

THE ROLE OF MANAGEMENT PRACTICES IN THE BHOPAL GAS LEAK DISASTER

(A second report by the Union Research Group- June 1985)

The following report makes no claim to being the truly authentic or final version of what happened in Bhopal on the night of 2nd December 1984. It was written largely in response to the need felt by some workers from the pesticides factory for an account that would highlight their experience of the way the factory was run. Its source is the discussions we had with these groups of workers in March and April of this year.

Apart from drawing public attention to the disastrous character of practices which have become almost a ruling orthodoxy in management circles - this report is directed specifically at unions in the chemical industry so we can work together to document such practices in plants where they are present.

Since Carbide management announced its decision to close the factory, the key question which faces every trade unionist is: what alternative will the trade union movement fight for when employers argue, 'There's no alternative - either you accept the way we run our factories or close down those factories and accept loss of jobs'? In Bhopal today this is a very real question because that is exactly the option UCIL and the government are offering to the gas-victims and employees.

But closure is not only a means of escape for Union Carbide, it is an open confession that employers would much rather destroy productive resources by closing down factories and increasing joblessness, than be forced to come to terms with a movement for socially-useful production controlled by the mass of employees.

PART ONE

"We have created the Safety Department, we have designed the safety rules and we tell you how to carry out jobs'.

This was the stock reply the workers at the Union Carbide India Ltd. (UCIL) pesticides complex in Bhopal received whenever they refused to do certain jobs on the grounds of safety or questioned work procedures on those grounds. Management was very clear and explicit about its rights and responsibilities. Clause fourteen of the agreement dated 14-5-83 between UCIL/APD and their hourly-rate workmen states that

'...The selection, placement, distribution, transfer, promotion of personnel fixing of working hours and laying down of working programmes, planning and control of factory operations, introduction of new or improved production methods, expansion of production facilities, establishment of quality standards, determination and assignment of workload, evaluation

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and classification of jobs and establishment of production standards, maintenance of efficiency, maintenance of discipline in the factory... are *exclusive* rights and responsibilities of the Management' (p6-7)

Instead of modifying unsafe procedures, management chose, time and again, to meet job-refusals with wage-cuts and chargesheeting. Standardised, safe procedures laid out in UCIL's own manuals were more often violated than followed.

For a plant which was running into losses, cutting down operating and maintenance costs and reducing down-time due to breakdowns had become the management's major preoccupation. Some real 'trouble-shooting' was needed to achieve this goal. Carbide management found the right man for this job in S.P.Choudhury - promoted to take charge as Production Manager (MIC) at the time UCIL started losing out on its MIC-based pesticides in 1982. A few months later, in 83, the new Alpha-Naphthol plant (1) which was to go on stream earlier, had to be abandoned because of some design snags- the company could not get a product of the desired purity. This meant a 'surplus' workforce of some 60 to 70 workers.

AN 'EXPERIMENT IN MANNING'

In 1981 management had in fact started reducing manning levels in the MIC and other plants. This directly conflicted with any idea of absorbing the Alpha-Naphthol workers in these plants. On the one hand, management was after a general speed-up of on-line and shut-down maintenance jobs, on the other hand, they also wanted lower manning ratios to cut operating costs further. Apart from the trainees, temporaries and probationers who were easily disposable (management would have no problem getting rid of them), there was the general problem of 60-70 'surplus' workers from the Alpha-Naphthol plant and another 30 to 40 who were redundant in other plants.

In 1983 a new agreement was due. Workers put up a demand for a 5-day week. Management decided to try out a new experiment. They asked for further reductions in manning (the previous reduction occurred in March 81; see box on 'Manning levels') as a trade-off against a 5-day week. One of the unions in the factory, the Union Carbide Karamchari Sangh (UCKS) apparently failed to realise the significance of this management demand at the time. The other, INTUC-affiliated union claims that it was reluctant to accept the company's demand for further reduction in manning. In any case, management forced the issue and got its way.

With a negotiated reduction in manning levels, management split workers into two groups, assigning jobs to only one of these. The workers in this active group faced a dramatic increase in workload (the UCKS leaders deny this, however) while the other group, some 100 workers in what was called a 'Common Pool', were under strict instructions to remain idle throughout the shift day after day. '*Baitha ke rakha tha*' is how the workers from the Common Pool described it.

Conceivably, management was after a workforce reduction which would bypass retrenchment and a possible confrontation. A Voluntary Retirement Scheme (VRS) was floated, and the plan started giving results. Enforced idleness

(1) Alpha-Naphthol is a chemical used along with MIC to manufacture the pesticide 'Sevin'.

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for prolonged periods every day led to massive frustration among workers in the Common Pool. There was a general mood of pessimism about their prospects in the company and many opted for the VRS and quit their jobs. A staggering fact: the total workforce at Bhopal was *reduced from around a thousand to about 650 (a 35% reduction) in a period of just 18 months!*

ON THE WAY TO A CATASTROPHE

That the right manning levels are crucial for the safe operation of a plant should be obvious. In the pesticides factory the link between manning and safety was both direct and catastrophic, since Carbide management's policies on manning were destined to have a fatal impact. The general policy of 'demaning' had at least three significant results:

- 1) When management wanted to speed up jobs during shut-down, they had (as the box shows) lower manning levels during shutdown than during a production run - in the MIC plant.
- 2) The company had 'rationalised' the work of the Maintenance Department by reducing the number of maintenance personnel assigned to the MIC plant on rotating shift from 6 to 2, and transferring 8 workers assigned to MIC to the general shift. The total maintenance personnel of this plant was cut from 18 ($= 6 \times 3$) to 14 ($= (2 \times 3) + 8$). The idea was: major maintenance jobs would be done during the general shift, and only emergency jobs handled in the other shifts. Management might have wanted tighter supervision of maintenance when these changes were made.
- 3) Management discontinued the practice of having at least one qualified and experienced engineer in each shift.

The overall effect? For one thing, speeding up shutdown jobs would mean that both the production and maintenance sides require more hands as the equipment has to be evacuated, cleaned, washed and prepared for maintenance and most maintenance jobs are 'major' jobs. The presence of a qualified and experienced supervisory personnel becomes essential where procedures have to be followed rigorously and where the individual details of job performance are strictly governed by work procedures which the supervisor lays down. A drive to finish off various jobs quickly coupled with the general policy of reduction in manning could only mean - 'short cuts', 'operational lapses' and in general repeated deviations from accepted safe procedures. How this finally led to the catastrophe of 2-3 December we can discuss in more detail when we turn to a chronology of the events leading to the explosion.

THE REGIME OF 'SHORT CUTS'

Short cuts and operational lapses were so widespread (and so integral to the normal functioning of the plant) that, according to a general claim, more than 70 percent of the MIC operators were chargesheeted or had their wages cut or threatened with wage cuts for refusals to deviate from standard procedures laid down in the company's manuals - and this at least once, in some cases as many as fifteen times, during the two years immediately preceding the disaster. The lapses were of three types (mainly):

- A. Operational lapses
- B. Deviations from maintenance procedures
- C. Pure negligence

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Here are some of the more striking practices which workers described, which would count as clear instances of lapses of one type or another:

A. Due to reduction in manning, parameter logging frequency was reduced, eg. in the MIC control room, earlier, with two operators, indicator readings were logged once every hour; later, with one operator in the control room, the frequency was brought down to once every two hours. Earlier, MIC samples were taken out and checked for impurities twice every shift; later this was reduced to one sample per shift.

B. Maintenance and preparation of equipment for maintenance naturally provided the major area of manoeuvre for management deviations from written procedure. The procedure actually laid down is quite rigorous (*see box II*). Apart from the various steps prescribed, a Master-card and Hazardous Work Permit have to be prepared making detailed checks for ten to twenty different items and the relevant isolation valves, etc. have to be tagged. Separate job requests have to be made for slip-blinding, to the Maintenance Dept.

With Carbide enforcing reduction in manning and the 'rationalisation' of the Maintenance Dept. it was just not possible to follow all the steps rigorously and at the same time be able to *complete jobs quickly*. Slip-blinding itself would require anything between thirty minutes to two hours (for a single piece of equipment) from the 2 maintenance workers in the rotating shift. Steam for evacuation was just not available as it was thought 'wasteful' to keep the boiler under operation during shutdowns. The time-consuming procedures of the Master-card and Hazardous Work Permit and the checks they involved were simply done away with for a host of jobs which were considered 'minor'.

The authors of the MIC operating manual (ironically, S.P.Choudhury among them!) were quite conscious of the dangers of contamination and clearly stated that 'All the equipment is to be *positively* isolated with the use of slip-blinds and isolation by valves is *not* to be relied upon'. In spite of this, MIC storage tanks were not isolated from the plant through the use of slip-blinds. When workers insisted on evacuation of the equipment (pumps, vessels, filters, etc.) before opening them, they were told 'We are standing here' or 'I will chargesheet you'. It is well known that one of the workers, Ashraf, died because of lack of proper evacuation. Instances involving this sort of violation were so frequent it would be pointless to list them here.

C. A level closer to the violence that is routinely inflicted on people; at least violence as an inert, stable condition. Because of their frequency so-called 'minor leaks' were mostly ignored. 'Minor' in the management's dictionary apparently refers to the quantity of material leaking and not to its lethality. Chlorine used to escape 'nearly everyday' as the chlorine storage tank valve was open to the atmosphere. So was the chloroform vent line. When the pyrolyzer bend corroded and developed a hole, a Teflon sheet was tied around it with a string and the production continued much in the same way as one might wrap a polythene bag around a leaking domestic water-tap. Only, what was leaking was not precious water but lethal MIC. When the phosgene converter condenser (a shell and tube heat exchanger) gave out a water-jet due to chlorine spillover in the inside tubes caused by a non-functioning chlorine liquid level indicator, the shell hole was sealed with M-seal and the production continued. Workers could recall numerous instances of this kind.

MORE ON THE STATE OF THE PLANT

But this is not all. A lot of the equipment inside the factory was simply non-functioning. The chlorine liquid level indicator, MIC tank 619 liquid level indicator, phosgene stripping still temperature indicator, pyrolyzer temperature indicator and MIC tank 610 pressure indicator controller alarm were in this condition for some time prior to the explosion. The 30 TR refrigeration unit which keeps the MIC in the storage tanks cool had been shut down in Sept. 1983 as part of the management's programme 'to reduce avoidable and wasteful expenditure'. The flare tower had been shut down for the same reason.

When some of the more experienced MIC operators quit Carbide for better-paid jobs, management decided to transfer some of the operators from Alpha-Naphthol to take their place. These workers were reluctant to accept the transfer. Early in 84 a test was conducted which most of them in fact failed. But none of this mattered because in the end they were compelled to work in the MIC plant. The earlier, one-year rigorous training for MIC operators was reduced to four or five months' functional training. No B.Sc.'s or Diploma engineers were recruited after 82, although quite a few qualified operators left the company throughout this period. 'What if' training was not among the kinds of training imparted to workers, as the Poulson Safety Review Committee Report (1982) noted. The general type of training was more like 'these are the valves you open, these are the valves you close, this is how you read these indicators and this is how you note down the readings. A complete understanding of the process was not encouraged. But the pressure for operational flexibility led to frequent scuffles between management and operators like this one between a plant superintendent and an MIC operator:

'Nitrogen purity test *karo*'
 'Mere unit ka job *nahin hai*'
 'No, you got to do it!'
 'I won't touch it'
 'I will cut your salary'
 'Kyon?'
 'It's procedure'

From production manager to supervisor, at least one manager was generally present in person when maintenance jobs were performed, and like the *mukadams* on building sites or roadworks would continually prod workers with 'hurry up' and '*jaldi karo*'. And S.P.Choudhury was occasionally 'congratulated' for successful troubleshooting.

But the organisation of the Carbide plant was based, fundamentally, on principles which are enforced throughout industry. It is management who decides the manning levels, operating and maintenance procedures. It is management who decides the order of priority in which various jobs will be attended to. They decide which equipment to shut down, what instruments to replace or not replace. They decide what kind of training is required. They decide whom to recruit. They decide the amount of inventory. Enormous power is concentrated in the hands of small groups of people called 'managers', on the ostensible grounds that only they are technically competent to run modern industry. But Bhopal tears a massive hole in this claim.

A CHRONOLOGY OF THE DISASTER

All plants which handle toxic, hazardous or explosive chemicals have preventive/safe disposal/dispersal and/or hazard control systems. These are designed to prevent or forestall the outbreak of accidents, otherwise to contain and control the factors leading to an accident, suppose one occurs, so as to minimise the resulting damage. So it's useful to distinguish between (a) the factors which actually led to the explosion in Bhopal, meaning by this a fast uncontrolled chemical reaction, and (b) the ensuing catastrophe, meaning the impact of the leak on the surrounding bastis.

The sequence of events could be reconstructed in the following (approximate?) form, in terms of the discussions we had with workers:

22-23 Oct. 1984

MIC plant shutdown. The storage tanks are not isolated from the rest of the plant through slip-blinds. *There is nothing unusual about this, as the practice had been discontinued because some managers felt it was an unnecessary waste of time.*

30 Nov. 1984

An attempt is made to transfer MIC from tank 610 to the Sevin plant. The attempt fails as pumping in nitrogen fails to raise pressure in the tank. The storage area operator suspects a corroded rupture disc and reports accordingly. *Failure to raise pressure in the tank is an indication that there could be a leak somewhere; but the matter is simply ignored, for no obvious reason. Sevin production can continue with MIC from tank 611, so management does not feel it necessary to subject tank 610 to immediate scrutiny.*

2 Dec. Second shift

A job pending from the first shift is taken up by the second shift operators.

2 Dec. 5.30 p.m.

Production Assistant (MIC) instructs the second shift Supervisor to start washing the quench filter and PSS filter vent lines. The instructions are written down in the form of Daily Notes. He does not mention slip-blinding. He reasons that since there is a sufficiently large 4" opening about 2' below the header line valve (see diagram) there is little chance of the water passing the valve. *The reasoning is o.k. but slipblinding is used to avoid any potential risks by maximising isolation, even at the cost of redundancy. The Production Assistant is simply 'eliminating' the 'wasteful practice' of following through what strikes him as an unnecessary and time-consuming procedure. He acts in keeping with the general policy of management.*

2 Dec. 8.30 p.m.

The job which was pending from the first shift can't be continued until the maintenance operators remove a flange and a valve. Only two maintenance operators are available at this time and they are busy elsewhere. So the Supervisor asks the MIC operators to abandon this job and start washing the quench and PSS filter lines. He tells the operators to close down the 4" opening which the Production Assistant was relying on as an outlet for the water. (cf. diagram) He closes it down because he assumes water will flow out of the large opening and will not enter the 4" filter vent

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line. He has come to the plant only recently, some months before, and obviously has not had an opportunity to grasp the significance of slip-blinding. He closes the opening but does not slip-blind as the Production Assistant has not asked for it.

- 9.15 p.m. A hose is connected to the header line bleeder and washing starts. Water starts flowing out of two bleeders. One bleeder is plugged and requires the attention of maintenance operators, but they are not available since they are busy elsewhere. All the work is done in the presence of the Supervisor. After some time, water starts flowing out of the remaining bleeder as well, the fourth one.
- 2 Dec. end of second shift The water flow continues. At around 9.40 p.m., after tea-break, the MIC operator checks the water-flow. It appears to be normal.
- 2 Dec. 10.40 p.m. Another check, and the flow of water from the bleeders again appears to be normal. The control-room operator logs the MIC tank 610 pressure. It is 2 psi(g).
- 10.45 p.m. The shift changes. Third shift operators take over.
- 11.00 p.m. Operators take a round of their respective work stations. Nothing unusual is noticed. Water flow from the bleeders still continues. The control-room operator logs MIC tank 610 pressure. *It is 10 psi(g). This is not considered abnormal as normally pressures up to 15 psi(g) are used for transfer of MIC, and frequently pressure indicators are faulty or show high readings.*
- 11.30 p.m. One of the plant area operators suspects a leak. He goes to inspect but can't locate it. He takes quite some time trying to locate it. *The leak is a small one in terms of quantity but it's an MIC leak. There is only one operator immediately available for locating the leak. But then, remember the experiment with manning?*
- 11.50 p.m. The MIC operator sees a liquid drip from the RVVH (relief valve vent header) flange near the 200TR side of the MIC plant. A yellowish gas is also flowing out along with the liquid. The operator informs the Supervisor and other operators.
- Midnight The Supervisor asks the operator to stop water-washing. He thinks that washing water has entered the RVVH and is pushing out the residue in the RVVH. Nothing serious is suspected at this stage.
- 3 Dec. 12.15 a.m. *Apparently there is nothing unusual about a small liquid drip or the fact that people suspect an MIC leak (it could be a 'minor' leak) or the appearance of a yellowish gas- perhaps this sort of thing happens frequently. It's tea-time, people push off for tea and the matter is allowed to rest.*
- 12.30 a.m. The control-room operator comes to check the 610 tank pressure. It is rising at a rapid rate. The temperature

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indicator is already out of its range. He calls the Supervisor. The pressure indicator has over-ranged. They go to inspect tank 610. It is hot and the concrete encasing is vibrating. They call the Superintendent.

12.40 a.m. The MIC operator sees a jet of gas gushing out of the atmospheric vent. The panic begins. Within seconds the area is engulfed by the white cloud of gas. All field operators rush for 30-minute breathing packs, and in the upwind direction. The control-room operator starts the scrubber pump but the scrubber flow cannot be checked. The Supervisor proposes they start the flare tower but it's already too late as the gas has spread and there is a risk of fire if the flare tower is lit.

1.45 - 2.00 a.m. The safety valve on tank 610 sits down. Most of the gas has escaped to the atmosphere.

The above report makes no claims to being an 'exact reproduction' of the events (even supposing something like that were possible). Its aim is essentially practical - to help start work with unions in the chemical industry. It was written by Ravi, Raju and Jairus from the URG. They would like to thank the Trade Union Relief Fund for Gas Victims of Bhopal (TURF) for supporting their stay in Bhopal.

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