



A new look at coker drum switching and de-heading

According to an Occupational Safety & Health Administration (OSHA) article titled *Hazards of Delayed Coker Unit (DCU) Operations*, "The batch portion of DCU operations (drum switching and coke cutting) creates unique hazards, resulting in relatively frequent and serious accidents." The report goes on to explain the need to understand the hazards, which are listed as coke drum switching, coke drum head removal and coke cutting (hydroblasting operation).

Several international companies asked SIS-TECH Solutions to help identify a better way to make DCU operation safer.

A simple solution. Coker unit experts from the participating companies met with SIS-TECH engineers with the goal of identifying the risks associated with drum switching and de-heading. The team identified the following in-service and open drum events that could lead to dangerous hydrocarbon incidents.

In-service events:

- Vent valve opening
- Blowdown valve opening
- Drain valve opening
- Top head opening
- Bottom head opening
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Open-drum events:

- Overhead to fractionator valve opening
- Inlet feed valve opening

The company's engineers analyzed the DCU switching and de-heading in-service and open-drum risk events and determined that the most reliable, simplest and most cost-effective solution was to design a system that protects each drum individually, thus eliminating the complexities associated with multiple coker drum applications.

The Diamond-SIS coker drum switching solution is claimed to continuously monitor three key process variables to accurately and reliably detect when a coker drum is in service. The Diamond-SIS's logic solver uses the results of these three variables to prevent or allow five different valves from being operated when unacceptable process conditions exist.





Diamond-SIS coker drum solution inputs and outputs

Inputs:

- Overhead pressure
- Overhead temperature
- Inlet temperature

Outputs:

- Vent drain valve
- Top/Bottom head valves
- Blowdown valve
- Overhead to fractionator valve
- Inlet feed valve

What makes the company's solution different than simply implementing the logic using conventional relays is that the Diamond-SIS is designed and built as a certified safety instrumented system (SIS) suitable for applications requiring up to safety integrity level three (SIL 3) and flexible enough to accommodate 1oo1 (read as 1 out of 1), 1oo2, 2oo2 or 2oo3 voting schemes.

The *Controlling the Hazards* section of OSHA's report states, "[No one system has proven effective in eliminating all incidents associated with incorrect valve activation due to mistaken coke drum or module identification; however, the following actions have been reported as beneficial:](#)

- Provide interlocks for automated or remotely activated valve-switching systems.
- Provide interlocks for valves that are manually operated as part of the switching/decoking cycle to avoid unanticipated valve movement."

SIS-TECH's approach to mitigating the risks of coker drum switching and de-heading is claimed to be suitable for both actions (recommendations) identified in the OSHA report. The company was able to visualize a completely different way to solve an age-old problem.