

Process Safety Conference Dordrecht May 2023

Captive Key Systems as an Independent Layer of Safety

Applied to pressure safety valves (PSV)

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Captive Key Systems as an Independent Layer of Safety

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Captive Key Systems as an Independent Layer of Safety

Introduction

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A **Halma** company



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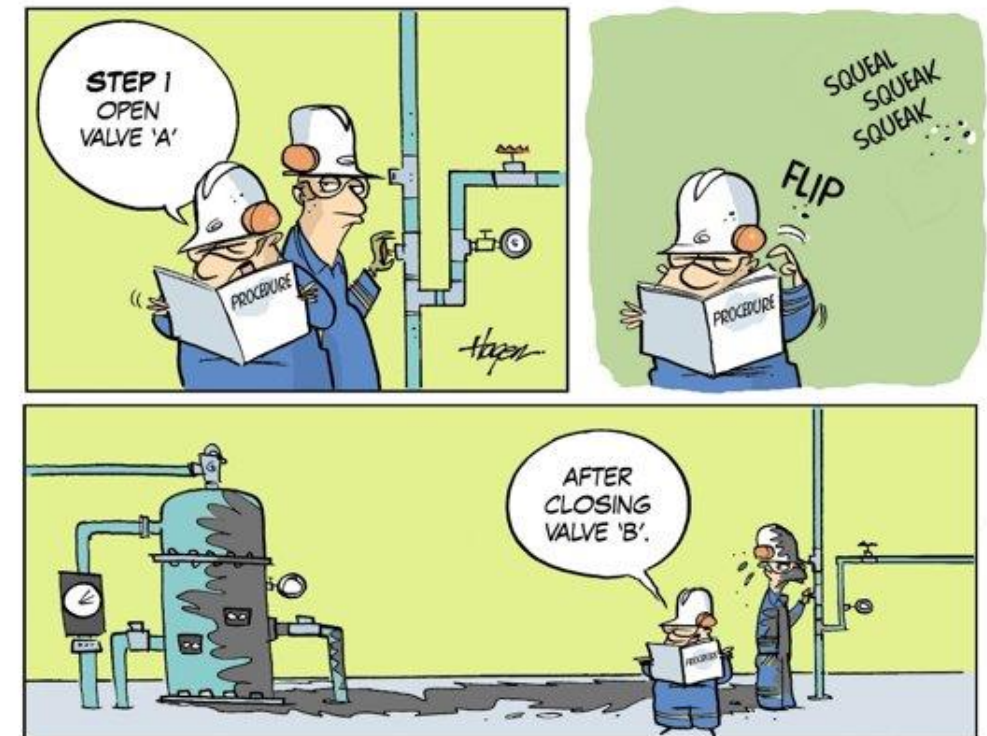
Safety Principles versus Investment Costs



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Written Procedure

- Common way to guide operators through tasks
- Ensure that tasks are performed correctly.
- 49 of 100 incidents in oil and gas industries over the past two decades include some sort of procedural errors
- Tend to be ambiguous and complex
- Require judgment or decisions from operators



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LOTO

LOTO is a procedure, used to isolate hazardous energy sources to prevent accident during servicing or maintenance

In Process Industry “LOTO” is the used to prevent valve operation.

Main Challenges:

- Clear definition between both way of use
- Lack of Procedures
- Training all Employees
- Audit of procedures and review of findings



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Individual Solution

- Massive Steelwork in front of the valves
- Steelwork hamper the operation of the valves
- Sliding bar difficult to operate and position
- All valve stems at one level
- Space consuming design
- Welding at the valve stem required



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Actuators

- Additional infrastructure required
- Save human resources on operation
- Implementation into the control system
- High investment costs
- Difficult to retrofit
- Potential risk for override by local operation



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Captive Key

- Fully mechanical
- Operator guiding by unique coded keys
- No misinterpretation of steps
- Safe handling of complex processes
- Easy retrofitting
- Involvement of all kind of equipment
- No additional infrastructure
- Training all Employees



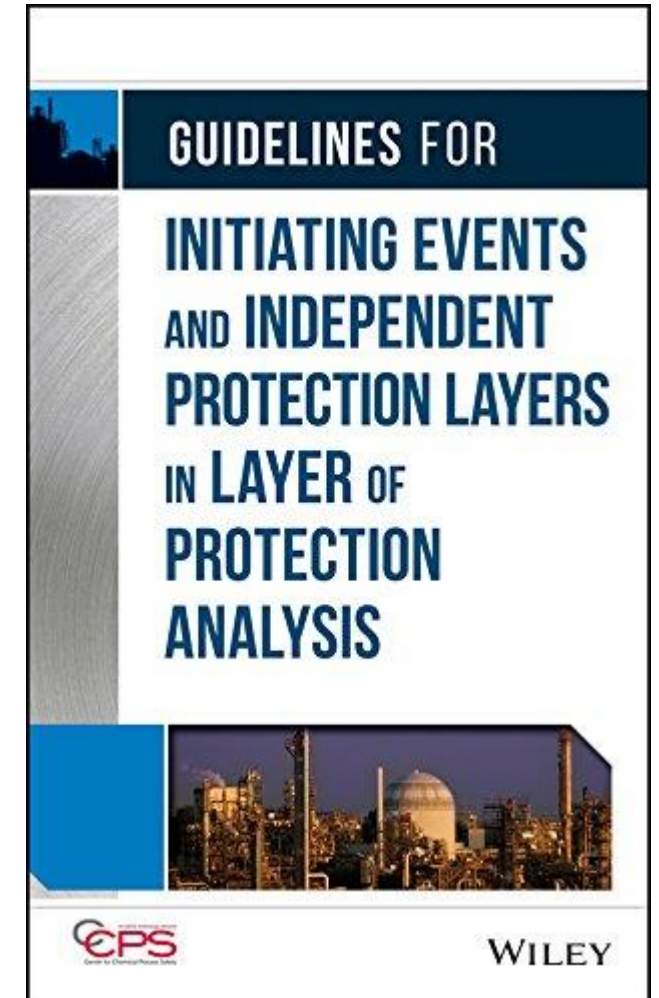
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Captive Key System

The Captive Key System is described as follows:

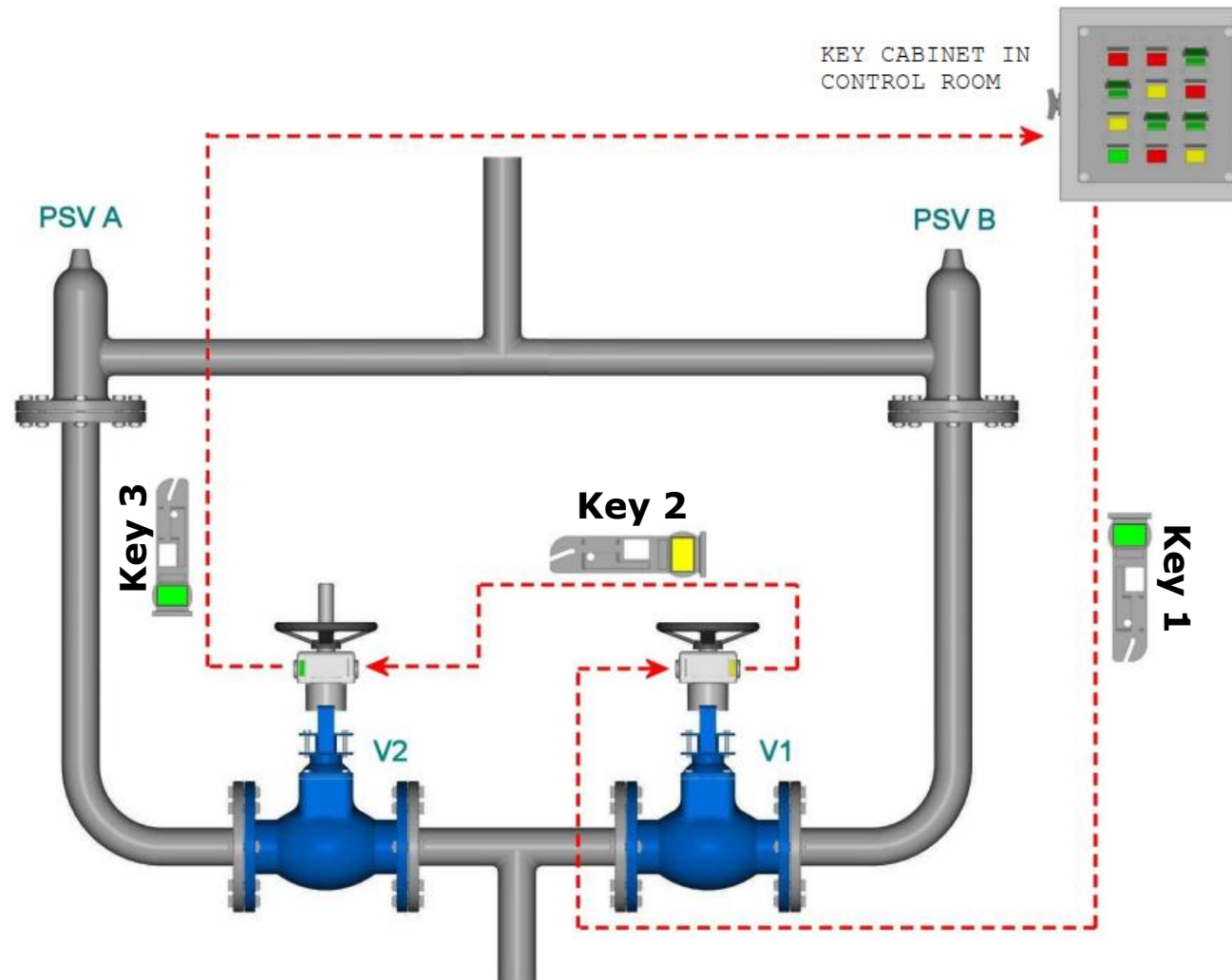
A captive key/lock system employs mechanical linkages that are released by unique keys to prevent movement of a device (such as door handle or valve). This prevent humans from operating the valves in the wrong sequence. The captive key lock capability is an integral part of the hardware design and is not able to be removed or defeated by tools readily available to the worker.

Generic PFD suggested for use in LOPA: 0,01



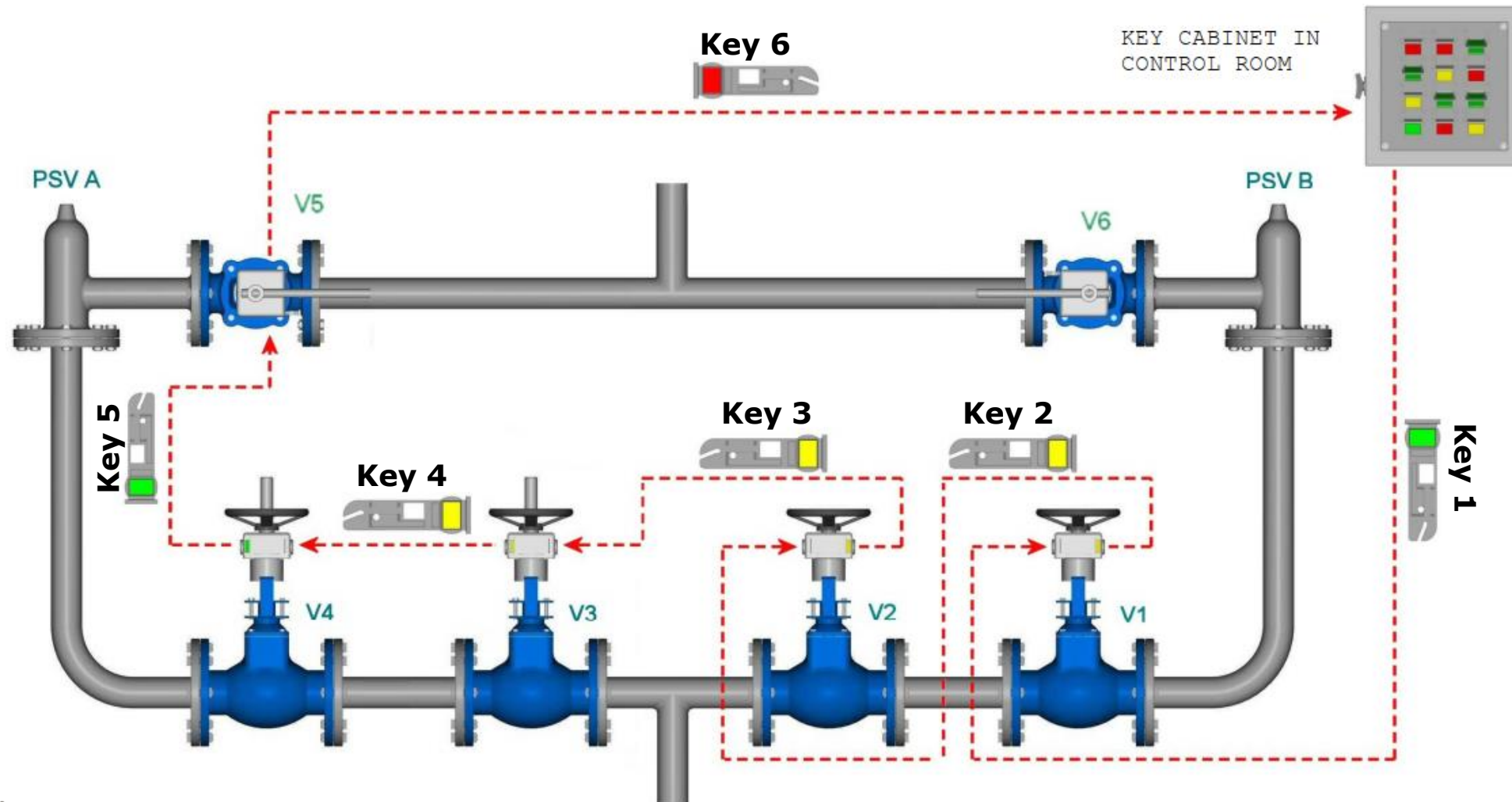
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Captive Key goes PSV Systems



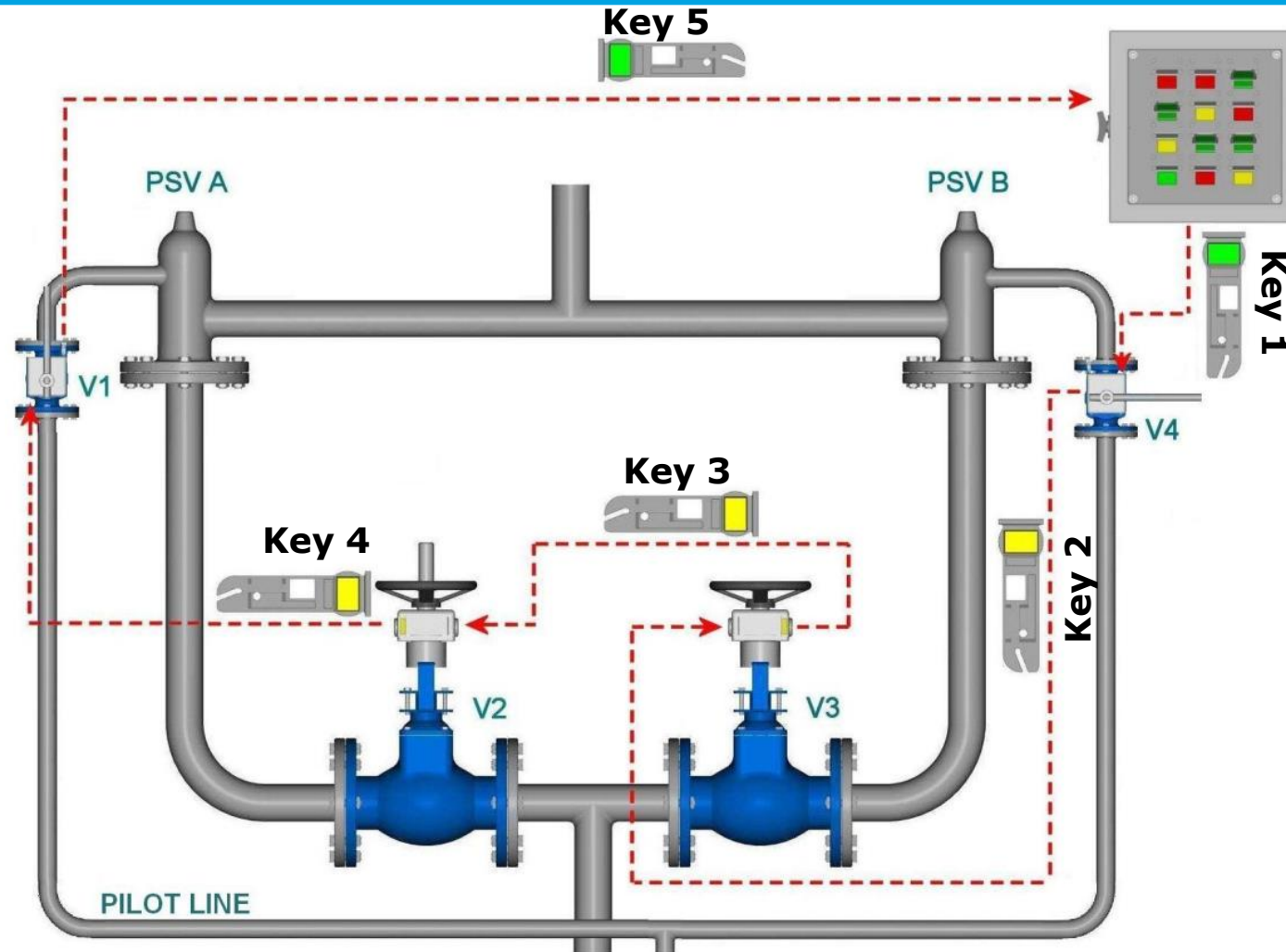
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Captive Key goes PSV Systems



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Captive Key goes PSV Systems



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Captive Key goes PSV Systems

PSV, an Application with challenges

- Redundancy
- Pilot operated (including the pilot line)
- PSV with pneumatic Air assistance (including the monitoring line)
- Status of the outlet valves (open or close)
- Captive key system with or without start key
- PSV Chattering



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Applications across the Industries

Pig Launching and Receiving

Guarantee safe pig launching and receiving with full integration into the DCS system.

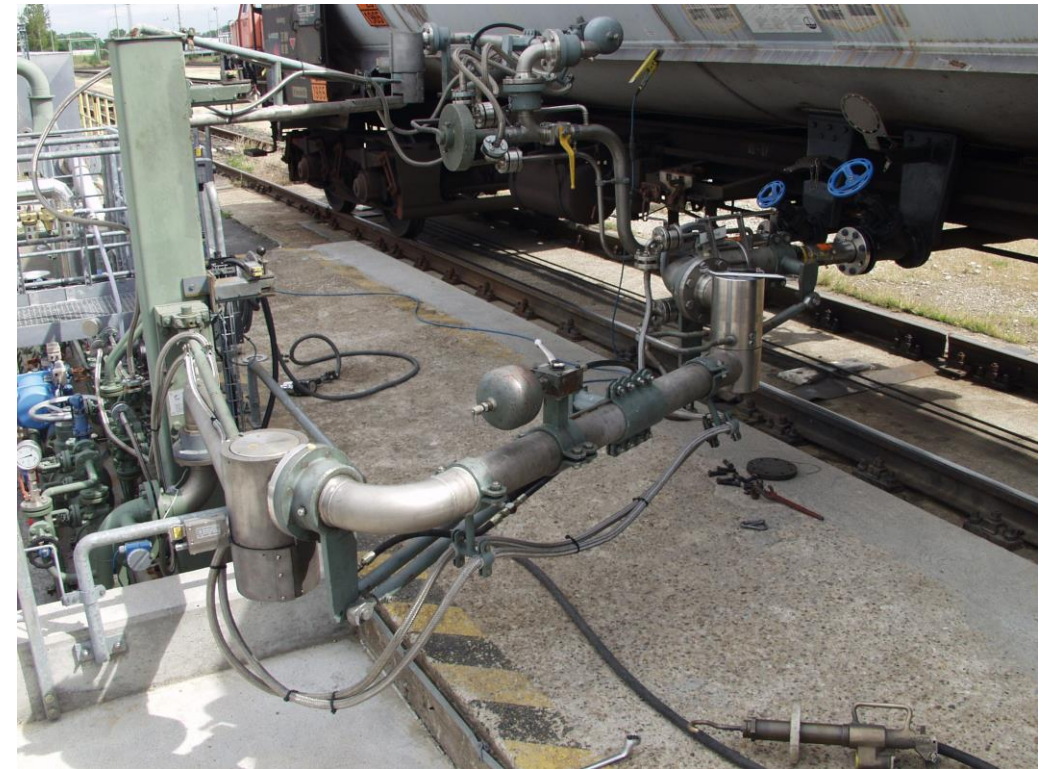


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Applications across the Industries

Railway loading and unloading

Prevent the tank wagon from moving during the loading process.

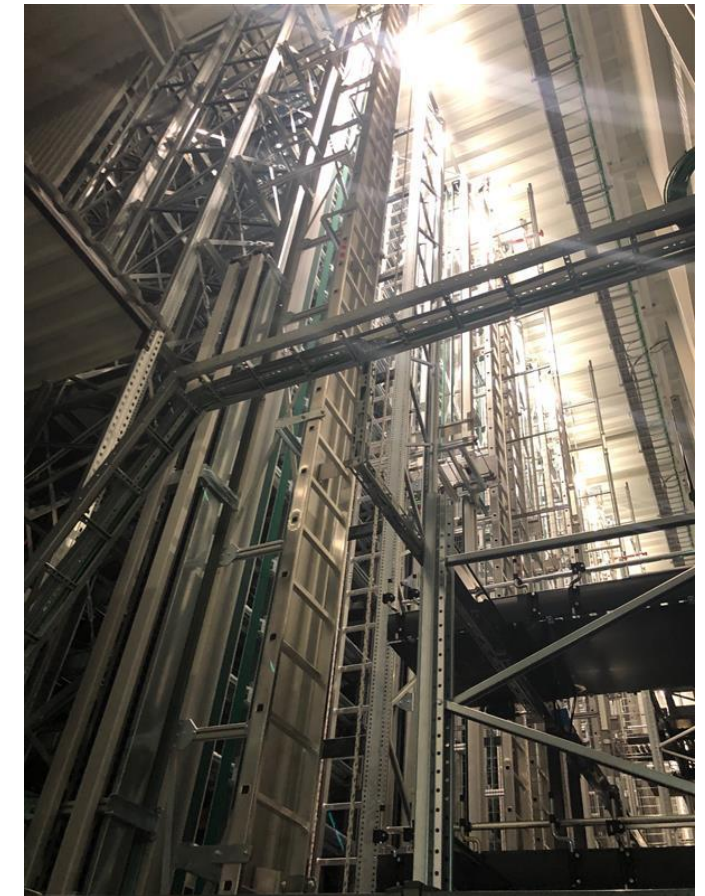


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Applications across the Industries

CO2 Fire Extinguishing System

Ensure that nobody is within the production area when the CO2 system get activated.

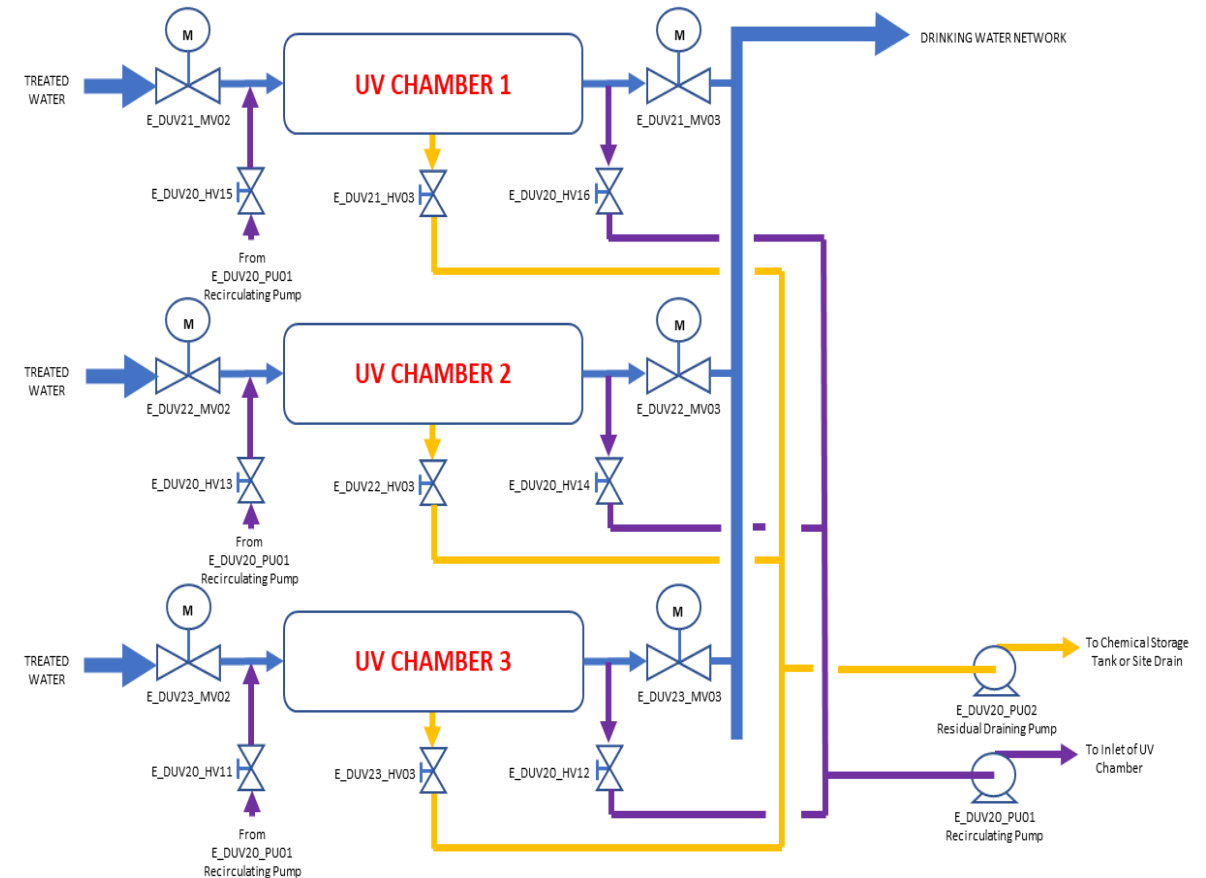
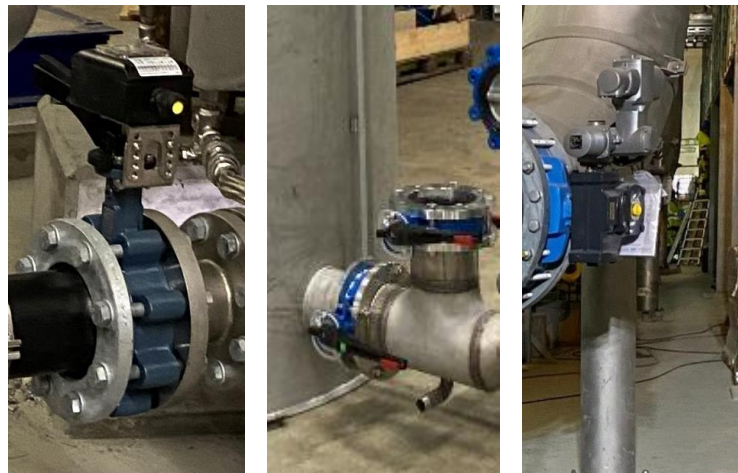


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Applications across the Industries

Drinking Water Supply

Prevent that Oxalic Acid, required for the cleaning process of the UV Chambers can be pumped into the drinking water network.

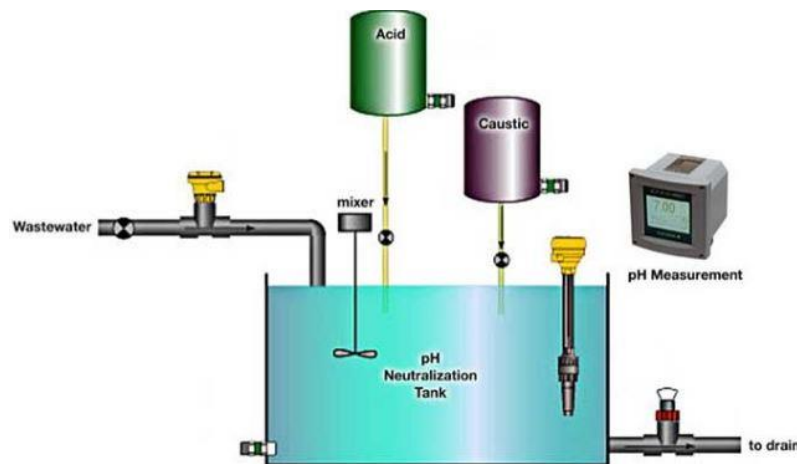


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Applications across the Industries

Wastewater Treatment

Prevent mixing of the chemicals as well as the contamination of the environment from offloading into the incorrect fill point.



Thank you for your audience.