr><td>1</td><td>Near Main Gate</td><td rowspan="8" colspan="4">DG set is used very rarely and for very short duration of time. The fuel used is also very less. Hence emission of PM10, PM2.5, SO2 and NOX are very less. Therefore incremental concentrations are not worked out using model.</td></tr>
<tr><td>2</td><td>Padghe Village</td></tr>
<tr><td>3</td><td>Navade Village</td></tr>
<tr><td>4</td><td>Papdipada Village</td></tr>
<tr><td>5</td><td>Vakadi Village</td></tr>
<tr><td>6</td><td>Harigram Village</td></tr>
<tr><td>7</td><td>Vavanje Village</td></tr>
<tr><td>8</td><td>Burdul Village</td></tr>
</table>

G. Discussion :

Effect of plume penetration & down wash on pollutant concentration in the ambient air-

For 5 TPH & 4 boiler, as the flue gas temperature is very high i.e. 473^0 K and flue gas pressure is low as 0.03 bar, there is no plume rise for stack, during any of the stability conditions.

Hence there shall not be any plume penetration and effective plume height will be equal to physical stack height.

Therefore theapplication of GPM is done for the case without plume rise condition which shall be the worst case.

Terrain Characteristics and Downwash of Pollutant :

The factory is located on a plain ground with respect to surrounding land. The condition of downwash is taken care by considering no plume rise condition for analysis. There are no high rise buildings, within 10 km radius and overall terrain is plain.

Air pollutant prediction is done for following conditions that may give the worst possible concentration of the pollutants.

1. **Both boilers and Thermo Pack working –**
   Maximum 24 hr average. concentration of SO_2 and NO_2 at 1 receptor points in factory area and 7 village receptor points in the 10 km radius based on critical wind and plausibility approach analysis, **without plume rise condition.**
2. One proposed DG set of 750 KVA capacity working ---
   DG Set is operated only during emergency. hence their contribution to total incremental concentration is negligible. Therefore it is not taken in to consideration.
3. Max. worst concentration likely to occur after addition of incremental concentration due to both Boilers and Thermo Pack boiler working is worked out.
4. Total ambient air quality concentrations are worked out by adding incremental concentration due to Boilers to get the final worst concentration values of pollutants.

G. Conclusion :

Expected Air Environment Status after Implementation of the project

For Boilers & Thermopac with stack assuming no Plume Rise

a. ForSO_2in µg / m^3

Receptor	Before Project	Incremental Conc. of Pollutant due to Without APC		Total Conc. of Pollutant Without APC & Δh
		5 TPH Boiler	4 TPH boiler + Thermo Pack	
Near Main Gate	3.32	14.15	40.75	58.22
Padghe Village	2.80	4.34	12.50	19.64
Navade Village	3.80	2.47	7.11	13.38
Papdipada Village	2.25	1.31	3.76	07.32
Vakadi Village	1.58	0.62	1.78	03.98
Harigram Village	0.88	0.86	2.47	04.22
Vavanje Village	0.88	1.11	3.19	05.18
Burdul Village	0.88	0.72	2.08	03.68

b. ForNO_2in µg / m^3

Receptor	Before Project	Incremental Conc. of Pollutant due to Without APC		Total Conc. of Pollutant Without APC && Δh
		5 TPH Boiler	4 TPH boiler + Thermo Pack	
Near Main Gate	3.00	7.86	20.97	31.83
Padghe Village	1.68	2.41	6.43	10.51
Navade Village	1.58	1.37	3.66	6.61
Papdipada Village	1.80	0.73	1.93	4.46
Vakadi Village	0.35	0.37	0.91	1.63
Harigram Village	0.28	0.48	1.27	1.97
Vavanje Village	0.22	0.62	1.64	2.48
Burdul Village	0.26	0.40	1.07	1.74

From the above estimation of GLC for **NO_2& SO_2**conc. from the emissions of the both Boilers working following conclusion are drawn :

1. Air pollution estimation is done for worst condition no plume rise existing. **Total concentration** is worked out by adding ambient air quality value with incremental concentration contributed by proposed addition of boilers.

2. Expected GLC of SO2 with both boilers in operation:

GLC of SO_2 for villages in 10 km radius -- From the tables above, it is seen that the under worst case and with no plume rise, the total concentration of **SO_2** from the Plant emission is in the range of **3.98 to 58.22 µgm^3** . **All these values do not exceed allowable limit AAQS for SO_2 of 80 g/m^3 under worst operating condition.**

3. Expected GLC of NO2 with both boilers in operation:

GLC of NO_x for villages in 10 km radius – From the tables above, it is seen that the under worst case of no plume rise, the total concentration of **NO_2** from the Plant emission is in the range of **1.63 to 31.83 µg/m^3** . **All these values too do not exceed the AAQS for $NO_2$of 80 µg/m$^{3.}$**

Therefore there shall not be any adverse impact on air environment due to the emissions from the industry.

Annexure- III

List of pollution control equipments w.r.t. each pollution source

DEEPAK NITRITE LTD

TALOJA UNIT

(PLOT NOS: K-09 AND K-10, MIDC TALOJA, TAL: PANVEL DIST: RAIGAD)

LIST OF POLLUTION CONTROL EQUIPMENT

A. AIR POLLUTION CONTROL DEVICES:

Stack attached to →	Nestler boiler 5 TPH	IEAC Boiler 4 TPH	D G set 750 KVA
Attachment →	Nil	2 lac kcal/hr Thermopac	Nil
Stack diameter	600 mm	800 mm	200 mm
Stack height	32 m	32 m	17.5 m

B. PROCESS VENTS:

	Process Unit	**Device**	**Stack**
Process Emissions	Hydrogenator 1	Scrubber-1	25 m
	Hydrogenator 2	Scrubber-2	25 m
	Hydrogenator 3	Scrubber-3	25 m

C. EFFLUENT TREATMENT PLANT:

Capacity: 90 KLD.

Effluent: 75 KLD

Sr. No.	**Description**	**Capacity**	**Qty**	**MOC**
1	Equalization Tank	80 M^3	1 Nos.	RCC
2	Bioreactor	150 M^3	1 No.	RCC
3	Secondary Settling Tank	80 M^3	1 No.	RCC
4	Sludge Sump	40 M^3	1 No.	RCC
5	Intermediate Sump	40 M^3	1 No.	RCC
6	Final Sump	20 M^3	1 No.	RCC
7	Sheds and Foundations	As required	Lot	RCC / MS Epoxy
8	Feed pumps	25 M^3/hr @ 10 M head	2 Nos.	C.I.

Sr. No.	Description	Capacity	Qty	MOC
9	Air Blowers for Equalization Tank and bioreactor	300 M^3/hr @0.5 kg/m^2	2 Nos.	C.I.
10	Coarse Bubble Diffusers	63 mm OD X 2.0 m long	10 Nos.	C.I.
11	Fine Bubble Diffusers for Bioreactor	63 mm OD X 2.0 m long	20 Nos.	Silicon
12	Sludge Recycle Pumps for settling tank	25 M^3/hr @ 10 M head	2 Nos.	C.I.
13	Alum Dosing Tank	0.5 M^3	2 No.	HDPE
14	Agitator for Alum Dosing	Suitable	2 No.	SS – 316
15	Alum Dosing Pumps	50 lt/hr	2 Nos.	SS – 316
16	Sludge Drying beds	6.6m x 3.4 m	2 No.	R. C. C.
17	Pressure Sand Filter Feed Pumps	25.0 m^3/hr @ 3 kg/cm^2	2 Nos.	C.I.
18	Pressure Sand Filter	1.5 M dia X1.0 M ht.	1 No.	MS – Epoxy
19	Activated Carbon Filter	1.5 M dia X1.0 M ht.	2 Nos.	MS – Epoxy
20	Instrumentation	Suitable	Lot	Suitable
21	Piping	Suitable	Lot	Suitable
22	Electricals	Suitable	Lot	Suitable

D. NOISE CONTROL DEVICES

Acoustic enclosure provided on D G set.

E. Treatment of Domestic Wastewater:

Domestic effluent-7 CMD is generated. It is discharged in septic tank followed by soak pit. Overflow is used for gardening.

F. Non- hazardous waste: Collection, storage and safe disposal

Sr No	NON hazardous waste	Unit	Quantity generated	Disposal
1.	Waste rubber hand gloves	Kg/annum	100	Sale to authorized recycler
2.	Waste packaging material	Kg/annum	300	Sale to authorized recycler

F. Hazardous Wastes: Collection, storage and safe disposal

Sr. No.	Waste Name	Category	Quantity MTPA	Form	Disposal Method
Hazardous Waste					
1	Spent Lube oil	5.1	21.0	Slurry	Sale to Authorized recycler
2	Distillation residue	20.3	70.0	Slurry	Disposal to MWML
3	Spent Chemicals	20.1	5.0	Slurry	Disposal to MWML
4	ETP Sludge	34.3	4.0	Sludge	Disposal to MWML
5	Flue gas cleaning residue	34.1	8.0	Dry	Disposal to MWML

DEEPAK NITRITE LTD

TALOJA UNIT

UNIT HEAD

Annexure-IV

Commitment to not store locally available raw materials more than 3 days.

Responsible Care®
OUR COMMITMENT TO SUSTAINABILITY

INTERTEK ISO 14001:2004

INTERTEK ISO 9001:2008

DEEPAK NITRITE LIMITED

RAW MATERIALS

SR.NO.	NAME OF RAW MATERIAL	QUNATITY TPM	STORAGE	SUPPLIER	NO. OF DAYS
1	Nitro Toluene (OT/PT/MT)	199.5	TANK	LOCAL	3 days
2	Nitro Xylene (2,3/2,4/2,5/2,6/3,5)	346.62	TANK	LOCAL	3 days
3	Nitro Cumene (PC/OC)	271.266	TANK	LOCAL	3 days
4	2,6 Xylenol	415.255	TANK	IMP.	3 days
5	Para Aminoazobenzene	50	TANK	IMP.	2 days
6	3- Nitro Amino Benzo Trifluoride & 4-Nitro Amino Benzo Trifluoride	150	TANK	IMP.	3 days
7	Benzophenone,	5	Drums	LOCAL	5 days
8	Methanol	15	TANK	LOCAL	5 days
9	Toluene	15	TANK	LOCAL	5days
10	Sulphuric acid	15	TANK	LOCAL	5 days
11	Liquid Ammonia	5	Drums	LOCAL	6 day
12	1-Cyclohexenacton,	20	Drums	LOCAL	4 day
13	3,4 Dimethoxyphenyl	30	Drums	LOCAL	4 day
14	Methyl Ethyl amino benzene	38	Drums	LOCAL	5 days
15	Hydrogen	720690	Pipe line/ Trolley	LOCAL	1 day

Note : All the Local Raw Materials will be stored for max 3 days at the site.

DEEPAK NITRITE LTD. TALOJA CHEMICAL DIVISION ★ TALOJA ★

Ankapre

Annexure-V

An ESR plan for 5 years @ 5 % of the project cost with the consultation of nearby villagers.

Budgetary Commitment of ESR (With reference to 23rd EAC MOM; PP has to spend 5% of project cost in 5 years of span. The project cost is 38.68Crs. Hence PP has to spend about 1.93Crs. in five years of span)

Sr. No.	Description	Years				
		1	**2**	**3**	**4**	**5**
1	**Provision of mobile ambulance with basic medical facilities for the benefit of villagers**	07	07	07	07	07
2	**Mobile libraries**	04	04	04	04	04
3	**Construction of farm pond**	02	02	02	02	02
4	**School health camps**	10	10	10	10	10
5	**Rain Water Harvesting system with filtration plan**	07	07	07	07	07
6	**Provision of solar power system**	10	10	10	10	10
Total (in lacs)		**40**	**40**	**40**	**40**	**40**

Yearly Budget for the CSR activities

Sr. No	CSR Activities proposed	Budget in Rs.
1	Provision of mobile ambulance with basic medical facilities for the benefit of villagers	700000
2	Mobile libraries	400000
3	Construction of farm pond	200000
4	School health camps	1000000
5	Rain Water Harvesting system with filtration plan	700000
6	Provision of solar power system	1000000
	Total	4000000

Needs Identified

- ✓ **Provision of smokeless chulhas (34% people in Roha and 38% in Taloje use wood as cooking fuel)**
- ✓ **Awareness generation regarding government irrigation schemes (only 12% people in Roha and 7% in Taloje are aware of any irrigation scheme)**
- ✓ **Mobile libraries can initiated for school going and dropouts (64% children attending school in Roha and 65% in Taloje. Drop out rate at Roha is 17% and 18% at Taloje)**

Grant Activity Chart for MHU activity for the Year 2017 – 2018

S. No.	Activities	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	Regular OPDs												
2	Counseling Sessions												
3	Operational use of MIS												
4	Anemia/HB Testing												
5	School Health Camp												
6	Identification of Underweight Children												
7	Blood Group check up Camp												
8	Eye Check Up camp												

Key Achievements of Mobile Health Unit

S. No.	Targets	Verification from Means of Verification
1	2000 patients monthly getting benefits from MHU	Average 1092 patients in OPDs, 460.66 individual counseling and 33.25 in group counseling are covered on monthly basis (Total 1585 patients are covered on monthly basis)
2	Four annual health Camps	Total 16 Camps have been held annually including 10 School Camps, 3 HB + HIV test camps, 2 health checkup camps and 1 Blood group testing camps
3	Annual 10% increase in patients	
4	Number of Patients referred to Civil Hospital	
5	Total number of patients accessing MHU	22483 patients covered for OPDs, individual and group counseling
6	Percentage decrease in disease load	No MIS for this data
7	At least three visits to each village	Two visits to each village are ensured

Grant chart for Mobile Library Activity for 2017-2018

S. No.	Activities	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	Story Session												
2	Counseling Session												
3	Operational Use of MIS												
4	Monthly Meeting												
5	Story telling Competition												
6	Mid Line Assessment												

Key Achievements of Mobile Library

S. No.	Objectives/Expected Out comes	Status
1	50% of the primary school children utilize mobile library facilities	Average monthly membership is 537 till now as against 935 school children
2	80% of regular readers clear the test for reading & writing in local language	
3	60% of children clear aptitude test expected in age 6 to 15 years	
4	Providing a library experience to more than 4500 children across Roha annually	We do not have month wise membership data till now but have started it from January 2016
5	Over 4000 books read/explored over one year period	Do not have budget for such a high stock we currently have 175 books in 3 kits
6	Improving reading levels literacy in the community	50% of regular readers are able to improve reading levels
7	Improving learning for life	

Mobile health unit initiated at Roha

OPDTotal OPD: 16,729

Awareness generation regarding government irrigation schemes

Pond at Nivi: while plastic liningbeingdone

NiviThakurwadi pond lining in progress