

PRACTICE SHARING

Simplified DCS Screen for FCC Non-Routine Operations

Purpose and Use:

The purpose of this document is to share the practice of generating and using a simplified Distributed Control System (DCS) screen for Fluidized Catalytic Cracking (FCC) units focused on critical operating parameters and equipment status. **THE INTENT OF THIS SCREEN IS FOR MONITORING ONLY AND NOT CONTROL.** FCC monitoring during non-routine operations is challenging because many process variables are outside their normal operating ranges, which may result in a multitude of alarms being active. Normal operating screens may be too congested with information that takes away from the importance of key variables essential for monitoring during non-routine operations, which may contribute to the potential for human error. In addition, there are operating parameters that are not significant considerations during routine operations that are key to maintaining within safe limits during non-routine operations. DCS screens utilized for routine operation may not contain enough information critical to non-routine operations or the critical information may be lost in the confusion caused by multiple alarms displayed during the non-routine event. Some of those alarms may be the result of instruments operating outside their design ranges during the non-routine operations. The use of a monitoring screen allows personnel to monitor critical values with less confusion.

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 with a DCS capable of displaying process variable data and equipment status on multiple screens configurable by the user (normally site Control Systems engineers). It covers the generation and use of simplified DCS displays focused on critical operating parameters and equipment status during non-routine operations. Users of this practice may decide to create separate simplified DCS screens for different non-routine operations such as start-up, standby and emergency shutdown conditions.

Description and Implementation:

A simplified DCS screen for non-routine operations is intended to reduce the risk of loss of containment events during these periods. The first step in implementing this practice is to determine which non-routine operations (Startup, Shutdown, Standby) could benefit from the use of a simplified DCS screen. The input of Control board operators helps in making this determination.

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The simplified DCS screen outlines key operating parameters and equipment status pertinent to the non-routine operation(s) for which it is intended. Those parameters may be different depending on the configuration of the FCC unit. A simplified DCS screen can be created for non-routine operations to outline the key process information in this mode, including:

- Safety Instrumented System (SIS) Status
- Key pressures (Reactor / Regenerator / Fractionator)
- Key differential pressures (Reactor / Regen, Reactor / Fractionator)
- Slide Valve (SV) positions and differential
- Reactor mix isolation valve position
- Key catalyst levels
- Torch flow
- Air heater outlet temperature and gas flow if the heater is in service
- Steam, nitrogen, or air purge rates
- Riser / cyclone velocity
- Flue gas CO / O₂ concentration
- Flue Gas Environmental readings (SO₂, CO, CO₂, NO_x, and Opacity)
- Key temperatures (Riser Outlet Temperature, Regenerator Bed Temperature)
- Status of downstream equipment, e.g., Electrostatic Precipitator (ESP) and CO boiler

A key factor in the success of a simplified DCS screen is it displays only the information that is relevant to monitoring the facility for safety during non-routine operation. Displaying parameters that are calculated values such as differential pressures and velocities, reactor/regenerator catalyst balance, and main fractionator sour water balance saves the operator from having to perform these calculations and adds value to implementing a simplified DCS screen. Ideally, the look and feel (e.g., navigation, icons, etc.) of the simplified DCS screen is consistent with all other displays used within the DCS.

Review of the simplified DCS screen, including each of the values and trends of those values, becomes an integral part of shift handover among Control board operators when the unit is in a non-routine mode. A Practice Share document for an FCC shift handover checklist while in standby operations will also be made available on the Safety Portal.

Figure 1 shows one version of a simplified DCS screen in use by an operator at an FCC unit console, while Figure 2 shows another version in use at a different site. The simplified DCS screen for alternative FCC configurations will be different than the one shown, as will the key process information. Input from Console board operators helps to achieve the optimum balance of simplicity while including the information considered vital to verification of safe conditions.

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Figure 1. Simplified DCS screen for FCC standby operation at console



Figure 2. Another Simplified DCS screen for FCC standby operation at console

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References:

None.

Revision	Date	Summary of Changes
Initial Draft	April 2021	Initial Version
Revision	June 2021	HIPS Review
Revision	August 2021	PSW Review
Legal Review	September 2021	AFPM Legal Review
Final	September 2021	Published

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