

Human Factors in chemical operations - getting rid of operational errors for good.

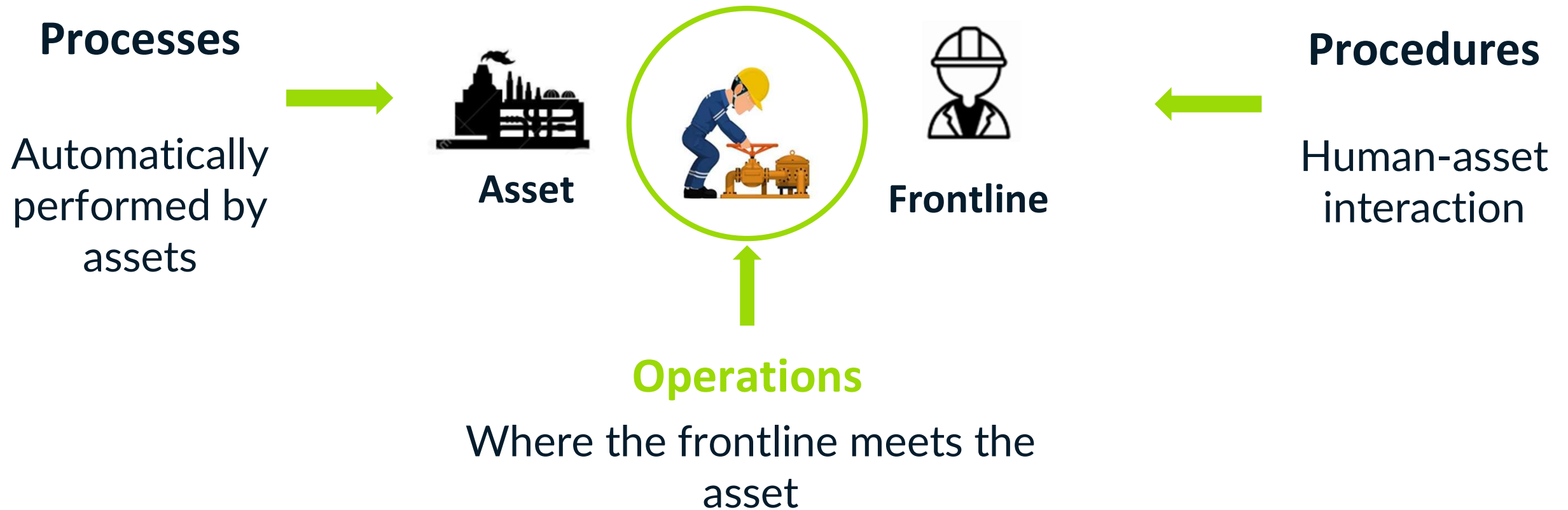
Voovio Technologies

5th EPSC European Conference on Plant & Process Safety

12th December 2025, Aachen

Dr. Susanna Voges

Chemical plants are run by humans.



A background image of an industrial facility, possibly an oil or gas processing plant, with complex piping, valves, and structural steel. A worker in a red uniform is visible in the center. The image is dimmed to allow text to be read.

Technology & automation will
not solve **human reliability issues.**

“40 - 60% of field operator tasks are not automatable.”

McKinsey
& Company

Operator Competency – a Key Pillar in Reducing Human-Error-Related Incidents.



Onboarding



Knowledge
Capture / Transfer



Scarce SMEs



Procedure
Clarity



Unplanned Equipment
Downtime



Quality
Issues



Environmental
Events



Safety
Incidents

Procedure Clarity - A very common Example.



Procedure
Clarity

1 step

*Open the non-instrumented fuel gas
cock valves and air dampers.*



10 actions



Also common and very open-ended...

1 step



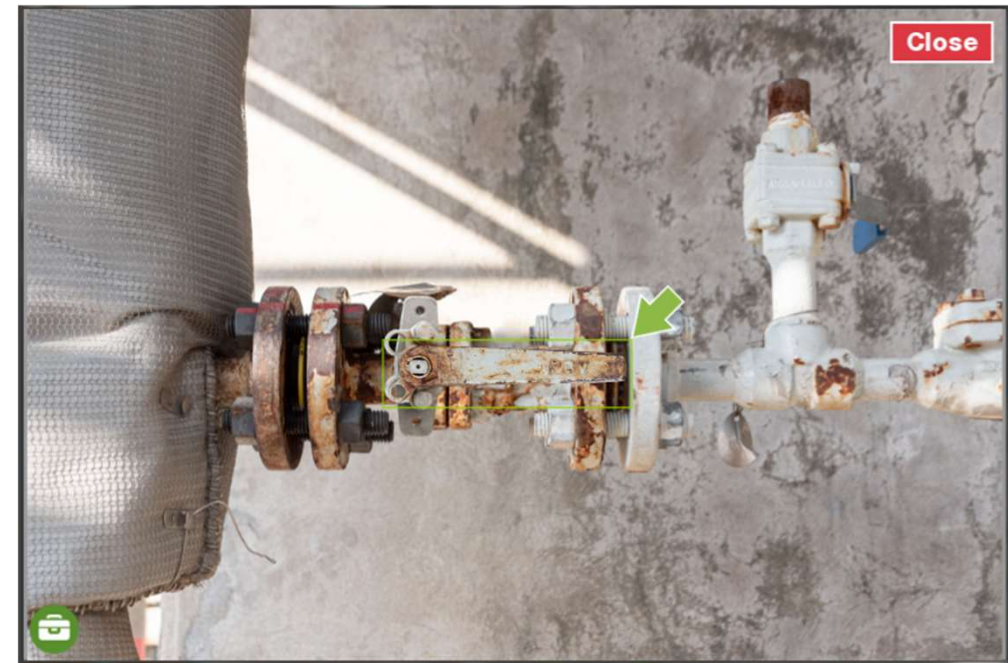
53 actions

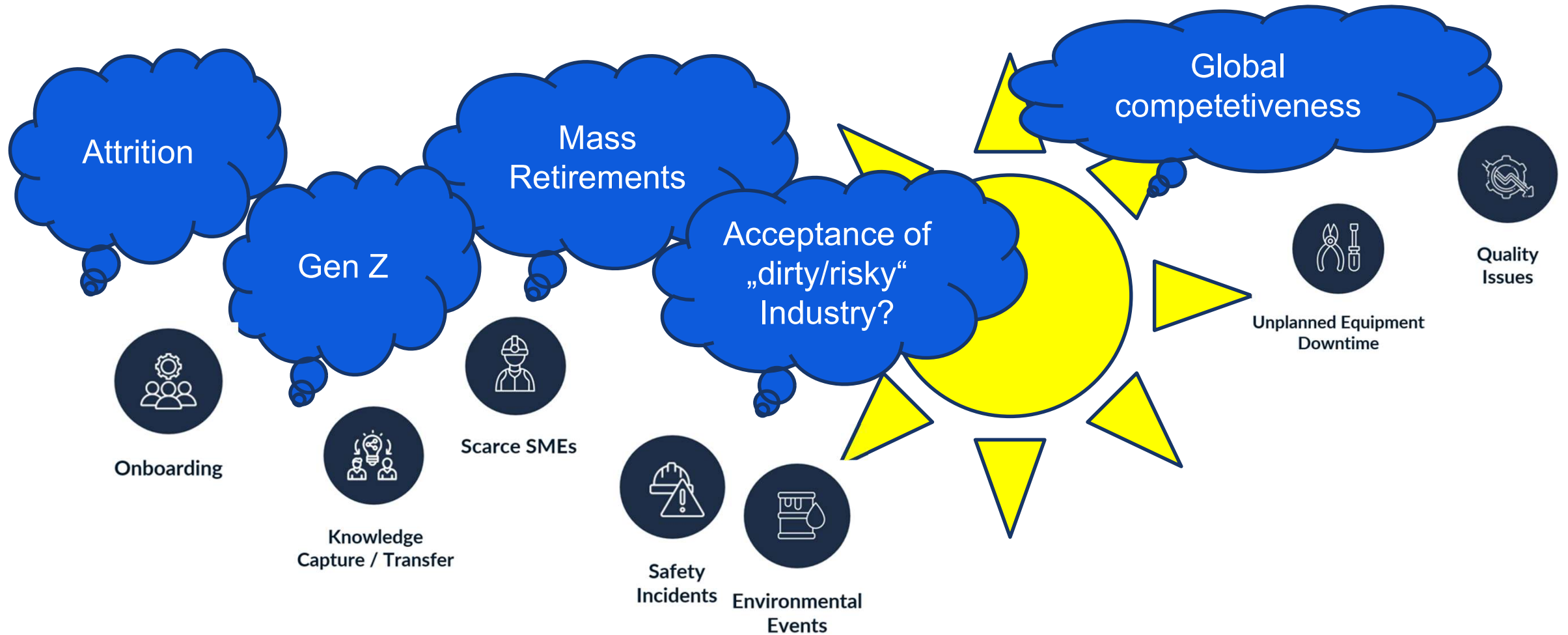
Actuating 15 different valves

MANUALLY FLUSH all CTO's, top/bottom flushes, bypasses around flush flow meters, and any other isolation flush valves

CAUTION

Failure to properly flush all CTOs may result in a reactor poisoning event

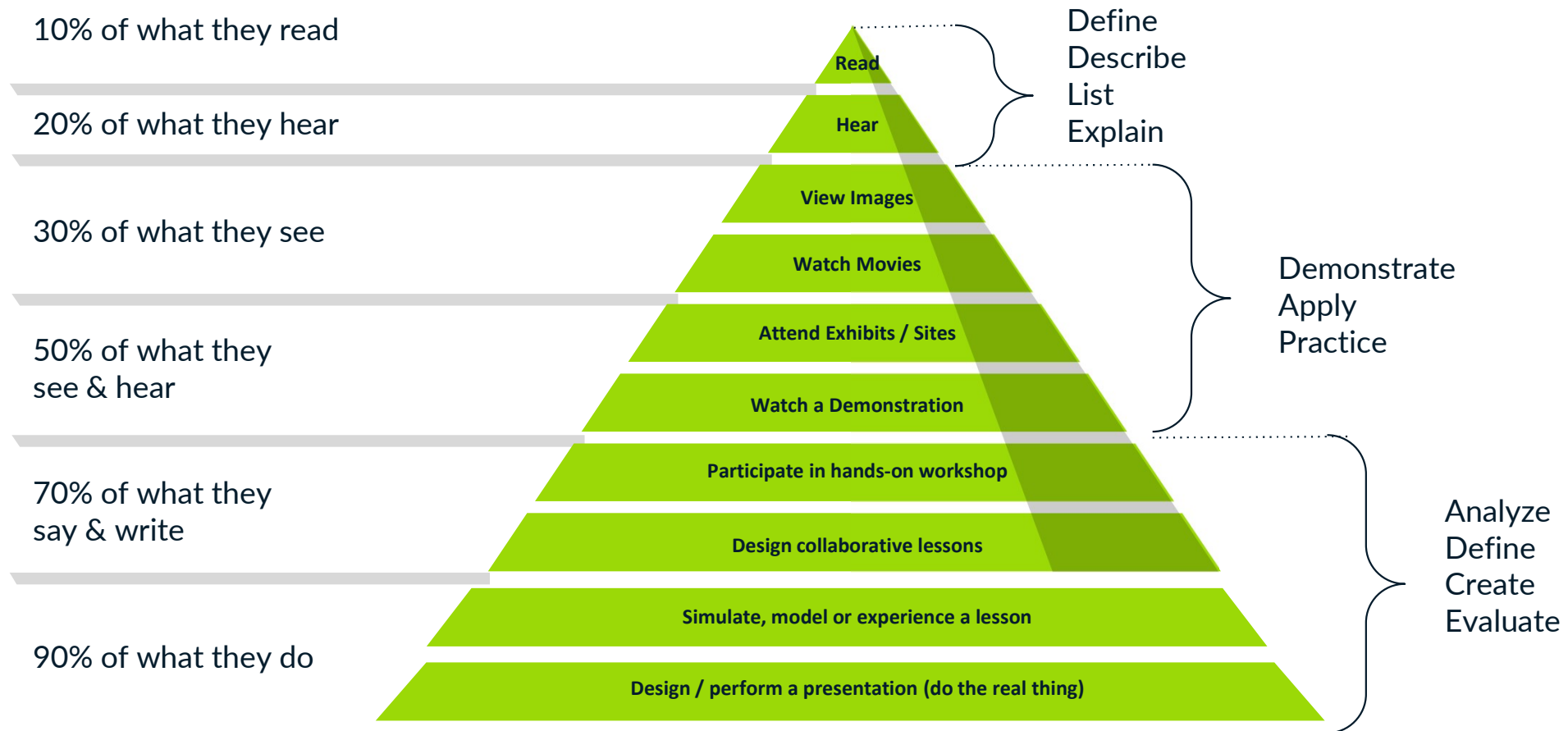




A fundamental upgrade in chemical operator qualification is needed!

The Power of Simulation.

People generally remember...



The Learning Pyramid

Let's see a demo.



YouTube video links:

[Voovio | Solving Manufacturing's Biggest Challenges](#)

[What Voovio customers say about the Skills Gap](#)

Questions? Come visit us at the booth!

The image displays three maps with company logos and lines indicating regional presence:

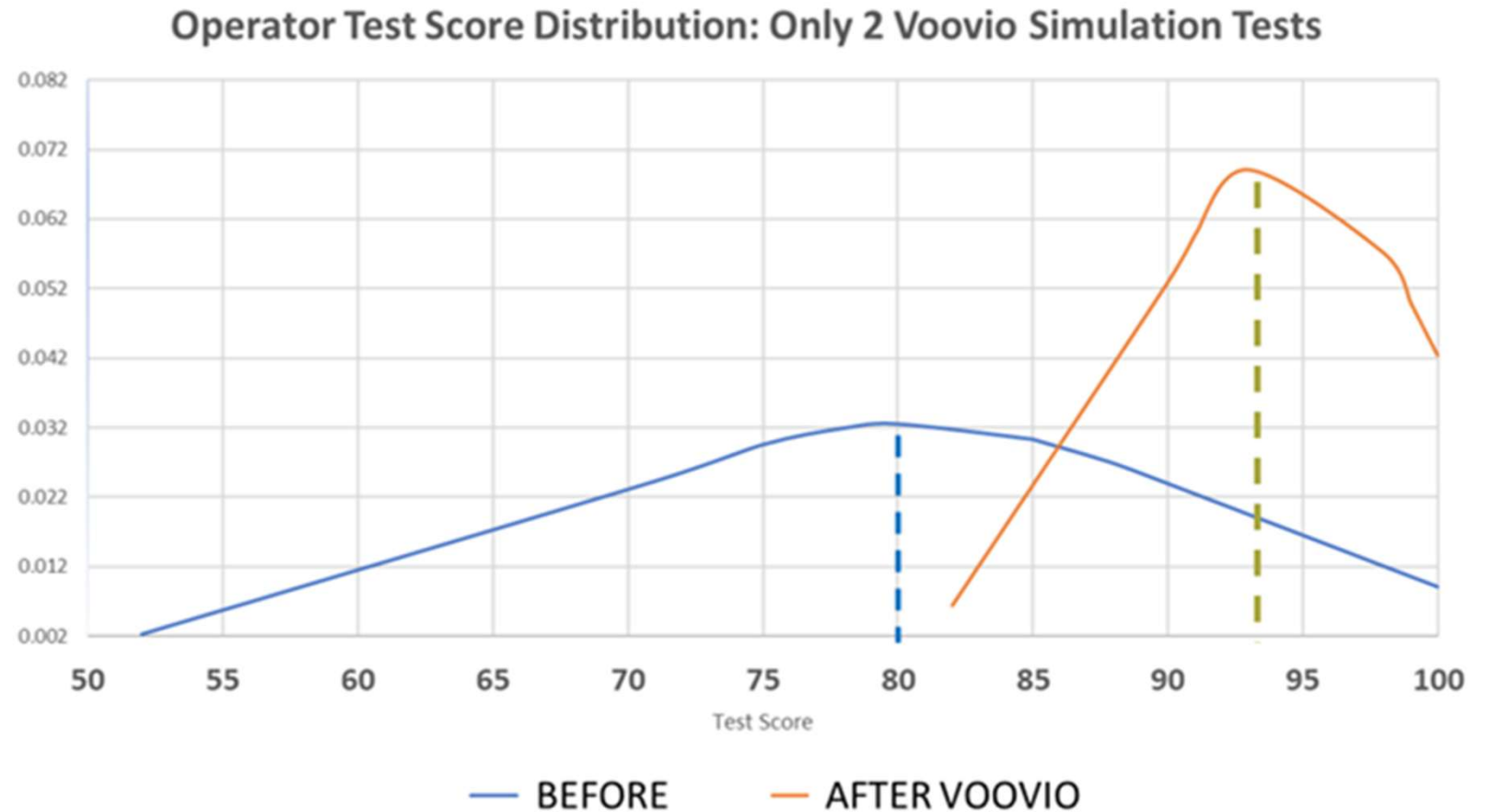
- North America Map:** Shows the United States and Canada with state/province abbreviations. Lines connect logos to specific regions: California (Covestro, Halliburton, Kuraray, LBC Tank Terminals, Vopak, Dow, Lyondellbasell), Texas (Westlake, Phillips 66, Galcasieu Refining Co.), and the Northeast (Eastman, PBF Energy, Clariant, Sabic, Ergon, BASF, Kraton, Chevron, Renewable Energy Group, Honeywell).
- Europe Map:** Shows various European countries. Lines connect logos to Germany (Climax Molybdenum, Braskem, Westlake Vinnolit) and the UK (Celanese, CRODA).
- Middle East Map:** Shows countries like Saudi Arabia, Iran, Iraq, and others. Lines connect logos to Saudi Arabia (Borouge) and Oman (Halliburton).

Logos shown include: CALUMET, Formosa Plastics, TESLA, Linde, covestro, HALLIBURTON, kuraray, LBC, Vopak, Dow, lyondellbasell, Westlake, PHILLIPS 66, Galcasieu Refining Co., Honeywell, HF Sinclair, East Kansas Agri-Energy, Celanese, CRODA, EASTMAN, PBF Energy, CLARIANT, سابك (sabic), ERGON, BASF, KRATON, Chevron, Renewable Energy Group, Climax Molybdenum, Braskem, Westlake Vinnolit, Borouge, and HALLIBURTON.

Impact.

1st Workforce Performance Data

- Data from 14 customers
- 1 critical SOP was assigned to each **qualified** operator.
- 1 month of autonomous practice.



Onboarding faster & ease pressure on SMEs

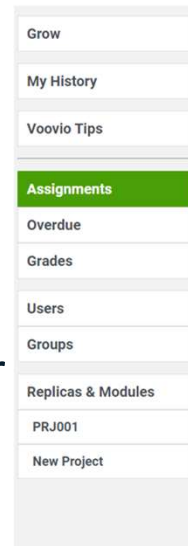
Impact on	Benefit	Time Required	
		Voovio	Traditional
Procedure Competency	65% faster	3.30 hours	9.75 hours
SME / Trainer Time	>73% reduction	2.25 hours	8.25 hours

- Controlled experiment at major Texas Petrochem facility with input from Rice university, Houston TX – June 2021.
- 24 operators, split into 2 groups, learned 2 SOPs in 2 days. No experience in that production unit prior to exercise.
- Traditional method: classroom, review P&IDs/SOP, field walkthrough
- Voovio method: Voovio Guided/ Learn, field walkthrough



Refinery's Self-Loading Racks Transformed.

- ~150 trucking companies
- ~900 drivers
- Email notification of assignments.
- Practice, learn and take Test via web browser
- Content available 24/7
- Email notifications
- Documented driver records
- Gate access on successful completion of Test



Assignments

New Assignment

Filter

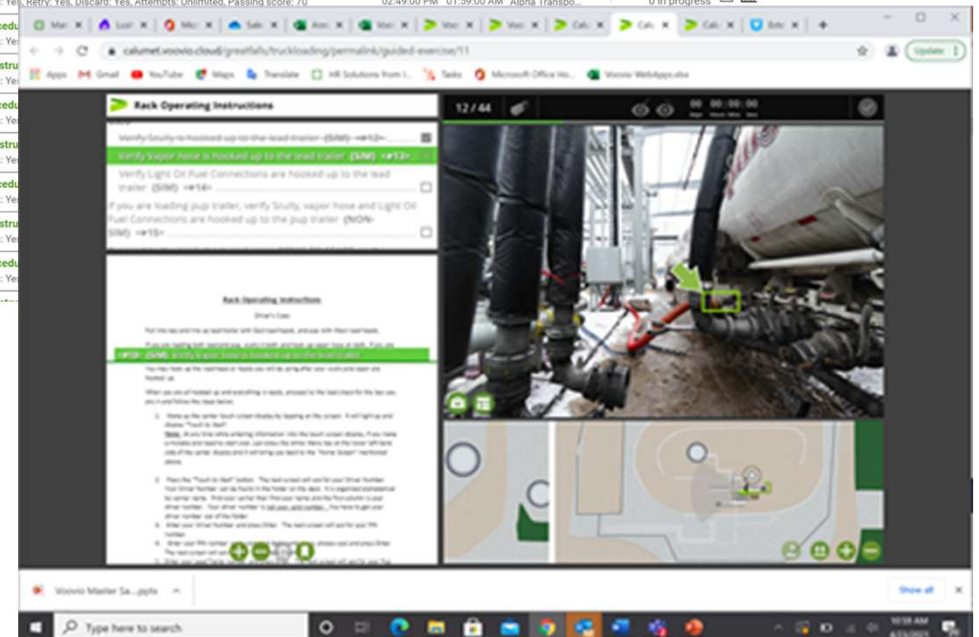
Simulation Module: All

Apply Reset

(68 results)

Pages: 1 2 3 4

Assignment Information	Start Date	Due Date	Assignees	Status	Progress
Asphalt Rack Procedure and Driver Training Record Tags: No, Shortcuts: Yes, Retry: Yes, Discard: Yes, Attempts: Unlimited, Passing score: 70	04/22/2021, 02:49:00 PM	06/23/2021, 01:59:00 AM	2 Alpha Transpo...	Open	1 completed 0 in progress
Rack Operating Instructions Tags: No, Shortcuts: Yes, Retry: Yes, Discard: Yes, Attempts: Unlimited, Passing score: 70	04/22/2021, 02:49:00 PM	06/23/2021, 01:59:00 AM	2 Alpha Transpo...	Open	1 completed 0 in progress
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ROI
1st Year

Refinery – fewer environmental releases.

Site:

- Refinery

Challenge:

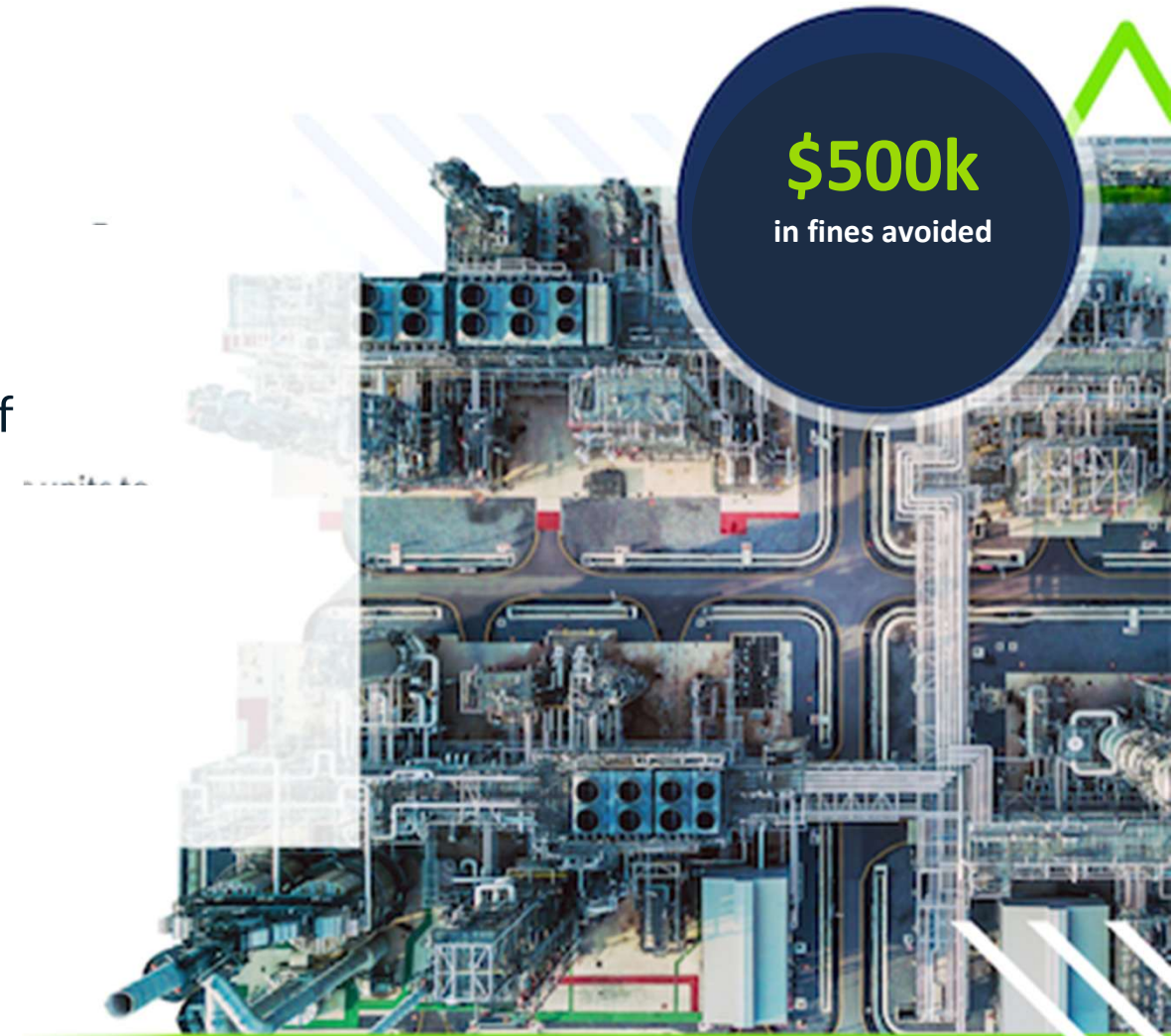
- Eliminate loss of containment of process materials resulting in reportable incidents and regulatory fines
- Procedure generalizations
- Lack of exposure to entire startup procedure and lack of competency

Use of Enhanced Reality/improved clarity:

- Line Walk process to create action checklist clearly defining all release sources
- Practice procedure simulators prior to procedure execution
- Field execution tool

Main ROI contributor:

- Elimination of environmental releases



More familiar with equipment and actions.

Major Refinery

- **Procedure:** Emergency Procedure- Feed Diversion to Hot Standby
- **Comparison:** Operators practiced Voovio simulators vs operators participating in monthly Tabletop exercises.
 - Voovio group demonstrated **70%** more accurate execution during field demonstrations.

Large Petrochemical Facility

- **Procedure:** Startup following weather event
- **Site Issue:** Sister units with similar assets were down due to the 2021 Freeze, 'Storm Uri'.
 - The unit that employed Voovio simulators restarted in a timely manner without issue days ahead of the sister unit.

