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Not having control system and process knowledge when creating a control systems narrative has consequences

Why Experience Matters When Developing the Control Narrative

Understanding the mechanical and structural design of a pressure letdown system requires a thorough understanding of the physical and chemical properties of the letdown medium, materials for the proposed construction and how to write the control system narrative to make all of these individual musicians play the same tune!

This is true for all letdown stations, regardless of application. What makes ebullating bed vacuum resid letdown stations exponentially more complex is understanding the required control systems that operate, maintain, and keep the facility safe.

One has to consider:

- high pressure
- high temperature
- abrasive particulate
- coking media
- hydrogen operating above the auto-ignition temperature

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Required Knowledge

There is the need to understand the delicate and time sensitive level control in the separator, including cutbacks, high rate depressuring and various other points of operation. Additionally, the vendor or engineering group designing modern letdown stations also need to understand how these stations are maintained and operated to supply 100% redundancy while maintaining near 100% availability in the main process letdown valve. This is a key feature and requirement from the licensor. To achieve such a monumental task as providing this much needed availability and redundancy, a series of valves, pipes, heaters, and other pieces of equipment must all work simultaneously to maintain process conditions, as well as auxiliary conditions on each station. This involves great product fluid knowledge related to coking, chemical composition of the process fluid, physical and compositional changes in the fluid due to the nature of the control valve, appropriate purge rates, boundary conditions and other considerations. Additionally, in-depth knowledge of the purging mediums, flushing mediums, supply lines, discharge lines, flare system tie ins, drain system tie ins, etc., are required for the process fluid to maintain a homogeneous and stable environment for the control system, not only on the letdown station, but upstream and downstream of the letdown station as well. It is this knowledge that has allowed the MOGAS Letdown Station to be **patent pending** in the United States, India and other key markets, thus ensuring MOGAS quality for the fabrication, import, or distribution of letdown stations.

Control valves take a beating by high pressure, abrasive, coke-prone media dropping from high temperatures with operating temperatures of 860° F or 460° C. This is the weakest link in the process requiring a fully redundant control valve in the letdown system.

Consequences

A stable plant is the only way to maximize conversion rates and profits for the facility, and can only be achieved when all systems work together. Having the appropriate experience in the operations and programming required to achieve this is paramount to the success of the overall project, not just to the success of the letdown stations. Failure to use an experienced design engineering company and experienced staff is a very critical aspect similar to the mechanical and structural design of the letdown station from a long-term operational view of the facility. These people will have knowledge and understanding of:

- the control system
- the operations of the facility
- the operations of past and other current facilities
- lessons learned from other facilities
- and how to implement the project to avoid past mistakes

Because without this knowledge and support, the facility will require longer commissioning, longer start up, and shorter run times due to coking, erosion, fire and maintenance issues. It will require to be shut down for longer turnaround periods all because the control system was not able to deliver the full potential of the intended mechanical design, not provide the 100% redundancy that was required in the first place.

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Conclusion

The control system is the heart and soul of the mechanical body of the letdown station. The safe, continuous operation of the control system is solely based on the proper control, interlock, safety functionality and integrated knowledge that its designer has placed into the system. The long-term success of the facility will always be tied to the competency of the control system. Past experience in previous ebullated bed plants has shown—and future ebullated bed projects will again most certainly demonstrate—that using control system designers without experience in ebullated plant letdown station functionality will not work to the benefit of the complex. It will add millions of dollars throughout the operational life of the facility to mitigate, migrate and alter both the physical structure, as well as the associate programming of these important and potentially dangerous parts of the facility. Only with proper planning and execution can these projects actually achieve the level of conversion and expected profits they are intended to deliver.