

Understand the Reactivity of Your Heat-Transfer Fluid

When thinking about chemical reaction hazards in your plant, remember to consider a possible reaction between heat-transfer fluids and your process materials in case of a leak in a heat exchanger, condenser, reboiler, reactor jacket or coil, or other heat-transfer equipment.

A plant had an explosion in the outlet piping of an oxidation reactor, which ruptured a 36-in. pipe. The explosion was caused by the reaction of nitrate salt, used as a heat-transfer fluid to remove heat from the reactor, leaking into the piping where carbonaceous deposits had been trapped in a short dead-leg. Reactive chemical testing indicated that the reaction closely resembled the decomposition of TNT explosive. Fortunately, nobody was injured. The incident showed that it was critical to avoid leaks of the nitrate salt, to detect leaks if they did occur, and to have a safe shutdown procedure if there was a leak.

While this incident involved a relatively reactive heat-transfer fluid (nitrate salt), many process materials can react with common heat-transfer fluids, such as water, steam, brine solutions, ethylene glycol solutions, or heat-transfer oils. The reactions may produce heat or generate gas and pressure.



What Can You Do?

- Make sure that your process-hazard-analysis studies consider the potential for leaks of non-process fluids, including reaction hazards. For example, consider: heat-transfer fluids; additives, such as corrosion inhibitors or biocides, in heat-transfer fluids; lubricating oils used in pumps, agitators, compressors, or other rotating equipment; material that might drain into vessels from vent collection systems; and any other materials that might get into your process equipment.
- Know how to detect utility fluid leaks into your plant equipment – including reactors or heat exchangers that can have thousands of tubes and require rigorous maintenance and inspection procedures to prevent leaks. You need to know:
 - How to recognize that a leak into the process is occurring
 - The specific changes that will take place in the way the process behaves if a leak does occur
 - Any specific process parameters that would provide useful information for detecting a leak
 - What to do if you suspect a leak

Don't forget that heating and cooling fluids can be reactive with your process!

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