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Process interruptions: a threat to process safety

July 2020

Screen capture of the explosion in the US CSB animation video of the incident (CSB REPORT NO. 2003-01-I-MS)

An explosion on October 13, 2002, propelled large fragments of debris offsite, some landed near crude oil storage tanks. Three people were injured, but fortunately, no fatalities occurred.

Steam leaking through manual block valves heated crude Mononitrotoluene (MNT) inside a vacuum distillation column, which was shut down and thought to be isolated. The column contained about 1,200 gallons (4.5 m³) of MNT, an energetic and reactive material which can decompose violently when heated. The material decomposed over several days, resulting in a runaway reaction and explosion. Debris from the explosion caused a storage tank fire and numerous smaller fires both onsite and offsite.

Low product demand delayed start up, but the MNT column was kept in total reflux, until the plant-wide shutdown was completed. A fire elsewhere caused operators to isolate heat sources to all columns including the MNT column by closing manual steam block valves and control valves. However, the valves on the MNT column were leaking through, and the temperature of the material in the MNT column did not drop but continued to rise, exceeding 450°F (232 °C) in about 8 days. There was no alarm, and there is no evidence that Operations personnel actively monitored the column temperature control system.

Did You Know?

- Some chemicals, especially when heated, can decompose, creating more heat and even exploding.
- Chemical reactions may continue at a slower rate below the usual reaction temperature and reach decomposition conditions given enough time.
- Chemical reactions can take place where they are not expected – like distillation columns or storage tanks.
- During shutdowns there may be distractions; crews may be performing different tasks or be working in different areas.
- Procedures may lack detail for non-standard operations like temporarily idling or shutting down with materials still in the process.

What Can You Do?

- Follow procedures and equipment isolation plans when equipment is shutdown.
- During shutdowns or temporary operations, continue to monitor process parameters and alarms.
- If chemicals are left in idled equipment, they need to be monitored and kept within safe limits; if those limits are exceeded, take appropriate action and notify the supervisor.
- If you notice block valves leaking through, have them repaired or replaced. Do not expect flow control valves to serve as block valves

Pay attention to all equipment containing chemicals, even if it is "shut down".