Bitumen boil over during a bitumen delivery into a storage tank

WHAT HAPPENED

Background – What is bitumen boil over?

A bitumen boil over occurs when hot bitumen comes into contact with 'free' water. The water immediately turns in steam expanding in volume by over 1600 times. The steam and hot bitumen form a hot foam which will rise up the tank and escape though any opening. If the foam cannot escape the tank will become pressurised. Both are extremely dangerous situations:

- Bitumen storage tanks are not designed to operate at pressure so rupture may occur.
- If the hot foam escapes it may be under pressure which is also extremely dangerous for anyone in the vicinity of the tank.

Brief description of the incident

1. Prior to a holiday period the contents of the tank were run down and the tank heating was turned off. The heating to the tank was off for over 2 weeks.
2. The heating was turned back on 18 hours prior to the planned bitumen delivery.
3. Prior to the delivery the contents gauges and High-Level Alarms (HLAs) were checked. The temperature of the product in the tank was also checked to confirm it was at 120°C, the expected temperature.
4. Towards the end of the bitumen delivery steam was emitted from the vent pipe followed by a hot bitumen foam. The hot foam was emitted for a period of 2 – 3 minutes. A video of the incident showed steam escaping from the tank shortly after commencing the delivery.

The driver could not see the steam being emitted from his location at the Homir valve on the delivery vehicle.

Root causes of the incident

The root causes of this incident were:

1. Condensation accumulating in the tank during the period that heating was turned off. Also, it is a possibility that there may have been ingress of water into the tank. No checks were made to see if water had accumulated in the tank.
2. Insufficient time was allowed for the bitumen in the tank to completely heat through. It is believed the surface of the bitumen in the tank was cold and therefore any water that had collected on the top of the cold bitumen had not had an opportunity to evaporate in a controlled manner.

Contributory factors

1. Although the HLAs on this tank are regularly checked there is no maintenance regime in place for the HLAs for this particular tank.
2. The contents gauge for the tank was out of calibration and it is believed that the reading on the contents gauge was inaccurate
3. The tank is over 20 years old and it is possible that carbonised bitumen on the side of the tank has reduced its safe working capacity (SWC).

LEARNING POINTS / ACTIONS TAKEN

Actions taken

The following actions were taken as a result of this incident:

1. For storage tanks containing cold bitumen a risk assessment and a safe system of work should be in place. When reheating the bitumen, it should be gradual heating applied at a relatively low level until all the bitumen has reached a temperature of 120°C. This will ensure that any moisture in the tank will evaporate in a controlled manner before any hot bitumen is added to the tank.
2. Do not turn off the heating for bitumen storage tanks over a short holiday period but reduce the operating temperature to 90-100°C to prevent condensation accumulating.
3. Carry out in-house training on bitumen storage and restarting the heating in cold tanks using the video of this incident to reinforce the message.

Learning points

1. The importance of ensuring that 'empty' bitumen storage tanks are free of water before starting to load hot bitumen into an empty tank.
2. The importance of planned maintenance to ensure that contents gauges and HLAs are calibrated and operating correctly.
3. Although pre-delivery checks were being carried out they were deemed insufficient as a check on the tank control system.

The vent pipe must be located where they do not pose a danger to any site personnel or to the delivery driver.

Useful literature

'*Guidance for bitumen deliveries into newstorage tanks and storage tanks being returned to service*'.

This can be downloaded free of charge from the Eurobitume website www.eurobitume.eu

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LOCATION:	**ASPHALT/COATING PLANT**	**ALERT STATUS:**	**Normal**
ACTIVITY:	**MANUAL HANDLING AND STORAGE**	**DATE ISSUED:**	**03/08/2022 18:51:09**
SUB ACTIVITY:	**BITUMEN**	**INCIDENT No:**	**03623**