0530 to 1000 the shift supervisor spent most of his time in the field helping operators perform shutdown tasks.

The operations manager indicated that he understood the importance of keeping catalyst above the spent slide valve and the importance of monitoring the differential pressure during the shutdown. However, he indicated that he was in and out of the control room the morning of the incident, primarily overseeing setup of the planned chemical cleaning, which was to occur immediately after shutdown.

As noted earlier, this was the board operator's first turnaround and [redacted] first experience with the shutdown procedure. [redacted] was not monitoring the spent slide valve differential pressure, and there was not a step in the new procedure indicating that the D/P was important to monitor.

Lack of Adequate Investigation and Response to Pre-Incident Events

Two booms were heard in the control room and by some workers in the field prior to the 1000 explosion on April 26, 2018. After the first boom, operators and supervisors stepped out of the control room to look for the cause, which they attributed to contractor work in the area (like a crane dropping a load), but without investigating further. The second of the two booms was heard and seen by operators and was the result of flammable materials travelling through the flare line – resulting in the flare lighting off. This was attributed to problems the manager had heard about occurring in the boiler house and SRU and again, was not investigated further.

It is not clear to the inspection team why this second event was not of significant concern and was not investigated further in light of the shutdown, which is known to result in serious events if not adequately monitored and performed. In fact, in this case Superior Refining Company had a 2018 Spring Turnaround Safety Bulletin[31] issued that included the following:

(b) (4)

The boom heard and seen from the vent line to flare (and the flare itself) should have resulted in alarms going off (such as a high pressure alarm) in the control room. However, operators interviewed did not know if an alarm had occurred.

Of interest though is that even though alarms may not have occurred or could have been missed, continuous emission monitoring (CEM) equipment at the stack experienced an increase in average stack flow beginning at approximately 0850 when the flow had been at a maximum of 290 scfm (standard cubic feet per minute), flow climbed to 1405 scfm at 0908am then gradually dropping to 785 scfm at 0935 before then climbing to 1180 scfm at 0946am (Figure 26). This indicated to the inspection team that reliefs had lifted somewhere in the refinery, which also should have been investigated by Superior Refining Company employees.

[31] See photos taken by the CSHO on 4/29/2018 of the site and of the incident planning. Photo number IMG 0760.