WorkSafe Bulletin

Reducing the risk of fires and explosions in asphalt plants

Bitumen, the main adhesive component in asphalt, releases flammable vapours when heated. These vapours can pose a significant fire and explosion hazard if they are not managed properly. This document describes situations in which bitumen releases flammable vapours in asphalt plants and discusses how employers can reduce the risk.

What are asphalt and bitumen?

Asphalt is a mixture of sand and gravel bound together by bitumen. Bitumen is a heavy residue by-product of oil refining. Bitumen ensures the durability and flexibility required in asphalt used for paving and roofing.

What increases the risk of fires and explosions?

When heated, bitumen releases flammable vapours. If these vapours build up in a work area, the risk of a fire or explosion increases.

The following incidents at asphalt plants illustrate this risk:

- A worker was welding to repair a hole in a container used for mixing cold-mix asphalt. The welding ignited vapours, triggering two explosions that caused minor injuries.
- Three workers were transferring liquid asphalt from a storage tank to a tanker trailer. The workers used a propane torch to heat a transfer line to make the asphalt flow more easily. The torch ignited vapours and caused a flash fire. The fire set off a series of blasts, killing two workers and injuring a third.
- A liquid asphalt storage tank was inadvertently overfilled. The excess asphalt seeped into the insulation layer between the tank's inner and outer shells. The insulation eventually ignited, resulting in a fire between the tank's shells. The fire was successfully contained, and no workers were injured.
- Workers saw smoke and flames coming from a liquid asphalt storage tank. An investigation found that the level of liquid asphalt was too low. This caused a high temperature inside the tank and led to a fire. No workers were injured.

How do I reduce the risk?

Review the safety data sheets (SDSs) for asphalt and other raw materials. In your review, confirm critical properties such as flashpoint, auto-ignition temperature, flammability limit, vapour pressure, and boiling point for each product. This review will help you determine the risk controls you need, such as those described in the following sections.

Train and supervise workers in the safe work procedures you put in place.

Implement appropriate controls when using cold-mix asphalt

Because of its chemical makeup, cold-mix asphalt generally has a lower flashpoint than hot-mix asphalt. This means that vapours from cold-mix asphalt can ignite at a lower temperature. It's crucial to implement the following safety measures:

- Make sure the heating temperatures do not exceed the manufacturer's recommendations.
- Provide adequate ventilation.
- Implement other appropriate precautions based on the SDS review, such as monitoring for flammable vapours.
- Control potential ignition sources (e.g., open flames, sparks, static electricity) in and around storage and application areas.
- Before carrying out welding or burning on a container that may have held cold-mix asphalt, clean the container thoroughly.

Ensure blockages in liquid asphalt transfer lines are managed safely

Blockages in pipes or valves can stop asphalt from flowing. In many cases, blockages can be prevented with the following engineering controls:

- Ensure piping is installed according to good engineering practice (e.g., adequate slope) to assist the flow of asphalt.
- Use an engineered heating system (e.g., oil jacket, heat tracing, asphalt cement piping) to reduce the likelihood of blockages.
- Insulate all piping, valves, and pumps that handle asphalt.

If a blockage occurs, workers typically use a propane torch (also called a tiger torch) to heat the transfer line and make the asphalt flow again. Before work begins with a propane torch, ensure that:

- A qualified person has conducted tests to ensure the work can be performed safely. (Under the Occupational Health and Safety Regulation, *qualified* means being knowledgeable of the work, the hazards involved, and how to control the hazards, through education, training, and/or experience.)
- Suitable safe work procedures have been put in place. This includes carrying out more testing at intervals that ensure the continuing safety of workers. Other safe work procedures may include the following:
  - Perform a field-level risk assessment before hot work (e.g., heating, welding, grinding) is carried out. The goal is to identify and control conditions that could result in fires and explosions.
  - Wear appropriate fire-resistant clothing.
  - Ensure fire extinguishers and fire blankets are readily available in case of a fire.
  - Inspect the torch's compressed gas cylinders before each use. If a cylinder is damaged, remove it from service and notify a supervisor.
  - Inspect the hoses, torches, and equipment that will be attached to a compressed gas cylinder before use. Remove and replace any damaged items.
  - Ensure that hoses connected to compressed gas cylinders have reverse flow check valves and flashback arrestors where applicable.
  - Apply heat through the steel pipe rather than directly to asphalt.
  - Move the torch back and forth along the pipe around the point of the blockage to prevent overheating a single spot.
  - Remove the torch immediately once asphalt begins flowing.

Manage the temperature and level of product in asphalt storage tanks

Preventing excessive temperature reduces the risk of fire or explosion by keeping the material stable and within safe operating limits. Controlling product levels prevents overfilling, spills, pressure buildup, and overheating.

First, consider implementing the following engineering controls:

- Automated temperature control systems. These systems keep asphalt within the required temperature range. This reduces the risk of overheating or cooling.
- Automated systems for monitoring temperature and product levels. These systems have sensors that can trigger alarms and/or shut off heating and filling operations when unsafe temperatures or levels are detected.

The following administrative controls can also reduce the risk:

- Develop and implement detailed standard operating procedures for monitoring and maintaining correct temperatures and levels in asphalt tanks.
- Implement a schedule of inspection, verification, and maintenance for monitoring and control systems to ensure they work properly.
- Provide comprehensive training to operators on proper monitoring techniques and emergency response in case equipment fails or temperatures or levels move outside safe limits.
- Set up real-time monitoring and alarm systems with adequate operating procedures for abnormal conditions (e.g., if temperatures or levels move outside safe limits).

For more information

The following sections of the OHS Regulation apply:

- Section 5.31, Flammable gas or vapour
- Sections 5.97–5.104, Emergency planning
- Section 8.31, When [flame resistant clothing is] required
- Section 12.116, Flammable and explosive substances
- Section 12.120, Flashback prevention

For more guidance on bitumen safety, refer to the EI 3011 Model Code of Safe Practice Part 11: Bitumen safety code, available for purchase from the Energy Institute (UK).