

MAJOR INCIDENTS AT WASTE TREATMENT SITES – CASE STUDIES AND LESSONS

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Over the past few years there have been a number of incidents at hazardous or chemical waste treatment facilities that have resulted in unacceptable impacts on the environment and human health. These incidents have fostered a negative public opinion of this industry at a time when the forthcoming implementation of the Landfill Directive in the UK may require a substantial increase in capacity.
The Environment Agency (Agency) and Health and Safety Executive (HSE) are concerned that the management and technical standards across this sector keep pace with best practice and learn the lessons of these incidents. Accordingly the Agency and HSE undertook a number of joint site inspections during late 2002 to assess the current state of the industry.
This paper briefly examines a number of recent incidents, their causes and impacts. It then identifies the relevant key technical standards for the sector. The paper then summarises the outcomes of the Agency and HSE audit exercise. The detailed findings of the exercise will be published in a forthcoming report.

KEYWORDS: waste establishments, Environment Agency, Health and Safety Executive, chemical or hazardous waste treatment, accident prevention, technical standards, COMAH

BACKGROUND

Waste transfer and treatment facilities have been an integral part of the waste management industry for many years. They handle a wide range of waste materials (for example acids/alkalis, organic compounds, oxidising compounds, chlorinated solvents, pesticide residues) and undertake a range of activities (storage, treatment or transfer) that pose various threats to the environment and human health. Typical treatment operations include neutralisation, immobilisation, de-watering and blending to make combustible fuels (commonly known as secondary liquid fuel (SLF)).

The Environment Agency (Agency) issues waste management licences under Part II of the Environmental Protection Act 1990 (EPA) to facilities that keep, treat and dispose of waste. There are approximately 150 licensed hazardous or chemical waste treatment facilitates in England and Wales. Part II EPA regulates the deposit, keeping, treatment and disposal of controlled waste to ensure that it does not cause pollution of the environment or harm to human health.

Certain process activities such as recovery of organic solvents by distillation require authorisations under Part I of EPA. These are also issued by the Agency and require the Best Available Techniques Not Entailing Excessive Costs (BATNEEC) to prevent, minimise and render harmless releases to the environment and the selection of the Best Practicable Environmental Options (BPEO). There are approximately 40 authorised solvent distillation facilities.

The Pollution Prevention and Control Act 1999 (PPC) will replace waste management licensing under Part II EPA 90 and waste processing authorisation under Part I EPA 90 with an integrated licensing regime for chemical and hazardous waste facilities. New facilities or substantial modifications to existing facilities are licensed under PPC and existing sites will be transferred over to the PPC regime around 2005. PPC requires the use of the Best Available Techniques (BAT) to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.

All waste treatment and transfer facilities are subject to the requirements of the Health and Safety at Work etc Act 1974 (HASAW). This includes a duty on employers to take all reasonably practicable measures to ensure the health, safety and welfare of employees, including the provision of safe systems of work, training, supervision etc. HASWA Act also includes a duty on employers to take all reasonably practicable measures to protect non-employees (contractors, local residents, other businesses etc). The Health and Safety Executive (HSE) enforce HASWA.

Certain waste transfer and treatment facilities are also subject to the requirements of the Control of Major Accident Hazard Regulations 1999 (COMAH). COMAH applies because of the presence or anticipated presence of threshold quantities of certain dangerous substances. COMAH requires operators to take all necessary measures to prevent major accidents and limit their consequences to persons and the environment. In England and Wales COMAH is enforced by a joint Competent Authority comprising the Agency and HSE. There are also additional planning consent requirements of sites subject to COMAH under the Planning (Control of Major Accident Hazards) Regulations 1999 (P(COMAH)). There are approximately 20 hazardous or chemical waste treatment facilities notified as under COMAH.

As you can see there is a raft of legislation whose purpose is to achieve high standards of operation within this industry sector. However despite this there has been a long history of incidents and a number of high profile incidents within the last 2–3 years.

RECENT INCIDENTS

Table 1 provides a summary of recent major incidents with off-site impacts at hazardous and chemical waste facilities. Perhaps the most significant being the incidents at the Cleansing Services Group (CSG) facility in Gloucestershire in October 2000 and the Distillex solvent recovery facility on Tyneside in April 2002.

FIRE AT CSG, SANDHURST, OCTOBER 2000

CSG operates a hazardous waste treatment facility and transfer station at Sandhurst, near Gloucester. At approximately 02.00 hours of 30 October 2000 a major fire started in a waste storage compound (Figure 1). The facility was unoccupied at the time and the fire service had difficulty accessing the facility because of fire blocking the only access route and a series of explosions of waste aerosol cans and larger drums. Approximately 60 people were evacuated by the emergency services and 13 persons mainly emergency services personnel, were taken to hospital as a precautionary measure but none were admitted. The fire service gained access to the site from upwind across fields and the fire was eventually extinguished at 18.00 hours.

Table 1. Summary details of recent incidents at hazardous and chemical waste treatment facilities

Operator, location and date	Incident description	Consequences and regulatory actions taken
Distillex Ltd, North Shields April 2002. IPC authorised (Part I EPA 90) distillation process (section 5.2(a)).	Fire and explosion caused by use of an angle grinder (see more detailed entry)	Site destroyed. Prosecution by HSE with £39k fine. Incident cost the company in excess of £1m.
P&R Disposal Services, St Helens. October 2001 Waste transfer station licensed under Part II EPA 90.	Fire and site extensively damaged. Cause unknown but malicious damage is a possibility. Fire associated with theft from site.	Contamination of local watercourses. Site destroyed. Warning letter issued by Agency.
Parke Environmental, Newport, Gwent. July 2001 Waste treatment facility licensed under Part II EPA 90 and COMAH lower tier (LT) establishment.	On-site fatality and off-site release of a cloud of hydrogen sulphide during a neutralisation reaction with in-complete characterisation of wastes.	HSE and Agency both served Prohibition Notices. Prosecution ongoing.
Cleansing Service Group Sandhurst. 30 October 2000 Waste treatment facility licensed under Part II EPA 90 and COMAH lower tier (LT) establishment.	Fire in a waste storage facility followed extensive flooding from the River Severn (see more detailed entry).	Agency served a Suspension Notice under Waste Management Licensing HSE served 2 Improvement Notices under HASAWA 74 Agency served Improvement Notice under RSR 1993 Prosecution pending.

Approximately 180 tonnes of mixed chemical wastes including some pesticides and chlorinated hydrocarbon solvents were consumed in the fire. The site is adjacent to the River Severn and flooded on 3 November. Emergency actions had to be taken to make the site safe and move fire damaged and other material beyond the reach of floodwaters. The site was surrounded by floodwater (Figure 2) and could only be accessed by boat. Serious flooding continued until 22 November and the site flooded again in December.

Detailed investigations were undertaken by the Agency and HSE. These investigations discovered the unforeseen presence of un-authorised wastes including 7 25 litre drums labelled "solvent contaminated with BSE" and 2 drums of radioactive waste.

Substantial and prolonged monitoring and modelling of the incident took place. This included:

- 17,500 tests on 500 environmental samples (air, water and land), none of which indicated any significant levels of contaminants off-site,
- At the time modelling of the accident by the HSE indicated that a "dangerous dose" of toxic materials would not have occurred at the site boundary,
- Blood tests on those exposed on the day of the fire were found to be negative for solvents and heavy metals,
- Radiological monitoring off-site concluded that there was no evidence for the presence of radioactive materials in the areas surveyed,
- The local Health Authority have undertaken multiple health surveys. These surveys offer evidence that the physical and/or physchological health of a significant number of Sandhurst residents involved in the surveys were affected following the fire, although these symptoms are generally though to be self-limiting. Health monitoring work continues.

At the time of the incident the site was subject to a waste management licence issued by the Agency under Part II EPA and was notified as a COMAH site. There was a high level of media and political interest in the incident and the HSE and Agency (acting as the COMAH Competent Authority) have submitted progress reports to the Deputy Prime Minister[1,2].

The cause of the accident has not been established. The most likely causes seem to be loss of containment of "laboratory smalls" or leakage of pyrophoric materials. Arson is also a possibility.

DISTILLEX EXPLOSION, APRIL 2002

Distillex Ltd is located ten miles to the east of Newcastle just north of the Fish Quay, North Shields. The facility refines organic solvents (including wastes) for toll recovery, for reuse by the originating company and for the recovery of reusable materials, which are subsequently sold on to other markets. The site is subject to an authorisation issued by the Agency under Part I EPA.

On the 12 April 2002 an intense fire devastated the Distillex facility (Figure 3). The office, the three drum storage areas, the warehouse, the boiler, the plant area and static road tanker were all destroyed. Commercial buildings adjacent to the site in line with the fire were also destroyed as a result of the extreme heat and embers from the fire, despite the actions of the fire service.

In the response to the incident the emergency services set up a ½ mile exclusion zone around the facility, evacuated 500 people, closed the Tyne tunnel road link and the metroline and diverted aircraft away from the air corridor. The incident attracted national media interest.

The cause of the incident is believed to be the use of a pneumatic angle grinder by an operator in an attempt to cut the steel frame off a 1 tonne Intermediate Bulk Container

(IBC), containing solid still bottoms. It is believed sparks given off from the grinder ignited vapour within the IBC. The fire spread rapidly to the skip and the drum storage area. At the time of the fire there were a number of containers of flammable and combustible materials stored outside of the bunded areas. This reduced the separation distances between flammable liquids and mean there was an absence of secondary containment both of which contributed to the spread of the fire.

Samples taken from soil and vegetation in areas affected by the smoke plume confirm that concentrations of combustion products were well below environmentally acceptable levels. Although the smoke plume was very dramatic, there is no evidence of lasting environmental damage as a result of the incident. However there was substantial distress caused to local residents and businesses. The local health authority reported 5 casualties as a result of the incident and the Police had 36 reported injuries on duty resulting from the incident.

BEST PRACTICE GUIDANCE

The Agency has recently published new best practice guidance for the waste treatment industry[3]. The Agency is encouraging operators to use it to review their current operations and in updating their working plans. The Agency will use the guidance in its reviews of licences. Facilities are expected to carry out improvement to reach the required standards at the earliest opportunity and to a programme agreed by the Agency.

The guidance identifies key issues for the sector including those relevant to accident prevention and mitigation.

ACCIDENT MANAGEMENT PLANS

Facilities should draw up accident management plans based upon a thorough assessment of the hazards and risks. These accident management plans should include the technical and managerial prevention and mitigation measures that are necessary based upon this assessment. Accident management arrangements should be regularly reviewed and tested.

WASTE CHARACTERISATION, SAMPLING AND CHECKING

Failure to adequately screen waste samples prior to acceptance and confirm the composition on arrival at the facility is key to safe management of waste facilities. You cannot manage the process risks or the treatment operations without adequate knowledge of the waste. A lack of knowledge has historically lead to subsequent problems that include; inappropriate storage and mixing of incompatible substances, accumulation of wastes and unexpected treatment characteristics (as in the Parke Environmental incident).

Pre-acceptance procedures should be sufficient to enable the facility to:

- screen out unsuitable wastes;
- confirm the details relating to composition i.e allow selection of verification parameters to be tested upon the arrival of the waste at site;
- identify any unexpected substances within the waste which may affect the treatment process or may react with other reagents;
- accurately define the hazards associated with the waste;

- ensure waste are stored on site in compliance with segregation, separation and engineering requirements;
- determine whether the waste is within the terms of possible onward permits and the cost of any onward disposal;
- meet legislative requirements.

Acceptance procedures should be sufficient to ensure:

- procedures for checking paperwork arriving with the load;
- procedures for safe unloading to allow inspection and sampling;
- visual load inspection;
- drum and package labelling procedures;
- timely sampling procedures for all incoming wastes including bulk wastes as well as drums, containers and laboratory smalls;
- written records of verification and compliance testing;
- written records of assessment of consistency with pre-acceptance information and documentation;
- policy for recording and dealing with non-conforming wastes;
- written records of rejection criteria applied to wastes;
- sample retention systems i.e period of retention, method of retention;
- written records of decision making re acceptance or rejection of wastes and decisions on future treatment or disposal options.

RECORD KEEPING

An internal tracking system and stock control procedure should be in place for all wastes. This system should record:

- what waste has arrived on site;
- what waste is currently held on site,
- where wastes are currently held;
- how long the waste has been on site;
- total quantity of wastes currently on site;
- compliance with licence conditions.

WASTE STORAGE AND SEGREGATION

Detailed procedures are necessary for ensuring the effective management for the storage of waste on site. These should be generated having conducted risk assessments to identify the correct manner in which licensed materials are to be stored and the standards of operation that are to be expected. This risk assessment should consider:

- location of storage areas;
- storage area infrastructure requirements and relevant standards to be met (materials of construction etc).
- conditions of tanks, drums, vessels and other containers;

- stock control systems
- segregated storage requirements

PREVENTION OF ACCUMULATIONS OF WASTE

Procedures and auditing systems should be in place to ensure waste does not accumulate. There should be a plan of disposal or treatment for each waste consignment accepted and if it is found that the plan is not being followed alternative arrangement need to be implemented in a timely manner.

Failure to ensure adequate removal of wastes has lead to large numbers of drums being stored on some sites. This causes increased accident risk as well as operational difficulties. Wastes involved are typically unchecked and drums are left to deteriorate. Such situations are often associated with large-scale site clearances and can be accompanied by competitive pressures and customer insistence to accept additional waste streams. Typically the wastes involved are difficult to handle and/or treat and may have been transferred between various facilities with a consequent unacceptable loss of information relating to original producer and composition.

TREATMENT

The key issues for control of the waste treatment operation include the following:

- ensuring the waste is suitable for the activity (pre-acceptance);
- adequately characterising the waste (acceptance procedures);
- appropriate and safe storage of wastes (storage);
- provision and maintenance and inspection of treatment equipment;
- operational control of the treatment process (key parameters and process monitoring equipment);
- appropriate disposal of effluents.

AGENCY AND HSE AUDIT EXERCISE

METHODOLOGY

The Agency and HSE undertook a joint audit exercise looking at standards within the hazardous and chemical waste treatment sector during late 2002. This exercise was prompted by growing concerns in the regulators about both the incident record of this sector and their impression that this industry as a whole operates below current best practice. An external report of this exercise will be published.

The audit exercise involved the joint inspection by both regulators of a cross section of 25 facilities selected so as to allow a picture of the "state of the industry" to be established. The exercise was launched at an industry seminar on 14 May 2002 jointly organised by both regulators and attended by the majority of industry.

An inspection template was drawn up that would allow for consistent inspections to enable conclusions to be drawn, and allow reporting on the greatest concerns.

The template follows the structure of the best practice guide, and was split into 6 selections:

- Management Arrangements
- Pre-acceptance Procedures to assess waste
- Acceptance Procedures
- Storage
- Treatment
- COMAH

Prior to the inspection the facility operator was informed of the visit and given a copy of the template to indicate the questions that would be asked. This was to enable the operator to prepare any response, have copies of any documents available and to plan for the inspection. If inspectors considered that by giving such notice the site conditions seen during the visit were not typical then a further unannounced follow up visit was undertaken.

FINDINGS

The inspection exercise was completed during June – October 2002 and all 25 facilities were jointly inspected by the Agency and the HSE.

Although the number of facilities visited was small and should not be used to draw statistical conclusions the regulators believe that the results are representative of this industry sector as a whole. The detailed findings and any subsequent conclusions drawn will be presented in the external report into the exercise to be published in early 2003. In summary the findings are: -

- On the whole industry was co-operative and some facilities had made recent steps to improve their standard of operation;
- On the whole management documentation was in-place, however in many cases it was of a poorer quality than expected;
- On almost half the sites tanks, vessels, pipework and values were not adequately identified and labelled;
- On a significant minority of sites there was concern over compliance with the COSHH Regulations;
- On a significant minority of sites there was no comprehensive preventative maintenance programme;
- On a significant minority of site there was not an adequate site storage plan;
- On a minority of sites waste reception areas/procedures were not considered adequate for the containment and segregation of wastes (this was a contributory factor in the Distillex incident);
- On a minority of sites labelling of wastes was not adequate to ensure that appropriate segregation took place;
- On a minority of sites layout and location of storage areas was not suitable with the standards contained in HSG51/71;
- On a number of the sites accumulations of waste were identified as a cause for concern;
- On two of the sites undertaking treatment operations concern was expressed over the standard of control instruments;

- One site was found to be holding COMAH qualifying inventories but was not notified under COMAH. A further 3 sites were considered to have operational flexibility which might bring them into COMAH.

The follow-up actions from the exercise have included:

- 6 sites where letters and/or site advice have been given on matters of concern;
- 1 Prohibition Notice served by the HSE on storage of laboratory "smalls" (although this was served just prior to the joint exercise visit);
- 3 Improvement Notices served by the HSE (although 2 of these were just prior to the joint exercise visit) on storage and management issues;
- 1 Enforcement Notice issued by the Agency to remove time expired waste accumulations.

JOINT WORKING

The Agency and HSE have both found the joint exercise very rewarding. The Agency and HSE already work closely under the COMAH regime and this exercise has shown that some of the benefits realised under COMAH can be extended to joint working under other regimes.

No evidence of conflicting interests or demands on operators has been exposed by the exercise, rather both organisations have been able to confirm the complementary nature of our requirements for this industry sector.

In the coming months the Agency and HSE will be considering whether joint working should be extended both within this sector and to other industry sectors where we have mutual interest.

FUTURE CHALLENGES FOR THE INDUSTRY

The way in which hazardous wastes are to be managed in the future is set to change significantly. This presents challenges and opportunities for both the industry and the regulators.

The Landfill Directive will result in a significant reduction in the number of landfill sites accepting hazardous wastes (current estimates[4] are 182 interim sites until July 2004 and 41 sites beyond this) and this may lead to serious shortfall in treatment and disposal capacity for a number of hazardous waste streams.

Unless there are significant reduction in hazardous waste generation it is likely that additional hazardous or waste treatment capacity (whether integrated at the producer end or as third part operations) will be necessary as part of the solution to the constriction of landfill capacity although there are still substantial areas of legislative, regulatory and market uncertainty.

In recognition of this problem the Department of Environment, Food and Rural Affairs (DEFRA) has recently announced the setting up of an Advisory Forum of Hazardous Waste in which the Agency will participate fully.

The Agency and HSE will be analysing the findings of this inspection exercise carefully over the coming months to ensure that accident prevention continues to be a major focus of compliance activity on these facilities with the aim of preventing further incidents of the nature described in this paper.

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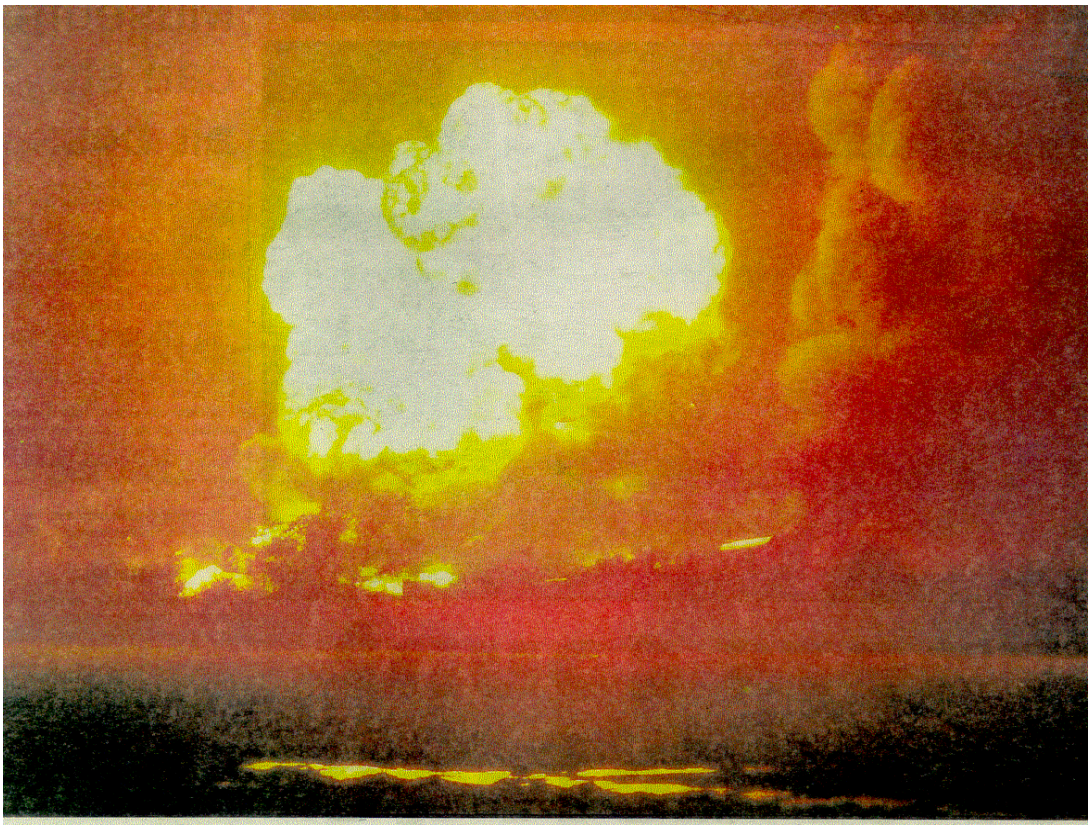

Figure 1. CSG Ltd, fire on 30 October 2000

Figure 2. CSG Ltd, aerial view of site during flooding

Figure 3. Distillex Ltd, fire on 12 April 2002