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Good management practices in hazardous waste management

Jó üzemeltetői tapasztalatok a veszélyes hulladék kezelésben

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Bevezetés

Jelen cikkben a szerzők esettanulmány keretében vizsgálják meg a veszélyes anyagokkal foglalkozó üzemek veszélyes hulladékkal történő érintettségének kérdéskörét. Az esettanulmány tapasztalatai az iparbiztonsági szabályozás jogalkalmazási területét használhatók fel.

Introduction

In this article, the authors examine the issue of hazardous waste in plants dealing with dangerous substances through a case study. The experiences of the case study can be used in the legal application area of industrial safety regulations.

Kulcsszavak: hulladékgazdálkodás, iparbiztonság, tűzvédelem, veszélyes hulladék, esettanulmány

Keywords: waste management, industrial safety, fire safety, hazardous waste, case study

Introduction of the scientific problem

On November 1, 2004, at All Souls' Day, a fire broke out at a hazardous waste disposal plant in the capital. The incident was quickly upgraded to a priority alert level 5. During the intervention at the scene of the fire, 41 units were deployed with a total of 144 personnel. The 300 m2 area of the incident increased to more than 1000 as the intervention progressed, and the volume of material involved in the fire was 187 tonnes. [1] The complexity of the incident provides a number of lessons for both industrial safety and firefighting that are still relevant today. At the same time, the damage clean-up and the preventive measures taken after the event are still remarkable 20 years on.

Analyses and Discussion of the Case Study Results

In November 2004, Hungary had only been a member of the European Union for six months and the SEVESO II Directive was in effect. The last chemical fire incident in the capital city of a comparable complexity was the 1986 Microelectronics Company fire. This incident has therefore rightly entered the national fire service consciousness, with lessons that are still relevant today [2].

The site

The facility under investigation is a lower-tier hazardous waste facility. The disposal is carried out by all possible methods, except incineration. Disposal by incineration is carried out exclusively through contracted partners elsewhere in the country. The site is located on the outskirts of the capital. To the north-east of the site there is a field, surrounded by other light industrial facilities. The nearest residential area is ~170 m as the crow flies, while a combined sports and youth facility operates ~150 m away. The fire started in the north-west side warehouse, at warehouse 2. The warehouse is located on the property line, next to a car dealership. A regular event in the area has been homeless people crawling into the partially abandoned buildings, seeking shelter for the night.. On the evening of November 1st, the same thing happened. Stumbling around in the dark, they had knocked over boxes containing lithium 'AA' batteries used to test mobile phones, put back in their original packaging. It was later discovered that the batteries were still 40-100% charged. The batteries were then mixed with the halogenated solvent barrels stored next to them, causing a fire.

In front of the warehouse, a 15 m^3 nitrous oxide tank was stored, and outside, next to the wall, were IBC tanks with unknown chemicals. During the night, there was a single alert night watchman on the site who detected the fire and called the fire brigade.

The intervention

The first alarm was received at 21:26 by the news centre in the capital. The incident immediately started with a level II alert, but was raised to level III immediately after the first units arrived. The first responders found that the area was severely short of water. The nearest hydrant was more than 600 metres away, from which extinguishing could be carried out with the use of pressure booster fire engines. At the same time, the water company was requested to put more pressure on the system and carry water trucks to the scene. However, shuttle fire engines were still needed to run the water cannons. At the peak of the event on site there were:

- 19 fire engines, 17 other fire vehicles,
- 20 pieces of water jets with 3% foam ingriedient (52 mm),
- 2 pieces of watercannon with foam ingriedient,
- 2 pieces of fire ladders and
- 2 pieces of extinguishing powder jets.

The chemicals had a significant foam-disrupting effect. Because of this, and the frequent water shortages, the jets had to be repeatedly withdrawn. Final blackening was achieved by a combination of foam, water and powder jets.

During the fire, several of the barrels containing halogen boiled and exploded, while others rolled out on the access ramp. The explosion caused several barrels to exit through the shale roof, preventing any significant access to the warehouse. As a result, the warehouse was only extinguished from a water cannon, with the outside jets acting as a barrier to the spread of the fire.

However, the large quantity of extinguishing water floated up the lighter chemicals, which then started to run down the ramp leading out of the warehouse towards the neighbouring smaller warehouse with fire risk class 'A'. The material also flowed under the nitro-cleaning tank and the IBCs, which had to be protected. In addition, 11 unidentified gas cylinders were recovered from the fire. The fire was knocked down the next day, 2 November, at 12:30 am. The fire was reported extinguished at two in the morning, and the withdrawal from the area began at three in the morning.

Measures to protect the public

The Civil Protection Emergency Response Team (VFCS) arrived on the scene 75 minutes after the first alarm. The fire brigade and the civil protection alert system were not yet common at that time. The combustion of the hydrochloric acid gas in the warehouse had produced dioxin, the extent of which was sampled in an attempt to determine the extent of the damage after the incident. The soil samples taken in the area did not subsequently reveal any exceedance of the health limit value or any associated morbidity [3]. There was no need to order isolation, evacuation or relocation [4]. Restrictions were only imposed for substances potentially affected by combustion products. These included, among others:

- Prohibition of the consumption of free grown foods.
- Washing clothes, cars and children's toys stored in the open.

The restriction took place only until the next morning. A fire investigation and a parliamentary committee of inquiry were set up to investigate the incident [5]. The procedure was closed without results, but it provided good lessons for tightening the relevant legal framework [6] Eight people from a neighbouring car dealership washed nearly a hundred vehicles for half a day [7] During the intervention, one firefighter suffered a broken wrist; he slipped on the ice [8]. No other damage or injuries were reported beyond the premises.

Afterlife

During the extinguishing work, 6000 litres of light water, 2400 litres of finiflam foaming agent and 1500 kg of powder were used. Following the incident, the entire protective gear of more than 70 responders had to be replaced. The extinguishing work cost the Metropolitan Fire Brigade more than 20 million HUF.

The damaged/destroyed slate roof was replaced with corrugated sheeting throughout the warehouse. Later, a solar panel covering was added to provide power to the site.

To keep the trespassers out, concrete fences have been reinforced all around the site. Barbed wire has been run along the top of the fence in several places. The land next to the warehouse has been leased to another company. All areas of the site are monitored by fixed-angle cameras and centrally controlled cameras, which, in addition to security tasks, also monitor fire alarms.

A number of line smoke, flame and solvent detectors have been installed throughout the plant. The line detectors have many false signals from dust, fog, mist, vapour, movement of buildings, etc. Self-adjusting prisms have been installed to eliminate distortion of light structures. They were also fitted with vapour-proof boxes. The control centre is connected to the fire brigade with a two-minute cancellation time. The floor is double-insulated, of damage-resistant design, piped with a drain, with a central confluence.

To control the initial fires, a built-in IFEX flooded medium expansion foam generator was installed with 2 x 6 m^3 instant foam tanks and CO^2. With automatic sprinklers starting at 68 °C. The built-in fire extinguisher can be manually started from an external wall plane and operates for 20 minutes from its own tank. [9] In addition, a 150 m^3 firewater storage pool shared with the neighbouring site also serves to protect the site.

Analyses of the Relating Onsite Safety Measures

The most important facilities for residential waste management are waste incinerators and landfills. In order to protect the health of the population and the environment, the operators of the facility must comply with a number of disaster prevention and civil protection planning and fire prevention measures [10]. The collected materials in residential landfills typically contain large amounts of plastic or rubber derivatives. The harmful effects of fires that may occur may be similar to those experienced in plants dealing with dangerous substances [11]. Therefore, the state authorities must be prepared to prevent significant environmental and health polluting effects, and to introduce population protection measures [12].

In accordance with the opinion of the authors, during internal and external emergency planning, one should also prepare for the pollution of air, groundwater, and leachate [13]. The measures require special tools, but they are similar to the procedures and methods already known in the prevention regulations against major industrial accidents [14-15]. In addition to industrial safety measures, it is also particularly important the application of monitoring systems for the detection of dangerous substances that are primarily flammable and toxic in industrial environments [16]. To prevent and response the latter events, we apply the international regulations for the prevention of accidental fire water pollution [17].

Summary and conclusion

The origin of the fire can be traced back to human factors. The intervention was made difficult by the large quantity of unknown chemicals and their chemical reaction to the use of combined extinguishing agents. Subsequent precautions required considerable financial investment, but they are effective in all three factors (*break-in, spill, fire fighting*). Since then there have been no fires on the site. The safety level of the plant meets today's fire safety and industrial safety requirements to the maximum.

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