The Importance of Platform Process Safety Audits – Data Collection and Documentation Needs

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Why are Audits Important?

- Verify that process safety systems are working as intended to manage risk and to keep everyone safe!
- Operators have opportunity for refresher discussions on process and safety system operations due to interaction with third-party audit/verification personnel.
- Standards, approaches, and processes are ever evolving, which audit could identify items for improvement.
- Operators, Engineers, Scientists, Trades, Contractors, or Regulators working with out-of-date information will result in the following:
  - More time/money expended to perform tasks with potential rework
  - Overlooked/misidentified process optimizations opportunities
API = American Petroleum Institute
MAWP = Maximum Allowable Working Pressure
MOC = Management of Change
PFD = Process Flow Diagram
PHA = Process Hazard Analysis
P&ID = Piping & Instrumentation Diagram
PSSR = Pre-Startup Safety Review
SAFE = Safety Analysis Function Evaluation
Identify Process Safety Items to be Audited (P&IDs/SAFE charts in example)

- Gather current and historical documentation from Operator to be audited
  - PFD, P&IDs, SAFE Charts, control philosophy, test records, and operating procedures
- Receive training from Operator for field safe access check of documentation
- Review PHA/PSSR information
- Perform Third-Party Independent Audit

Break Process Safety Item into smaller tasks (SAFE chart – single process)

- Pressure relief system, fire water system, production well, injection well, etc.
- Assemble drawings by system for field verification
- Check whether system modifications are planned and review MOC documentation
P&ID Verification

Trace each process system line

- Wellhead to departing pipeline
- Locate safety devices
- Verify process control components
- Verify maximum allowable working pressures (MAWP)
Update equipment and safety device function matrix

- All sensing devices
- Shutdown Valves (SDVs)
- Shutdown Devices
- Emergency Support Systems

Refer to API RP 14C – Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Safety Systems for Offshore Production Systems
Process Component Checklist

- Flow Lines (segment - portion of flow line with different assigned operating pressures than other portions of the same flow line)
- Wellhead Injection Lines
- Headers
- Pressure Vessels
- Atmospheric Vessels
- Fired and Exhaust Heated Components
- Pumps
- Compressors
- Pipelines (Lines between Platforms or Platform to/from Shore)
- Heat Exchangers
Undesirable Events

List of some undesirable events

- Overpressure or underpressure
- Leak (low flow) or Overflow
- Gas Blowby
- Excess Temperature
- Direct Ignition Source
- Excess fuel in Firing Chamber
### Master Safety Analysis Table

- Undesirable Events
- Cause
- Effect
- Detectable Condition at Component
- Protection
  - Primary
  - Secondary
Pipeline Pump Overpressure Example

➢ Cause
  • Closed/Blocked Valve

➢ Effect
  • Potential rupture or leak of process fluids

➢ Detectable Condition at Component
  • High Pressure

➢ Primary Protection
  • Pressure Safety High (PSH) shutdown

➢ Secondary Protection
  • Pressure Safety Valve (PSV) relieves system pressure
Pump Component Checklist (pipeline pumps)

- Pressure Safety High (PSH)
  - Installed

- Pressure Safety Low (PSL)
  - Installed
  - Pump does not handle hydrocarbons.

- Pressure Safety Valve (PSV)
  - Installed
  - Pump is kinetic energy type and incapable of generating a head greater than the MAWP of the discharging pipe.

- Flow Safety Valve (FSV)
  - Installed
## EXAMPLE

### SAFETY ANALYSIS FUNCTION EVALUATION CHART

<table>
<thead>
<tr>
<th>Process Component</th>
<th>Device I.D.</th>
<th>Alternate Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Identification</strong></td>
<td><strong>Service</strong></td>
<td><strong>SAC REF. Number</strong></td>
</tr>
<tr>
<td>P 1</td>
<td>PIPELINE PUMP</td>
<td>PSH 001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSL 002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSV 003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSV 005</td>
</tr>
</tbody>
</table>
Safety Analysis Checklist (SAC)

- Lists process components
- List of all recommended safety devices
- List conditions under which particular safety devices may be excluded (SAC’d out)
Lessons Learned

Process Safety Audit – Lessons Learned

➢ Audit Execution

• Remind personnel that goal is to keep processes operating as intended, to manage risk, and to keep personnel safe on the platform.

• Avoid tracing piping when simultaneous operations are occurring at the facility.

• Overhead scaffolding and welding habitats can obscure the piping from the walkways, requiring much more time to check and verify the P&IDs/SAFE Charts.

• Communicate with Operation & Maintenance personnel regarding component/device controls during the field verification process to validate operating as intended, when possible.

• When available, device test records are valuable in checking that the correct device labels are present on the P&IDs, as well as checking the device functionality listed on the SAFE charts.

• Take temporary tags for devices/valves that are missing tags for later permanent tag installation.
Lessons Learned

Process Safety Audit – Lessons Learned (continued)

- Post Audit
  - Recommend Management of Change (MOC) procedures include drawing revisions when equipment or control logic are changed.
  - One goal is to improve communications between Engineering, Operations & Maintenance, and Health/Environmental/Safety (HES) personnel when process changes are made.
  - Process Safety Audit provides feedback whether Process Hazard Analysis (PHA) → Pre-startup Safety Review (PSSR) with overarching MOC procedures are being effectively used for risk management.
  - Process Safety Audit approaches vary and should migrate towards evaluation of the levels of documentation, implementation, and effectiveness for risk management.