

# Sitapura Industrial Disaster in Jaipur and Its Management

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## ABSTRACT

A massive fire broke out at the Indian Oil Corporation depot in Sitapura Industrial Area of Jaipur on Thursday night. This led to an uncontrollable fire which engulfed 12 huge tanks. Nearly one lakh kilolitres of fuel, worth Rs 500 crore just burn out. The flames, had thrown up huge columns of thick, black smoke which blocked sunlight. Officials and firefighters finally decided to wait for the burning fuel to get consumed and for the fire to extinguish by itself, as there seemed to be no other alternative. An area of 5 km radius had been marked as danger zone. More than 150 persons were admitted in various hospitals for burn and splinter injuries and eight people had been declared dead. The fire was accompanied with several explosions that shook the industrial area while people fled in panic. All educational institutions and industries in the area remained shut through the days. Even train and bus routes plying through the area had to be changed. The Jaipur-Kota highway had been closed down for vehicles and about 20 trains scheduled to pass through the nearby railway line were affected. Nearby villages had also been vacated. Residents of about ten nearby villages, which housed an estimated five lakh people, and inmates of hostels in 10 engineering and technical colleges and a medical college had been evacuated in the wake of the incident after which power supply in the area was cut off. Over the past years, many countries and regions of the world are experiencing an increase of extremely large and severe fires. This paper deals with the effect of fire, smoke and water pollution. Such fires directly impact lives, human health, safety, livelihoods, material possessions, etc. They cause loss of biodiversity and site degradation at landscape level leading to desertification. The depletion of terrestrial carbon by fires burning under extreme conditions in some vegetation types, including organic terrain in peat land biomes, is a major contributor to global climate change.

**KEYWORDS:** sitapura, industrial, jaipur, fire, biodiversity, global, climate, health, explosions

## INTRODUCTION



The Jaipur oil depot fire broke out on 29 October 2009 at 7:30 PM (IST) at the Indian Oil Corporation (IOC) oil depot's giant tank holding 8,000 kilolitres (280,000 cu ft) of petrol, in Sitapura Industrial Area on the outskirts of Jaipur, Rajasthan, killing 12 people and injuring over 300. The blaze continued to rage out of control for over a week after it started and during the period half a million people were evacuated from the area. The oil depot is about 16 kilometres (9.9 mi) south of the city of Jaipur.[1,2]

The incident occurred when petrol was being transferred from the Indian Oil Corporation's oil

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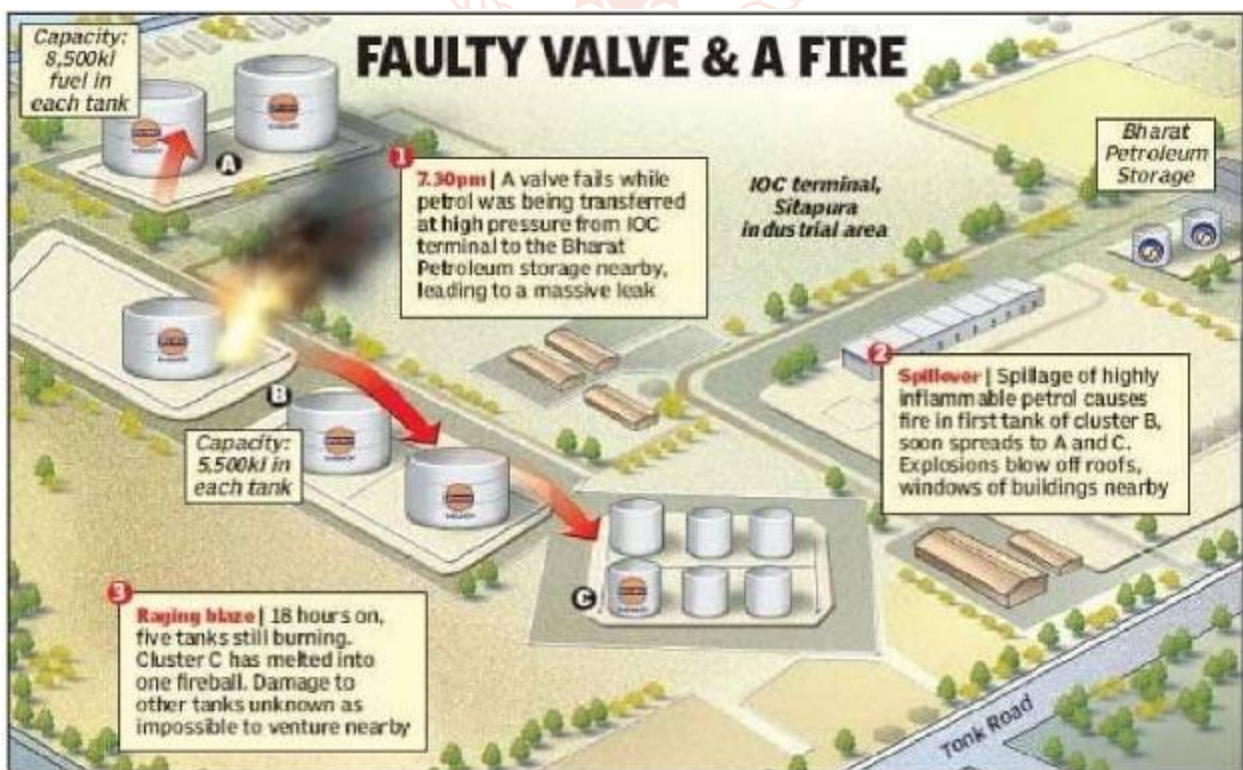


depot to a pipeline. There were at least 40 IOC employees at the terminal (situated close to the Jaipur International Airport) when it caught fire with an explosion. The Met department recorded a tremor

measuring 2.3 on the Richter scale around the time the first explosion at 7:36 pm which resulted in shattering of glass windows nearly 3 kilometres (1.9 mi) from the accident site.

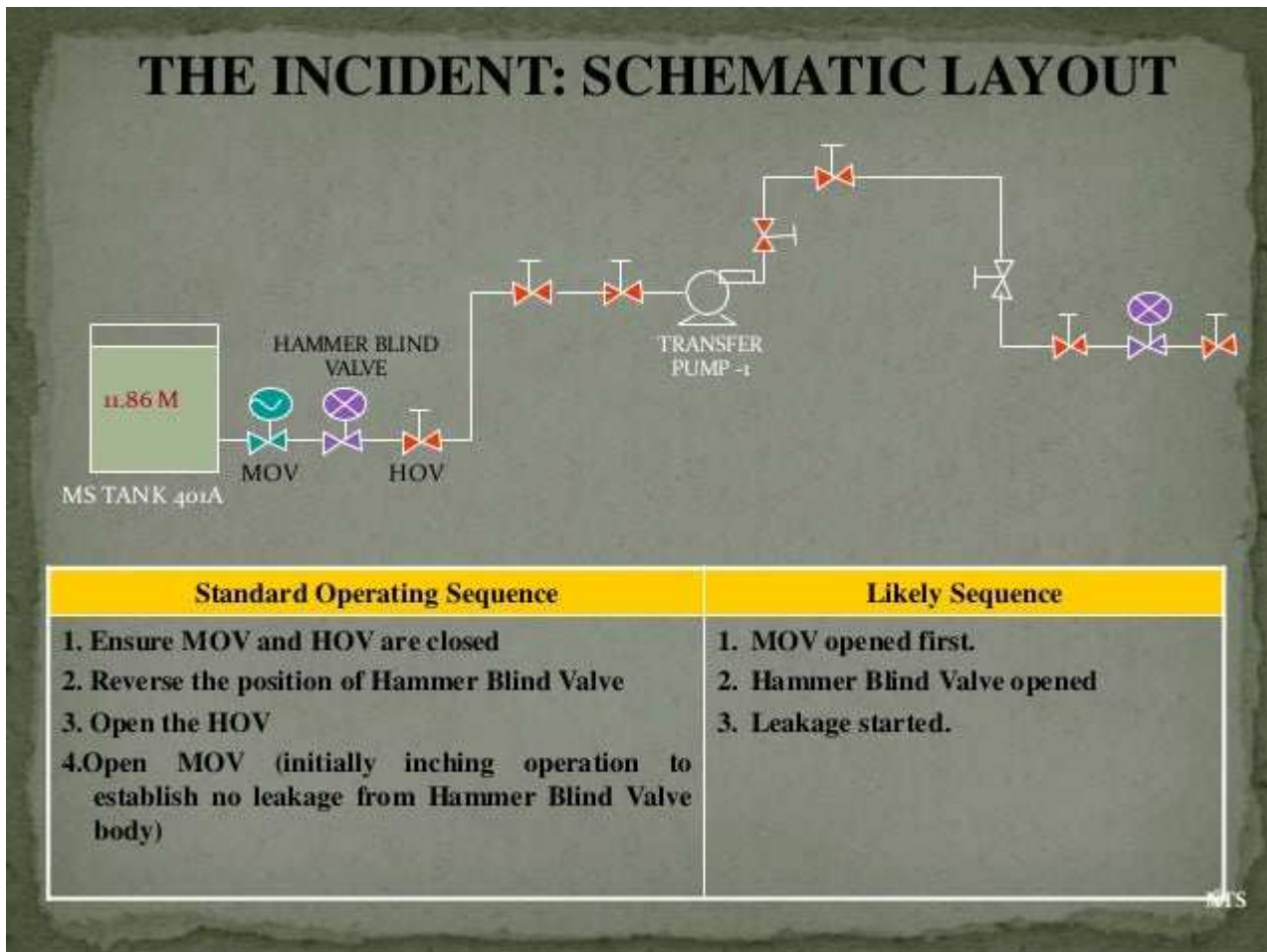


The fire was a major disaster in terms of deaths, injury, loss of business, property and man-days, displacement of people, environmental impact in Jaipur, the capital city of the Indian state of Rajasthan and a popular tourist destination. As per eyewitnesses having factories and hotels around Indian Oil's Sitapura (Jaipur) Oil Terminal they felt presence of petrol vapour in the atmosphere around 4:00 p.m. on 29 October 2009. Within the next few hours the concentration of petrol vapour intensified making it difficult to breathe.[2][3] The Ayush Hotel in the vicinity of the terminal asked all its guests to vacate the hotel to avert any tragedy. Adjacent to the terminal wall was the workshop of Morani Motors (P) Limited where as per eyewitnesses cars parked on the roof top were thrown up into the air to about 10 feet and 35 new Hyundai brand cars were completely destroyed. The police, civil administration and fire emergency services were oblivious to the situation developing in the Indian Oil Terminal.[3,4]



Around half past six the staff in the terminal who had contained the leak and flow of petrol panicked and reported the matter to nearby Sanganer Sadar Police Station. Within the next 30 minutes the local police chief and District Collector were on the spot along with the terminal's general manager, but with no plan to deal with the situation. The nearby industries, which were running second shifts, were cautioned to vacate the area.

At 7:35 p.m. a huge ball of fire with loud explosion broke out engulfing the leaking petrol tank and other nearby petrol tanks with continuous fire with flames rising 30–35 m (98–115 ft) and visible from a 30 km (19 mi) radius. The traffic on adjacent National Highway No.12 was stopped leading to a 20 km (12 mi) long traffic jam. The Jaipur International Airport is just 5 km (3.1 mi) away from the accident site.[5,6]



Both the army and experts from Mumbai were employed on 30 October 2009 to contain the fire in the Sitapura Industrial Area. The district administration disconnected electricity and evacuated nearby areas to limit the damage.

The fire still raged on 31 October. By then, the accident had already claimed eleven lives and seriously injured more than 150 people. The District Administration and Indian Oil Corporation had no disaster management plan to deal with this kind of calamity. The local fire officers were ill-equipped to deal with fire accidents of this magnitude. They remained onlookers and no efforts were made to breach the terminal wall to get closer to kerosene and diesel tanks to cool them with water jets.[7,8]

The fire was blamed on non-observance of normal safety procedures. The depot fire raged for 11 days, killed 11 people in all and resulted in losses worth Rs 2.80 billion.



## OBSERVATIONS

It seems that the Indian Oil Corporation Limited (IOCL) has not learnt any lesson from the past incident of a devastating fire in 2009 that killed around 11 people including its own employees. A pipeline leaked and fountain of oil spilled in nearby areas at Sitapura-situated IOCL oil depot on Sunday.

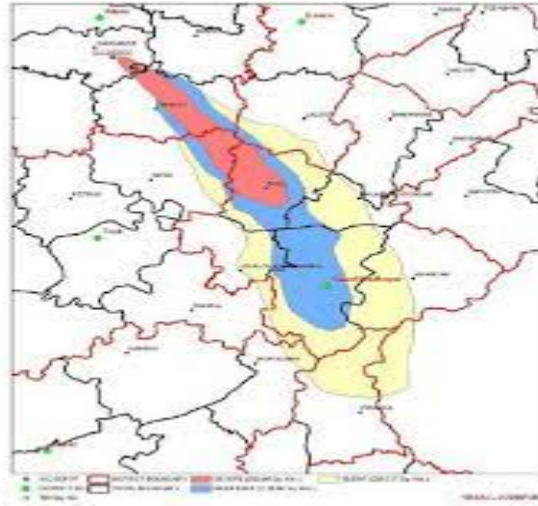


District administration, civil defense and disaster management deputy controller Phool Chand Chaudhary has alleged negligence in the matter. “There must be negligence on the safety part. The incident happened while increasing the pressure in the pipeline. While increasing the pressure up to 70kg/cm square, they have not taken care of various other technical factors and which is why the gas kit failed,” Choudhary said. Choudhary said the Jaisinghpura Khor incident is also connected with Saturday’s incident when thieves try to steal crude oil. After repairing the pipeline, which was damaged by the unidentified thieves, the officials exerted extra pressure by starting another engine.[9,10]

He also said the two engineers present at the IOCL depot, took timely action and prevented the oil from further spilling from the pipeline.

The IOCL officials denied that the incident happened due to negligence. Deputy general manager S K Jain said, “The incident happened not because of negligence but because of mechanical failure. The gas kit failed because of that the incident happened.” Meanwhile, the Sitapura Industry Association claimed that they are living under constant fear because of the presence of the IOCL depot.

To inquire into the incident of fire at POL Terminal of IOCL at Sanganer, Jaipur and to arrive at the causes of the incident and suggest the remedial measures to prevent recurrence of such incidents; and The Committee is to submit its report within 60 days from the date of its constitution.



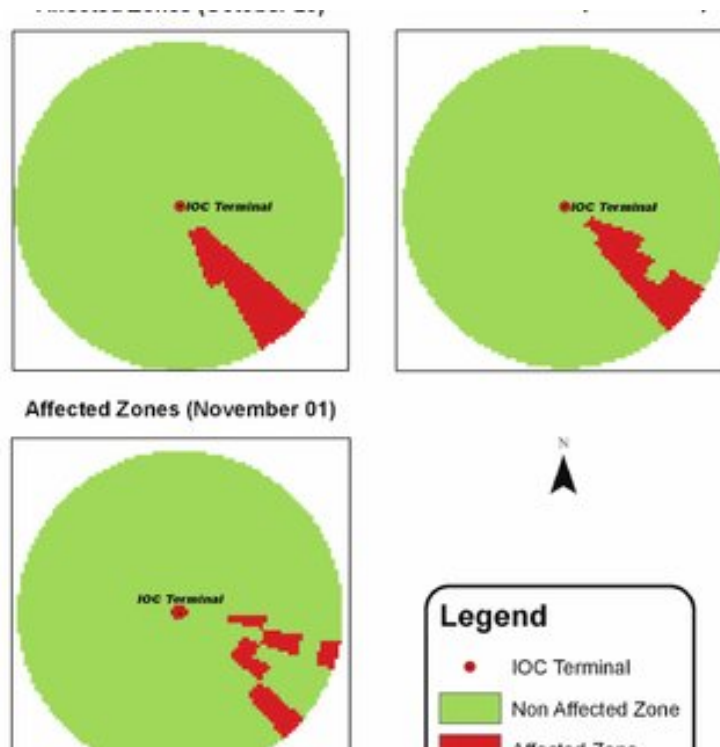
### Sitapura fire and its environmental effects

1. The Committee consists of the following: 1. Shri M B Lal, Ex C&MD, HPCL - Chairman
2. Dr. Govind Sharma, Principal Secy. Deptt. Of Mines and Minerals, Govt. of Raj. – Member
3. Sh. M K Joshi, Director (Technical), EIL – Member 4. Sh. J.B. Verma, Executive Dir, OISD – Member
4. Sh. J.B. Verma, Executive Dir, OISD – Member
5. Sh. P.B. Yedla, Jt.Chief Controller of Explosives In -charge – PESO) – Member
6. Sh. S.K. Hazra, Ex-MD, Aegis Logistics – Member
7. Sh. B.K. Datta, Executive Dir. (Supply Chain Optimisation), BPCL – Member

The Committee constituted by the MoPNG visited the site immediately and members from the Committee were present at the site from 30 th October, 2009 onwards till the 3 rd of November to gather first hand evidence and information. Subsequently, the Committee made several other visits to Jaipur site and to IOC Jodhpur Terminal as well besides conducting interview until January 14, 2010. The information thus collected was used to analyse the sequence of events and deduce the causes thereof. In the absence of hard disk of computers (TFMS System), records of CCTV which were collected and remained in police custody, the conformity assessment could not be carried out.

### DISCUSSION

During the evening shift of 29 Oct 2009, the Terminal was preparing to carry out a routine transfer of Motor Spirit (MS) to the neighbouring Terminal operated by Bharat Petroleum Corporation Limited (BPCL). Four employees were supposed to be on the shift and the operating crew started to prepare the MS tank (tank 401-A) for pumping to BPCL terminal.[11,12]



### Sitapura industrial area-fire affected zones

At about 6.10 pm, while preparing the MS tank for the transfer, a huge leak occurred from a 'Hammer Blind Valve' at the bottom of the tank. The leak resulted in a jet of MS directed upwards from the valve under the hydrostatic pressure head of MS in the tank. The liquid MS rapidly generated vapours which made the operator lose consciousness. The fact that this critical activity was initiated after normal working hours led to delay in responding to the situation. The shift officer tried to help the operator but was also affected by the vapours and barely managed to evacuate the area. The 2nd operator, who was in the canteen and was contacted by the shift officer, rushed to the tank but also lost consciousness. The 3rd operator on the shift had earlier left for home and was not available for initiate any rescue or mitigating steps. With no other operating crew available to initiate control actions, the leak remained uncontrolled for 75 minutes. After 75 minutes, the vapour cloud ignited causing a huge explosion followed by a fireball covering the entire installation.

It is notable that in the case of the Jaipur incident, the vapour cloud was not visible. Personnel on site were aware of the presence of the vapour by its odour. Some personnel were able to make their escape from the site, whilst others were either incapacitated by the MS vapours or were caught within the vapour cloud when it ignited.[13,14]

The fire which followed the explosion spread to all other tanks and burnt for 11 days. All the petroleum products stored in the Terminal at the time of the accident (approx. 60 million litres) were consumed in the fire and the installation was totally destroyed. Buildings in the immediate neighbourhood were heavily damaged. Minor damage and window panes breakages occurred within a radius 2 km from the site.



Eleven people lost their lives in the accident - six from IOC and five outsiders, and several others were injured. There were factories and industrial complexes in close proximity to the site.

The immediate causes of the accident were the non-observance of normal safe procedure which involves a sequence of valve operations during line up activity and an engineering design which permitted use of a 'Hammer Blind Valve'. A large area at the top of these valves can remain completely open every time the valve position has to be changed. It was through this open area that the liquid MS leaked when the tank was prepared for pumping to BPCL) because another valve connecting to the tank was also open when the Hammer Blind was in the changeover position.

The root causes were the absence of site specific written operating procedures, absence of remotely operated shutdown valves and lack of understanding of hazards, risks and consequences.

At the time the leak and subsequent explosion occurred, calm, low wind speed, conditions prevailed. This, coupled with the nature of the release (an upwards jet of MS), is likely to have assisted in the production of vapour. Post incident analysis indicates that a flammable vapour cloud covered much of the IOC site, bound by a perimeter wall which would have contained most of the cloud. The cloud diameter was approximately 1000 m, almost four times that which developed in the Buncefield accident (12/2005).

The explosion resulted in widespread severe pressure damage over almost the entire site. The evidence indicates that the vapour cloud explosion generated overpressures that were in excess of 200kPa over most of the IOC site. The nature of damage was similar to that observed at Buncefield (12/2005) with crushing of oil drums above liquid level, severe damage to buildings and severe damage to vehicles. Areas exhibiting high overpressures included many open regions, without trees, bushes or pipework. In these areas, a deflagration would not be

sustained and overpressures would have decayed. The overpressure damage evidence is therefore not consistent with the vapour cloud explosion involving only deflagration. Directional indicators were also inconsistent with the explosion resulting from a deflagration only.[15]

The directional indicators point to the source of the detonation being in the Pipeline Division area in the north east corner of the site. Unlike Buncefield, the possibility of the detonation occurring as a result of flame acceleration in trees does not appear consistent with the evidence. The most likely cause of the detonation is flame entering either the Pipeline Area control room or the pipeline pump house, causing a confined or partially confined explosion that then initiated a detonation as it vented from the building. In drawing this conclusion it would seem necessary for some of the directional evidence to be affected by lack of symmetry in the vapour cloud.

The exact source of the transition to detonation cannot be determined due to the limited evidence from the Pipeline Division area.

**Immediate measures**

- Introduction of measures to make emergency action possible from remote locations;
- Introduction and enforcement of site operating procedures to reduce human error, improve operating discipline, improve site communications and ensure availability and competency in the use of personal protective equipment;
- Introduction of dual level gauges and alarms, detectors and CCTV systems;
- Introduce a requirement for QRA to be undertaken on larger sites.

**Long-term measures**



- Design and layout improvements to prevent loss of hydrocarbon containment;
- Improvement to firefighting capabilities;
- Better training, performance evaluation criteria and safety oriented corporate policies;
- Making the safety function independent and autonomous, reporting directly to the company CEO;
- Strengthening the internal safety auditing functions and providing professional safety auditing training;
- Siting criteria should be informed by QRA;

- Review of land use legislation in the vicinity of major hazard facilities and the role of local and state governments in such matters;
- Country-wide review of major hazard facilities from a security view-point.

**Lessons Learnt**

- Facilities and installations with inherently high hazards should incorporate redundancy in safety systems and ensure their upkeep at all times;
- Management should ensure that reliable systems are in place to give timely feedback on the current practices and state of readiness in different facilities;

- Management must ensure that identified actions are being carried out;
- A high priority on safety from the senior and top management groups will send the right signals down the line to ensure safety and production;
- High degree of operational competence should be maintained at all times by building on the combined knowledge and experience of all the professional groups. The lessons learnt from all major incidents should be shared and widely disseminated in the entire Industry preferably through an appropriate website.[16]

## RESULTS

### Disaster management

The Disaster Management Act, 2005 envisages that each revenue District must have a Disaster Management Plan. While 31 revenue Districts of Rajasthan had placed the Disaster Management Plan on Rajasthan Government website Jaipur District did not have any Disaster Management Plan. A Disaster Management Plan for Jaipur District has been put on Internet on 17 November 2009 i.e. 20 days after the accident took place on 29 October 2009. A Legal Notice has been issued to Indian Oil Corporation for violating The Water (Prevention and Control of Pollution) Act 1974, The Air (Prevention and Control of Pollution) Act, 1981, and The Environment (Protection) Act, 1986.

Air pollution across Jaipur was way above maximum permitted limits when the Indian Oil Corporation (IOC) depot on the edge of the city was caught fire. It significant effect on the air in Delhi or Agra, the Central Pollution Control Board (CPCB) reported. Almost 60,000 kilolitres (2,100,000 cu ft) of oil in 11 storage tanks went up in flames on the evening of 29 Oct and the blaze raged till 6 Nov. The Petroleum Minister of India Murli Deora had appointed a 5-member committee to investigate the causes of Fire and submit its report within 60 days. The Industries & Education Institutions in Sitapura Industrial Area have filed about 150 complaints with Sanganer Sadar police station about deaths, injury and loss of property due to negligence of Indian Oil Corporation Limited.

Variation in stock of liquid petroleum products due to temperature variation, evaporation, handling (and also due to pilferage) result in what is known as *stock loss*. Percentage stock loss for every product for every depot is fixed based on historical operating data. Monitoring of stock loss is done on shift basis daily.[17]

Abnormal variation in stock loss beyond permitted limit invites explanation and even disciplinary actions

for the officers at the Depots and Terminals. The Competent Authorities for such charge sheeting for Depot level Officers for such lapses are Executive Director (Supplies) and Director (Marketing) who prefer to selectively issue charge sheets to defaulting officers to protect their favourites.

The Chief Judicial Magistrate, Jaipur City, Jaipur Mr. Mahaveer Swami ordered registering of a number of First Information Report (FIR) against Indian Oil Corporation Limited officers and Civil Administration for non-performance of statutory duty and negligence. The Director General of Police, Rajasthan to investigate against Mr. B. L. Soni, Inspector General of Police Jaipur Range I, Mr. Kuldeep Ranka, District Collector, Jaipur and Mr. Biju George Joseph, Superintendent of Police Jaipur (East) for commission of offences u/ss 120B, 166, 167, 201, 202, 203, 204, 217, 218, 221 IPC. The order was passed on 10 December 2009, a month after the fire got extinguished.

### Section 120B: Punishment of criminal conspiracy

(1) Whoever is a party to a criminal conspiracy to commit an offence punishable with death, 2[imprisonment for life] or rigorous imprisonment for a term of two years or upwards shall, where no express provision is made in this Code for the punishment of such a conspiracy, be punished in the same abetted such offence. (2) Whoever is a party to a criminal conspiracy other than a criminal conspiracy to commit an offence punishable as aforesaid shall be punished with imprisonment of either description for a term not exceeding six months, or with fine or with both.]

### Section 166: Public servant disobeying law, with intent to cause injury to any person

Whoever, being a public servant, knowingly disobeys any direction of the law as to the way in which he is to conduct himself as such public servant, intending to cause, or knowing it to be likely that he will, by such disobedience, cause injury to any person, shall be punished with simple imprisonment for a term which may extend to one year, or with fine, or with both.

**Illustration A**, being an officer directed by law to take property in execution, to satisfy a decree pronounced in Z's favour by a Court of Justice, knowingly disobeys that direction of law, with the knowledge that he is likely thereby to cause injury to Z. A has committed the offence defined in this section.

**Section 304A: Causing death by negligence** Whoever causes the death of any person by doing any rash or negligent act not amounting to culpable homicide, shall be punished with



imprisonment of either description for a term which may extend to two years, or with fine, or with both.]

**Section 511: Punishment for attempting to commit offences punishable with imprisonment for life or other imprisonment** Whoever attempts to commit an offence punishable by this Code with 1[imprisonment for life] or imprisonment, or to cause such an offence to be committed, and in such attempts does any act towards the commission of the offence, shall, where no express provision is made by this Code for the punishment of such attempt, be punished with 2[imprisonment of any description provided for the offence, for a term which may extend to one-half of the imprisonment for life or, as the case may be, one-half of the longest term of imprisonment provided for that offence], or with such fine as is provided for the offence, or with both.[18]

In addition to the above two more FIR 241/09 dated 2 November 2009 by Mr. Prit Pal Singh of Genus Overseas an Industrial unit in Sitapura and FIR 242/09 dated 3 November 2009 by Mr. B. L. Meharada of BLM Institute have been registered against Indian Oil by Police Station Sanganer Sadar. A city court in Sanganer has ordered registering of FIR on the complaint of Ayush Hotel Sitapura.[17]

#### Arrests

On 2 July 2010, eight months after the devastating fire at an Indian Oil Corp (IOC) fuel depot that killed 11 people, police arrested 9 senior company officials including its general manager on charges of criminal negligence. IOC general manager for Rajasthan Mr. Gautam Bose and 8 other officers were arrested under various sections of the Indian Penal Code (IPC) including section 304-II (culpable homicide not amounting to murder). Section 304-II of IPC carries a maximum prison term of 10 years. Those arrested in connection with the fire caused by leakage of petrol during transfer from storage tank, included chief of operations at IOC's Jaipur Office, Mr. Rajesh Sayal. The others arrested are Mr. Shashank Shekhar, Manager Operation, Mr. K S Kanojia, Senior Terminal Manager, Mr. Arun Poddar, Manager Terminal, Mr. Kapil Goyal, Deputy Manager Terminal, Mr. Ashok Gupta, Operation Officer, Mr. Kailash Nath Agarwal, Chargeman, and Mr. S S Gupta, DGM Pipeline who is presently posted in Ghaziabad. While eight accused have been enlarged on bail, Mr. Ashok Kumar Gupta is still in judicial custody after 4 months. The next hearing in the matter is fixed on 11 November 2010.

Ms. Savita Saroha and Ms. Alka Kumar whose husbands Mr. S. K. Saroha and Mr. Ravindra Kumar died in the Fire on 29 October 2009 have moved to Rajasthan High Court for equitable and fair

compensation. The duo allege that they were not given the compensation of Rs. 1,000,000 (One million rupees) promised by Mr. Murlu Deora the Minister for Petroleum and Natural Gas, Government of India. The widows are also upset that the company Indian Oil and the arrested officers have tried to pass on blame on their husbands. They are now opposing the accused officers in High Court against quashing of First Information Report and grant of bail to them.

The State Government promptly announced a cash compensation of Rs. 2,000,000.00 to the dead and in addition Indian Oil Corporation paid Rs. 10,000,000.00 to the next of the kin of dead and varied amount of compensation between Rs. 1,000,000.00 and 2,000,000.00 to the injured. It has been decided to review the location of all Oil Terminals throughout India and shift these terminals beyond city limits within a period of next 12–18 months.[17]

#### CONCLUSION

The Sitapura Industries Association has 1383 units, consisting of 325 garment, 115 jewellers, 110 handicraft, and other units like chemical, cable, manufacturing, IT, BPO, Auto parts, Educational Institutes and Hospitals having an investment of over 750 billion. The Sitapura Industries Association have played an important part in shaping the economy of the State of Rajasthan and generation of employment (approximately 1,000,000 direct/indirect workers). The Sitapura Industries Association has played an important role in exports and generation of foreign exchange. That on 29 October 2009 at about 4:00 p.m. some leakage of Petrol started in IOC Terminal and by 6:00 p.m. the fumes had spread far and wide in and around the Indian Oil Corporation terminal. That a huge explosion and fire erupted at 7:35 p.m. and the noise and shock waves were so intense that it gave an impression of an earthquake to the Industries of the area. The neighbouring industries adjacent to the Indian Oil Corporation terminal suffered major structural damages, loss of inventory, equipment, and finished goods. As a consequence of the Fire and associated hazards the District Collector, Jaipur declared a 5 km. zone as dangerous area and prohibited entry of the persons and vehicles in the area. The Sitapura Industries Association claims to have lost Rs. 4000 million worth of property, equipment and inventory instantaneously on 29 October 2009. Thereafter the loss of production, dispatch and consequent loss of goodwill is valued at Rs. 2000 million per day. The industries were allowed free access to their units since 5 November 2009. The total estimated loss is valued at 18000 million. As an

EPZ is part of the Sitapura Industrial Area it houses a number of export-oriented units. The peak season for the export oriented units was at handshake. Due to fire and subsequent pollution and dispersion of carbon soot particles in atmosphere almost 100% finished garments would fail in stringent quality test and would have to be dumped in the domestic market at throwaway prices. As the industries are most likely to falter on their export commitment, the loss of Goodwill will takes years to rebuild.

On 10 December 2009, the Indian Minister of State of Petroleum and Natural Gas Jitin Prasada said the government today ruled out a C.B.I. / केंद्रीय अन्वेषण ब्यूरो probe into the November fires and informed the Lok Sabha and the Indian press that a Committee had- 'ruled out sabotage or terrorism', blamed both 'corporate neglect' and 'severe radiant heat' from the October fires, and denied any connection with a similar, but smaller blast that month in Kashmir[18]

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