

Incident

The Allied Colloids fire and its immediate lessons

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Summary

In Part 1, I discuss the circumstances and consequences of the fire at Allied Colloids Ltd, Low Moor, Bradford, England, on July 21st 1992. I then examine the immediate causes of the fire as disclosed by the UK Health and Safety Executive's Report.

In Part 2, I discuss the lessons which the Report concluded should be learned from the fire together with the Company's responses to them.

In a future article which is also scheduled to appear in the Bulletin, I seek to draw wider conclusions. These include the need to develop new methodologies of risk limitation which are especially appropriate to multiple product plants in which warehousing plays a significant role. Such plants represent an important and growing sector of the chemical industry.

Documentation

The incident is fully documented in the Health and Safety Executive's 43 page Report 'The Fire at Allied Colloids Limited'. This may be obtained from HSE Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS. Price £9.00. It is referred to below as 'The Report'.

Copies of the Allied Colloids 'Press Information', detailing their response to the recommendations contained in the HSE report, may be obtained, free of charge, on application to the Company Secretary, Allied Colloids, PO Box 38, Low Moor, Bradford, England, BD12 0JZ. This publication is referred to below as 'AC's Response'.

Part 1 — The circumstances, consequences and causes of the fire

The background

Low Moor, the area to which Allied Colloids moved in 1953, is situated some 5 km (3 miles) south of the centre of the City of Bradford. Low Moor has been a centre of heavy industry, which has included the manufacture of chemicals and dyestuffs, since the early 19th century. However, today, with the exception of Allied Colloids, nothing remains of the Low Moor chemical industry and most of the other heavy industries have disappeared too.

Though some of the nearby housing dates back to the 19th century, there is modern housing close to Allied Colloids.

Allied Colloids has grown very rapidly on its Low Moor site, it has expanded to become Number 17 among Britain's chemical manufacturers and has world-wide connections. Its labour force has grown from 60 in 1953 to 2,000 today.

In its 9 divisions it manufactures a total of 2,000 different products. These products are mainly polymers.

The fire

At 14:20 hours on July 21st 1992 there were a series of explosions in a storeroom which formed part of the raw materials warehouse. This led to an intense fire which spread to the remainder of the warehouse and also involved external drum storage.

The incident was first noted by a fork lift truck driver at 13:30 hours who saw a fume coming from a vent in what was termed an 'oxystore'. He set off the fire alarm which alerted the works fire brigade.

They, along with five senior managers and the safety manager, investigated and found that a number of kegs of azodiisobutyronitrile (AZDN), which is a reducing agent and which had been stored on an upper shelf, had ruptured and spilled their contents on the floor and had created a dust cloud. There was also a portion of a ceiling insulation tile on the ground. Part of it, which remained in situ, bore the marks of impact from a keg lid.

In the immediate vicinity of the spilled AZDN there were bags of sodium persulphate (SPS), an oxidising agent.

The internal fire crew brought up an appliance and laid out their hoses, but it was decided to clear up the spillage by means of a vacuum cleaner.

Whilst the vacuum cleaner was being brought, observers saw a further white plume emerging from a ventilation grill.

At 14:15 hours the shift chemist could see that a reaction was taking place in or near a bag of SPS. A flame developed, followed by a flash and he was forced to retreat. There was a further explosion (probably a dust explosion) which blew him over. By this time people were running away from the scene.

The public fire brigade were called at 14:22 hours and began arriving at 14:28 hours. There was thus a lapse of time of some 52 minutes between the first discovery, which resulted in the internal fire alarm being sounded, and the public fire brigade being summoned.

The brigade found that it was facing an intense fire (see Photograph 1.1). At its peak it required 36 appliances and 173 fire-

fighters to combat it. The mains water supply proved inadequate and water had to be pumped from adjacent dams.

A dense black smoke pall developed which interfered with traffic on the adjacent motorways and spread eastward for several kilometres.

The fire was brought under control by about 17:40 hours and thus lasted for some 3 hours. It was 18 days later, after danger of reignition had passed, that the fire brigade presence could be withdrawn.

The emergency

The Company, in accordance with the Regulations in force for a Major Hazard site had distributed information to its neighbours advising them, in the event of an emergency to stay indoors and to close windows. They were to take this action on hearing a siren. The Company's incident controller seemed not to have a clear idea of the circumstances under which the warning siren should be sounded. Though pressed to do so by the fire service, the controller did not actuate the siren until 27 minutes after the arrival of the brigade.

The siren was actuated by mains electricity and when this was cut off the all-clear could not be sounded until the supply had been restored.

The consequences

There were no fatalities but 33 people, three of them members of the public, had to be given hospital treatment. Six were detained overnight. A police officer, who had conducted traffic duties directly in the path of the smoke cloud was absent from duty for four months.

The residents in eight immediately adjacent houses were evacuated as a precaution and around 2,000 people were confined to their houses for several hours.

Fire-water run off, which was of the order of tens of thousands of cubic metres, could not be coped with by the local sewage treatment facilities and most of it eventually ran, via a local stream, into the River Calder. It was estimated that it eventually killed some 10,000 fish. Photograph 1.2 shows the extent of the fire water problem on-site following the fire.

Damage to AC's property amounted to £4.5 million. There were, in addition, substantial indirect losses.

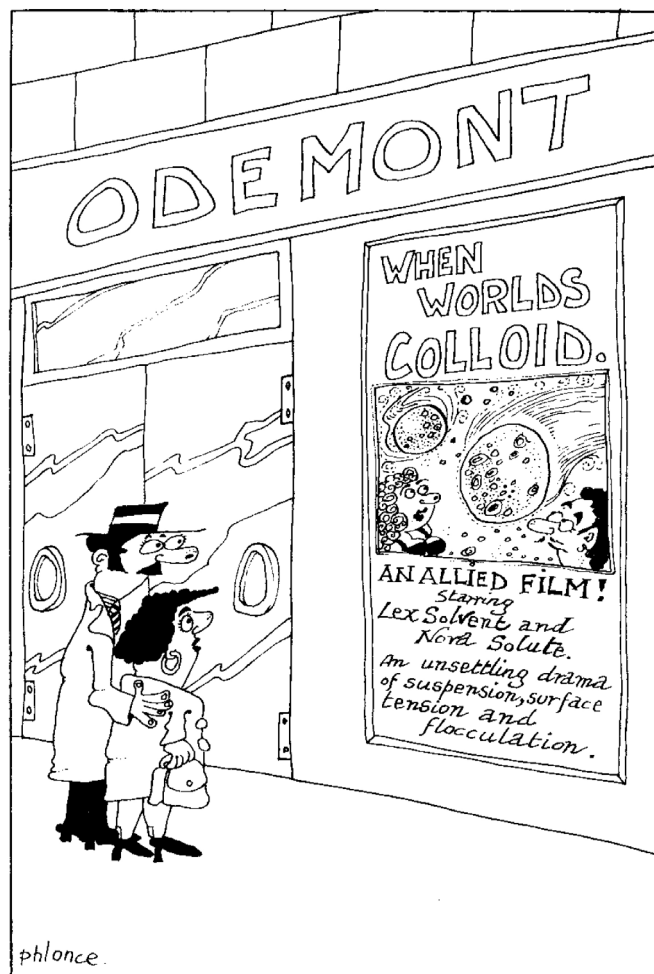
The raw materials warehousing was destroyed and there was substantial damage to the finished goods warehouse. A road tanker containing 16 tonnes of butyl acetate was burned out and many plastic drums, stored in the open were burst by the effects of radiant heat in spite of the efforts of the fire brigade to keep them cool.

Store tanks containing a total of 600 tonnes of acrylonitrile, (which were responsible for the site being designated as a Major Hazards site) and a vessel containing 40 tonnes of methyl chloride, stored as a liquefied gas, were unaffected on account of their distance from the fire.

The production facilities of the factory escaped damage.

Legal proceedings

The Company were subsequently prosecuted. They were fined a total of £100,000 for breaches of the UK Health and Safety at Work Act.



The immediate causes

An investigation by the HSE established that the fire had been initiated by the thermal decomposition of kegs of the thermally unstable reducing agent, AZDN in oxystore 2. This had arisen because of the proximity of the kegs to a hot steam condensate return line.

There was a total of 1.9 tonnes of AZDN in oxystore 2.

The powder released reacted with sodium persulphate, an oxidising agent, which was stored adjacent to it. It was also capable of burning in air.

Underlying causes

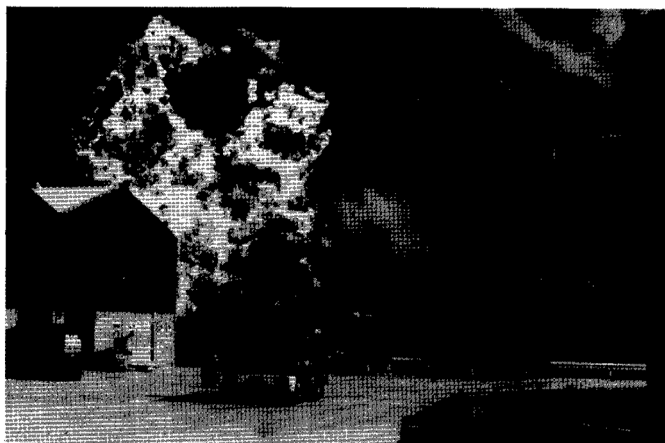
Erroneous classification

An immediate underlying cause was that AZDN, a reducing agent, which was a chemical in regular use by AC, had, for store-keeping purposes, been wrongly classified, in 1989, as an oxidising agent. This was why it was stored in an 'oxystore'.

This was not an isolated case as investigation showed that 0.8 tonnes of VAZO 67, a reducing agent with properties very similar to AZDN, had been stored with organic peroxides, which are powerful oxidising agents, in neighbouring oxystore 1. VAZO 67 had also been classified as an oxidising agent in 1989.

Management of warehousing

Originally each production department had its own warehousing



Photograph 1.1 The scene facing fire-fighters (photo: Bradford Argus & Telegraph)



Photograph 2.1: Fire-water runoff on-site (photo: Yorkshire Fire Service)

arrangements but this seems to have led to difficulties.

To overcome these difficulties the Company had set up a 'Logistics' department in 1990. Though its area of responsibilities is not made clear in the HSE Report, it seems reasonable to assume that the chief responsibilities of the department were (1) receiving and storing raw materials, (2) storing, packaging and dispatching finished materials, (3) transporting raw materials from store to the point of production and (4) for taking finished chemicals from the point of production into store. It seems also to have had the responsibility for transporting and storing some intermediate products.

The magnitude of these operations is disclosed by the 125 people employed in the department.

However none of those employed in the Logistics department was qualified in chemistry. This was no doubt the reason why the errors in the classifications of AZDN and VAZO 67 were not noticed.

Nor was anyone in the Logistics department qualified in safety.

Part 2 – the conclusions of the inspectorate and the company's response to them

Comments by HSE's area director

Norma Collins, the Area Director for the Health and Safety

Executive, commented 'Allied Colloids have learned their lessons the hard way. They have now taken many measures in order to prevent a similar occurrence in the future.'

But there are lessons from this disastrous fire to be learned by the rest of the chemical industry and others. It is regrettable that many of these lessons are not new'.

Recommendations

In the following discussion, for the sake of brevity, the exact wording of the HSE's conclusions, and of the AC's responses have not been quoted. Readers who wish to follow the conclusions in detail are advised to obtain copies of the Report and AC's response. (See 'Documentation' page 1).

1. **HSE recommendation:** Incompatible substances must be segregated and stored in accordance with current UK legislation.

AC's response: A new warehouse is to be built. This will be built with 4 hour fire resistant walls and will be equipped with a sprinkler system. In addition there are to be a flammable liquid store and a highly flammable liquid store. These will be separated by distances of 8.5 m and 15 m respectively from the main warehouse. They will have fixed foam installations. There will be other, suitably equipped, stores for organic peroxides, oxidising substances, flammable solids and compressed and liquefied gases.

The whole system will be computer controlled.

Management

2. **HSE recommendation:** Non-production departments, especially warehouses should not be neglected areas so far as health and safety are concerned.

AC's response: The Logistics department is now part of our Operations division and is headed by the Operations and Safety Director. The Safety department is fully involved in planning and design of new warehouses.

There is now an extensive programme for training people in the Logistics department. This training includes the labeling and segregation of chemicals.

3. **HSE's recommendation:** Safety policy statements shall be updated immediately following changes in the management system. Job descriptions of managers shall correspond with safety policy statements.

AC's response: This has been accepted. Details of the response are given.

4. **HSE's recommendation:** Safety performance in storage facilities shall be regularly monitored and statistics compiled.

AC's response: All areas of the Company's activities are now monitored. A qualified safety auditor is now employed.

5. **HSE's recommendation:** Targets should be set for safety performance in storage areas.

AC's response: This is accepted. New safety standards are being drawn up.

6. **HSE's recommendation:** Safety related maintenance or engineering requests should be identified as such and given priority.

AC's response: The arrangements for dealing with these has

been reorganised and computerised.

- 7. HSE's recommendation:** Managers, supervisors and operators of chemical warehouses shall be given appropriate training especially in regard to placement and segregation of chemicals. Records should be kept of the training given to each individual.

AC's response: This has been fully implemented.

Emergencies

- 8. HSE's recommendation:** The emergency services (fire brigade, police), should be summoned to any incident with the potential of escalation and this provision shall be incorporated in emergency plans.

AC's response: Written instructions now state that the public fire brigade, as well as the internal works brigade, shall be called in to any fire, or suspected fire, or explosion. For other incidents, such as spillages, the Company Fire Officer shall decide whether to summon the public fire brigade.

- 9. HSE's recommendation:** Where a site has a public warning system the circumstances in which it is used, and who can authorise its use, should be agreed with the emergency services. Such sirens shall have back-up power supply.

AC's response: This has been implemented.

- 10. HSE's recommendation:** Emergency plans should set out the actions needed to prevent or mitigate environmental pollution from a major incident and which body is responsible for this. The company should give the necessary advice.

AC's response: The off-site emergency plan now provides for this.

- 11. HSE's recommendation:** A company should ensure that they can advise emergency services and other public authorities of the potential toxicity of smoke from fires on their premises.

AC's response: Best to assume that all smoke is toxic. The Company follows British Standard DD180 which takes the view that most smoke from burning toxic materials is similar and that for most materials that rate of production of smoke is more important than its toxicity.

AC will assist emergency services by providing computer generated maps showing the area likely to be affected by a smoke plume, taking weather conditions into account. AC consider that because of the buoyancy of smoke plumes there is little likelihood of significant ground level deposition of toxics.

- 12. HSE's recommendation:** The HSE will develop guidance on the control of fire-water run-off in conjunction with interested parties.

AC's response: AC welcomes this and will give any assistance required.

- 13. HSE's recommendations:** Site occupiers where water run-off could create a major environmental accident should consider how to contain fire-water run-off or to mitigate its effects.

AC's response: A three pronged attack is envisaged. This is (1) to upgrade fire prevention and (2) to extinguish fires quickly before they take hold and (3) to provide a catchment system for the run-off.

The company plans to buy additional fire fighting appliances. They now have a dedicated 250 mm water

main and are proposing to install a ring main with pillar type hydrants. This will be fed from a new reservoir of ca 4.500 cu metres capacity. The catchment system will have a similar total capacity. These changes will cost ca £3,600,000.

Site layout

- 14. HSE's recommendation:** Major hazard sites should pay particular attention to congestion, especially when planning modifications or extensions.

AC's response: The new warehouses will reduce congestion. AC will also implement recommendations on reducing congestion made by their consultants.

Authors Note: Though I live and work in the Bradford area, I have no connection with Allied Colloids.