PRACTICE SHARING

AFPM American Fuel & Petrochemical Manufacturers

FCC Slide Valve Purge for Safe and Reliable Operation

Purpose and Use:

The purpose of this document is to share the practice of, and facilities used for, both continuous and non-continuous purging of slide valves on FCC units. Continuous purging of the stuffing box of FCC slide valves extends the life of the sealing materials, preventing leaks of hot-catalyst and process gasses, and ensures the reliable operation of the valve. Non-continuous purging of the valve body and guide rails with “blast” connections can be utilized to prevent valve “sticking” and ensure it is available to close if and when needed to mitigate mixture of air and hydrocarbon gases. However, excessive use of the non-continuous purge locations may result in excessive valve damage preventing their effectiveness and limiting their service life.

DISCLAIMER:

Practice Sharing Documents are meant to share information on process safety practices in order to help improve process safety performance and awareness throughout industry. The goal is to capture and share knowledge that could be used by other companies or sites when developing new process safety practices or improving existing ones. The Practice being shared has been used by an industry member, but this does not mean it should be used or that it will produce similar results at any other site. Rather, it is an option to consider when implementing or adjusting programs and practices at a site.

BY THEMSELVES, THE PRACTICE SHARING DOCUMENTS ARE NOT STANDARDS OR RECOMMENDED PRACTICES. THEY ARE NOT INTENDED TO REPLACE SOUND ENGINEERING JUDGMENT. THEY DO NOT PRECLUDE THE USE OF ALTERNATIVE METHODS THAT COMPLY WITH LEGAL REQUIREMENTS. A SUBJECT MATTER EXPERT SHOULD BE CONSULTED PRIOR TO DETERMINING WHETHER A PRACTICE SHARING DOCUMENT CAN BE USED IN ANY SPECIFIC SITUATION.

Scope:

This Practice Share document applies to FCC units, specifically, the slide valves in hot, catalyst-dense streams. The document shares practices and facilities used to purge the stuffing box of these valves. It also shares practices for use of non-continuous purges to the valve body and guide rails.

Description and Implementation:

FCC slide valves commonly have various purge locations where utility gas, typically nitrogen or steam, may be injected into the valve. These purge locations can generally be categorized as “continuous” and “non-continuous.” Continuous purge points are those that should have a utility gas lined up and flow regulated at all times. Non-continuous purge points are usually utilized for “blasting,” and use an outside operator to line up the utility gas. Maloperation of either of these systems can severely compromise the integrity of the valve, resulting in a valve that will not work as intended for control or in an emergency shutdown situation.

A common continuous purge location is the FCC slide valve stuffing box. A utility gas, typically nitrogen, is injected into the FCC slide valve stuffing box to prevent the ingress of abrasive catalyst particles into the annular space between the shaft and the graphite sealing rings. Catalyst that works its way into the slide valve stuffing

box can cause damage to the shaft and prevent the valve from moving or can lead to failure of the stuffing box and loss of containment of catalyst and process gasses.

The purge gas flow should be regulated, either by an orifice plate, pressure regulator, or throttling valve. Excessive purge flow rate/pressure could result in blowout of the sealing components. Too little purge flow rate/pressure can allow catalyst to enter the stuffing box. Figure 1 shows a Piping & Instrument Diagram (P&ID) of a typical basic stuffing box purge arrangement. The inclusion of a pressure gauge downstream of the purge pressure let-down gives basic minimum information about the operation of the stuffing box purge. The pressure at this location is typically controlled to 5-10 psi greater than the slide valve inlet process pressure. The addition of a flow meter to the purge piping is another enhancement that allows direct measurement of the purge flow rate and means to adjust the purge rate to match the OEM recommendations.

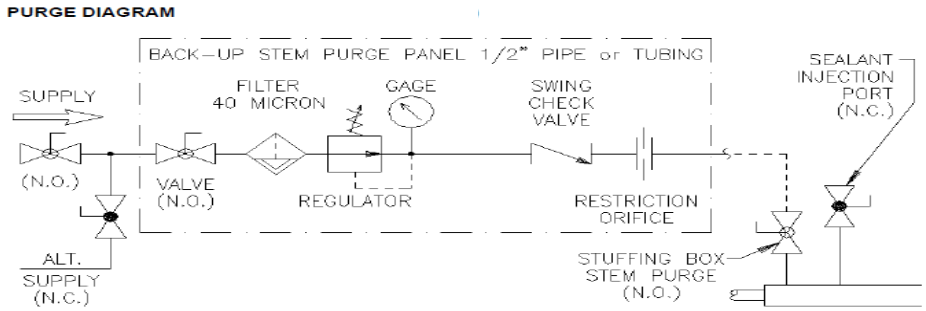

Figure 1. Purge medium control and monitoring P&ID

Slide valve vendors also offer compact “purge panels,” which are manifolds engineered to provide all necessary valves and instruments required to ensure the correct conditions for the slide valve purge. An example is shown in Figure 2 below. These purge panels can be provided with provisions for manual flow adjustment or automatic flow control, complete with Programmable Logic Controller (PLC)/Distributed Control System (DCS) continuous controllability and monitoring.

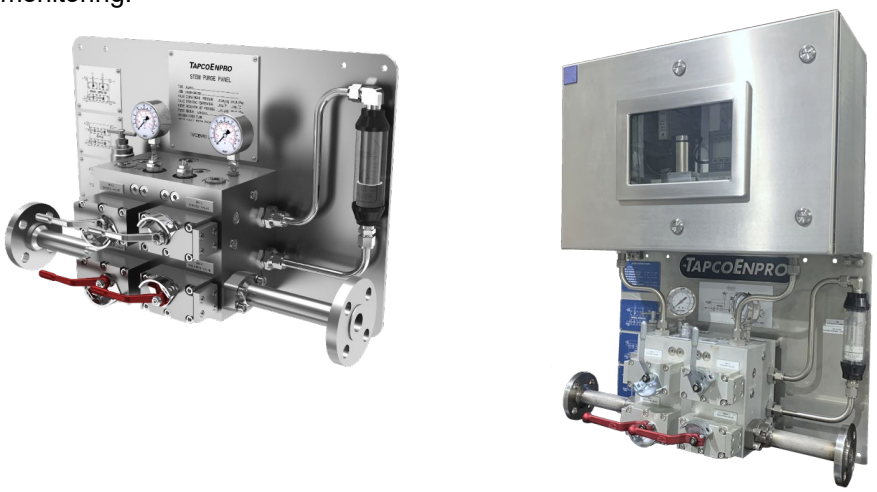

Figure 2. Example of compact purge panels with built-in redundancy. Manual control (left) and automatic control (right) control panel.

Note: This practice sharing document in no way alters any legal requirements. It is not intended to replace sound engineering analysis or judgment.

Practice Sharing

FCC Slide Valve Purge for Safe and Reliable Operation

Generally, there are two types of slide valve stuffing box purges, each with distinctive characteristics in how they are intended to function.

- **Dynamic (continuous) purge stuffing box design -** a continuing flow of purge media is supplied to the stuffing box to achieve the target pressure. Monitoring the purge gas flow rate and pressure over time allows the user to detect when the valve or stuffing box internals have significantly eroded or become obstructed.

- **Static purge stuffing box (previously known as 'purge-less' stuffing box) –** A continuous pressure from the purge media is maintained on the stuffing box and sealing components with very limited or no flow rate. If the sealing components get eroded or damaged, the purge starts to flow into the process and the stuffing box transitions to the equivalent of a continuous purge stuffing box design.

Stuffing box designs may vary from vendor to vendor. Users should be aware of the specifics of their valve's design and verify that the purge supply pressure/flows are within the vendors specification limits. In either case, observance of a change in flow/pressure of the purge media may indicate that the sealing components within the stuffing box have become worn.

Online intervention may be necessary to maintain the integrity of the stuffing box and thus the reliable operation of the valve. This may entail torquing the stuffing box to manufacturer specifications to tighten the sealing components, or injection of emergency sealant into the stuffing box to prevent a loss of containment. Maintenance should be well versed in these practices with procedures established and well understood. Users should consult with their valves manufacturer in case any doubt persists on maintaining their equipment.

Other provided injection points on the slide valve are intended for non-continuous use. These connections are often referred to as 'blast points,' provided for the purpose of injecting a high flow rate of gas over a very short interval. Common locations for blast points are in line with the valve guides and/or on the valve bonnet. In general, these blast points are used to remove catalysts that may prevent the smooth movement of the valve (i.e. valve sticking). Blast points only should be used over very short intervals (e.g., 30 seconds on, 60 seconds off, repeat) until valve movement is reestablished. Continuous usage of the blast points will result in severe internal erosion and compromise the integrity of the valve. Normally, the blast points should be air-gapped and only used with temporary hose connections, thus preventing inadvertent use and/or block valve leakage leading to internal slide valve damage.

Practice Sharing

FCC Slide Valve Purge for Safe and Reliable Operation

Example Implementation Checklist:

Procedures

- Establish a procedure for torquing/tightening the stuffing box
- Establish a procedure for the injection of emergency sealant into stuffing box.
- Establish a procedure for the use of non-continuous slide valve purges (e.g., “blast” taps)

Training

- Ensure there is clear understanding of the OEM specifications for the stuffing box purge – minimum/maximum flow and pressure of purge media.
- Ensure there is clear understanding of the purpose and usage of non-continuous slide valve purges (e.g., ‘blast’ taps)

Equipment and Piping Design

- Periodic operator rounds are used to confirm the stuffing box purge condition is aligned with the OEM specifications.
- Periodic operator rounds are used to confirm that non-continuous slide valve purges are normally isolated.

Control and Shutdown Systems

- Ensure that a functioning pressure gauge is provided downstream of the stuffing box purge flow regulator for use in confirming valve condition and troubleshooting.

References:

None.

Revision	Date	Summary of Changes
Initial Draft	August 2024	Initial Version
Revision	August 2024	HIPS Review
Revision	September 2024	PSW Review
Legal Review	January 2025	AFPM Legal Review
Final	March 2025	Published