

Engineering and Social Responsibility: Incorporating Environmental Culture in Management

María DE MIGUEL MOLINA

Management Department, Valencia Polytechnic University. Camino de Vera, s/n. 46022 Valencia (Spain), mademi@omp.upv.es, ttt.upv.es/mademi.

Gabriela RIBES GINER

Management Department, Valencia Polytechnic University. Camino de Vera, s/n. 46022 Valencia (Spain), gabrigi@omp.upv.es.

KEYWORDS: *environmental ethics, social responsibility, management, corporate culture.*

ABSTRACT: *We consider that Business Ethics, or more specifically Environmental Ethics, should not be regarded as a different type of Engineering courses, since it is much more interesting for our students to be able to explain how does Environmental Ethics work in each one of the corporation's management aspects. We have noticed that these future professionals, from industrial engineers to computer engineers, are later on requested to work in a wide range of management fields and therefore, they need to be responsible professional workers in any area. Moreover, environmental culture is not just for the company's senior officials but also for all the staff, who need to understand and comply with the company's policies including those about environment. Engineers have to encourage the rest of their colleagues to behave carefully, and they may have to change jobs throughout their careers, then the environmental culture of each company might be different. To a large extent it is not only the 'company's problem' but also 'their problem', their professional responsibility, because environment protection is a global issue. We introduce Environmental Responsibility to our students with one of the worst industrial accidents: the Bhopal Case. It is presented as a practical problem to see all the management components that could be improved to avoid this type of accident, from Human Resources to Quality Strategy. It is our aim to have them reflect on their consequences of their professional decisions, on their responsibility about their decision-making.*

1 INTRODUCTION

Engineering courses do not usually deal with topics related with human relations or with values that, like corporate social responsibility, will affect the future work of our students. On the contrary, courses related with *Management* provide the opportunity to deal with the social aspect of Engineering not covered in other courses of a more technical nature. Human resources departments are the most important part of any business, as they really deal with decision making in all the areas. Many times, students are not prepared for those decision-making processes that not related to technology, but to people.

With a simple example, our aim is to let students see the scope and the importance of that decision-making process, not only at in-house level but also to the outside, and that example can be easily taken from a concern that affects even individual consumers, such as respect for the environment and, as a consequence, for everybody's health.

If we understand corporate social responsibility as the consequences derived from its behavior and we use real-life examples, students can apply the theory to a specific case, where they may take a critical position about the absence of a corporate culture that respects social values, in this case environment. Therefore, we have taken a very well-known episode - the Bhopal catastrophe - that still has serious social consequences.

2 CORPORATE SOCIAL RESPONSIBILITY

Environmental culture should be applied to all the organizational aspects of a corporation and not only presented as a written proposal. In any ethical code, the so-called "environmental policy" of the corporation should be put to practice. The case at hand can be a good example of the absence of that transfer from a written intention to reality.

As we all know, on the night of December 3, 1984, in the city of Bhopal, India, a factory of pesticides operated by the chemical multinational *Union Carbide* had the most severe environmental accident of all times. The toxicity level was so high that up to 30,000 people might have died on that terrible night. According to the company, only between 2,000 and 3,000 people died. Why did that happened? This has been a very controversial case for years and so far there is no final version, as there are different opinions on many of the questions raised. Here we have preferred to approach the issue from the point of view of the victims of the accident since, 19 years later, many citizens of Bhopal are still dying due to the sequels of the toxic cloud, with a large number of illnesses and breathing problems. Some authors, like Martínez-Alier, still raises several questions: Why was the Indian Government satisfied with a ridiculous compensation? Why has not Warren Anderson been extradited to India to be judged? Why are the statistics so different? Why was the solution to the accident of the Exxon Valdez in Alaska better - the negative impact on flora and fauna was very strong but nobody died?

At that time, 50.9% of *Union Carbide India Limited* (U.C.I.L.) was owned by *American Union Carbide Corporation* - its parent company. In 1994, this percentage was sold to *McLeod Russel Ltd.* in Calcutta, and since then, U.C.I.L. was devoted to manufacturing batteries. Currently, *Union Carbide Corporation* has become a subsidiary of the international chemical corporation *Dow Chemical*, which accepts no responsibility for those facts.

3 THE “BHOPAL CASE”

India, a mainly agricultural country, has experienced for years large economic losses due to plagues of insects. Before World War II, DDT was discovered but some years later it was declared illegal due to the strong contamination it produced, for animals as well as for plants. This fact led companies to invest considerable amounts of money in R&D to develop a pesticide not so harmful for the environment.

After three years of research, in 1957, scientists of the multinational *Union Carbide* developed a combination of substances that allowed to eliminate plagues without the devastating effects of DDT. Such substance was called “Sevin.” Soon they began to market their product all over the world and to establish factories to produce it. One of the locations where they established was the Indian city of Bhopal. There, the population welcomed the company’s establishment; firstly, because it brought an inexpensive solution for their crops and, secondly, because it involved the creation of many jobs.

Around the area where the company would be established, people from different places of the country began to settle down looking for a job, which led to the expansion of the existing shantytown area. For the Hindu working in the factory was a type of “honor”, and everybody did their best to work for *Carbide* and wear its uniform. It was a prestige. The company also motivated its workers with cultural and recreational activities.

However, the gas from which Sevin was produced was dangerous. Methyl isocyanate (MIC) had to be kept at 0°C otherwise it could be a highly pollutant agent. The North American multinational designed a safety handbook to warn of the severe consequences in case of inadequate handling: asphyxiation, lung edema... At first, it was determined to make these safety measures followed. What the company did not say was that, when MIC is exposed to a source of heat (above 39° C), it would not only be pollutant, but also highly mortal since the decomposition of its molecules would result in, among other things, hydrocyanic acid molecules. In addition, the existence of an antidote substance was also known, but this was not revealed to workers or to the public opinion.

The company gave higher salaries to the senior officials working there due to the risk of the dangerous substances and tried to appear as a model in safety and environmental protection. High safety measures were applied for the personnel by means of strong economic investments. But this did not prevent several leaks from occurring, about which the company did not inform to employees or to the local inhabitants as they were considered unimportant.

But, what happened with those high safety measures that would be applied since the factory was planned in 1968, until the disaster, in 1984?

The first person in charge of executing and managing this project was the agricultural engineer E. Muñoz, whose philosophy was to start producing gradually, according to the needs for MIC, since it was dangerous to store this product for a long time. However, *Union Carbide* senior officials did not pay attention and, shortly afterwards, they wanted to produce many tons of the pesticide. Muñoz consulted

with other companies and they warned him of the dangers of this option since, if they did not sell that production, storing such amounts of MIC was like storing a bomb. Even worse as they were near an inhabited area. According to the Indian legislation, in cases of risks by toxic substances, no industry was allowed to settle down near a populated area. However, the company did not mention in the reports about the application of the MIC toxic gas. On the contrary, it would involve more manpower. Due to their different views, Muñoz left the company at the end of 1976.

One of the first accidents took place that same year. In the morning, water was polluted and several cows died. The inhabitants of the shanties complained, but the company solved the problem by giving them more money for their cows than their actual market value. The analyses revealed that water was polluted, but the factory managers did not release these results and water continued polluted. This water was also drunk by local inhabitants.

The factory was finally built in 1976. However, in their final production it suffered several saving measures that would end up in another reduction of the high safety measures, usually very expensive. In 1978, a fire in the factory raised an extensive cloud of smoke, and its ashes fell on Bhopal.

First, MIC was brought from another factory and it was stored in Bhopal, but since 1980, the Bhopal company would manufacture its own. The company sent W. Woomer, as manager of the factory in this new stage. This senior official managed the factory for two years, in which the safety measures were strong. There was also training for technicians and engineers of Bhopal with intensive courses in North America. There they drafted an extensive safety manual. "Safety first" was the motto of the company. Woomer tried to be the best possible manager, trying to know the Indian culture and the customs of its inhabitants.

However, the first fatal accident of an employee happened in 1981. The person responsible for a team of the phosgene manufacturing unit went to change a spare part and inhaled some small drops of the substance. In spite of having apparently taken the regulatory safety measures, his mask came off too soon, and he died two days later. The union representatives blamed the company for not warning the employees of the existence of gas while the conduits were manipulated, although it should not have been this way (because previously the conduits should be completely emptied), and they requested the factory to be included in the list of high risk companies, so that the safety measures were made stricter. The second industrial accident took place the following month, 25 employees were intoxicated as they were not wearing their protecting mask. None died.

The third accident happened eight months later (October 82), in the MIC manufacturing unit. The operator on duty at that moment set off the alarm and the company was evacuated. The person responsible for the trade union decided to start a hunger strike. Woomer did not give much importance to this, because he thought that the company took safety very seriously.

A journalist, friend of the worker who died, decided then to start investigating and studying the case of this factory. "*The single fact of understanding that MIC and phosgene are almost three times heavier than air, and that they tend to move in small clouds very low close to the ground, led me to immediately think that a massive leak of these gases would be catastrophic*" (p. 195, Lapierre & Moro, 2001). In addition, an expert report was written by the engineers of the factory where they listed serious disorders in connection with the safety measures. However, nobody paid attention to the journalist's warnings.

After this report, Woomer decided to change everything necessary to improve and repair the safety mistakes, however he was removed from his post and on December 6, 1982, he left Bhopal and the company appointed Mukund - India native - as director of the factory. Woomer left convinced that the company would not develop as much MIC as the managers of *Union Carbide* wanted and that the safety measures would be kept.

But 1982 finished with bad economic results for the factory. Not all the amount of Sevin expected was sold and the imminent arrival of the Monsoon overcrowded Bhopal with hundreds of peasants that came escaping from the winds. For Mukund it would be an extremely difficult mission, even more when they also appointed a financial director only in charge of reducing the losses by some means or other, without having any experience in the functioning of a chemical industry. Mukund as well as the financial director soon began to not taking into account workers' opinions and keep much more "hierarchical" relationships, what demotivated the company's personnel.

The financial measures began to be noticed with the dismissal of 300 people and the closing of the school in the shanties. Later on, they fired 200 workers more. The work crew of the MIC unit was halved, qualified personnel were offered early retirement and their positions were occupied by people without the necessary training. Furthermore, cheaper but more fragile materials were used for replacements.

When the financial director finished his work, Mukund had less expenses but serious infractions of the safety manual. However, he wanted to go further on and, since there was less production, he decided to turn off the refrigeration system while MIC was not being manufactured, without keeping in mind what was stored. Half of the engineers left the factory before the end of the year to avoid responsibility for the disaster they were foreseeing.

The North American staff did not inform Mukund about the risks of the factory and the amount of MIC stored, all the factories of *Union Carbide* were informed except for Bhopal's. The North American staff did not pay attention to the engineers in Bhopal who feared for the safety of the factory. What they did not know was that the multinational was already planning to close Bhopal and transfer its production to other developing countries.

In December 1984, the crew on duty at the MIC unit lack experience in this type of factories. They only have the supervisor's written instructions. On the night of December 2, the first shift of workers decided to wash the conduits following these instructions (in which an important step was omitted). When the following shift arrived, soon afterwards they started to notice a strong MIC smell, but the valve did not reveal anything since it had been broken for several days. In spite of trying to avoid it, the MIC undergoes an explosion of heat that transforms the liquid into gas. Within a few seconds the pointer of the valve triggers, and they can only turn on the emergency siren and evacuate the factory. That night, the wind was blowing towards the shanties.

The gas ball was not only composed of MIC, but also of phosgene and other toxic gases. The toxic fog devastated all types of life in its way. Between 16,000 and 30,000 people died in three days.

The president of the multinational, Warren Anderson, decided to travel to Bhopal to explain the accident. When he arrived, he was arrested by the police, but after a few hours, the Indian government decided to release him to prevent a crisis with the USA, upon paying a bail of approximately 420 €. He was not allowed to speak with anybody and was sent back to the USA. The company sent again Woomer in order to solve the catastrophe. The only solution to finish the amount of MIC left, and prevent a new explosion was to start the factory's operation again and manufacture as much Sevin as possible. The operation lasted three days.

At first, the victims did not receive any compensation. The multinational blamed on the employee on duty that night. Only four years later and after long negotiations, the Indian Government received a much smaller compensation than what corresponded, in exchange for withdrawing legal actions. We have to keep in mind that the compensations received by the inhabitants of Bhopal were not at all in keeping with the damage produced. The amounts were established according to the per capita income in India, not in the USA, and without keeping in mind the high number of people that were sick and needed medical treatment for life.

In the American multinational, the employees did not perceive high economic losses, but they experienced the demotivation of working for a company that had not behaved ethically. Today, the factory of Bhopal is abandoned and several of its managers are being prosecuted. Anderson was wanted by the Interpol but, after he was found, he continues living in his home and the US Government does not allow that he is prosecuted in India; most of the trial has taken place in the United States.

4 QUESTIONS ON THE CASE

The practice is carried out in groups because we think that it is much more enriching for the students. In addition, business decision making is carried out many times in team and they learn how to come to an agreement. The questions to analyze are the following, although depending on the level of knowledge of the group they could be different. In this case, we think of a basic level of the course *Management*.

- The cultural and social environment of the company.
- The company's social responsibility: a) which behaviors in the company you do not find ethical b) who are the main characters and what are the different behaviors on the problem? c) what would you

have done in their place? d) Do you think that the blame is on the Indian branch or would it also be on the multinational?

- Brainstorm to find three measures that you think could have avoided the catastrophe. To carry this out, one student will first write down the ideas presented; and then a second round will be made to score them and to remove those that are not realistic; finally, the most important ideas should remain.
- Position of that each character, considering the managerial dimension of *Union Carbide*.
- Pyramid of Maslow: what needs do you believe the workers of the factory of Bhopal had? Arrange them according to their importance. What measures can you see the company used to motivate them?
- Do you think any of the senior officials was a leader? What type of leader would have been better for the company during the period of low benefits?

5 SOME DATA ON INDIA

To provide additional data in the case study, we facilitate the following statistics:

- In 1998, income per capita in India was lower than 760 dollars, in Spain it is higher than 9,000 dollars.
- Public expenditure in health was 0.7% of the GDP in 1996. In Spain it is 5.8%. Electric energy consumption is 347 kw/person, while in the US is 11,796.
- CO2 emissions in the USA are 20 tons per inhabitant, while in India are 1.1 tons.

This allows us to see that we are studying the case of an underdeveloped country, which confirms the so-called “20/80 rule”, according to which 20% of the planet consumes 80% of natural resources (and contaminates in a similar proportion).

6 CONCLUSIONS

In the Bhopal case we have described an example of *Management*, but also an example of environment protection or more specifically of the so-called *Ecological Debt*, as we are studying a factory located in an underdeveloped country such as India, which makes an abusive use of the space of a country different to the country of origin. In developing countries, environmental and health issues are usually left aside by the local governments themselves, or they are sold at a low cost. Engineers assigned with such type of tasks need the foundations to see the social problems derived from this type of not very ethical practices.

Students taking *Management* courses should not only study contents, but also the necessary abilities to work in teams, make decisions, be aware of the dimension of their responsibility and acquire a social vision of their work and not only in economic terms. With this case they acquire culture, they get to know other situations, they are able to observe the consequences of a wrong business administration and they assess better the consequences of their future work.

REFERENCES:

Anuario “El País” 2000.

BALLESTEROS, J. *Ecologismo Personalista*. Tecnos Ed., 1995. ISBN: 84-309-2597-X.

BELLVER, V. *Ecología: de las razones a los derechos*. Ecorama Ed., 1994. ISBN: 84-8151-075-0.

FONTRODONA, J., GUILLÉN, M., RODRÍGUEZ, A. *La Ética que necesita la empresa*. Unión Ed., 1998. ISBN: 84-7209-332-8.

LAPIERRE, D., MORO, J. *Era medianoche en Bhopal*. Planeta Ed., 2001. ISBN: 84-08-03845-1.

www.bhopal.com.

MARTÍNEZ-ALIER, J. *The Environmentalism of the Poor: a Study of Ecological Conflicts and Valuation*. Edward Elgar Publishing, 2002. ISBN: 1-84376-486-5.