

## Union Carbide at Bhopal: Ethically Stupid?

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### **Abstract**

*1984 was perhaps a bad year for India, with the assassination of Prime Minister Indira Gandhi and then the Bhopal Gas plant disaster happened. It happened in the late night of 2<sup>nd</sup> December 1984, when around midnight in the Union Carbide plant in Bhopal, the tank that stored the toxic Methyl Isocyanate (MIC) became unstable. Five minutes past midnight, on 3<sup>rd</sup> December 1984, about 25 tons of the deadly gas leaked into the cold night atmosphere forming a toxic cloud that floated across the city of Bhopal, killing men, animals and birds that came along its way. The aftermath was that about 2500 people were killed, about a 200,000 affected and a large number of cattle died, going by the conservative estimates. This was the worst Industrial disaster, unprecedented and Bhopal overnight became a synonym for Industrial disaster. The Union Carbide India Limited (UCIL) plant in Bhopal was a joint-venture between Union Carbide Corporation (UCC) of United States, the Government of India and some private Indian companies. At the time of the gas disaster, UCIL posted revenues crossing Rs 2 billion and was ranked 21<sup>st</sup> largest size company operating in India.*

*With the death of so many human, lawsuits followed. UCC was flooded with lawsuits from the accident, not only from Indian lawyers, but also from the US lawyers, representing the victims. The public outrage was evident with numerous worldwide demonstrations against the UCC and the stocks of UCC crashed. The initial reaction of the company was denial. The works manager of UCIL, J. Mukund refuted the gas leak and did not believe it could happen as the plant was not in operation at the time. The Government (politicians and bureaucrats) tried to control the situation, but failed miserably. UCC blamed UCIL for the disaster and said that the plant was run-operated-maintained by UCIL's Indian employees and they have no hand in the disaster. Bhopal looked like a city hit by a neutron-bomb.*

*A long legal battle ensued and both the plaintiff and defendant suffered. After the Bhopal Gas disaster, the UCC lost goodwill and shrunk its international operations, most victims still waiting for due compensation, and the Government of India trying to forget the past. Seemingly, 'too little-too late' was done by judiciary, when after more than 25 years; eight key personnel of Union Carbide's Bhopal plant were convicted for Bhopal Gas incident that happened to kill thousands and harmed millions. Did the partners, the UCC, UCIL and Government of India, stand for each other or against? Could the horror story of this tragedy been scripted somewhat else? Where was the humanity when it was needed most?*

### **Introduction**

3<sup>rd</sup> December 1984, 00:05 hours, on the cold winter night at the Union Carbide's Bhopal plant, the poisonous methyl isocyanate (MIC) gas leaks (exhibit 1), killing about 2500 people immediately and disabling several thousands<sup>1</sup>. The after-effects of the gas leak lingered many-many years thereafter and is announced as perhaps the worst industrial disaster that the world has seen. After more than 25 years, eight key personnel of Union Carbide's Bhopal plant, Union Carbide India Limited (UCIL), were convicted for

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<sup>1</sup> Dominique Lapierre in his book (coauthored with Javier Moro), Five Past Midnight in Bhopal, puts the dead between 16000-30000 and injured around 500000. An affidavit on the death and injury figures is filed by the Government of India, is given in exhibit-5.

Bhopal Gas incident<sup>2</sup>. It became obvious for the world not only the things that went wrong that night, but also what other ‘wrongs’ happened thereafter (exhibit 2). The whole wide world watched in dread.

In 1984, Union Carbide Corporation (UCC) operated in 38 countries and ranked 35<sup>th</sup> in size among the large corporations in the United States<sup>3</sup>. The Bhopal plant was one of the thirteen plants owned by UCIL<sup>4</sup>. The plant was so safe and with such high safety device controls that no one comprehended that all the crucial safety mechanisms would fail simultaneously, ever<sup>5</sup>. However, after the incident, the reputation of the UCC suffered and for the company, things never remained the same (exhibit 3).

## The Bhopal Gas Plant

The Union Carbide Plant (UCIL) in Bhopal was publicized as the largest foreign investment at the time. The time was when the trade policies of India was following ‘*license raj*’, and India was actively pursuing the green-revolution in agriculture to solve its food crises. The Government felt that chemical (pesticides) industry is safer as the chemical industry has about 66 percent less incidents as compared to industry average and Union Carbide was deemed as a benchmark in safety, with their plant in United States to tell the story<sup>6</sup>. The company’s experience of about three decades in handling MIC and its reputation across the world, especially in developing countries, was one of the best<sup>7</sup>. In 1975, the Government of India grants the license to UCIL to manufacture pesticides in Bhopal with a capacity to produce 5000 tons.

A huge plant was made that was expected to augment the agriculture by supplying pesticides to the whole of the nation and more. The plausible huge employment generation and the benefit of having the rail-head close-by made the Government to allocate land for the UCIL Greenfield project close to the existing population. Moreover, the causal or daily laborers, in search for employment, came closer to the plant<sup>8</sup> and many slums came up closer to the plant<sup>9</sup>.

The UCIL plant chose the proprietary process of UCC that needed MIC as an intermediate. The high reactivity, high volatility and high toxicity made MIC a tricky chemical to handle and the process hazardous<sup>10</sup>. German manufacturing company, Bayer, used as little MIC as possible and reduced the amount of time, it will be stored<sup>11</sup>. Others produced MIC only as much as was absolutely required. Although there were other processes that did not warrant such dangerous intermediate chemicals, but their

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<sup>2</sup> The convicted—UCIL’s Chairman Keshub Mahindra, Managing Director VP Gokhale, Vice President Kishore Kamdar, Works Manager J Mukund, Production Manager SP Chowdhury, Plant Superintendent KV Shetty, and on-duty Production Assistant SI Qureshi—were held guilty under Sections 304-A (causing death by negligence), 304-II (culpable homicide not amounting to murder), 336, 337 and 338 (gross negligence) of the Indian Penal Code. The Chairman of Union Carbide, Warren Anderson, was declared an absconder. [http://newsvote.bbc.co.uk/mpapps/pagetools/print/news.bbc.co.uk/2/hi/south\\_asia/8725140.stm?ad=1](http://newsvote.bbc.co.uk/mpapps/pagetools/print/news.bbc.co.uk/2/hi/south_asia/8725140.stm?ad=1) visited 10 Jan 2014.

<sup>3</sup> Martin, M. and Schinzinger, R. 2010. Introduction to Engineering Ethics, 2nd Ed. McGraw-Hill, New York, p231.

<sup>4</sup> Shrivastava, P. 1987. *Bhopal: Anatomy of a Crisis*, Ballinger Publishing Company, Cambridge, MA, p38.

<sup>5</sup> Bogard, W. 1989. The Bhopal Tragedy: Language, Logic and Politics in the Production of a Hazard, Westview Press, Boulder, CO, US, p23.

<sup>6</sup> Bowander, B. Kasperon, JX and Kasperon, RE. 1985. Avoiding Future Bhopals, *Environment*, Vol. 27, No. 7, p6.

<sup>7</sup> Kirkland Jr., RI. 1985. Union Carbide Coping with Catastrophe, *Fortune*, 7 Jan 1985, p53.

<sup>8</sup> Bowander, B. Kasperon, JX and Kasperon, RE. 1985. Avoiding Future Bhopals, *Environment*, Vol. 27, No. 7, p7.

<sup>9</sup> Lapierre, D and Moro, J. 2001, *Five Past Midnight in Bhopal*, Simon & Schuster, UK, pp107-115.

<sup>10</sup> Heylin, M. 1985. Bhopal, *Chemical and Engineering News*, 11 Feb 1985, p14.

<sup>11</sup> Shrivastava, P. 1987. *Bhopal: Anatomy of a Crisis*, Ballinger Publishing Company, Cambridge, MA, p54.

manufacturing process was expensive, created more waste and the product was found to not be as efficient. Moreover, the alternate process that avoided MIC was combining phosgene<sup>12</sup>, alpha-naphthol and methylamine to get similar pesticides, was only comparatively safer, as phosgene (mustard gas) was also lethal. Bayer's process utilized dimethylurea and diphenylcarbonate to make MIC, avoiding phosgene completely. However, this process was less efficient and comparatively costly to the UCC's process that used phosgene and methylamine to make MIC and then combining it with alpha-naphthol to produce the desired pesticide<sup>13</sup>. Many MIC experts believed that storing MIC in large quantities over a long period was very risky and discouraged the practice<sup>14</sup>.

The UCC designed the plant based on its operating plant in West Virginia, US<sup>15</sup>, and some modifications were made, with the help of UCIL's Indian employees, keeping the Indian conditions in mind. For example, the UCC's plant in West Virginia had multiple temperature and pressure gauges in their storage tanks, whereas the UCIL plant had one, each<sup>16</sup>. Automated systems, including automated safety systems, were not preferred as it was cheaper to hire more labor locally and the Government of India also liked the scope of more employment. Also, the erratic power supply of Bhopal would make the automated systems, impractical<sup>17</sup>. The construction and supervision was overseen by both UCC and UCIL employees. UCIL's employees were given production and safety training at the UCC plant in West Virginia, US, which followed the same production process<sup>18</sup>. However, most of the safety trained personnel of UCIL had left UCIL by 1983 and the new recruits did not have adequate training or education<sup>19</sup>. Moreover, by 1980, most of the expatriates of UCIL and employees of UCC have left the Bhopal plant's production, operation, maintenance and safety, completely in the hand of their Indian counterparts<sup>20</sup>. Needless to say, personnel who joined the company through recommendations of the powerful and wealthy (read politicians, bureaucrats and businessmen) stayed on. UCIL by the time was a happening place and its guest house - a social place for the rich and powerful. UCIL was a host to many such gatherings, over the years. "In Bhopal, as elsewhere, money and power made comfortable bedfellows"<sup>21</sup>.

Interestingly, UCIL could never run on full production capacity and during the best years, it could run at 75percent capacity. During the initial years, the MIC was source by UCIL from abroad, which was later produced locally, as planned<sup>22</sup>. The pesticides marketing team of UCIL found it difficult to raise demand as the agricultural growth in India has been sluggish during those years. Apart from the Indian market, the UCIL India plant was made to cater to supply pesticide in the Asiatic region and the demand there for pesticides was also dwindling. Based on the requirement, pesticides were produced at the Bhopal plant and the plant was shut down most of the times. Maintenance was lax and there was an overall mood of cost optimization. Pressure to wear safety gears and following safety norms decreased over the years<sup>23</sup>. Yet, the factory inspectors routinely cleared the factory for following adequate safety norms (exhibit 4).

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<sup>12</sup> Phosgene (popularly known as Mustard Gas) is highly toxic and was used as a primary chemical warfare agent in World War-I.

<sup>13</sup> Kurzman, D. 1987. *A Killing Wind*, McGraw-Hill, New York, p21.

<sup>14</sup> Banerjee, BN. 1986. *Bhopal Gas Tragedy: Accident or Experiment?*, Paribus Publishers, New Delhi, p158.

<sup>15</sup> Bowander, B. Kasperson, JX and Kasperson, RE. 1985. Avoiding Future Bhopals, *Environment*, Vol. 27, No. 7, p6.

<sup>16</sup> Bogard, W. 1989. *The Bhopal Tragedy: Language, Logic and Politics in the Production of a Hazard*, Westview Press, Boulder, CO, US, p15.

<sup>17</sup> Martin, M. and Schinzinger, R. 1989. *Ethics in Engineering*, 2<sup>nd</sup> Ed. McGraw-Hill, New York, pp258-261.

<sup>18</sup> Bowander, B. Kasperson, JX and Kasperson, RE. 1985. Avoiding Future Bhopals, *Environment*, Vol. 27, No. 7, p7.

<sup>19</sup> Kurzman, D. 1987. *A Killing Wind*, McGraw-Hill, New York, p41.

<sup>20</sup> Martin, M. and Schinzinger, R. 2010. *Introduction to Engineering Ethics*, 2<sup>nd</sup> Ed. McGraw-Hill, New York, p232.

<sup>21</sup> Lapierre, D and Moro, J. 2001, *Five Past Midnight in Bhopal*, Simon & Schuster, UK, p158.

<sup>22</sup> Shrivastava, P. 1987. *Bhopal: Anatomy of a Crisis*, Ballinger Publishing Company, Cambridge, MA.

<sup>23</sup> Kurzman, D. 1987. *A Killing Wind*, McGraw-Hill, New York, p91.

However, in 1982 a visit by UCC to audit the safety systems of UCIL showed ten major safety deficiencies, which UCIL later reported to UCC that they were all complied with. Records and logs at UCIL were inconsistent and even the production figures varied across all parts of the supply chain of the plant. To make the point, the works manager was not certain how much of MIC was stored in each tank at the time of the disaster and the tank 619, which was to be empty, was almost full with MIC.<sup>24</sup>

### A Series of Unfortunate Events

The UCIL plant produced a potent pesticide Carbyl Sevin that had an intermediary toxic MIC. The MIC was stored in three double-walled, stainless steel tanks (No. 610, 611 and a balancing tank 619) that was housed in thick concrete underground. Each tank was 40 feet in length and eight feet in diameter with a capacity of about 50 tons<sup>25</sup>.

In the night shift of 2<sup>nd</sup> December, one worker noticed that the pressure gauge of tank 610 showed the pressure of about 10 pounds per square inch (psi), which was five-fold the operational pressure of 2 psi. However, this sudden rise in pressure did not alarm the plant supervisor as he felt that the pressure gauge may be faulty. There were too many not-working gauges and instruments in the plant, an act of poor maintenance and were not replaced. Moreover, the balancing tank 619 was also not empty and found to contain good amount of MIC. Had the balancing tank been empty, the pressure that was being built in tank 610 could have been divided.<sup>26</sup>

Close to midnight, some initial drip of liquid and some gas escaping was spotted, but the plant supervisor decided to check them after his tea -break that last for more than half -an-hour. By this time, the temperature gauge of tank 610 showed 25 °C and the pressure gauge touched 40 psi, cracking the concrete housing. This is when the emergency relief valve opened and the gas leaked into the atmosphere with a pressure of 55 psi. About 25 tons of MIC and other toxic gases leaked into the atmosphere in the next two hours and when the pressure reduced to below 40 psi, the emergency valves closed. By this time a huge toxic white cloud has started floating down-wind and took lives as the air flowed through the heavily populated slums of Bhopal. The gas spread for more than 40 square kilometer area, killing about 2500 people and affecting about 200,000.

Subsequently, it was found that the MIC became unstable as some impurity, such as water or iron, somehow got into the MIC storage tanks<sup>27</sup>. The explosive 'runaway reaction' in MIC happened as MIC was extremely potent chemical that could react with any impurity and generate substantial exothermic reaction. This heat can speed up the process to generate even more heat leading to an uncontrollable explosive state. Hence, to keep the MIC from reacting, it was important to not let MIC store in tanks for longer periods and the storage temperature should be at 0 °C. The presence of water in the MIC tank could have come from pipe flushing (a maintenance task) where somehow the isolation valves/slips leaked, or an act of sabotage, where a disgruntled employee introduced water directly into the MIC tanks through a water hose<sup>28</sup>. Some felt that the water along with the corrosion of steel pipes triggered the reaction. Although all the critical pipelines of UCIL were of stainless steel, but recent changes to steel pipes was an

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<sup>24</sup> Centre for Science and Environment's Report, *India's Environment 1984-85*, p208.

<sup>25</sup> Morehouse, W. 1986. *The Bhopal Tragedy*, Council on International and Public Affairs, New York, p3.

<sup>26</sup> Centre for Science and Environment's Report, *India's Environment 1984-85*, p206.

<sup>27</sup> Indian Council of Scientific and Industrial Research. 1985. Report on Scientific Studies on the Release Factors Related to Bhopal Toxic Gas Leakage, Dec 1985.

<sup>28</sup> Kalelkar, AS. 1988. Investigation of Large-Magnitude Incidents: Bhopal as a Case Study, Presented at the *Institution of Chemical Engineers Conference on Preventing Major Chemical Accidents*, London, Arthur D Little, Cambridge, MA, US, May 1988.

act of cost cutting that the plant was actively undertaking. The poor maintenance of the valves and gauges are also attributed to the cost cutting measure. The refrigeration system (of 30 ton capacity) that keeps the stored MIC cool was shut-off to save cost and also that the winter in Bhopal is cold. However, the initial reaction of UCC and UCIL was that water was deliberately induced into the MIC tank by a disgruntled employee as an act of sabotage.<sup>29</sup>

The UCIL plant which had the proprietary process to make the pesticide Carbyl Sevin had three major safety features, which incidentally failed on that fateful night. The first safety system, the Vent Gas Scrubber was built to spray caustic soda on any leaking vapor to render the vapor harmless. The capacity of the scrubber was to handle about 7 tons of gas<sup>30</sup>. However, the Scrubber was under maintenance and thus not working on-line. The second safety system, the Water Curtain was designed with criss-cross water jets that would neutralize MIC in case of leak. However, the water jets were designed to reach to a height of about 15m, while MIC gushed at more than 30m. The third safety system, the Flare Tower was built to burn any escaping vapor. However, a piece of piping was absent as the maintenance team has removed it as it was corroded and had not yet replaced that section of piping. This did not allow the MIC vapor to even reach the flare tower. It appeared that maintenance in the plant was poor and a disaster was waiting to happen. Moreover, the plant operators, including the works manager had little understanding of the working of the safety systems and never saw one in operation.<sup>31</sup>

Even after the gas leak, the public siren that alerts outside population of any leak was put on after an hour of leak, only to be muted immediately. The common population, most of whom were fast asleep, did not alarm as the plant had frequent numerous small leaks<sup>32</sup> and have always put on siren only to stop that in a few minutes. By the time, the siren was again put on, a good three hours elapsed. The need for the siren the second time was not essential as by this time, people were found dead on the road. The next day, the company (UCIL and UCC) was not forthcoming in confirming what gas has leaked and this made medical help to those affected difficult. As was later evident that the plant doctor knew little of the effects of MIC on human and the doctor was hired as a specialist who could treat workers who are exposed to the chemical. Little to say of the common doctors in other hospitals and clinics in Bhopal felt the chemical to be just an eye irritant and most did not know what to do<sup>33</sup>.

On 16<sup>th</sup> Dec 1984, *Operation Faith* was initiated to convert the remaining MIC in the tanks to harmless pesticide Sevin. This operation took three days and night to be successful of converting every remaining MIC into Sevin. The operation was under the direct supervision of Mr Warren Woomer, the last American Managing Director, his successor, Mr Jagannathan Mukund, Works Manager, UCIL, Mr Shakil Qureshi, Supervisor, UCIL, Mr VN Shukla, Central Bureau of Investigation, and Professor S Vardarajan, Centre for Science and Industry Research, Indian Academy of Science.<sup>34</sup>

## **Justice – Delayed or Denied?**

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<sup>29</sup> Martin, M. and Schinzinger, R. 2010. *Introduction to Engineering Ethics*, 2nd Ed. McGraw-Hill, New York, p232.

<sup>30</sup> Kurzman, D. 1987. *A Killing Wind*, McGraw-Hill, New York, p51-52.

<sup>31</sup> Centre for Science and Environment's Report, *India's Environment 1984-85*, p207.

<sup>32</sup> Bogard, W. 1989. *The Bhopal Tragedy: Language, Logic and Politics in the Production of a Hazard*, Westview Press, Boulder, CO, US, p4.

<sup>33</sup> Ibid, p13.

<sup>34</sup> Kalelkar, AS. 1988. *Investigation of Large-Magnitude Incidents: Bhopal as a Case Study*, Presented at the Institution of Chemical Engineers Conference on Preventing Major Chemical Accidents, London, Arthur D Little, Cambridge, MA, US, May 1988, p4 and Lapierre, D and Moro, J. 2001, *Five Past Midnight in Bhopal*, Simon & Schuster, UK, pp354-361.

After the news of the gas leak reached, Mr Warren Anderson, the Chairman of UCC, decided to immediately visit the plant at Bhopal. The plant that inaugurated by him on 4<sup>th</sup> May 1980, would meet such an accident in less than five years was unbelievable. It is necessary to figure out who is to be blamed, as UCC had left UCIL's operations in the hand of the Indian counterparts. Anderson reached Bombay, India on 6<sup>th</sup> Dec 1984, early morning and after immediate discussion with the two personnel, Mr Keshub Mahindra, President, UCIL and Mr VP Gokhale, Managing Director, UCIL, decided to meet Mr Arjun Singh, the Chief Minister of Madhya Pradesh and Mr Rajiv Gandhi, the Prime Minister of India, to initiate the compensation. The three left for Bhopal the next day in an Indian Airlines flight only to be arrested by virtue of articles 92, 102B, 278, 304, 426 and 429 of Indian penal code outlining culpable homicide causing death by negligence, making the atmosphere noxious to health, negligent conduct with respect to poisonous substances, and mischief in killing the livestock.<sup>35</sup> Three hours later, the three were released and were sent to Delhi in a Government plane, from where Mr Anderson could return to US. Mr Anderson never came back to India, since.

In March 1985, the Government of India passed the Bhopal Gas Disaster Act that allowed it to legally represent all the victims of the disaster. The act was called the Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985, and gives all power to the Central Government to represent claimants, power to delegate authority for these claims, power to frame scheme, power to override effect, removal of doubts, categorization and registration of claims, manner of filing claims, maintenance of records, procedure and processing of claims, relief fund management and finally the disbursement.<sup>36</sup>

The Government of India filed a complaint against UCC in New York, US as the Indian courts did not have jurisdiction over UCC, which is a US based company. Moreover, the decision to go to US courts could have been for the reason that US courts are known for heavy compensation as compared to Indian courts. The District Court dismissed the case on grounds of '*forum non conveniens*', as all the records, evidences and witnesses are in India. On the other hand, UCC wanted the case to be heard in US as Indian courts are ill equipped to handle such a case. UCC eventually gave consent to the jurisdiction of the courts in India and agreed to satisfy any judgment rendered by the Indian court.<sup>37</sup> The Government of India had an interesting double role, one of the plaintiff and the other of a defendant.

After a long legal battle, in February 1989, the Supreme Court of India ordered the company (UCC/UCIL) to pay \$470 million compensation against the claims of the gas victims. All the parties, the Government of India and the UCC/UCIL accepted the ruling and the settlement was paid to the Government of India in order to distribute the compensation (exhibit 4). For lack of proper identification systems, the Government is still struggling to remove bogus claims, while many genuine victims suffered in silence.

Although the property of UCIL Bhopal Plant was sealed by the Government of India, in November 1994, UCC was allowed to see its stakes in UCIL to McLeod Russel Ltd. of Calcutta, which was subsequently, renamed Eveready Industries India Ltd. Now Eveready Industries assumed responsibility for the site environmental cleanup but was cleared of any liability arising out the gas incident. In August 1999, UCC became a subsidiary of Dow Chemicals for \$11.6 billion<sup>38</sup> and in February, 2001, UCC becomes a wholly owned subsidiary of Dow Chemicals<sup>39</sup>.

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<sup>35</sup> Lapiere, D and Moro, J. 2001, Five Past Midnight in Bhopal, Simon & Schuster, UK, pp349-351.

<sup>36</sup> The Bhopal Gas Leak Disaster (Processing of Claims) Act, 1985 (Act 21 of 1985 and Scheme, 1985), Bhopal, Government Central Press, 1994.

<sup>37</sup> Taken from US Court Records – Case 809F.2d 195 (2nd Cir. 1987).

<sup>38</sup> <http://www.unioncarbide.com/About%20Us>, retrieved on 10 Oct 2014.

<sup>39</sup> <http://www.unioncarbide.com/History>, retrieved on 10 Oct 2014.

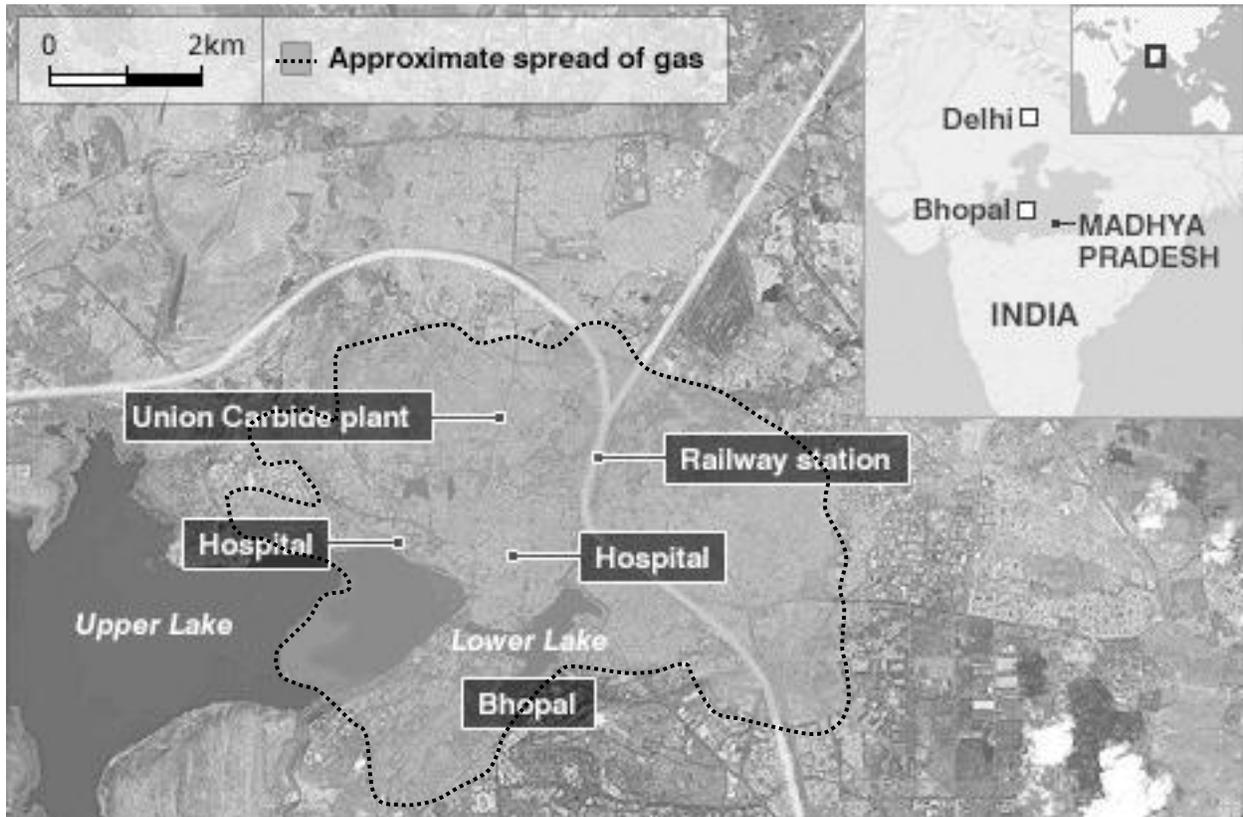
UCC's life after Bhopal Gas tragedy was not the same. The Bhopal Plant Joint Venture was known as the Union Carbide India Ltd, which was a joint venture Union Carbide, Government of India and some wealthy Individuals, was commissioned in 1979, and after the Bhopal Gas disaster, the joint venture partner were seen blaming each other.

In June 2010, seven employees of UCIL were sentenced to 2 years imprisonment and a fine of Rs 100,000. Subsequently, they were all granted bail. UCC Chairman at the time of Bhopal Gas disaster, Warren Anderson, was declared absconding and India's repeated requests to extradition of Warren Anderson were turned down. Anderson was reportedly seen in US having a retired life and eventually died of old age in September 2014<sup>40</sup>. UCC in 2001 was taken over by Dow Chemical Company. A movie, Bhopal: A Prayer for Rain was released on 5 December 2014.

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<sup>40</sup> <http://www.nytimes.com/2014/10/31/business/w-m-anderson-92-dies-led-union-carbide-in-80s-.html? r=0>, retrieved on 5 Nov 2014.

**Exhibit 1: MIC Gas Affected Region in Bhopal in Dec 1984.**



(Source: [http://news.bbc.co.uk/2/hi/south\\_asia/8725140.stm](http://news.bbc.co.uk/2/hi/south_asia/8725140.stm), retrieved on 10 Oct 2014)

## Exhibit 2: Related Time-Line of Events

- 1934 Union Carbide India Limited (UCIL) established. The joint venture UCIL was 51% owned by Union Carbide Corporation (UCC) and 49% by Indian investors (numerous financial institutions, private investors, and the Government of India). This was the first US company investment in India. UCIL stocks were traded publicly on the Calcutta Stock Exchange. Employing more than 9000 people across 14 plants all-over India, UCIL became a diversified company that produced batteries, carbon products, welding equipment, marine products, plastics, industrial chemicals, and also pesticides.
- 1969 Union Carbide (India), a subsidiary of UCC sets up a pesticide formulation plant on the north edge of Bhopal, to import, mix and package pesticides manufactured in US. 10 years later, a 5000 ton methyl isocyanate (MIC) production taken up to manufacture carbaryl pesticide in Bhopal plant.
- 1970 India takes up “The Green Revolution” in a major way to solve its food crisis.
- 1974 UCC initiates construction of a huge Agriculture Chemicals Plant in Bhopal, slated to be operational in the next two years. The plant’s pesticides were slated to help India’s agricultural sector, a cornerstone of the green revolution effort by the Government. Pesticides would increase agriculture productivity and meet the food needs of the heavily populated country.
- 1975 UCIL secures license from Government of India to produce pesticides in Bhopal Plant.
- Dec 1981 One worker dies and about 20 injured in a phosgene gas leak at Bhopal Plant.
- Mid 1982 UCIL’s safety inspectors find about ten major potential deficiencies. However, Government factory inspectors routinely approve plant safety.
- Nov 1984 Maintenance engineer only roster for regular day. No safety engineers for each shift.
- 3 Dec 1984 Five minutes past midnight, poisonous methyl isocyanate (MIC) gas leaks from a tank at the UCIL Bhopal plant. About 3000 people die, and a several thousand suffer from permanent and partial disabilities. The death figure rises to more than 8000, adding the after-effects death of the gas leak.
- 5 Dec 1984 Following the tragedy, the Government of India takes control of the property. 6 million shares of UCC are dumped in the market by the Investors.
- 9 Dec 1984 \$1 Million in Aid is announced by UCC that is donated to the victims. Chairman Warren Anderson leaves for India from US, was arrested by the local police and later released on bail within 24 hours (promised to return back in his Bail Bond) to go back to US, after intervention by the Government at the Centre.  
Cause of the gas leak is investigated by the UCC’s technical team.
- 11 Dec 1984 UCC/UCIL acknowledges of problems in chemical tank storage based on earlier internal inspection reports, after preliminary post mortem by neutral agencies.
- 12 Dec 1984 Class-action suits against UCC in US courts by many.
- 13 Dec 1984 Plant reopens temporarily after Indian officials give a go-ahead. Processing of the remaining MIC done.
- 14 Dec 1984 Warren Anderson testifies before Congress and stresses UCC commitment to safety. He assures that actions will be taken immediately to secure that such a leak will not happen

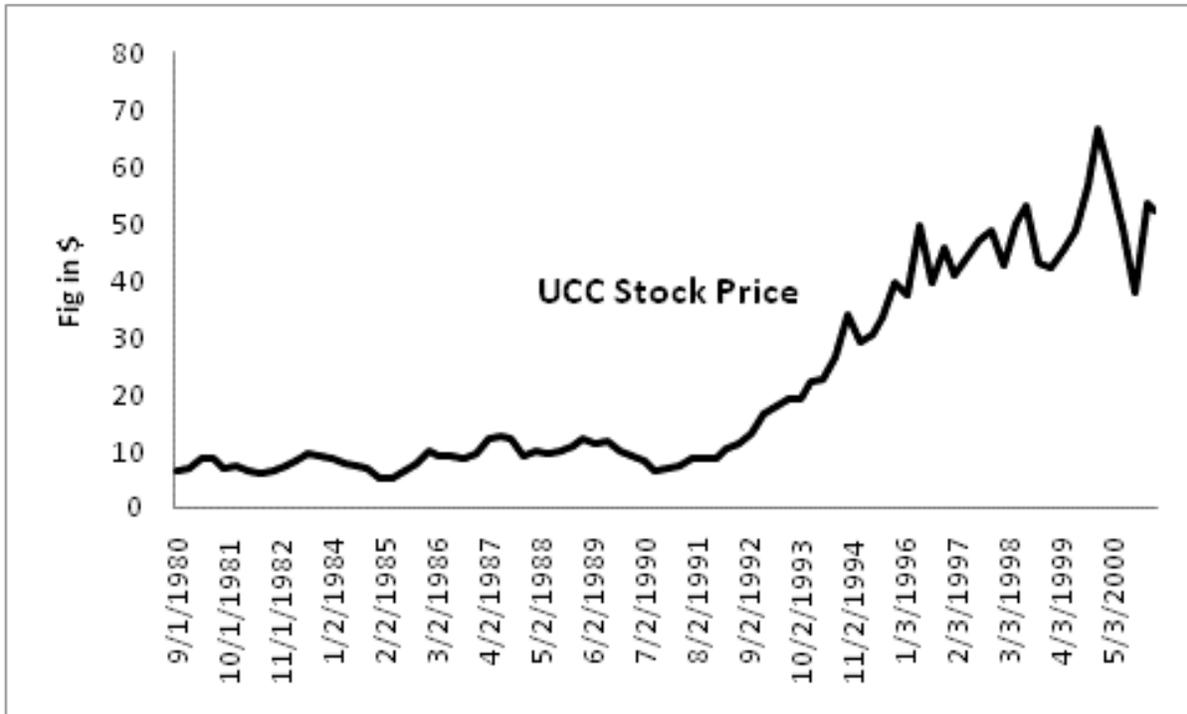
- again in future.
- 24 Dec 1984 UCC stockholders sue UCC in reaction to Bhopal Plant leak.
- 11 Jan 1985 UCC announces that claims from Bhopal Plant are likely to be settled in 6 months.
- 30 Jan 1985 Residents near UCC's West Virginia, US Plant file \$3 billion class-action lawsuit against UCC.
- Mar 1985 UCC Technical team reports that the cause for MIC to become unstable is that a large volume of water was somehow introduced into the MIC tank and this activated an uncontrolled reaction that resulted in the gas high gas pressure being developed in the tank and then gas release due to uncontrollable high pressure.  
An independent committee of experts set by the Government of India reports similar reason for the gas leak.
- 29 Mar 1985 Bhopal Gas Leak Disaster Act passed by Indian government, where the Government of India represents the interests of the Bhopal Gas Leak affected victims. Government of India is to act as the sole legal representative of the victims and relatives of the victims of the Bhopal Gas Leak.
- 9 Apr 1985 UCC sued by the Government of India in New York federal court.
- 12 Apr 1985 UCIL Bhopal Plant license renewal is rejected by the Government of India.
- Jun 1985 In addition to the \$2 million declared earlier, UCC offers additional \$5 million in relief for Bhopal gas leak victims before the US District Court. However, the Government of India rejects the offer.
- Jul 1985 UCC funds participation of Indian medical experts to offer the latest medical treatment techniques for victims.
- 1986 Samples collected from the MIC tank confirm that water triggered the uncontrollable reaction that led to the gas release. Conspiracy theory takes root.  
Aged 65, Warren Anderson retires from Union Carbide.
- May 1986 UCC proposes a settlement amount of \$350 million that will generate a fund for Bhopal victims of between \$500-600 million over 20 years. Plaintiffs' US attorneys endorse amount.
- 14 Jan 1987 US District Court transfers all Bhopal litigation to India. Decision is appealed.  
The US Second Circuit Court of Appeals in Manhattan upheld a decision by the US District Court to send the legal case against UCC to India. It ruled that UCIL is a separate and independent legal entity managed and staffed by Indian citizens.
- Aug 1987 After finding out that UCC funded the project Bhopal Technical and Vocational Training Center that was built by Arizona State University, the Government of India tears down the facility.
- Dec 1987 India's Central Bureau of Investigation (CBI) files charge sheet against Warren Anderson, chairman of UCC, and eleven other accused individuals. Anderson is charged under Indian Penal Code sections 304 (culpable homicide, punishable by 10 years to life imprisonment and fine), 320 (causing grievous hurt punishable by 10 years to life imprisonment and fine), 324 (causing hurt, punishable by 3 years imprisonment and/or fine) and 429 (causing death and poisoning of animals, punishable by 3 years imprisonment and/or fine). Anderson never showed up in Bhopal Court despite several summons through Interpol.
- 1988 For immediate rehabilitation of victims, UCC offers an additional \$4.6 million interim

- humanitarian relief.
- 24 Feb 1989 The Supreme Court of India directed UCC (and UCIL) to pay \$470 million to settle all claims of the victims of Bhopal gas leak. The Government of India, agrees with the ruling, and UCC and UCIL does the final settlement.
- 1989 Arthur D' Little, independent investigating engineering and consulting firm, reaffirms that the gas leak could only have been caused by an act of sabotage. It is likely that someone intentionally connected a water hose to the gas storage tank that caused a massive chemical reaction.
- Dec 1989 The Supreme Court emphasizes that the compensation levels provided for in the settlement are substantially higher than those ordinarily payable under Indian law.
- 1990 The Supreme Court upholds the validity of the Bhopal Gas Leak Disaster Act (1985) that authorized the Government of India to represent the Bhopal gas leak victims.
- Dec 1990 The State Government of Madhya Pradesh submits to the Supreme Court of India the completed categorization of the claims of all of the victims. The State determined that the Bhopal gas incident resulted in 3,828 deaths, in addition to victims who suffered various levels of temporary and permanent disabilities.
- Oct 1991 The Supreme Court of India directs UCC to finance a 500 bedded hospital for long-term medical care of Bhopal gas leak survivors. Bhopal Hospital Trust (BHT), registered by UCC in England, is set up for the purpose.
- 1 Feb 1992 UCC CEO, Anderson charged with manslaughter by Indian authorities, was declared a fugitive from justice by the Chief Judicial Magistrate (CJM) of Bhopal, for failing to appear at the court hearings.
- 10 Apr 1992 CJM, Bhopal issues non-bailable Warrant of arrest against Warren Anderson and orders the Government of India to seek extradition of Anderson from the United States.
- Nov 1994 Mcleod Russel India Limited of Calcutta buys UCC's 50.9 percent stake in UCIL. UCIL is subsequently renamed Eveready Industries India Ltd. As part of this transaction, EIIL becomes the property leaser and assumes responsibility for the site environmental clean-up.
- 1998 The Indian Bhopal Hospital Memorial Trust (BHMT) is formed from Bhopal Hospital Trust (BHT), and proceeds of sale of Indian shares of UCC is utilized for this.
- 1995-2001 UCC provides initial \$20 million to charitable trust for Bhopal hospital. The hospital charitable trust begins facility construction in October 1995. UCC provides approximately \$90 million from the sale of all its UCIL stock. By 1999, the trust has \$100 million. Building is completed and physicians and medical staff are being selected. The hospital to have facilities for the treatment of eye, lung and heart problems.
- May 2003 Ministry of External Affairs, Government of India sends request for extradition of Warren Anderson to Department of State and Department of Justice, US.
- 24 Jul 2003 The Department of State, United States rejects the application for Warren Anderson's extradition.
- 2004 The Bhopal Memorial Hospital and Research Centre (earlier BHMT), funded largely by proceeds from UCC sale of all its UCIL stock, begins treating patients.
- Feb 2006 BMHT is found to give harmful or useless prescriptions to Bhopal gas leak patients.

- BHMT employees go on strike, 300 staff fired, 12 Doctors resign. Management shuts down the hospital. Rampant corruption and discrimination against gas leak victims found.
- 2008 Indian Supreme Court again reaffirms adequacy of the compensation and the finality of 1989 settlement.
- 31 Jul 2009 The chief judicial magistrate of Bhopal issues an arrest warrant for Warren Anderson. The United States declines to extradite him citing a lack of evidence.
- Jun 2010 Seven former key employees of UCIL (non-executive chairman of UCIL, managing director, vice-president, works manager, production manager, plant superintendent, and production assistant) were convicted of causing death by negligence and each sentenced to two years imprisonment and fined INR 100,000. All were released on bail shortly after the verdict.  
UCC spokesperson says, “All the appropriate people from UCIL – officers and those who actually ran the plant on a daily basis – have appeared to face charges.”
- 29 Jul 2012 A US federal court has ruled that neither UCC nor Warren Anderson are liable for any environmental remediation or pollution-related claims made by the victims of the 1984 Bhopal gas tragedy.
- 2013 Indian Government through its Ministry of External Affairs keeps sending requests for extradition of Warren Anderson to the US Department of Justice, in 2004, 2005, 2008 and 2011. The request is still pending.  
Warren Anderson lives a life of luxury and exile in US and is past 92 years of age.
- 29 Sep 2014 Warren Anderson dies quietly in a nursing home in US. His death is not announced by the family, but is confirmed from public records. Anderson was initially praised for his feistiness to have come to Bhopal immediately after the accident in 1984. However, he never returned to face the trial in India and was subsequently treated as an absconder. With the help of the US government, he successfully escaped extradition by the Government of India. Ironically, a paperweight on Mr Anderson’s desk quoted his favorite Chinese proverb, “Leader is best when people barely know he exists.”
- 5 Dec 2014 Movie – Bhopal: A Prayer for Rain is released. The movie dramatizes the real events and the perspectives of the Bhopal Gas Tragedy. The movie is released in US on 7 Nov 2014.

(Source: Compiled by the author from various sources, including <http://www.bhopal.com/chronology>, <http://bhopal.net/>, <http://www.bhopal.net/delhi-marchers/factsheets/BMHT%20sheet.pdf>, [http://www.mid-day.com/search/chairman-warren-anderson\\_all](http://www.mid-day.com/search/chairman-warren-anderson_all), <http://www.bhopalithemovie.com/sign-the-petition-to-extradite-warren-anderson/>, and <http://www.bhopal.net/march>, visited on 10 Feb 2014; [http://www.nytimes.com/2014/10/31/business/w-m-anderson-92-dies-led-union-carbide-in-80s-.html?\\_r=0](http://www.nytimes.com/2014/10/31/business/w-m-anderson-92-dies-led-union-carbide-in-80s-.html?_r=0), and [http://en.wikipedia.org/wiki/Bhopal:\\_A\\_Prayer\\_for\\_Rain](http://en.wikipedia.org/wiki/Bhopal:_A_Prayer_for_Rain), visited on 5 Dec 2014.)

**Exhibit 3: Union Carbide's Stock Price**



(Source: Bloomberg)

#### **Exhibit 4: Some Industrial Health and Safety Reports on the UCIL Plant**

The following outlines the salient points from the Inspector's Reports (filed by the Director, Industrial Health and Safety, Senior Inspector of Factories, Bhopal Division, Bhopal) a few years before the Union Carbide's Bhopal plant gas leak incident.

- 2 Aug 1980 In the Air Compressor section, N<sub>2</sub> bottle is to be painted and water drain of this tank to be operated regularly. Enquired into the accident case of Mr AN Banerjee, Draftsman, who got burn injury when he was supervising and standing nearby at the time of the drum was being cut by the welder. Management is directed to ensure that the cutting of such drums shall be carried out only after ascertaining that the drum has no chemical. Also enquired into the accident case of minor nature since last inspection. MIC and Co. plant were down at the time of inspection.
- 5 Oct 1981 At formulation department, dust was found coming out from joints of Raymond mills. Waste material found lying near the entrance gate of the packing line. Floor of Sevidol plant was found much dusty. Instructions were issued to put some packing material to avoid leaking of dust and to keep the entrance and floors clean.
- 26 Dec 1981 Enquired into the fatal accident of Mr Ashraf Khan, s/o Akbar Khan, at the Phosgene evaporator in the MIC plant. No eye witness was available at the time of enquiry and therefore management is instructed to keep eye witness available to conduct enquiry. Order is given to not handle the stop valve at the site of phosgene gas evaporator in want of examination and testing for leakage. Management is instructed to keep record of handling, testing, checking repairs, operation and examining the valve cocks etc available for checking.
- 2 Feb 1982 All cocks and valves shall be operated at least once a month and shall be tested periodically. Simple and special instructions in case of emergency shall be formed and displayed in every work-shed of the factory to deal with escaped poisonous gases, vapors, liquids or dust. All workers shall be trained and instructed to handle emergency situations. While they are working, they must not remove the protective appliances in case of any failure. Workers shall only be allowed in those places in which they have been given work or do work.
- 18 Feb 1982 There was accidental leakage of phosgene gas in the MIC plant from 10.2.82 to 12.2.82 and the workers were interviewed regarding the accident. While handling dangerous chemicals or liquid gases it should be ensured that those factory pumps should be used that carry mechanical seal on it. While fitting the ring of mechanical seal, an engineer should measure and verify the compression fitting setting and this fitting should also be entered in the log book. After the pump leakage has been tested in the workshop and before this pump becomes operational, it should be ensured that water or other suitable chemicals should be tested for half hour to an hour and the leakage should be observed. All the phosgene handling pumps that actually are in the process of production should be carefully secured and observed at all times. There should be constant check on the leakage to ensure that leakage is not in great quantity and necessary steps can be taken immediately to cope with the leakage.
- 13 Aug 1982 Enquired in to accident causes. They were found to be of minor nature. Maintenance work shops near the Sevidol plant be shifted to some other suitable place because large

quantity of dust was coming to this shop and irritation swell of the chemical was affecting the workers working in this shop. Compliance to the last inspections shall be reported to the office.

- 18 Oct 1982 Factor manager confirms a leakage in the MIC plant on 6.10.82 in which 3 workers were affected. The leak happened on the gillet line. This incident has been under investigation.
- 1 Aug 1983 Only formulation section was found operational. Kindly submit detailed information of all the pressure vessels which are in use in the plant. Enquired into the accident cause. Only 3 accident cases found reportable and workers have joined their duties. These accidents were of minor nature. Half yearly returned proposal was checked.
- 16 Dec 1983 Studied the circumstances under which exposure to Phosgene gas took place, and the suspected inhalation of the gas, to some people of the nearby plant was reported in the plant medical centre. It was explained that the phosgene surge tank was under evacuation step-by-step as per procedure and when the water is flushed inside the tank, the protected gas escaped from the tank soon after the gas was smelt and the water showers were put on to hill it out. It is reported that the MIC will be taken up for maintenance. It is once again brought to the notice of the management that their sevidol xi chemicals sub-rule 6 and 7, the instrument corks and valves are to be tested periodically and recorded of such test examinations shall be maintained. Such records are not so far maintained. These shall be completed and reported to the office.
- 17 Jan 1984 Manager, Utilities and Electricals, UCIL plant confirms to the Chief Inspector of Factories, Indore, the names of Mt TK Chakravarty and Mr SK Bhattacharya to entrust the responsibility of testing of pressure vessels. The two are mechanical engineers working with the plant and have enough experience of testing pressure vessels etc. You can authorize these as 'Competent Authority' for testing of pressure vessels and maintain necessary records etc. Both these gentlemen are available in our Bhopal factory on all working days and can be interviewed if desired.
- 17 Feb 1984 Only the formulation plant was secure kind and workers were found doing packing jobs. Empty gunny bags and polythene bags kept near the machines in the formulation plant shall be removed. Fine dust was seen leaking from R-5 joints. Declaring competent person for examining and testing the pressure vessels in the plant is required. There is no accident since 1 Jan 1984. Record of payment of wages checked and was found that wages are paid every 1<sup>st</sup> of the month.
- 15 Nov 1984 Only packing process was seen carried on in the formulation section. House keeping in the formulation section and road near this block 10 shall be improved. First aid boxes shall be replenished with the prescribed materials.

(Source: Factory Inspector's Report (1982) at the <http://bhopal.bard.edu/resources/research.php>, retrieved on 10 Oct 2014).

### Exhibit 5: Compensation Awarded

Earlier, the application was based on initial assumption of 3000 cases of death and about 100,000 cases of injury. The total amount of settlement approved by the Supreme Court of India was US\$ 470 million (approximately Rs 7500 million) in 1989.

Category	No. of Cases	Amount of Compensation	Total Amount (Rs)
Death Cases	3000	From Rs 100000 to 300000 per individual	700 million
Serious Injury Cases	30000 – 40000	From Rs 50000 to 200000 per individual	2500 million
Cases of Injuries of Utmost Severity	2000	Rs 400000 per individual	800 million
Simple Injury Cases	50000	Rs 20000 per individual	1000 million
Cases of Loss of Personal Belongings	50000	Rs 15000 per individual	750 million
Cases of Loss of Livestock	50000	Rs 10000 per individual	500 million
Cases of Temporary, Total or Partial Disability	20000	Rs 25000 to 100000 per individual	1000 million
For Creation of Medical Facilities	--	--	250 million
<b>Total Compensation (All Categories)</b>			<b>Rs 7500 million</b>

With the actual figures surfacing around 2005, the cases of death rose to 15,248 and the injury cases to 554,895. Both these figures were more than 5 times higher than the initial estimates. The Union of India pleads the Supreme Court of India that 5207 death cases were confirmed to be caused by this gas disaster and in 10007 cases, the cause of death due to exposure of the gas could not be proved. For these confirmed death cases, the compensation was raised to be from Rs 100000 to 500000 by 1992. For the injury cases, the Union of India submitted that whoever was present and filed claims was granted compensation (at least on account of trauma). The Government also said in the affidavit that the awarded compensation amount was 3 times higher than comparable cases of Motor Vehicle Accident Claims and Workmen Compensation Cases.

In 2001, the injury category had 1,001,723 filed cases, out of which 558,125 cases were given compensation till 31<sup>st</sup> July 2006, totaling Rs 14,570 million. In 2002, the loss of livestock category had 658 registered cases, out of which 233 cases were given compensation, totaling Rs 1.1 million. In 2003, the loss of property category had 4901 registered cases, out of which 547 cases were given compensation, totaling Rs 1.4 million. In 2005, the loss to the institutions category had 84 registered cases, out of which 7 cases were given compensation, totaling Rs 0.4 million. The amount of compensation after disbursal is at Rs 30360 million by 31<sup>st</sup> July 2006, which is more than 4 times the original broadly estimated settlement figure of Rs 7500 million. The concluding statement of the affidavit reiterates that every category of claimants/affected persons were awarded more compensation than that was duly prescribed to them under the Act and thus the further applications filed by the applicants is frivolous and may be dismissed with heavy costs.

(Source: Affidavit filed by the Under Secretary to the Government of India, Ministry of Chemicals and Fertilizers, Department of Chemicals and Petrochemicals, New Delhi to the Supreme Court of India, Civil Appellate Jurisdiction (I.A. No. 48-49/2004 in Civil Court No. 3187-88 of 1988) dated 26 Oct 2006.)