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Directors' and engineers' responsibilities for safety—a cautionary tale

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This paper is based on my personal experience in 1988 when I was joint managing director of Nobels Explosives Company Limited and is about coming face to face with one's corporate and legal responsibilities and with reality. Our failure to meet all the requirements all the time may result in severe corporate and personal penalties through ultimate judgement before the Courts. More than that, directors, managers and engineers are directly accountable for the health and safety of their employees, subordinates and colleagues. Hopefully by sharing my experience, it will help directors on company boards, executives and anyone in a position of responsibility to review their own arrangements and their actions to ensure they are meeting all legal requirements and the intent of their Health and Safety policies in their organizations.

On 14 June 1988 there was an explosion at Cookes Works at Penrhyndeudraeth in North Wales in which two employees were killed. This paper is in three parts:

- setting the background and context;
- the event and the immediate aftermath;
- the legal consequences and learning.

Background and context

Company environment

With the help of Scottish entrepreneurs, Alfred Nobel founded the original company, British Dynamite, in 1871 and in 1876 its name was changed to Nobels Explosives Company Limited. It was one of the four companies that merged in 1926 to form Imperial Chemical Industries. In 1986 the company operated as a wholly owned subsidiary of ICI plc and had approximately 2500 employees. It produced a range of commercial explosives, detonators, propellants and propellant devices. Its heritage meant there was extensive experience and a profound understanding of the nature of the materials being processed and produced.

My office was at the headquarters and main manufacturing site at Ardeer in South West Scotland, 56 km north of Ayr. There were two other manufacturing sites—one near Wigan, Lancashire with 250 employees and the other, Cookes Works, at Penrhyndeudraeth near Portmadoc in North Wales with 100 employees. It was at Cookes Works where nitroglycerine based explosives were produced in the familiar form known as gelignite.

It is 560 km by road from Ardeer to Cookes works and the travelling time is seven hours by car (see Figure 1). Using commercial flights between Glasgow and Manchester reduces the total journey time to five hours.

As already mentioned the company was a wholly owned subsidiary of ICI plc. There were two managing directors, of whom I was one. My colleague and I shared the executive responsibility for and leadership of the company. We had well defined areas of responsibility that were set out in an up-to-date scheme of organization (see Figure 2).

We held monthly management meetings that included key senior managers and quarterly Board meetings. The ICI Group had a strong focus on health, safety and environmental performance and there was a well-publicized policy statement and supporting arrangements, which were reflected in the Nobels Explosives Company policy and management arrangements. We had well-defined and practised joint consultation arrangements with employees covering all parts of the business. These arrangements included active safety committees and safety representatives. Given the nature of our business, review of health and safety issues and performance was always a prominent and first agenda item at all meetings. There was visible commitment to safety performance from the senior executives through their involvement in area audits, meetings and prompt appearance and involvement in any major incident, particularly any incidents causing injury or significant near misses. My colleague managing director and I invested significant time to foster and encourage multilateral communication throughout the company.

At plant level there was a practice of weekly 'toolbox talks' to remind people of the particular hazards and

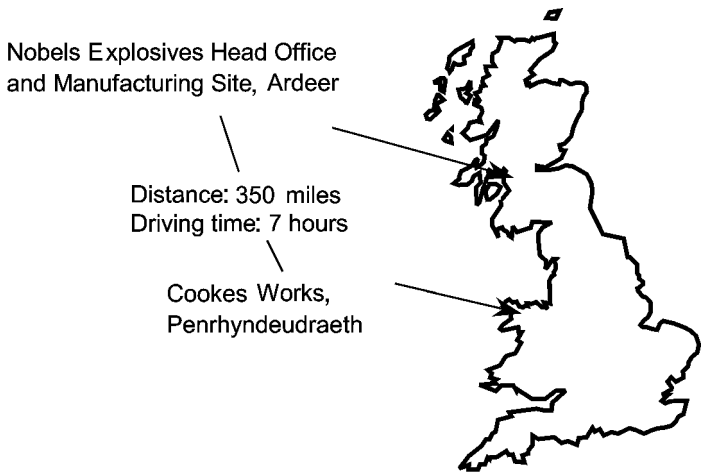

FIGURE 1: LOCATION OF THE SITE OF THE INCIDENT AND THE COMPANY HEADQUARTERS

procedures in their respective areas and to provide opportunity for employees to raise concerns. There were plant hazards books in active use to enable anyone to record safety issues and to see that issues were closed out. These were a particular focus for me during plant visits.

All of our operations were subject to hazard analysis and safety review. These were on a cycle so that all operations were revalidated every five years. Any modifications to hardware or operating procedures were subject to a formal change review procedure including, where appropriate, Hazop and risk assessment studies. There was a well-defined audit programme comprising internal audits, audits by ICI and audits by the Explosives Inspectorate division of the HSE. There were audit action plans and close out reviews with status reviewed at company board level.

Cookes Works

Cookes Works was the only remaining factory in the UK to produce commercial nitroglycerine-based explosives and was located on the edge of the small village of Penrhyndeudraeth. The manufacturing process was

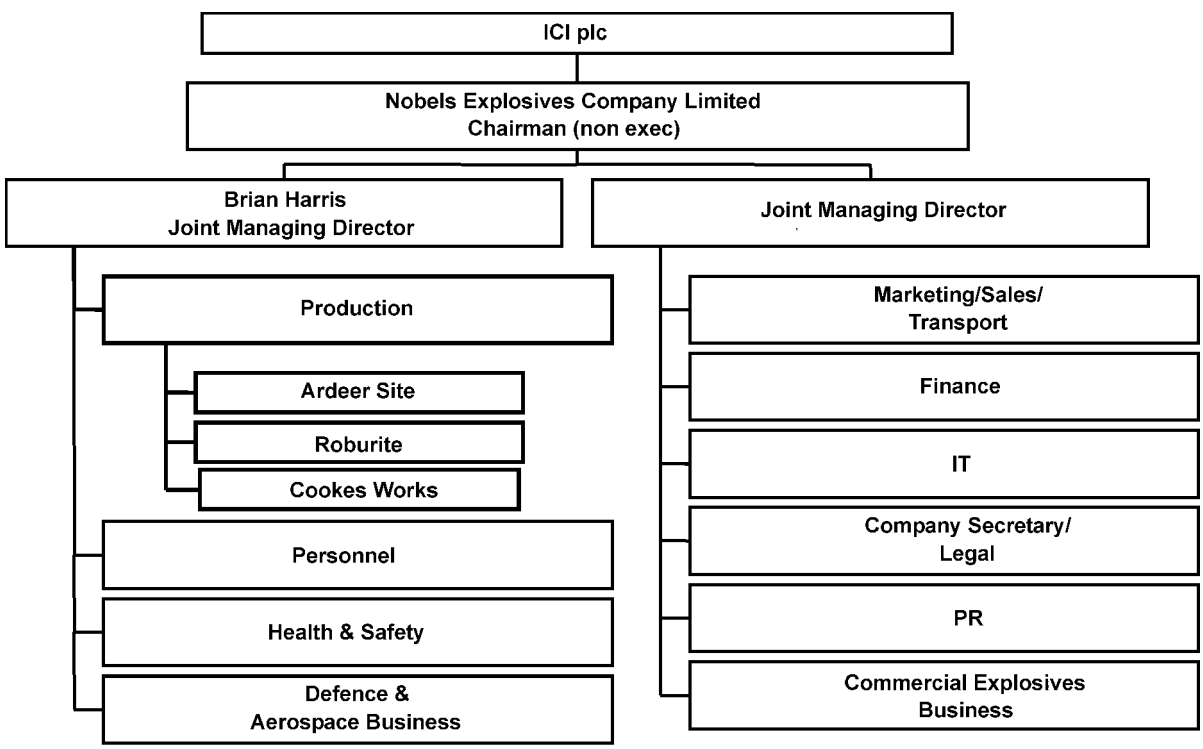

FIGURE 2: NOBELS EXPLOSIVES COMPANY ORGANIZATION IN 1986

relatively straightforward albeit with significant well identified and understood hazards. There were three key steps:

- Nitration of glycerine with mixed acid to produce nitroglycerine that was stored in alkaline conditions. The nitroglycerine was transferred to the next stage as an alkaline emulsion in batches.
- Mixing of nitroglycerine with kieselguhr, nitrocellulose, aluminium powder and salt to produce gelignite, a safe workable paste. The bulk gelignite was transferred to the next stage in polythene tubs.
- Cartridging of the gelignite in paper wrapped 'sticks' of usable explosives.

Each step was well separated to avoid sympathetic initiation of the explosive materials in the event of an incident at any stage in the manufacturing process. In fact the natural topography of Cookes Works was fully exploited and facilitated excellent physical separation. There were two mixing houses properly segregated and overlooking an uninhabited valley. They were located within mounds in a way to direct any explosive blast away from each other, the factory and into the valley. The mixing houses were batch operations, with sufficient nitroglycerine being transferred from the remote main storage batch by batch. This mixing was one of the most hazardous operations and with the highest potential for initiation of the nitroglycerine. The design and maintenance of the plant and the operating procedures took full account of the hazard. The mixing houses were controlled from a reinforced concrete 'bunker'. In fact it was assumed that an explosion could occur so great care was taken in the design, layout and procedures to fully protect employees and to localize the impact of any such initiation.

The works had a flat organization structure and employed about 100 people (see Figure 3).

It was a close-knit 'family'. In that part of Wales the Welsh language was dominant and was the language used within the factory.

Personal involvement at Cookes Works

I visited Cookes Works four times per year. I always walked round the factory and spoke with employees and would generally take a closer look at one particular part of the factory while it was in operation. I would invariably have informal meetings with operators and supervisors, and always met with safety representatives.

I would review with the works manager progress on action plans, outcomes of audits and their close out. High priority was given to critical safety-related expenditure.

I felt I had a good relationship with the factory, the management and the employees. We had good, open, two-way communication.

Personal background

Before I moved to the Nobels Explosives Company I had spent the first twenty years of my career in ICI in the Petrochemicals Division based on Teesside in North East England. I had been very involved in the design and management of high hazard chemical and petrochemical plants. During that time Trevor Kletz was a very prominent leader of safety and hazard assessment and management education in the Division and I benefited directly from his expert 'schooling'.

I moved to the Explosives business in 1986 and my first assignment was as production and personnel director. As part of my education and introduction to this business I was exposed in my first week to witness and feel the power and effect of detonators and explosives. I had no doubt about the nature of the company's products and precursor materials.

Two years later I was appointed joint managing director.

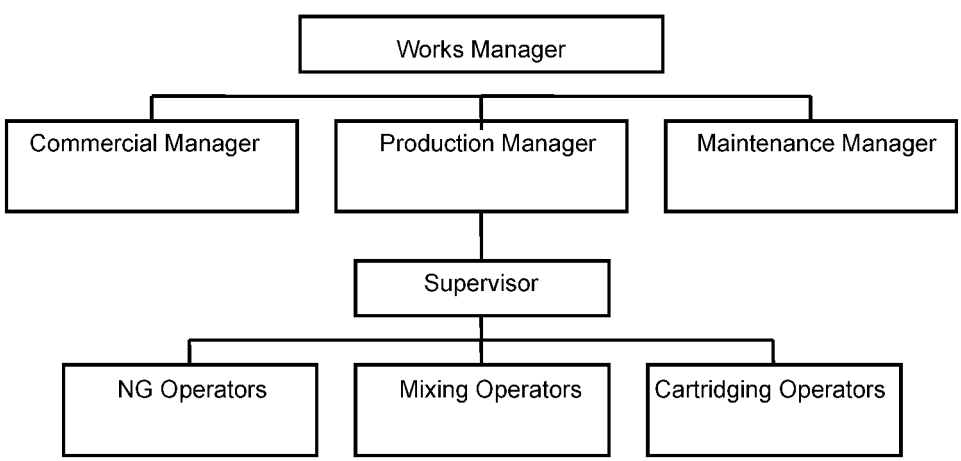

FIGURE 3: COOKES WORKS ORGANIZATION IN 1986

Assessment

Before moving on to the incident, the reader might like to take stock of the arrangements in Nobels Explosives Company and consider how they compare with those in their own organization.

- Did the company have the right attitude to safety?
- Did it have the right focus and approach to safety?
- Did it have appropriate arrangements in place?

One might conclude it was not untypical of a company striving to achieve a good safety performance and exercising due care over its activities.

The event and the immediate aftermath

Monday 14th June 1988

It was a bright, sunny, cloudless June day. I had woken to the sound of the waves of the sea breaking gently on the shore outside my house. The Isle of Arran was standing majestically in the distance. As I drove to the office I thought, 'it's good to be alive'.

At 10:45 am in a sun drenched office I received an emotional call from the Cookes Works manager. There had been an explosion in one of the two mix houses. Two men were missing. There were fires and there had been secondary explosions. There was no time for lengthy discussion; he needed support. We agreed he was able to manage the immediate situation and had all the resources he needed to control the emergency. I reassured him that support would be on its way to help him deal with the aftermath. I immediately put our major emergency plan into operation and informed ICI Group head office and the public relations resources.

I brought together a team comprising the company safety advisor, the human resources manager, public relations manager and an experienced nitroglycerine manager. An aircraft was arranged to fly us from Prestwick to a small grass strip airfield near to the factory. We were in the air at 1:00 pm and used the travelling time to discuss and rehearse the plan to deal with the immediate aftermath. We contemplated the potential reaction of the HSE. We flew over the factory and saw the devastation on the hillside and the crowds standing around the factory gate together with fire engines, ambulances and the police. We landed and were driven through the crowds and emergency services, with press cameras clicking!

I had a short period of reflection with the works manager and discussed the way forward. The factory was in a safe condition. The fires were out. The second mix house had withstood the explosion of its neighbour. The design features had worked perfectly. However, it did have a charge of nitroglycerine waiting for its next batch. Two men were missing without trace; the works manager had already made contact with their families.

The immediate need was to say something to the community and the press. A police inspector was pressing for an urgent press conference. I contacted ICI head office to 'clear my lines'. I was conscious of the very serious nature of what had happened and the fact that I was about to go 'on the record' in a very public way. I agreed a statement with the police inspector.

At 5:00 pm I found myself, together with the police inspector, on the platform of the Works social club building in front of a packed array of press and TV reporters and cameras. I read the statement and responded to questions sticking solely to the facts with no speculation. Afterwards I was persuaded by the BBC TV news team to be interviewed and at 5:45 pm I found myself being interviewed in front of the devastation. Again I stuck solely to the facts.

The factory was stable and our team gathered for dinner and reflection. Most importantly we thought of the bereaved families and considered the recovery of the factory. We contemplated the response of the HSE. At 9:00 pm there I was on BBC TV national news. In the space of a little over 12 hours the world had changed dramatically—there was still blue sky and the evening chorus was in full swing, but now two people were dead in one of our factories.

15–18 June

After a restless night the phone woke me at 6:45 am. BBC Radio Wales had tracked me down and wanted a live interview over the phone immediately after their 8:00 am news bulletin. My judgement was to agree but conscious once again that my words would be a matter of record. The interview was completed satisfactorily. The next few days were concerned with:

- the bereaved families;
- the recovery plan for the factory, including dealing with nitroglycerine in the second mix house (unless this material was removed within 10–14 days it would be liable to self-initiate);
- establishing the investigation and agreeing with the police and the HSE appropriate forensic work.

Using DNA testing we were able to demonstrate from remains that two people had been killed in the explosion.

Since we had not established the cause of the explosion we could not process the nitroglycerine sitting in the second mix house. The HSE believed the only way forward was to explode the building. That would have ended production at the factory and the loss of significant employment for the area, so we eventually decided to hand carry the material back to the main storage in rubber buckets. Two people willingly volunteered to carry out the task. The task was carried out on the Friday evening and was complete by 10:00 pm. A major milestone for the recovery plan was achieved.

The following week and cause of the incident

In the following week the detailed investigation was in full swing. Detailed recovery work proceeded. Discussions with the HSE suggested a desire to prosecute individuals for what had happened as well as to investigate corporate responsibility.

I am sure the reader is familiar with the 3 P's; accidents can be categorized into:

- People—inappropriate behaviour due to ignorance, lack of attention or deliberate intent;
- Plant—inadequate design or poor maintenance;
- Procedures—inadequate or poor compliance.

With these categories in mind, what had happened at Cookes Works? Significant care was taken in the quality control of raw materials used in the mix plant. The materials were sieved and passed through magnetic traps but, in spite of this, the most likely cause of the explosion was a foreign body entering the mixer with the raw materials—clearly a *plant* deficiency. It is not the purpose of this paper to review any further the details of the investigation into the cause of the explosion.

However, while the explosion killed the two operators it was not the reason for their deaths! The men were killed because they were in the wrong place. They were not following the prescribed *procedure*. During the mixing operation they should have been inside the reinforced control room bunker. Although shaken, this building was largely intact and the men would have escaped with only minor cuts and bruises had they been inside.

There was compelling evidence about the operators' behaviour:

- The plant logbook was filled in for batches not yet started.
- It was well known to other employees that these two operators were regularly in the canteen at times that were inconsistent with the batch cycle times.
- Based on the crater size and the trajectories of various items it was concluded that, in addition to the 250 kg of nitroglycerine in the mixer, the product from the previous batch had not been moved from the building. It is probable the operators were moving the material while the next batch was proceeding. A clear breach of procedure.

It was obvious that these men were cutting corners, i.e. deliberate intent. It was also clear that this was not one-off behaviour. There was no financial or any other general incentive to cut corners; it appears their behaviour was driven solely by a desire to have more time in the canteen.

The legal consequences and learning

A few weeks after the incident, it became clear that I was to be interviewed by the HSE as part of their investigation. I was conscious of other recent fatal accidents, such as the fire at Kings Cross underground station and the sinking of the Herald of Free Enterprise ferry. There was a strong drive to prosecute individuals rather than companies if at all possible. Two people had been killed and there was the potential for a manslaughter charge. I had excellent moral support from the parent company, ICI, who said my first priority was to look after myself. However, I was also aware of my corporate responsibilities. I did a lot of deep thinking and preparation for the forthcoming interview. I obtained independent legal representation and the day of the HSE interview duly arrived. I wonder how many readers will have been formally cautioned following the death of two employees—'anything you say will be taken down and may be used in evidence against you'. I can assure you it's not a comfortable feeling!

The interview started. What follows are the types of questions I was asked. As you read them consider how you would answer them. Although they were framed for my role as managing director, they are generally relevant to any person in a position of responsibility.

HSE questions

- How is Nobels Explosives Company organized to implement its safety policy?
- What is the relationship between this company and your parent company? (Looking for a link back to the parent company and a deeper pocket!)
- How does the board of the company operate?
- What is *your* role in the company and what does it entail?
- What are *your* qualifications for this role?
- Who appointed you? (Is someone else at fault because they might have appointed a person who was not qualified for the role)
- What training have *you* had for this role particularly with regard to your health and safety responsibilities?
- Explain to me *your* role in safety management in the company.
- How do you discharge *your* safety accountability?
- What information do *you* receive?
- What do *you* do with it?
- How do *you* know that the information is valid?
- How do *you* know that company procedures are being followed?
- You have told me about audit processes and their findings. How do you know that agreed actions are properly closed out?
- What else would you like me to know?
  etc etc etc

The interview ended, I signed a statement and received a copy.

Uncertainty

A year of uncertainty followed. I have already mentioned the national environment following two earlier disasters. Would I fall victim to the pressure to prosecute directors of companies? I had a strong personal belief that I had not been negligent and that I had carried out my role to the best of my ability. Eventually, I was notified that the HSE would be bringing a case against the company rather than a personal prosecution. This was a great relief to me personally but a concern that, in spite of the arrangements and background I described earlier in this paper, the HSE believed they had a case against the company.

Outcome

On 29 March 1990 in Mold Crown Court the company was prosecuted under section 2 the Health and Safety at Work Act for failing to ensure the safety of employees by lack of supervision of compliance with operating instructions for the safe mixing of explosives. On legal advice the company pleaded guilty, which was difficult for me and my colleague managing director to accept. The company was fined £100,000 and £30,000 costs. The Court had taken due account of the employees' own negligence in not following operating instructions.

In addition to these financial penalties there were other costs:

- the personal impact of uncertainty and a long drawn out process;
- the company's and my own legal costs;
- significant diverted management effort;
- the commercial impact on the business;
- a significant escalation in the company's insurance premium.

Learning

The events of 14 June 1988 and the subsequent months are permanently etched in my memory. I offer the following learning as a consequence of my experience:

- Check that the health and safety policy gives clear direction to the organization.
- Understand the scheme of organization for health and safety and ensure it is understood throughout the organization.
- Clarify your accountabilities for health and safety and make them explicit.
- Get any training you need to fulfil your accountabilities. This applies to *every* level in the organization—directors need training as well as operators!
- Identify the information you need to enable you to discharge your accountabilities. Know how you know the information is valid.
- Use the HSE questions in this paper as a further personal checklist. Do you know that you could demonstrate a satisfactory response to these questions if you were facing investigation and possible prosecution?
- Validate the assurance process in your organization. How do you know that what is supposed to happen does happen? Does the assurance process provide assurance about the outcomes that you desire? Too many assurance processes check hardware and systems and fail to assure what people actually do. How do you know that the procedures throughout your organization are being followed?
- How do you demonstrate that you have not been negligent?

Finally

As a senior executive, by knowing how you would demonstrate that you are not negligent because of what you do and what others do, you are assuring your own integrity and that of your company. More importantly you are increasing the probability that people in your organization will not be injured and will return home each day to their families.

Sadly that was not the fate of two men on 14 June 1988