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**Question 3: What considerations do you make in determining the need for a safety instrumented system (SIS) in an Isomerization unit? What safety integrity level (SIL) do you use for temperature excursions, liquids fed to the regeneration superheater, or other significant safety events? What typical unit design features do you implement to mitigate these safety events?**

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For chlorided-alumina catalyst systems (Penex™ and Butamer™ units), the top hazard events for which interlock systems are provided are: Reactor temperature excursion Excessive Temperature in Regenerant (Electric) Superheater.

One of the leading causes of a reactor temperature excursion in a Penex or Butamer unit is low feed flow across the catalyst bed. The design of the shutdown interlocks includes upon low feed flow, the stoppage of reactor feed heating source and eventual removal of feed from the Reactors. Standard procedures, outside of shutdown systems exist for stopping or reducing the severity of incipient temperature excursions before they become uncontrolled.

In the event of high temperature at the heater elements, which can lead to sufficient heating of the heater walls to the point that there may be vessel damage, high sheath temperature will shut down the Superheater.

For Par-Isom™ Units, the following events which an interlock system is provided are:

Reactor bed temperature high temperature

Loss of Recycle Gas flow

Low Feed flow

The above events will remove the feed flow and stop the reactor feed heating source. For Par-Isom units, high temperatures will result in a loss of catalyst activity. The operator has the ability to initiate the automatic depressuring and purging of the reactor if the temperatures go excessively high.

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Year

2014