Bhopal gas tragedy assignment

Art & Culture

The government of Madhya Pradesh confirmed a total of 3, 787 deaths related to the gas release. 3] Others estimate 8, 000 died within two weeks and another 8, 000 or more have since died from gas-related A government affidavit in 2006 stated the leak caused 558, 125 Injuries Including 38, 478 temporary partial Injuries and approximately 3, 900 severely and permanently disabling injuries. [6] CULL was the Indian subsidiary of union Carbide Corporation (USC), with Indian Government controlled banks and the Indian public holding a 49. 1 percent stake. In 1994, the Supreme Court of India allowed USC to sell its 50. Percent interest in CULL to Eveready Industries India Limited. The Papal plant was later sold to McLeod Russell (India) Ltd. DOD Chemical Company purchased USC in 2001. CAM and criminal cases are pending in the District Court of Papal, India. Involving USC and Warren Anderson, USC CEO at the time of the In June 2010, seven ex-employees, Including the former COIL chairman, were convicted In Papal of causing death by negligence and sentenced to two years imprisonment and a fine of about $2, 000 each, the maximum punishment allowed by Indian law.

An eighth former employee was also convicted, but died before the Judgment was passed. [I] The pre-event phase The CULL factory was built in 1969 to produce the pesticide Seven (Coco’s brand name for carbonyl) using methyl assassinate (MIMIC) as an intermediate. [5] A MIMIC production plant was added in the Papal plant was built, other manufacturers including Brayer produced carbonyl without MIMIC, though ATA greater manufacturing cost. However, Brayer also uses the USC process at the chemical plant once owned by USC at Institute, West Virginia, USA. 12] The chemical process

employed in the Papal plant had amphetamine reacting with phosgene to form MIMIC, which was then reacted with I-naphtha to form the final product, carbonyl. This “ route” differed from the MIMIC-free routes used elsewhere, In which the same raw materials were combined in a deferent manufacturing order, with phosgene first reacting with naphtha to form a chloroformed ester, which was then reacted with amphetamine. In the early sass, the demand for pesticides had fallen, but production continued, leading to buildup of stores of unused In 1976, two trade unions complained of pollution within the plant. 5][13] In 1981, a Nortek was splashed with phosgene. In a panic, he removed his mask, inhaling a large amount of phosgene gas which resulted in his death 72 hours later. 5][13] USC Nas warned by American experts who visited the plant after 1981 of the potential of a ‘ runaway reaction” in the MIMIC storage tank. Local Indian authorities had warned the company of the problem as early as 1979, but constructive actions were not undertaken by GUCCI at that In January 1982, a phosgene leak exposed 24 Markers, all of whom were admitted to a hospital.

None of the workers had been ordered to wear protective masks. One month later, in February 1982, a MIMIC leak affected 18 In August 1982, a chemical engineer came into contact Ninth liquid MIMIC, resulting in burns over 30 percent of his body. 5][13] Later that same [ear, in October 1982, there was another MIMIC leak. In attempting to stop the leak, the MIMIC supervisor suffered intensive chemical burns and two other workers were severely exposed to the gases. 5][13] During 1983 and 1984, there were leaks of MIMIC, chlorine, methamphetamine, phosgene, and carbon tetrachloride, sometimes in combination Contributing factors Factors leading to the

magnitude of the gas leak mainly included problems such as; storing MIMIC in large tanks and filling beyond recommended levels, poor maintenance after the plant ceased MIMIC production at the end of 1984, failure of several safety yester due to poor maintenance, and safety systems being switched off to save money?? including the MIMIC tank refrigeration system which could have mitigated the disaster severity.

The situation was worsened by the mushrooming of slums in the ‘ sanity of the plant, non-existent catastrophe plans, and shortcomings in health care and socio-economic Other factors identified by the inquiry included: use of a more dangerous pesticide manufacturing method, large-scale MIMIC storage, plant location close to a densely populated area, undersized safety devices, and the dependence on manual operations.] Plant management deficiencies were also identified – lack of skilled operators, reduction of safety management, insufficient maintenance, and Inadequate emergency action Nor conditions Attempts to reduce expenses affected the factory’s employees and their conditions. Juryman argues that “ cuts… Meant less stringent quality control and thus looser Markers needed more training? They could do with less. Promotions were halted, seriously affecting employee morale and driving some of the most skilled Workers were forced to use English manuals, even though only a few had a grasp of the language. Ay 1984, only six of the original twelve operators were still working with MIMIC and the number of supervisory personnel was also halved. No maintenance supervisor was placed on the night shift and instrument readings were taken every two hours, rather than the previous and required one-hour readings. [1 Workers made complaints about the cuts through their union but were

ignored. One employee was fired after going on a 15-day hunger strike. 70% of the plant’s employees were fined before the disaster for refusing to deviate from the proper safety regulations under pressure from the management. 5][14] In addition, some observers, such as those writing in the Trade Environmental Database (TED) Case Studies as part of the Mandela Project from American University, have pointed to “ serious communication problems and management gaps between Union Carbide and its Indian operation”, characterized by “ the parent companies [sic] hands-off approach to its overseas operation” and “ cross-cultural Equipment and safety regulations ere MIMIC tank alarms had not been working for four years and there was only one manual back-up system, compared to a four-stage system used in the United States.

The flare tower and several vent gas scrubbers had been out of service for five months before the disaster. Only one gas scrubber was operating: it could not treat such a large amount of MIMIC with sodium hydroxide (caustic soda), which would have brought the concentration down to a safe level. [18] The flare tower could only handle a quarter of the gas that leaked in 1984, and moreover it was out of order at the time of the incident. [4][5][1 reduce energy costs, the refrigeration system Nas idle. The MIMIC was kept at 20 degrees Celsius, not the 4. 5 degrees advised by the

Even the steam boiler, intended to clean the pipes, was inoperative for unknown reasons. [4][5][1 5][18] Slip-blind plates that would have prevented water from pipes being cleaned from leaking into the MIMIC tanks, had the ‘ elves been faulty, were not installed and their installation had been omitted from the cleaning 5] The water pressure was too weak to spray the escaping

gases from the stack. They could not spray high enough to reduce the concentration of escaping In addition to it, carbon steel valves were used at the factory, even though they were known to corrode when exposed to acid.

According to the operators, the MIMIC tank pressure gauge had been malfunctioning for roughly a week. Other tanks were used, rather than repairing the gauge. The the gas USC admitted in their own investigation report that most of the safety systems were not functioning on the night of 3 December 1984. 120]The design of the MIMIC plant, following government guidelines, was " Initialized" by CULL engineers to maximize the use of indigenous materials and products. Iambi-based Humphreys and Glasgow Consultants Pit. Ltd. , were the main consultants, Larsen & Doubt fabricated the MIMIC storage tanks, and Taylor of India

Ltd. Provided the instrumentation. [21] In 1998, during civil action suits in India, it emerged that the plant was not prepared for problems. No action plans had been established to cope with incidents of this magnitude. This included not informing local authorities of the quantities or dangers of chemicals used and manufactured at papal. ere leakage and its immediate effects ere release ere 1985 reports give a picture of what led to the disaster and how it developed, although they differ in In November 1984, most of the safety systems were not functioning and many valves ND lines were in poor condition.

In addition to this, several vent gas scrubbers had been out of service as well as the steam boiler, intended to clean the pipes was infiltration. Other issue was that, Tank 610 contained 42 tons of MIMIC which was much more than

what safety rules allowed. [5] During the night of 2-3 December 1984, water entered Tank IEEE containing 42 tons of MIMIC. A runaway reaction started, Inch was accelerated by contaminants, high temperatures and other factors. The reaction was sped up by the presence of iron from corroding non-stainless steel pipelines.] The resulting exothermic reaction increased the temperature inside the tank to over 200 co (392 OF) and raised the pressure. This forced the emergency denting of pressure from the MIMIC holding tank, releasing a large volume of toxic gases. About 30 metric tons of methyl assassinate (MIMIC) escaped from the tank into the atmosphere in 45 to 60 minutes ere gas cloud ere gases were blown in southeastern direction over Papal. [5][24] As of 2008, USC had not released information about the possible composition of the cloud.

Apart from MIMIC, the gas cloud may have contraindications, hydrogen mine (MA) and carbon dioxide, either produced in the storage tank or in the atmosphere. [5] The gas cloud was composed mainly of materials denser than the surrounding air, stayed close to the ground and spread outwards through the surrounding community. [5] ere nature of the cloud is still discussed. The chemical reactions would have produced a liquid or solid aerosol with high density. The concentrations at ground level would have been much higher than earlier published. 25] Release theories Much speculation arose in the aftermath. The closing of the plant to outsiders including USC) by the Indian government and the failure to make data public contributed to the confusion. The initial investigation was conducted entirely by the Council of Scientific and Industrial Research (SIR) and the Central Bureau of Investigation. Theories differ as to how the water entered the tank.

At the time, workers were cleaning out a clogged pipe with water about 400 feet from the tank.

They claimed that they were not told to isolate the tank with a pipe slip-blind plate. The operators assumed that owing to bad maintenance and leaking valves, it was possible for the Neater to leak into the 5] However, this water entry route could not be reproduced. [26] USC maintains that this route was not possible, but instead alleges water was introduced directly into the tank as an act of sabotage by a disgruntled worker via a connection to a missing pressure gauge on the top of the tank. Early the next morning, a CULL manager asked the instrument engineer to replace the gauge.

Scull’s investigation team found no evidence of the necessary connection; however, the investigation was totally controlled by the government, denying USC Investigators access to the tank or interviews with the operators. 27][22] USC believed that a “ disgruntled worker” deliberately connected a hose to a pressure gauge connection and was the real cause Acute effects ere initial effects of exposure were coughing, vomiting, severe eye irritation and a feeling of suffocation. People awakened by these symptoms fled away from the plant. Those who ran inhaled more than those who had a vehicle to ride.

Owing to their height, children and other people of shorter stature inhaled higher concentrations. Thousands of people had succumbed by the morning hours. There were mass funerals and mass cremations. Bodies were dumped into the Miranda River, less than 100 km from Papal. 170, 000 people were treated at hospitals and temporary dispensaries. 2, 000 buffalo, goats, and

other animals were collected and buried. Nothing a few days, leaves on trees yellowed and fell off. Supplies, including food, became scarce owing to suppliers' safety fears. Fishing was prohibited causing further supply shortages. 5] Nothing a few days, trees in the vicinity became barren, and 2, 000 bloated animal carcasses had to be disposed of. [5] On 16 December, tanks 611 and 619 were emptied of the remaining MIMIC. This led to a second mass evacuation from Papal. 15] The Government of India passed the " Papal Gas Leak Disaster Act" that gave the government rights to represent all victims, whether or not in India. [5] Complaints of lack of information or misinformation were widespread. An Indian Government spokesman said, " Carbide is more interested in getting information from us than in helping our relief work. [5] Formal statements were issued that air, water, vegetation and foodstuffs were safe Nothing the city. At the same time, people were informed that poultry was unaffected, but were warned not to consume fish. 5] No one under the age of 18 was registered at the time of the accident. The number of children exposed to the gases was at least 200, 000. 15] ere acute symptoms were burning in the respiratory tract and eyes, paleographers, breathlessness, stomach pains and vomiting. The causes of deaths wrenching, reflecting circulatory collapse and pulmonary edema.

Findings during autopsies revealed changes not only in the lungs but also cerebral edema, tubular necrosis of the kidneys, fatty degeneration of the liver and engrossing enteritis. [28] The stillbirth rate increased by up to 300% and neonatal retaliatory rate by around 200% Long term effects Long term health effects All data about the health effects are still not available.

The Indian Council of Medical Research (COMIC) was forbidden to publish health effect data until 1994. [5] A total of 36 wards were marked by the authorities as being “ gas affected”, affecting a population of 520, 000.

Of these, 200, 000 were below 1 5 years of age, and 3, 000 were pregnant women. [4][5] The official immediate death toll was 2, 259, and in 1991, 3, 928 (5] ere government of Madhya Pradesh confirmed a total of 3, 787 deaths related to the gas release. [3] Later, the affected area was expanded to include 700, 000 citizens. A government affidavit in 2006 stated the leak caused 558, 125 injuries including 38, 478 temporary partial injuries and approximately 3, 900 severely and permanently disabling injuries. 16] Health care In the immediate aftermath of the disaster, the health care system became overloaded.

Within weeks, the State Government established a number of hospitals, clinics and mobile units in the gas-affected area to treat the victims. [5] Since the leak, large number of private practitioners were opened in Papal. In the severely affected areas, nearly 70 percent were underspecified doctors. [5] Medical staff was unprepared for the thousands of casualties. Doctors and hospitals were not aware about proper treatment methods for MIMIC gas inhalation and they were directed to give cough medicine and eye drops to the patients. 5] ere Government of India had focused primarily on increasing the hospital-based services for gas victims thus hospitals had been built after the disaster. [5] When USC Anted to sell its shares in CULL, it was directed by the Supreme Court to finance a 500-bed hospital for the medical care of the survivors. Thus, Papal Memorial Hospital and Research Centre (BOMBER) was inaugurated in 1998 and was obliged to give free care for survivors for

eight years. [5] BOMBER was a 350-bedded super specialist hospital were heart surgery and hemophilia’s were done however, there Nas dearth of campanology, obstetrics and pediatrics.

Eight mint-units (outreach health centers) were started and free health care for gas victims were to be offered till 2006. [5] The management had also faced problems with strikes, and the quality of the health care being disputed. [37][38] Sambaing Trust is a charitable trust, stirred in 1995, that gives modern as well as arrived treatments to gas victims, free of charge. [5] [39] Environmental rehabilitation En the factory was closed in 1986, pipes, drums and tanks were sold. The MIMIC and the Seven plants are still there, as are storages of different residues.

Isolation material is falling down and spreading. [5]The area around the plant was used as a dumping area for hazardous chemicals. In 1982 tubeless in the vicinity of the CULL factory had to be abandoned and tests in 1989 performed by Sac’s laboratory plant were toxic to fish. [40] Several other studies had also shown polluted soil and roundtable in the area. Reported polluting compounds include 1- naphtha, naphthalene, Seven, tarry residue, mercury, toxic organogenesis, volatile reconciling compounds, chromium, copper, nickel, lead, historicalness, hexachlorobutadiene, and the pesticide HCI. 5] In order to provide safe drinking water to the population around the CULL factory, Government of Madhya Pradesh presented a scheme for improvement of water supply. [41] In December 2008, the Madhya Pradesh High Court decided that the toxic Nasty should be incinerated at Anklebones in Gujarat, which was met by protests from activists all over India. 42] On 8 June 2012, the Centre for incineration of toxic Papal waste agreed to pay

[pick]250 million (US$4. 6 million) to dispose of CULL Chemical plants waste in Germany. 43] On 9 August 2012, Supreme court directed the Union and Madhya Pradesh Governments to, take immediate steps for disposal of toxic waste lying around and inside the factory within six-month. [44] A US court rejected the law suit blaming USC for causing soil and water pollution around the site of the plant and ruled that responsibility for remedial measures or related claims rested with the State Government and not with USC. 45] In 2005, the state government invited various Indian architects to enter their " concept for development of a memorial complex for Papal gas tragedy victims at the site of Union Carbide".

In 2011, a conference was held on the site, with participants from European universities which was aimed for the same. [46] [47] Occupational and habitation rehabilitation 33 of the 50 planned work-sheds for gas victims started. All except one was closed down by 1992. [5] 1986, the PM government invested in the Special Industrial Area Papal. 152 of the planned 200 work-sheds were built and in 2000, 16 were partially injunction. [5] It was estimated that 50, 000 persons need alternative Jobs, and that less than 100 gas victims had found regular employment under the government's scheme. 5] The government also planned 2486 flats in two- and four-story buildings in the " Widows colony" outside Papal. The water did not reach the upper floors and it was not possible to keep cattle which were their primary occupation. Infrastructure like buses, schools, etc. Were missing for at least a decade. [5] Economic rehabilitation Immediate relieves were decided two days after the tragedy. Relief measures menaced in 1985 when food was distributed for a short period along with ration cards. [5] Madhya Pradesh

government’s finance department allocated [pick]874 million (US$16 million) for victim relief in July 1985. 48][49] Widow 15] They government also decided to pay [pick]1 500 (IIS$28) to families with monthly income [pick]500 (US$9. 20) or less. [5] As a result of the interim relief, more children Nerve able to attend school, more money was spent on treatment and food, and housing also eventually improved. [5] From 1990 interim relief of [pick]200 (IIS$3. 70) Nas paid to everyone in the family who was born before the disaster. 5] ere final compensation, including interim relief for personal injury was for the majority (IIS$460).

For death claim, the average sum paid out Nas (IIS$I Each claimant were to be categorized by a doctor. In court, the claimants were expected to prove “ beyond reasonable doubt” that death or injury in each case was attributable to exposure. In 1992, 44 percent of the claimants still had to be medically examined. [5] Ay the end of October 2003, according to the Papal Gas Tragedy Relief and Rehabilitation Department, compensation had been awarded to 554, 895 people for injuries received and 15, 310 survivors of those killed.

The average amount to families of the dead was In 2007, 1 cases were registered and decided. Number of awarded cases Nerve 574, 304 and number of rejected cases 455, 213. Total compensation awarded NAS [Pick]1 5464. 7 million (US$280 On 24 June 2010, the Union Cabinet of the Government of India approved [pick]12650 million (IIS$230 million) aid package which would be funded by Indian taxpayers through the government. [51] Union Carbide’s defense Now owned by DOD Chemical

Company, Union Carbide denied the allegations against on its website dedicated to the tragedy.

The corporation claimed that the incident Nas the result of sabotage, stating that safety systems were in place and operative. It also stressed that it did all it could to alleviate human suffering following the disaster. [52] Investigation into possible sabotage cleaning out pipes with water. The workers maintain that entry of water through the plant's piping system during the washing of lines was possible because a slip-blind Nas not used, the downstream bleeder lines were partially clogged, many valves were leaking, and the tank was not pressurized.

The water, which was not draining properly through the bleeder valves, may have built up in the pipe, rising high Once water had accumulated to a height of 6 meters (20 feet), it could drain by gravity flow back into the system. Alternatively, the water may have been routed through another standby " Jumper line" that had only recently been connected to the system. Indian scientists suggested that additional water might have been introduced as a " back-flow" from the defectively designed vent-gas scrubber.

However, none of these postulated routes of entry could be duplicated when tested y the Central Bureau of Investigators (CB) and CULL engineers. [5][15] Union Carbide cited an investigation conducted by the engineering consulting firm Arthur D. Little, which concluded that a single employee secretly and deliberately introduced a large amount of water into the MIMIC tank by removing a meter and connecting a water hose directly to the tank through the metering port. 127] Carbide claimed that such a large amount of

water could not have found its way into the tank by accident, and safety systems were not designed to deal with intentional sabotage.

Documents cited in the Arthur D. Little report stated that the Central Bureau of Investigation (CB) along with CULL engineers tried to simulate the Neater-washing hypothesis as a route of the entry of water into the tank. This test failed to support this as a route of the water entry. USC claims the plant staff falsified numerous records to distance themselves from the incident, and that the Indian Government impeded its investigation and declined to prosecute the employee responsible, presumably because that would weaken its allegations of negligence by Union Carbide. [53]

Safety and equipment issues ere corporation denied the claim that the valves on the tank were malfunctioning, and claimed that the documented evidence gathered after the incident showed that the valve close to the plant’s water-washing operation was closed and was leak-tight. Furthermore, process safety systems had prevented water from entering the tank by accident. Carbide states that the safety concerns identified in 1982 were all allayed before 1984 and had nothing to do with the incident. [54] ere company admitted that the safety systems in place would not have been able to revert a chemical reaction of that magnitude from causing a leak.

According to Carbide, “ in designing the plant’s safety systems, a chemical reaction of this magnitude was not factored in” because “ the tank’s gas storage system was designed to automatically prevent such a large amount of water from being inadvertently Introduced into the system” and “ process safety systems?? in place and operational?? Mould have prevented water

from entering the tank by accident”. Instead, they claim that “ employee sabotage?? not faulty design or operation?? was the cause of the tragedy”. [54]