SAFETY BULLETIN 35/22

Management of Safety Critical Device - Key element of Risk Management

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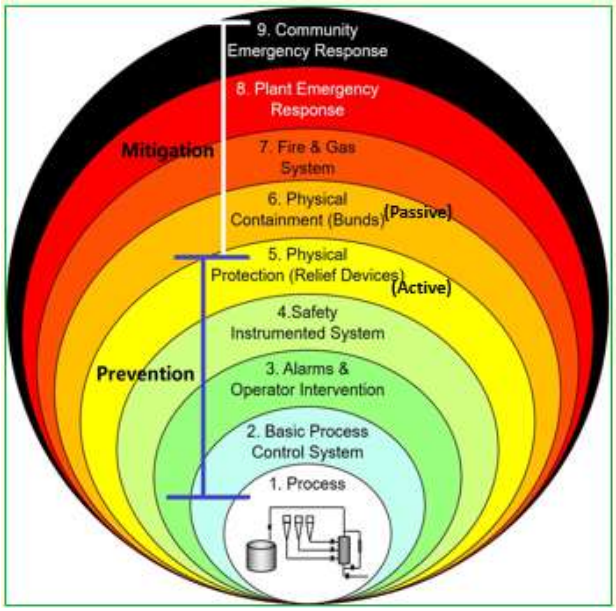
PSM Element # 16, Management of Safety Critical Devices

What is a Safety Critical Device and why does it have to be managed?

Safety Critical Devices

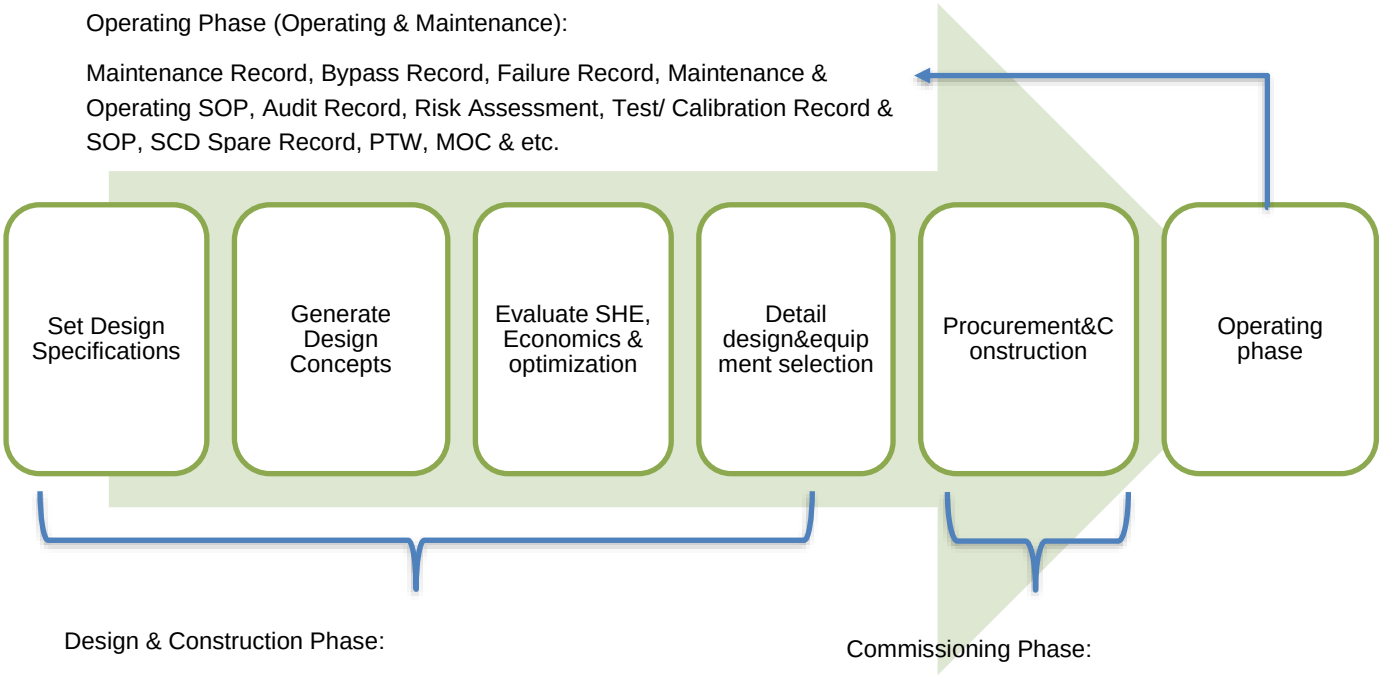
- ✓ Safety Critical Devices (SCDs) have the purpose of preventing, or limiting the effect of a major incident, and the failure of SCDs could cause or contribute substantially to a major incident.
- ✓ SCDs are intended to be the important lines of defense against a major incident and its consequences.



Examples

- ✓ Safety Instrumented System:
  Warm End Cold Embrittlement Protection; Cryogenic Tank LIN, LOX, LAR Overflow & Spillage Detection
- ✓ Physical Protection (Relief Devices):
  Bursting Disc; Pressure Safety Relief Device; Line block Safety Valve
- ✓ Physical Containment:
  Bunds; Containment tank; Barrier for O_2 compressor

An essential requirement for process safety is that the safety critical equipment and devices (SCDs) are in service and functioning correctly. Management should ensure that the safety critical equipment and devices are identified and appropriately managed, so that they are in service and functioning correctly. SCD Management **MUST** be practiced throughout the plant life cycle



What can go wrong? Examples of incidents

There have been many incidents within the industrial gas industry which occurred due to non-adherence to the Management of Safety Critical Device. Several cases study are seen below to illustrate the importance of the Management of SCDs:

Case 1

What Happened?

- Inlet LIN valve failed to close upon low temperature detection at the backup LIN vaporizer outlet gas pipeline.

- Causes cold embrittlement on the CS side of the outlet N2 gas pipeline
- Pipe bursting occurred

Findings

- **Risk assessment** not completed
- **MOC** not fully implemented
- **Valve was not designed** to be in the open position for long periods
- Low temperature trip system loop - **not fully tested** since start up

Case 2

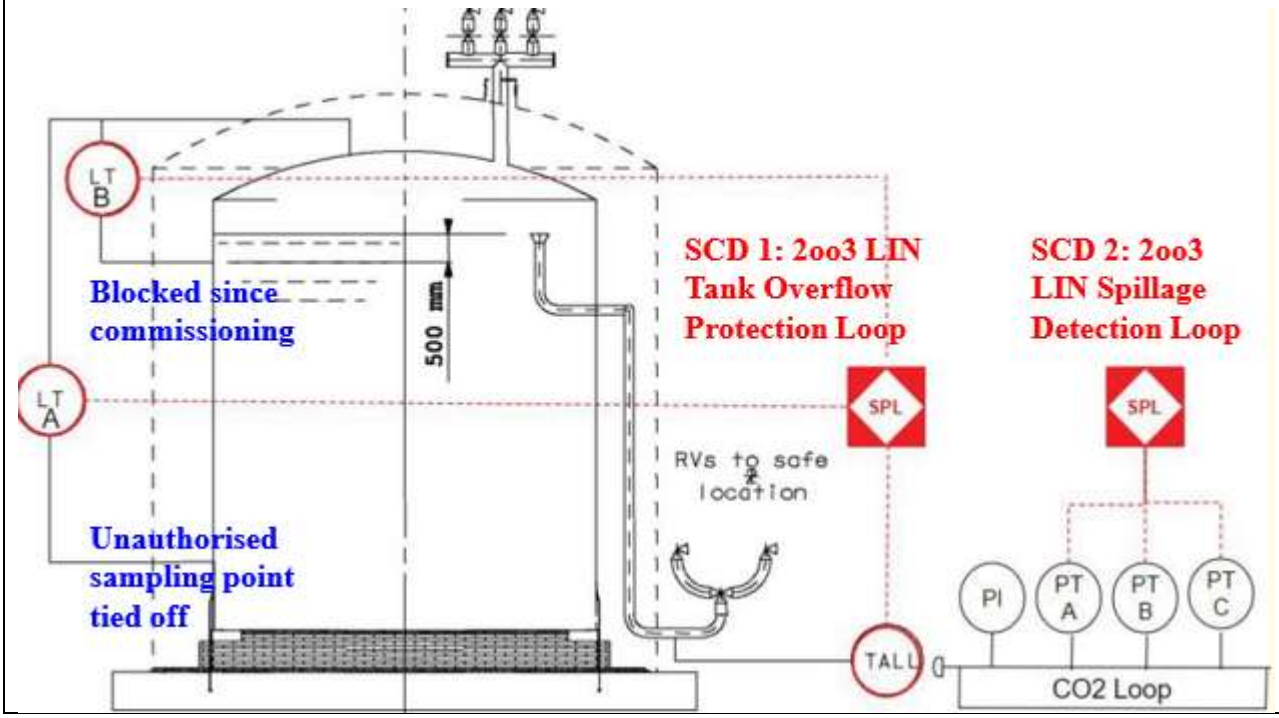
What Happened?

- LOX Transferred from ASU to FBT by a small shop-built tank.
- Intermittent Transfers of LOX through a long run of warm piping caused excessive vapor to FBT, resulting in pressure spikes.
- PSV lifted and exceeded its capacity due to the warm case
- LOX FBT Overpressure

Findings

- **Risk assessment** for intermittent liquid transfers not completed
- Icing **blocked one PSV** nozzle caused by periodic operation at low pressure was not identified.

Case 3



What Happened?
• LIN Tank overflow. • Detected & isolated by spillage detection (PALL of the “CO2 loop”, Safety related programmable Logic) • Overflow safety loop (2 out of 3; LT-A, LT-B & TALL, **Safety related programmable Logic**) failed to detect the overflow. • LIN Spillage from Flat Bottom Tank(FBT)
Findings
• **LT-B blocked since commissioning** - improper drying during hydrostatic testing. No MOC. • An **unauthorized sample point** was tied off to the LT-A. No MOC.

Learnings from the Incidents – what can you do?

Your safety is built in layers. Make sure the Safety Critical Devices (SCDs) are kept functional!

Inspect and test your safety systems to be sure they work!

What can you do?	What can you do?
• Understand the major hazards at your plant. • Know the critical safeguards against those hazards and be sure they are working properly. • If you regularly have to operate with critical safeguards bypassed or impaired, report this to management. • Do not place automatic controls in manual, do not bypass interlocks nor disable relief valves. • If there is no other choice while something is being repaired, use Temporary MOC procedures to manage disabling/impairing of safety systems for a short time, with all affected persons made aware of this. • Make sure that unreliable controls and safeguards are considered in Process Hazards Analysis reviews.	• If you are involved in inspecting and testing safety alarms, interlocks, and other safety devices, always follow procedures rigorously, and document the results. • Use written checklists and procedures to ensure that required tests are properly done. • Always remember to put the safety device back online when inspection and testing are complete. • Know where to find the results of safety device tests. If you find that the required tests have not been done or documented, report your observations to management. • If you are aware of safety devices that do not have inspection and testing programs, report this to management.

Conclusion and key takeaways:

The following is a list of guidelines for SCDs from AIGA 099/20, Process Safety Management

- SCDs are uniquely identified and a file is kept of all design information and maintenance activity on the equipment;
- SCD testing, inspection and maintenance programs are in place and approved by competent individuals;
- There are systems in place to ensure that SCD testing, inspection, and maintenance programs are reviewed periodically using findings from the program, industry experience, and incidents to identify and address issues and opportunities for improvement;
- Plans and schedules are developed for execution of testing, inspection, and maintenance programs based upon the risk associated with failure of the SCDs;
- Competent personnel are available to establish and perform the testing, inspection, and maintenance programs;
- There are systems in place to ensure that findings and recommendations from the SCD testing, inspection, and maintenance programs are prioritized and addressed; and
- Procedures for disarming, deactivation, or bypassing of SCDs are reviewed and approved by management.

Useful Reference Information

1. AIGA 099/20, *Process Safety Management*, www.asiaiga.org
2. AIGA Safety Bulletin SB 30/22, *Management of Change*, www.asiaiga.org
3. AIGA Safety Poster 07/19, *Process Safety*, www.asiaiga.org