SAFETY HAZARDS AND SOLUTIONS FOR ENCLOSED FIELD GAS COMPRESSORS

Joe Avila, HSE Supervisor, JWPC

AGENDA

- **Introduction**
- **The Hazards**
- **Standards and Resources**
- **The Solutions**
- **Summary and Questions**

SO WHAT'S THE ISSUE WITH ENCLOSING A FIELD GAS COMPRESSOR PACKAGE?

ENCLOSED UNIT CONCERNS

- **Lack of adequate ventilation**
- **Fires and explosions**
- **Lack of adequate access with service truck and crane**
- **Lack of adequate access/egress by personnel**
- **Lack of adequate lighting, prevalent trip hazards**

! VENTILATION HAZARDS !

Allowing gas to vent inside

Not piping engine exhaust outside

No/not enough fresh air

MYTHS: Partial enclosures, roof canopy only – "It's okay"

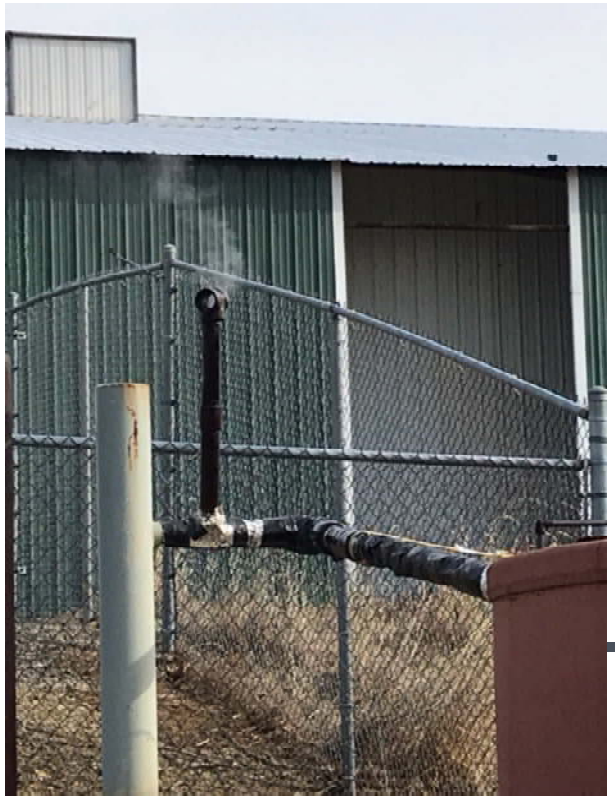
CHANGES: Canopy gets wrapped in tarps first cold snap

https://www.youtube.com/watch?v=A6hDjCA0Z-4

! VENTILATION HAZARDS !

Ancillary equipment venting into building - dehys, flares, etc.

No engineering, thought put into it – crossdraft, predominant winds, cooler draw, obstacles



https://www.youtube.com/watch?v=q9mV5lx2VFs

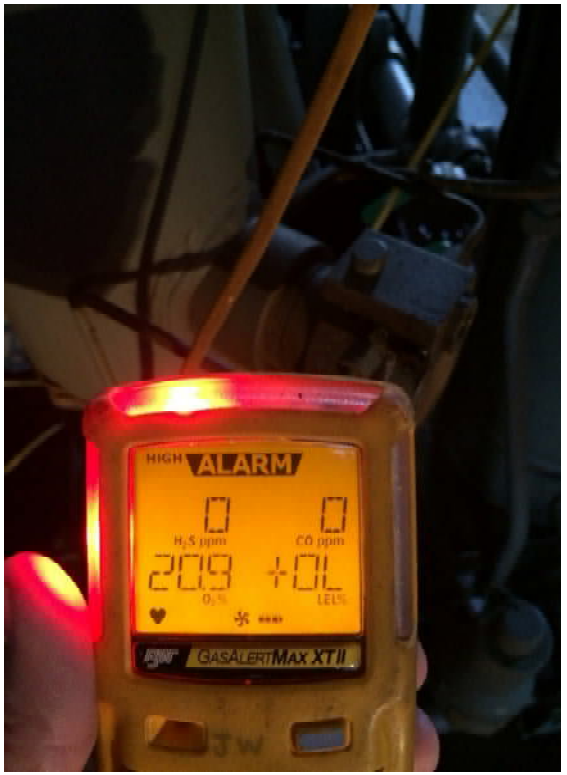
! FIRE AND EXPLOSION HAZARDS!

MYTH: "It's too small to matter". Trapped over time, even small gas leaks can ignite

Certain types of prime movers, packages more susceptible

Rental/field gas packages, enclosed by operators, have resulted in countless flash fires, equipment fires and explosions

Personnel injuries and deaths can and have occurred



If flammable gases do not have a vent, they will create one!

! FIRE AND EXPLOSION HAZARDS!

ACCESS HAZARDS – SVCE. EQUIPMENT

Most enclosures over field gas compressors do not have an overhead crane inside. Service truck access commonly blocked

Results: OSHA Recordables, musculosketal injuries moving heavy parts

Trickle-down effect: tools, air compressor, pressure washer, pumps, etc. outside, too far or inconvenient to use

Hot Work permits?

ACCESS HAZARDS – SVCE. EQUIPMENT

ACCESS HAZARDS – PERSONNEL

Little or no planning, engineering for most enclosures over field gas compression

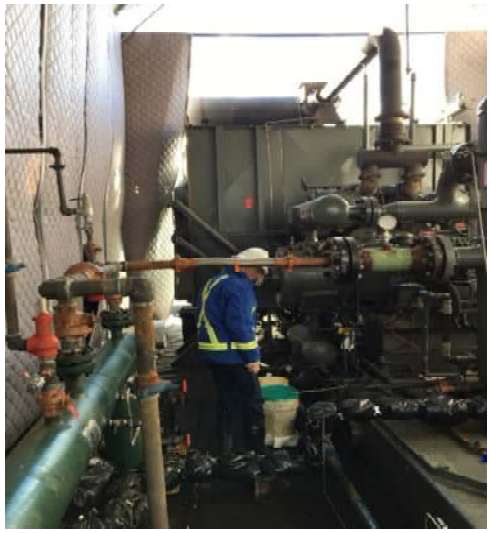
Results:

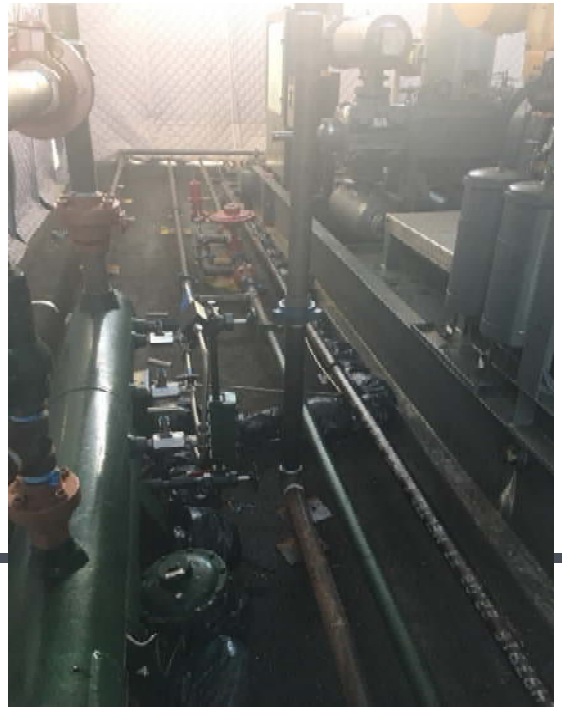
Under-sized, cramped/tight spaces, low roofs, very obstructed paths, lack of a clear path to escape in emergency!

Slips/trips/falls, struck by/against injuries, MSDs, thermal burns

Confined Space permits?

ACCESS HAZARDS – PERSONNEL



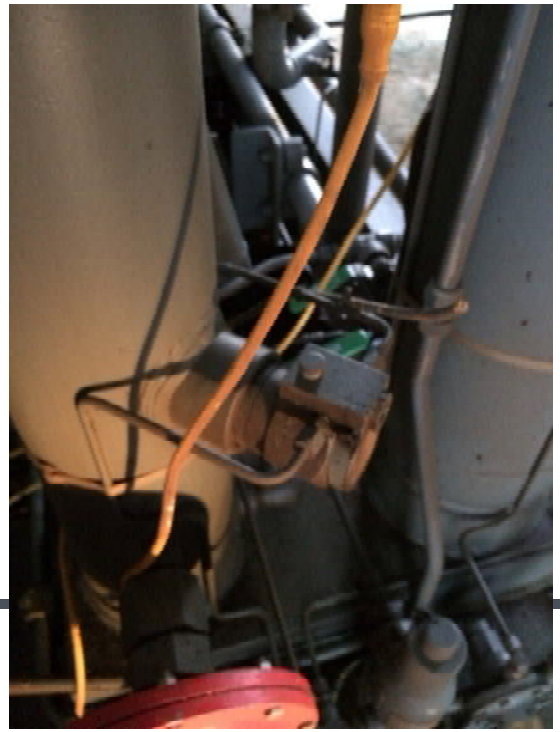


INADEQUATE LIGHTING HAZARDS

Most enclosures over field gas compressors do not have adequate light to safely work

Results:

Slips/trips/falls, crushing and struck by/against injuries, lacerations, thermal burns



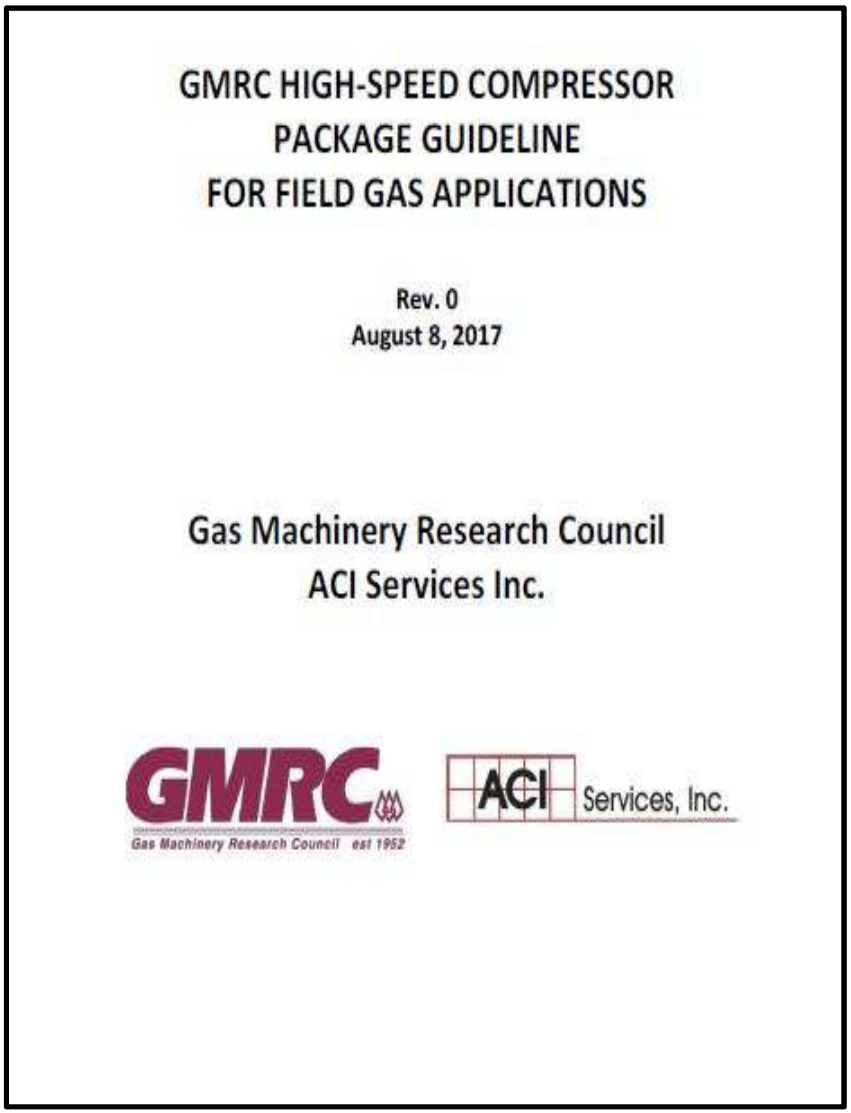
INADEQUATE LIGHTING HAZARDS

STANDARDS AND REGULATIONS

- **What resources cover these issues?**
- **August, 2017. GMRC High Speed Compressor Package Guideline for Field Gas Applications. Voluntary industry standard.**
  - **October, 2018. GCA Guidelines for Compressor Package Safety, Installation and Siting Considerations.**

  - **? 2019. API 11P, Specification for Packaged Reciprocating Compressors, for Oil and Gas Production Services, Third Edition.**
- **OSHA 29 CFR 1910, Subparts D, E, L, most applicable**

STANDARDS AND REGULATIONS



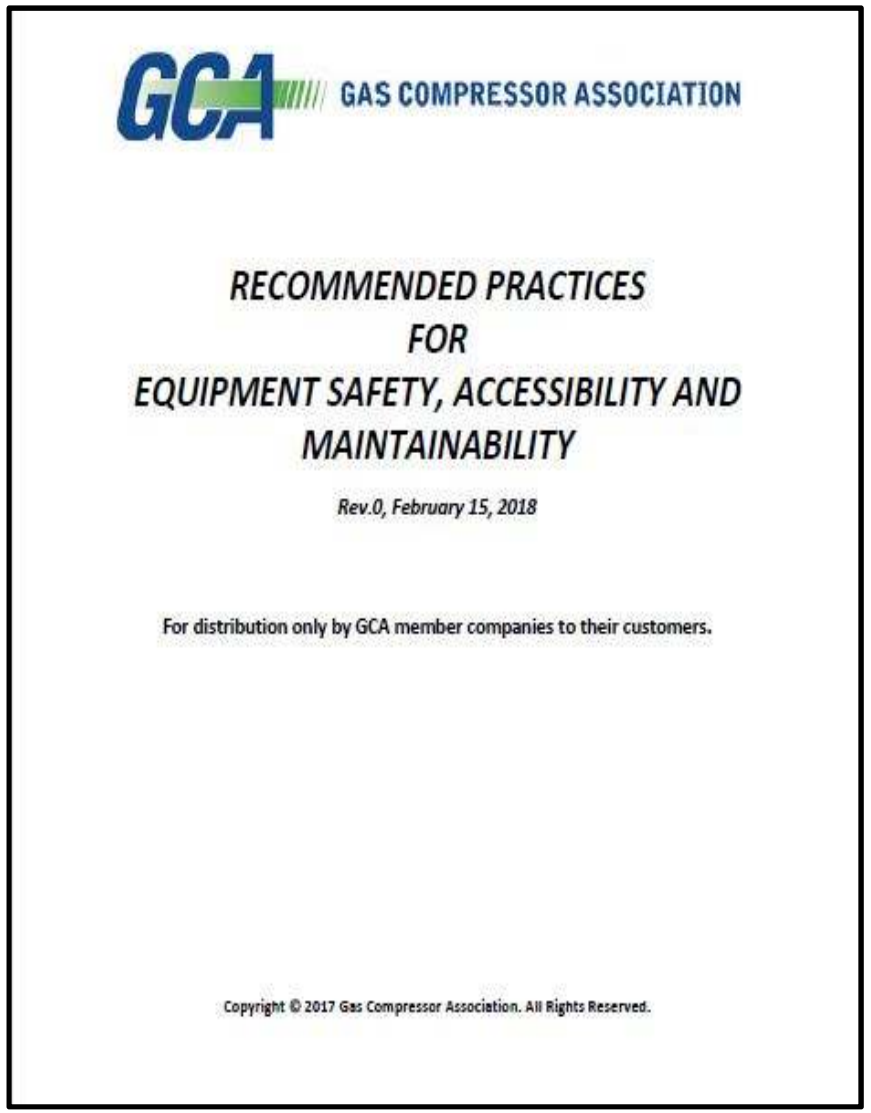
GMRC HIGH-SPEED COMPRESSOR
PACKAGE GUIDELINE
FOR FIELD GAS APPLICATIONS

Rev. 0
August 8, 2017

Gas Machinery Research Council
ACI Services Inc.

GMRC
Gas Machinery Research Council est 1952

ACI Services, Inc.



GCA GAS COMPRESSOR ASSOCIATION

RECOMMENDED PRACTICES
FOR
EQUIPMENT SAFETY, ACCESSIBILITY AND MAINTAINABILITY

Rev.0, February 15, 2018

For distribution only by GCA member companies to their customers.

INSPECTIONS AND DOCUMENTATION

Inspect sites at time of unit set, and on a regular schedule afterwards (Supervision, HSE)

Document conditions – Audits, Service Reports, JSAs, BBS Observations, etc.

Document correspondence with operators

New BBS Observation Notification - Tyler Schielke - Site 1760

Retention Policy 60D Deleted Items (60 days)

This item will expire in 10 days. To keep this item longer apply a different Retention Policy.

35CA8DE5-506E-4180-9393-CAB69D6D5D0E.jpeg
4 MB

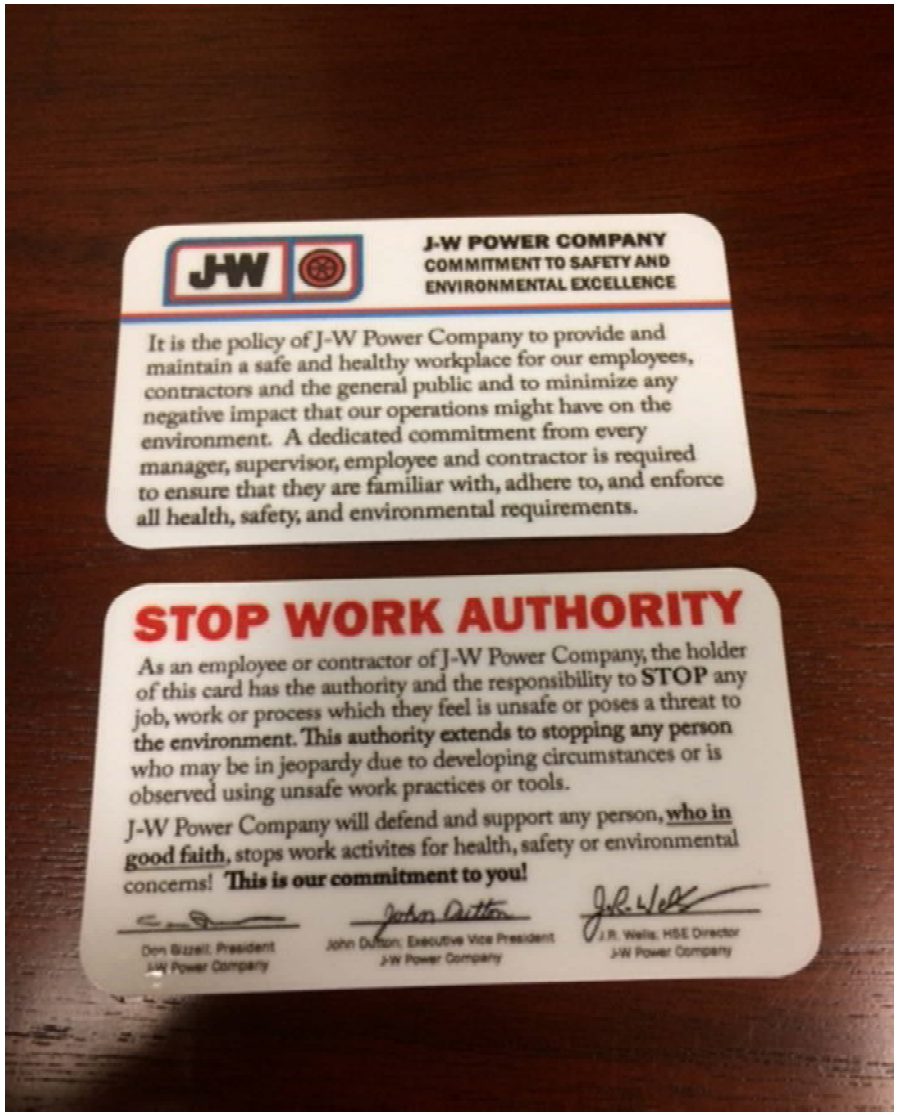
Working Environment:	Unsafe
Walking/Working Surfaces:	Unsafe
Housekeeping:	Safe
Temperature Extremes:	Safe
Lighting:	Safe
Ingress/Egress:	Safe
:	Safe
Working Environment Comments:	Weighted bucket in front of compressor door exit
Working Environment Corrective Actions Taken:	Removed bucket for unobstructed access

STOP WORK AUTHORITY

When needed – call STOP Work, shut it down and lock it out

Document and communicate

Do Not knowingly allow a life-threatening condition to continue



SOLUTIONS – VENTILATION

- **Engine exhaust piped out or set with cooler/ exhaust outside**
- **Engineering: Cross-draft, open sides or top**
- **Cl 1/Div 2 Exhaust fans**
- **Roof vents, louver vents**
- **Doors, removable panels FR curtains, easily opened**

SOLUTIONS – VENTILATION

SOLUTIONS – FIRES AND EXPLOSIONS

Engineered routing of ALL sources of gas outside

LEL sensors, Fire eye sensors, ESDs,

Fire loops, Automatic extinguishers

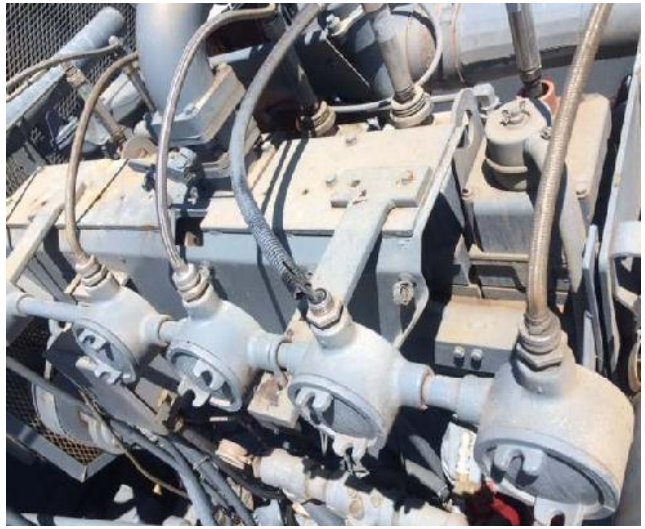
SOLUTIONS – FIRES AND EXPLOSIONS

Proper hook-up and install – PHA!

Sensors and ESDs must initiate closure of ALL fuel sources

SOLUTIONS – FIRES AND EXPLOSIONS

Consider the compressor package itself
NEC/NFPA explosion proof ignition systems, wiring, etc.
may be required



SOLUTIONS – SVCE EQUIPMENT

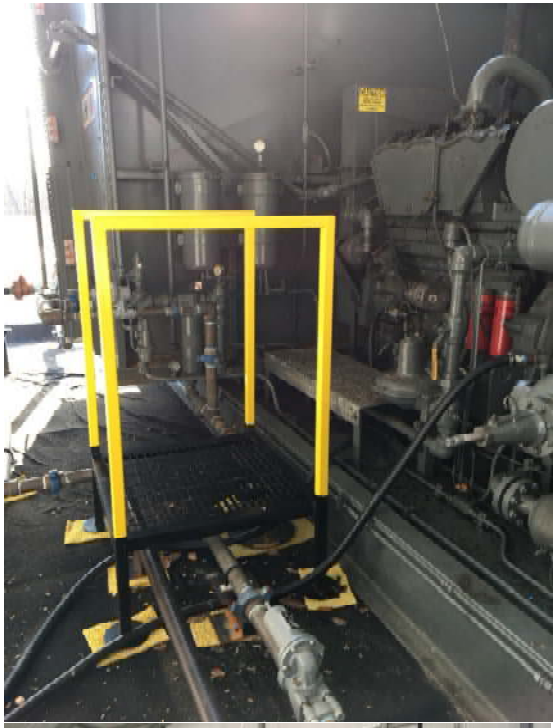
Roll-up doors
Open sides with roof clearance
Easily removed panels or canopy
Adequate clearance around package (10 ft.)
Set with cooler/exhaust outside

SOLUTIONS – SVCE EQUIPMENT

SOLUTIONS – PERSONNEL ACCESS

At least two exits, on either side, MUST be quickly opened from inside
Clear path, minimal trip hazards
Set with panel close to door
Catwalks, stairs, cross-overs

SOLUTIONS – PERSONNEL ACCESS



SOLUTIONS – LIGHTING

Skylight panels or easily opened/ removed panels
Electric lighting (NEC/NFPA)
Open sides, high roof
Clear path, minimal trip and head bump hazards
Set with panel close to a door/open side

SOLUTIONS – LIGHTING

OTHER ISSUES

INTERFERENCE WITH THE PACKAGE

- Tarps pulled into rotating equipment
- Ladders and/or stairs blocked
- Cooler fan intake air blocked (high heat)
- Out of spec with engineering requirements, such as catalyst temps

HIGH HEAT EXPOSURE

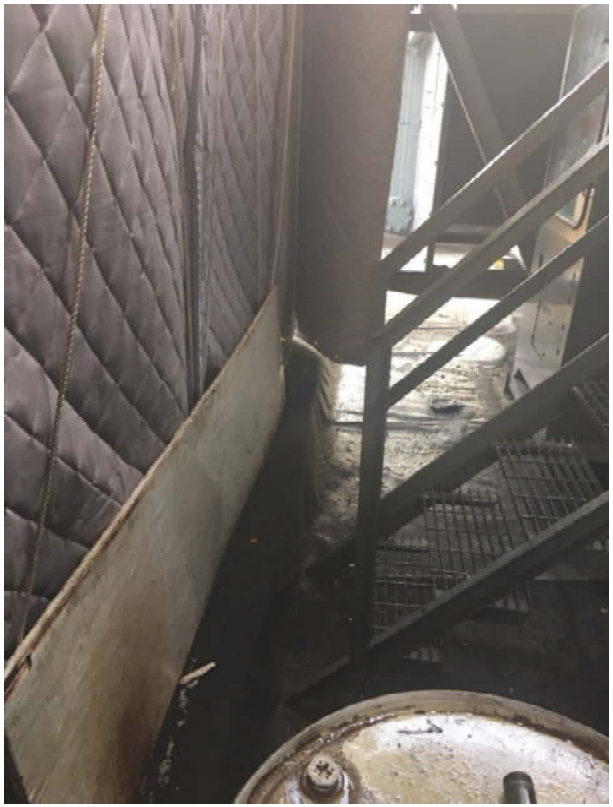
- Workers in heavy FRC, high levels of physical exertion

HIGH NOISE EXPOSURE

- Is NRR of PPE device adequate? Double up?

JSAs – Communication – Safe Work Processes - Hazard Control Hierarchy – Own it, Track it!

OTHER ISSUES



SOLUTIONS – It CAN Be Done!

SUMMARY

- **Enclosures around upstream/field gas compressors frequently add unique hazards for service personnel.**
- **Federal Regulations and new Industry Standards address these.**
- **Preventing fire and explosion hazards is critical. Never allow flammable gases to be trapped.**
- **Toxic exhaust fumes must go to atmosphere. Adequate ventilation must be present. Engineering support should be sought.**
- **Both service personnel and equipment access need to be accommodated.**
- **Proper lighting must be present.**
- **Numerous practical solutions exist when enclosures are necessary.**
- **Good communication and documentation are important. Use STOP Work authority when required.**
    - **Safety is Everyone's Job!**

? QUESTIONS ?