

## Delhi's Chemical Monster

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A MASSIVE gas leak took place in Denli on the morning of December 4, 1985. Several hundred, perhaps several thousand of people were injured by the leak, three of whom have by now succumbed to their injuries. Coming as it did on the morning after the first 'anniversary' of the Bhopal disaster, the leak was yet another grim reminder of the dangers posed by chemical industries all over India. And though vastly different in magnitude, the Delhi leak told the same sordid story that was narrated in the case of Bhopal: the total absence of social responsibility on part of an industrial company, the indifference of the authorities to public safety, the lack of any system of emergency health and safety measures, the attempts at covering up the people and agencies exposed by the leak. And once again, it was a tragedy which was entirely avoidable, which in fact could have been avoided if the warnings of some individuals and organisations had been heeded.

The leak on December 4 took place at the chemicals production complex of Sriram Foods and Fertiliser Industries (SFFI), situated in West Delhi on Najafgarh Road. SFFI is an old industrial complex, established in 1944 as DCM Chemicals. Spread over an area of 76 acres, the complex contains several production units, producing caustic soda, hydrochloric acid, sulphuric acid, alum, superphosphate fertiliser, bleaching powder, vanaspati, active earth, refined oil, soap, glycerine, and liquid chlorine. The complex also has a captive power plant meeting most of its needs.

At about 10.30 am on the December 4, a tank of oleum ( $H_2S_2O_7$ ) housed in the sulphuric acid plant collapsed, causing a rupture in a connecting pipe and letting loose tons of acid. This acid reacted with water, (large quantities of which were sprayed on it in a thoroughly misguided attempt to neutralise the spill), to form a dense cloud of sulphuric acid and oleum mist, sulphur trioxide, and sulphur dioxide. This dangerous cloud travelled low along the ground for a distance of over 10 kilometres, causing severe discomfort and panic among lakhs of people in the crowded localities of Sadar Bazar, Chandni Chowk, Kashmere Gate, Old Delhi Railway Station, etc. Markets closed down, traffic got jammed and people felt a choking, burning, nauseating sensation as visibility got reduced to a few metres. Fortunately the cloud did not linger long over any area, reaching the Jarnuna, over 10 km away, 20-25 minutes after starting off. But by then the damage had been done: over 700 people were hospitalised, one of whom died two days later, a second some 10 days after, and a third as late as in mid-February 1986. No one knows how many more will succumb, for the

long-term health consequences of exposure to this mixture of gases is not yet fully known. Such consequences could range from consistent, mild irritation and moderate reduction in lung capacity to irreversible fibrosis and death.

Following the leak, SFFI's General Manager and two other officials were arrested, but subsequently released on bail. The public outrage which was voiced subsequent to the leak moved the Delhi Administration to issue orders for the closure of the entire factory, and the Supreme Court admitted a petition pleading for permanent closure of the caustic soda-chlorine and sulphuric acid units at the present location.

### CALLOUSNESS AND NEGLIGENCE

The December 4 leak did not really come as a surprise to those who had been observing the Sriram plant for some time. Indeed, warnings about the threat it posed were issued several times before the leak, both by the government and non-governmental agencies.

Several times in the past, SFFI has itself given clear indications of the threat it poses to its workers and to the surrounding population. Residents of several colonies nearby have been complaining about the irritating smell of gas and have reported frequent gas discharges from the factory. On December 17, 1982, 40 school-children fell ill, some losing consciousness, while walking along a path adjacent to the place where SFFI discharges its effluents into the Najafgarh drain. Investigations by the Central Pollution Control Board indicate the possibility of a chlorine leakage from SFFI, but the matter was hushed up and SFFI now claims that no leak took place on its premises that day. On September 10, 1985, a leak from the sulphuric acid plant affected several hundred residents in nearby colonies. Again, SFFI's management denied any leak, but subsequent inquiries amongst the factory's workers showed that a serious malfunction in the sulphuric acid plant had indeed caused a major leak. Many minor leaks have been reported from time to time, and even two days after the December 4 incident there was another leak at the sulphuric acid plant.

While the sulphuric acid plant has been the most common source of leaks, it is SFFI's caustic soda-chlorine plant which has posed the greatest threat. This unit produces over 66,000 tonnes of caustic soda per annum, and as a by-product of this process about 26,500 tonnes of chlorine per annum. Part of this chlorine is used by SFFI in the manufacture of hydrochloric acid and bleaching powder, a substantial part is piped over to the adjacent Hindustan Insecticides

Ltd, and the remainder bottled for sale to other customers. There is also a chlorine storage capacity of almost 300 metric tonnes.

It is the presence of chlorine in such a large quantity that has evoked the greatest alarm. Chlorine is known to be extremely toxic to humans, and was in fact used as a large-scale killer in World War I. Long-term (chronic) exposure to low levels, or sudden (acute) exposure to high levels can seriously affect the respiratory tract and cause lung edema, suffocation, chest constriction, and death. The safety limit, or tolerance level value (TLV) for chlorine has been fixed at 1 PPM (i.e., one part per million parts of air) by most countries. At SFFI the potential danger is of two sorts—regular low-level emissions, and sudden high-level leaks of chlorine. The former has frequently been reported by workers of SFFI, and in January 1985 the Central Pollution Control Board measured chlorine levels of upto 2 PPM, twice the TLV, near the stable bleaching powder plant. But it is the latter, sudden leaks, which could be disastrous. Till recently SFFI was storing liquid tanks of upto 100 metric tonnes capacity—an accident like the one which occurred in the sulphuric acid plant on December 4 could release tonnes of deadly chlorine in the form of a mist which would spread over several square kilometres. Each of the expert committees which has looked at the caustic soda plant have stated that the result of such a leak would be catastrophic: several thousand people may die or be permanently maimed, and several lakh could be affected in varying degrees. And the possibility of such a leak occurring has been far from remote—as has been repeatedly pointed out, safety conditions and emergency measures at SFFI, including at the caustic soda plant, are thoroughly inadequate. The most chilling reminder of this was the December 4 leak itself.

The negligence of SFFI's management is indicated by other observations too. Workers of SIFT, members of the Lokahit Congress Trade Union, have presented elaborate details not only of lack of certain basic safety measures but also careless maintenance of equipment. A Kalpavriksh member who visited the plant in November 1985 noticed a general state of disrepair, especially glaring being rusted and broken pipes all over the place. Two government reports, one in February 1985 and another in October 1985, both pointed out serious flaws in the maintenance system. On an inspection on January 8, 1985 the Central Pollution Control Board found the stack of the superphosphate plant broken—it seems it had been in that state for quite some time. But one of the most damning pieces of evidence comes from an internal note of SFFI itself, wherein frequent overflows of acidic effluents from one unit has been complained about by the superintendent of another unit.

Finally, proof of SFFI's negligence comes from the highly revealing records of the Central Pollution Control Board. Measurements of air and water effluents over the last several years have shown levels of pollution consistently exceeding the prescribed limits. In March and April 1981, suspended solids in SFFI's combined industrial effluent were found to have an average concentration of 920 mg/litre as against the permissible limit of 100 mg/litre; average oil and grease concentration was 94 mg/litre as against a limit of 10 mg/litre; and flourides concentration was 4.8 mg/litre as against a limit of 2 mg/litre. A letter dated January 20, 1983 from G D Agrawal, then member-secretary in the Board, to SFFI's General Manager states: 'The results of our survey reveal that your effluents at the outfall point had very high residual chlorine and also high flourides, phosphates, and sulphates. All these were much higher than allowed in the consent limits. Also it was seen that in the air immediately in the vicinity of your outfall, there was significant concentration of free chlorine.' Another study in October 1984 found that emissions of sulphur oxides from the sulphuric acid plants were twice the proposed emission standards. SFFI was asked to reduce its emission levels immediately. Yet again in September 1985, "Fugitive emissions of SO<sub>2</sub> were found exceptionally high ... the four-hourly average ... was as high as 41,607 ug/m<sup>3</sup>" as against a proposed standard of 800 ug/m<sup>3</sup>. Measurements of the combined effluent on several occasions from March 1985 October 85 showed that levels of suspended solids ranged from 741 mg/litre to 1,256 mg/litre as against a limit of 100 mg/litre; of chemical oxygen demand (COD) from 371 to 813 mg/litre as against a limit of 250 mg/litre; of biological oxygen demand (BOD) of 104 to 598 mg/litre, whereas the limit is 30 mg/litre; of oil and grease from 9 to 555 mg/litre as against a limit of 10 mg/litre; and of flouride from 0.2 to 22.7 mg/litre.

#### CONSEQUENCES TO ENVIRONMENT AND WORKERS

The frequent release of gases, along with the normal emissions from the industrial processes at SFFI, have already created a highly unhealthy local environment. According to measurements made by the Central Pollution Control Board, levels of sulphur dioxide in the air in the Najafgarh Road area next to SFFI are usually far in excess of the standard of 120 micrograms per cubic metre (ug/m<sup>3</sup>). The constant presence of sulphur dioxide, and perhaps also chlorine, in the air has caused 'burning' and bleaching of vegetation in the area. It is well-established that chlorine can reduce the photosynthetic activity of a plant by destroying its chlorophyll content; similarly sulphur dioxide reacts with the moisture on a leaf's surface to form sulphuric acid, which 'burns' the leaf. A 1984 PhD thesis by Poonam Mohindra of the Botany department, Delhi University, revealed that the growth and yield of crops like wheat and sunhemp in the SFFI area are far

lower than at a relatively unpolluted site like Delhi University Botanical Garden. It is of course necessary to point out that SFFI is not the only source of pollution in the area; there are several other industries. But SFFI is by far the single largest source. The human health impact of such high pollution levels is not well studied or documented in the area, but interviews with residents or several nearby colonies indicated a high level of respiratory and eye problems. Indeed, even low levels of SO<sub>2</sub> and chlorine, which are not immediately dangerous, can over a long period of exposure cause problems like reduced pulmonary function and higher susceptibility to diseases like TB.

Apart from damage to the health of plants and animals, including human beings, pollution from SFFI is also causing damage to material property. One family living just adjacent to where SFFI's toxic discharge flows into the Najafgarh Drain, showed Kalpavriksh members corroded metal drain-pipes on the outer walls of its house—it claimed that these had to be changed very frequently. They also brought out blackened metal storage pots which they said they had scrubbed clean just two days before. Such complaints are common in the area. There is of course, no estimate of the total material damage being caused by pollution from SFFI and its neighbouring industries, but it must be quite large.

Perhaps the people most exposed to an unhealthy environment are SFFI's own employees. Working conditions in almost all of SFFI's units are hazardous, the major problems being dust, heat, noise, toxic gas, and machinery accidents. The DCM Chemicals Lokahit Congress Trade Union has documented five fatal accidents in the last two years, all of them due to official callousness. Apart from these, several workers have been inflicted with a range of injuries caused by machine accidents and acute gas exposure. But the largest number of workers are being affected slowly, chronically, through constant exposure to dust, noise, heat, and low levels of gas. Dust levels, for instance, are extremely high at the coal handling plant and the superphosphate plant. The latter is always enveloped in a yellowish haze, consisting of particulate flourides which could lead to flourosis in the workers.

An inspection of this plant by the Inspector of Factories on March 16, 1985 revealed that "dangerous offensive chemical, phosphate dust was found evolving in various manufacturing operations ... and the dust was freely escaping into the working atmosphere; this had resulted in unhealthy and unhygienic working conditions in the plant, since the workers had been subjected to inhalation of injurious dust!" A study by Central Pollution Control Board in March 1985 found stack flouride levels of 490 and 121 mg/Nm<sup>3</sup> in the two samples taken, both several times higher than the stipulated 25 mg/Nm<sup>3</sup>. In the turbine room of the power plant, noise level is so high that one has to shout to make oneself heard to someone

standing even a few feet away.

Yet when Kalpavriksh members visited the plant they did not see a single worker at these units wearing dust screen masks, goggles, or ear muffs. Workers allege that such equipment is rarely provided; according to a trainee at the SFFI store, the equipment does exist but is rarely issued out. The SFFI management maintains however that it is given to workers, who however don't use it because of the resultant inconvenience. But even if this is true, the management cannot escape the blame for having such a terrible working environment.

The precise impact of such an environment is as yet unclear, for there seems to exist no comprehensive medical survey of SFFI's workers. A health check-up camp organised by the Directorate (Medical) Delhi ESI Scheme, found that of the 530 workers examined, 50 per cent had dental problems, 30 per cent had eye problems, 64 workers had pharyngitis (due either to smoking or to exposure to gases, or both), five had TB, another five anaemia, 23 had pallor, 16 high blood pressure, and so on. Strangely, the camp concluded that existing health status of workers was good! The Lokahit Congress Trade Union claims that incidence of these and other diseases is much much higher, but unfortunately it is not in a position to document these.

#### INACTION OF AUTHORITIES

The atrocious safety and pollution control record of SFFI is an eloquent testimony to the kind of negligence shown by its management and owners. But they are by no means the sole culprits—a certain degree of negligence has also been shown by the various government agencies responsible for ensuring public safety. This is amply shown by the fact that despite repeated indications of the threat SFFI posed, the government allowed it to continue functioning in the midst of such a heavily populated area until the December 4 tragedy.

Specifically, one can pinpoint some agencies or officials who must be held accountable in this case. Under the Factories Act 1948 and the Delhi Factories Rules 1950, an Inspector of Factories is appointed who is supposed to ensure that all industrial units in Delhi comply with rules concerning labour, environmental safety and working conditions. Records of the Factories Inspector, Delhi Administration, reveal that periodic checks of SFFI had unearthed several violations of the rules in the last few years including serious deficiencies in both the chlorine and sulphuric acid units. But the subsequent prosecutions only acted as minor irritants for SFFI; there was no serious effort to ensure that all the rules were complied with. Even more significant is that while the last inspection of the sulphuric acid plant before the December 4 leak, on May 28, 1985, revealed several violations, it did not expose the dangerously weakened support structure of the oleum tank which collapsed on December 4. Evidently the inspection was not thorough enough.

Similarly' the Central Pollution Control Board is supposed to ensure that an industry's air and water emissions do not exceed permissible limits. The Board has indeed been pursuing this issue with SFFI for several years, and has repeatedly found excessive emissions, as discussed above. Yet, despite this knowledge the Board did not use its power to ensure compliance; it only repeatedly threatened to withdraw its consent order. At one point in 1985 it even threatened legal action, but none was taken despite continued violations by SFFI. Interestingly, when Kalpavriksh members had talked to some of the Board's officials in October 1985, they were told that barring SFFI's vanaspati unit, all other units had no excessive discharge! Why should the Board try to hide the wrong doings of SFFI—because it was afraid that its own inefficacy would be revealed?

The Union government too is to blame. An instance of this is when the then Union Minister of Chemicals and Fertilisers, Veerendra Patil, in a Lok Sabha discussion on SFFI's chlorine unit in March 1985, flatly rejected the demand made by some MPs to shift the unit. This was despite reports by a British chemical expert D H Slater and by the then Secretary (Labour), Delhi Administration, Nita Bali, both of whom had explicitly recommended shifting of the chlorine unit. Patil vaguely stated that the licence of a factory, once given, was not so easy to revoke; now strikingly similar this sounds to the statement, made in the Jvladhya Pradesh Sabha long before the Bhopal tragedy, that the Union Carbide Plant was not a mere 'stone' that it could be translocated. Obviously the government was willing to sacrifice the interests and safety of the public and give precedence to the interests of the industrialists, both in Bhopal and in Delhi.

This is not to deny the fact that a few government officials did stand up for the truth. Some officials of the Central Pollution Board and the Inspectorate of Factories, Delhi, did conduct honest studies but were largely ineffective in getting these acted upon. The one person who took creditably bold steps was the former Secretary (Labour), Delhi Administration, Nita Bali. Way back in March 1985 she explicitly recommended that the ministry of chemicals and fertilisers suspend SFFI's chlorine production licence. That she was transferred soon after this, allegedly before her term had been completed, indicates that she may have tread on a few soft toes.

Yet another facet of the negligence of the authorities is the total absence of an emergency safety and evacuation strategy for those living around SFFI or other such hazardous plants. Such a strategy requires that the surrounding population be fully aware of the potential hazards of a factory, and of how to react in case of an emergency like the one created on December 4. It also requires that all local hospitals, police stations, fire brigades, and other such essen-

tial service agencies know how to react. That there is no such strategy was amply demonstrated by the total chaos and panic which followed the December 4 leak: many hospitals did not know what line of treatment would be most effective; the fire brigade was misinformed about how to stem the leak (they sprayed water on the oleum which only reacted and aggravated the situation); All India Radio's broadcast appealing for calm only came two hours after the leak; Door-darshan misleadingly stated that the gases which leaked were not 'toxic'; teachers in many schools panicked and sent children hurrying back home even before the gas cloud had dispersed; and so on.

One of the most shameful parts of the December 4 leak was the public statement of Dr S Varadarajan, then Director General, Council of Scientific and Industrial Research, that the gases which leaked were "not toxic". He did add that they could be harmful, but it is the first statement which registered in the public mind; the finer scientific distinctions between toxicity, poison, and hazard are of little use while making a public statement. In any case some standard textbooks on the subject classify sulphuric acid and sulphur trioxide as toxic, and *all* of them state that they can be extremely harmful. Varadarajan should have known better than to make misleading statements like this, especially since they are likely to be lapped up with glee by those who wish to underplay the extent of the tragedy. Look at what SFFI said in a note filed in the Supreme Court: "It is further submitted and as corroborated by Dr Varadarajan ... that the sulphur trioxide gas that escaped on December 4, 1985 is *not hazardous*" And, shamelessly, even further: "This respondent (SFFI) is only aware of the death of one person as reported in the newspapers. It is submitted *that the said unfortunate death cannot be attributed to gas leakage*" (Italics and exclamation mark mine.)

#### PUBLIC RESPONSE

Members of SFFI's Lokahit Congress Trade Union had, for a long-time made working hazards one of the main points in their struggle with the management, and long before the December leak they had warned of the possibility of a Bhopal-like tragedy being caused by SFFI. Then in early 1985 the report of D H Slater on the hazards posed by SFFI's caustic soda-chlorine plant, which had not been made public, leaked and was publicised. Soon after, several individuals and agencies took up the issue. Some journalists wrote about it, and municipal councillor P K Chandla repeatedly highlighted it. Residents of colonies adjacent to SFFI also reacted publicly, especially after the leak of September 10, 1985 which affected them. In September 1985 the Delhi Committee on Bhopal Gas Tragedy, an association of over 20 environmental, civil rights, cultural and other organisations, began investigating the issue. Convinced of

the gravity of the situation the Delhi Committee organised a full-day dharna on October 21, 1985 to press home its demands to relocate the chlorine and sulphuric acid plants and to provide a safer working environment. Around the same time M C Mehta of the Hindustani Andolan filed a petition in the Supreme Court pleading that the chlorine plant be shifted. On December 3, in a public meeting held on the occasion of the first 'anniversary' of Bhopal, the Delhi Committee again highlighted the danger posed by SFFI. Fifteen hours later, the massive leak of oleum took place. It may never have, had the warnings of these individuals and organisations been heeded in time.

As in the case of the Bhopal tragedy, several aspects of the sordid story of SFFI and the December 4 gas leak in Delhi raise a number of vital questions. For instance, SFFI's products were considered so necessary for 'development' that the dangers of it being located in a densely populated area were consistently ignored—is the present developmental process in India insensitive to the basic human right to a safe life? Do we really need the kind of dangerous industries represented by SFFI, and if so, can we ever ensure that they will indeed be more beneficial than harmful? Then again, it has been difficult to pinpoint the individuals and agencies responsible for the December tragedy, and claims for compensation for the damage caused became possible only after the highest court of the land intervened—why do we not have a system whereby corporate and governmental liability is established and their accountability ensured? Yet another aspect is that the two government reports which indicted SFFI for callous safety standards were never made public, indeed that people living around SFFI had little knowledge of what may be in store for them—why is it that in India, the public has almost no access to, let alone a *right* to, information which directly relates to their lives?

It is an indication of the strangle-hold that big industrialists, technocrats, and other vested interests have on our society that anyone who raises such questions is immediately branded "anti-progress" and even "anti-India". The 'foreign hand' is seen whenever doubts on the wisdom of the present development policies are raised. But with tragedies like the December 4 one coming increasingly into focus, proponents of such policies will find it harder to evade the questions being raised.

[This report is based on investigations carried out by Kalpavriksh, Environmental Action Group, over the last six months. The story of the Sriram Chemicals Factory and the gas leaks which occurred in it in December 1985 is especially relevant now in the context of the Supreme Court decisions, wherein the issues of industrial siting and safety, corporate and governmental liability, the public's access to information, etc, have been focused on.]