

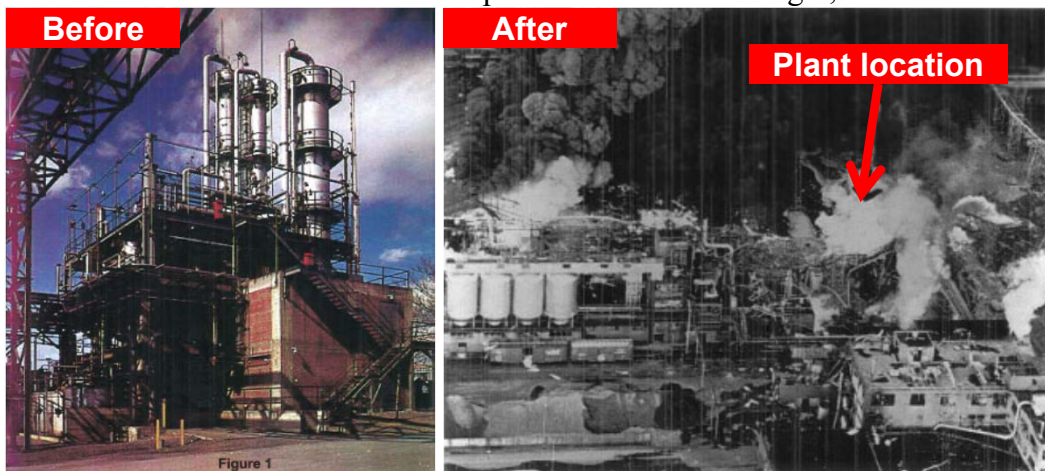
## What if that “wrong” instrument reading is correct?

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An explosion at a large US chemical manufacturing site caused 16 fatalities and more than 300 injuries. There were significant property damage and business interruption losses as well. The explosion occurred during startup of a distillation column. It is believed that the trays in the column were damaged early in the startup. The tray damage caused poor separation. There was an abnormally high nitrobenzene concentration in the bottom of the column – a concentration which was unstable.

There are many lessons from this incident (see references). This Beacon focuses on one – a “bad” temperature indication in the distillation column. Hours before the explosion, the column was put on total reflux because of startup difficulties. Later, a control system technician was asked to replace a thermocouple on a tray in the column below the feed tray. The reason – it was reading 121°C when it “should have been reading 102 °C.” The conclusion at the time was that the thermocouple had failed. In hindsight, the thermocouple was probably

reading correctly. Computer modeling of the column, done many years after the incident and assuming damage to the trays in the bottom of the column, predicted increased nitrobenzene concentration. This would account for the observed temperature of 121°C.



### What Can You Do?

How often do we dismiss readings that are not normal as “erroneous?” While this may be the case, shouldn’t we first assume that the instrument is reading correctly? Then, try to understand why the reading is not normal.

- Use other process instruments and related information to perform a more comprehensive assessment of what is happening in your process.
- What else can you do to understand if the instrument is failed or correct? For example, can you take a process sample for analysis to help understand the situation? Can you look at local temperature or pressure gages in the field? Can you look through a sight glass on top of a tank to see the level?
- Get help from your co-workers, supervisors, and engineering support.
- Ask “What are the possible consequences if this reading is correct?” Asking the question may lead to reviews that could uncover unexpected hazards.
- If the “erroneous” reading warns of a significant threat, work with your supervisors and technical support engineers. Understand what action you should be taking to prevent a possible incident if it turns out that the instrument reading is correct.
- In a good process safety culture, everybody should believe instruments, unless a thorough assessment indicates that an instrument reading is wrong.

References: *Process Safety Progress* 23 (3), September 2004, pp. 221–228, and *Process Safety Progress* 35 (1), March 2016, pp. 103–106.

**Think about what an “abnormal” instrument reading could mean!**

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