EPSC
Process Safety Fundamentals and Learning From Incidents

For 7th IACG meeting

EPSC
THE PROCESS SAFETY NETWORK

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After Bhopal
"Protecting Society Together"

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THE PROCESS SAFETY NETWORK

Legitimate Network

Industrial Best Practices

Active topics

Pharma: Dust & Statics

CHEF / RAST

Leadership & Culture

Digitalization

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HAZOP Efficiency

Energy Transition & Renewables

PS Fundamentals

EPSC Process Safety Fundamentals

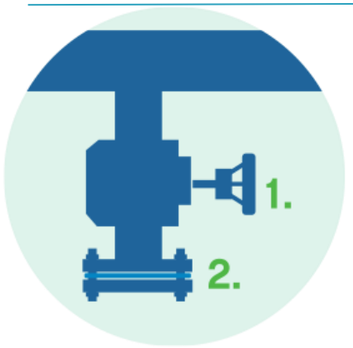
Different from:

- PSM
- Life saving rules

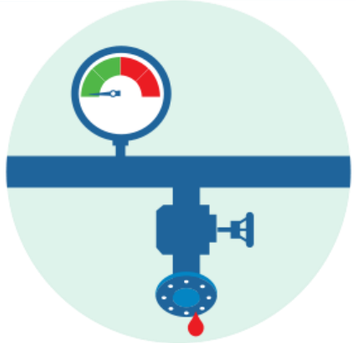
Booklet:
https://viewer.pdf-online.nl/books/bial/#p=4

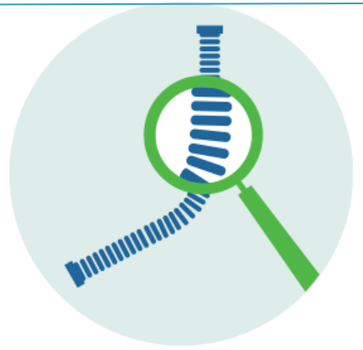
	LIFE SAVING RULES	PROCESS SAFETY FUNDAMENTALS
OBJECTIVE	Reduce number of injuries/Fatalities	Avoid loss of containment of chemicals with potentially serious consequences for people, environment and assets
HSE DOMAIN	Behaviors in occupational safety	Behaviors in operations involving hazardous chemicals
TARGET POPULATION	All	Operation teams on hazardous sites (process operators, supervisors, operational management, contractors, maintenance technicians)
NATURE AND APPLICABILLITY	Simple rules that are easy to understand and apply in all circumstances	More complex principles that cannot always be fully applied (e.g. in case of design issues)
IMPLMENTATION	Non-negotiable set of requirements (Life Saving Rules / Golden Rules)	The aim is to identify situations that are not in line with the Process Safety Fundamentals and to start a discussion on how to proceed, while avoiding uncontrolled initiatives "to get the job done"

EPSC PSF Pictograms

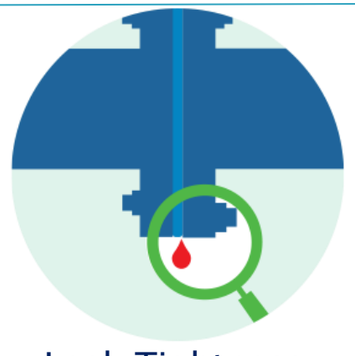


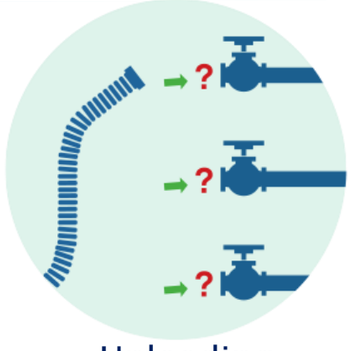
Double Isolation


First Line Break


Flexible Hoses


Furnace Burners

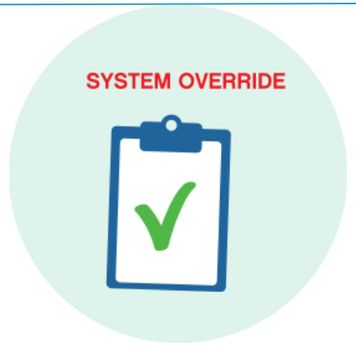

Leak Tightness



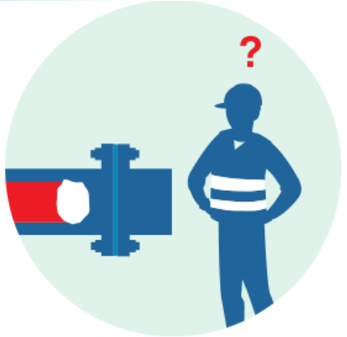
Unloading


Open Drain


Operating Limits



Overrides



Plugged Equipment

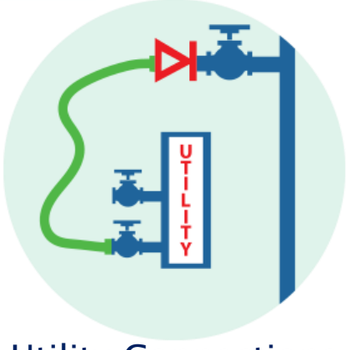
Critical Equipment

Reporting


Run Away Reaction


Splash Loading


Line of Fire



Utility Connections


Walk the Line


Single valve

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Sharing practical learnings

Antwerp: Dec 7&8 2021

www.SafetyCongress.eu

Industry Leaders

Effective & Practical Learning

EPSC Learning Sheets

www.EPSC.be

- Raise awareness on a relevant cases
- Anonymous (no shame no blame)
- Story with a photo
- Relevant aspects
- The discussion creates the effect
- Easy accessible in multiple languages

Learning Sheets

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www.EPSC.be

Fire in a Pipeline Trench

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EPSC Learning Sheet February 2021

What Happened:
To start-up a new isomerisation unit at a refinery, an existing pipeline was cleaned and drained. When Naphtha was pumped through that line, the drain plate was still open and over 1000 m3 spilled into a pipe trench. This started a fire with serious damages.

Relevant Process Safety Fundamentals

Walk the Line

Validate Leak Tightness

Aspects:

- Good checklists “isolation plans” should indicate all flanges and valves to be involved in a special operation.
- After opening an installation, a leak proof test is required before putting hazardous chemicals in that system.
- Before starting a transfer-pump apply “walk the line” principles, to validate the line-up. Also check that changes in level and transfer-flow do match well.
- Pipeline trench design can reduce consequences of a spill: compartment of the trench, gas detection, fire resistance of critical pipelines and good access to fire hydrants.

Validate the line-up at a transfer

Learning Sheets

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SM cloud from a storage tank

EPSC Learning Sheet September 2020

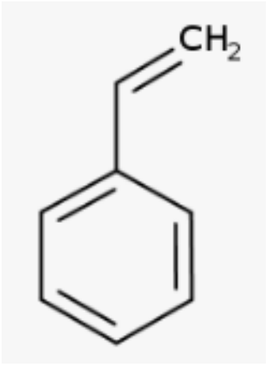
EPSC

What Happened:
Styrene Monomer (SM) polymerised exothermally in two storage tanks, evaporating SM that was released from the tank. The toxic gas cloud killed 12 and injured ca 1000 in the area.

Aspects:

- SM evaporation created a lethal concentration of 5000 ppm at 200 m distance, killing and injuring nearby civilians.
- SM polymerisation must be avoided by keeping the temperature below 20°C and adding an inhibitor (TBC).
- Control tank temperature with a SIL rated cooling system.
- Understand inhibitor (TBC) depletion characteristics, measure it and add it in time to stop a runaway reaction.
- Keep O_2 concentration 15-20 ppm in the liquid (that equals about 5% in the gas phase) to help inhibiting polymerisation.
- Keep circulation over the tank to avoid stratification.
- Storage siting: take off-site exposure into account.

Styrene Monomer storage needs attention



Styrene

Learning Sheets

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Unplugging

EPSC Learning Sheet Sept 2021

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What Happened:
In 1989 the Philips Pasadena disaster started after an ethylene release that ignited.

High pressure ethylene might have been used to blow out residual PE polymer from a reactor settling leg. A LOTO locked ball valve was opened to do so.

Process Safety Fundamental: Unplugging of Equipment

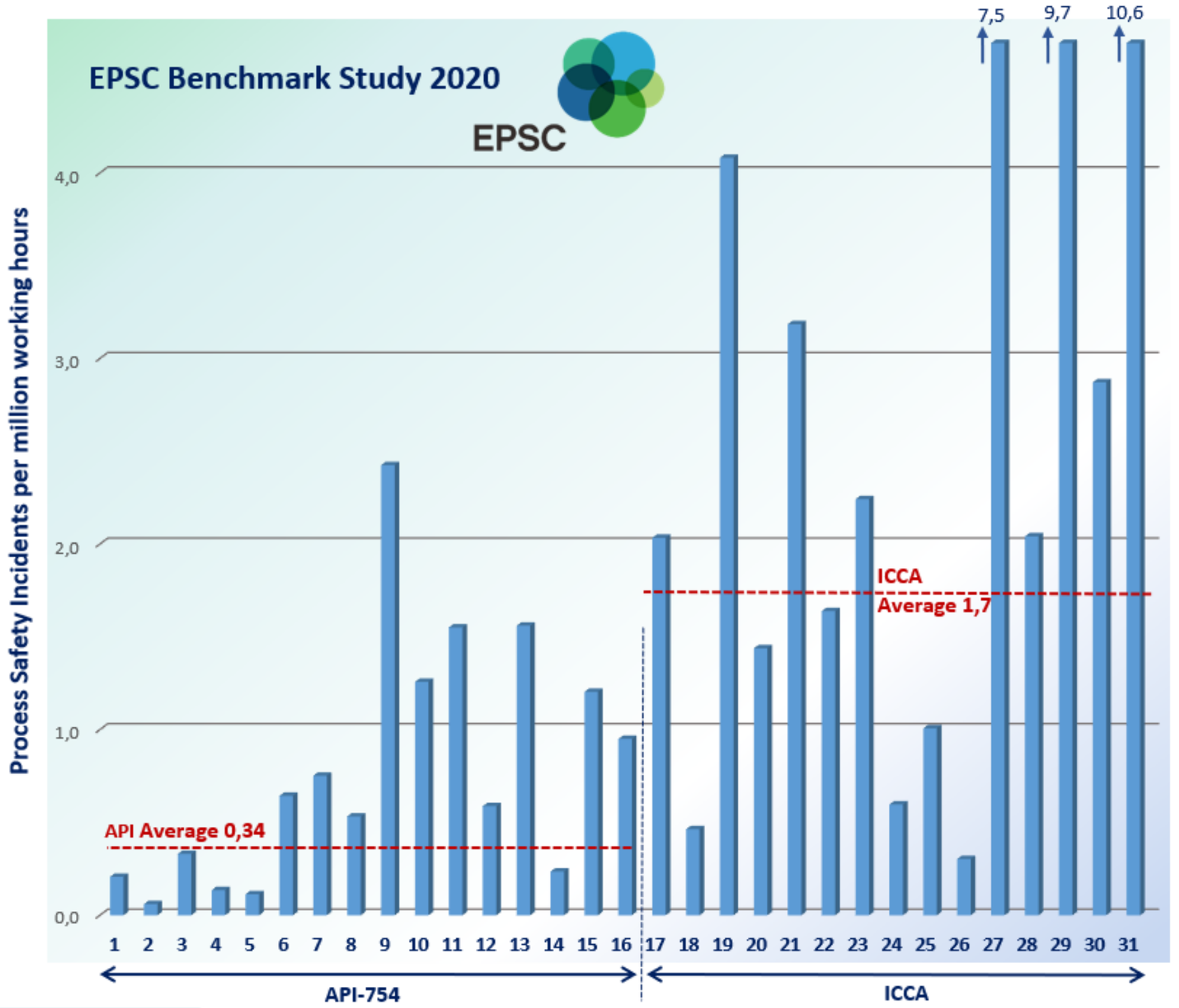
Aspects:

- Polymers have the tendency to plug lines that can restrict flows or block instrument lines.
- Plants generally have no good procedures to remove plugs and operators tend to become creative to avoid shut down.
- The hazards of removing plugs need to be well understood and opening of equipment to reach the plug need to be avoided or controlled by senior management.
- Do not use pressure of hazardous chemicals to de-plug pipe lines or process equipment.
- Before opening an installation to remove polymer or plugs, remove hazardous chemicals, pressure and energy.

Unplugging of equipment needs an approved plan!

2020 Benchmark

Year	PSE rate	St dev	companies	M Hours
2017	1,1	1,3	20	894
2018	1,0	3,4	20	689
2019	1,2	2,6	26	968
2020	0,84	1,0	31	1341



EPSC Members

Thank you for your attention

our shared responsibility to protect society