# Methane Reduction Through Integration of New Practices and Technologies

**Faraz Naeem & Stephen Jehlicka**

Energy Nexus | Annual Technical Conference

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# Methane Reduction Through Integration of New Practices and Technologies


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# Methane Reduction through Integration of New Practices/Technologies

- Methane has a higher global warming impact than Carbon Dioxide as a green house Gas.
- Methane emissions sources at Enbridge Gas include venting, stationary combustion, and fugitive emissions
- Enbridge Inc. corporate commitments
  - Enbridge Inc is committed to achieving net zero emissions by 2050
  - Interim goal of 35% reduction by 2030
- Prudent to look for ways to avoid venting, both from standpoint of environment and efficiency
- Use of innovative technologies is one pathway to this goal
- Introduction of new emission opportunities require collaborative effort between Operations, Engineering, and technology providers.
- Involves introduction of new operating philosophies while leveraging existing infrastructure/tools .
- New technologies are introduced through Engineering Reviews, controlled pilots and design standard changes.

# Doing things a Different Way:

## Elimination of Distribution Venting Methane Emission

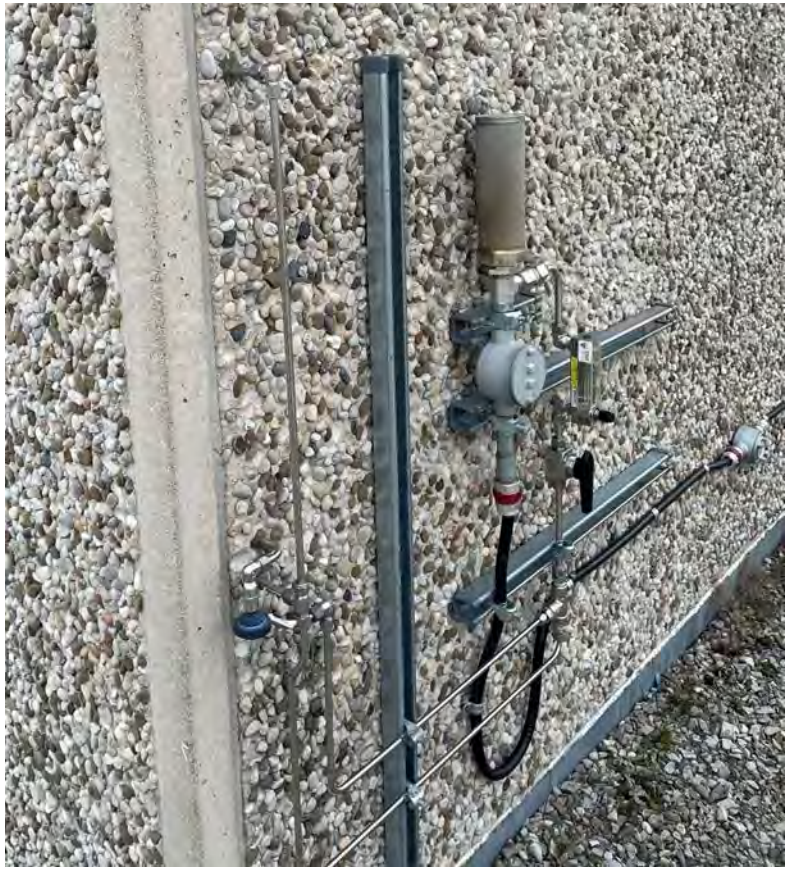
Distribution Venting Sources Include:

- Sampling
  - Gas analyzers,
  - Moisture analyzers,
- Odorization
  - Pneumatic Odorant pumps
- Maintenance Blowdowns
  - Turbine meter inspections, filter changes.
- Actuator Emissions
  - Gas Over Hydraulic actuators on-line valves
  - Differential bleed actuators on ball valve regulators
  - Constant bleed actuators on ball valve regulators

# Sampling – use of Catalytic combustion

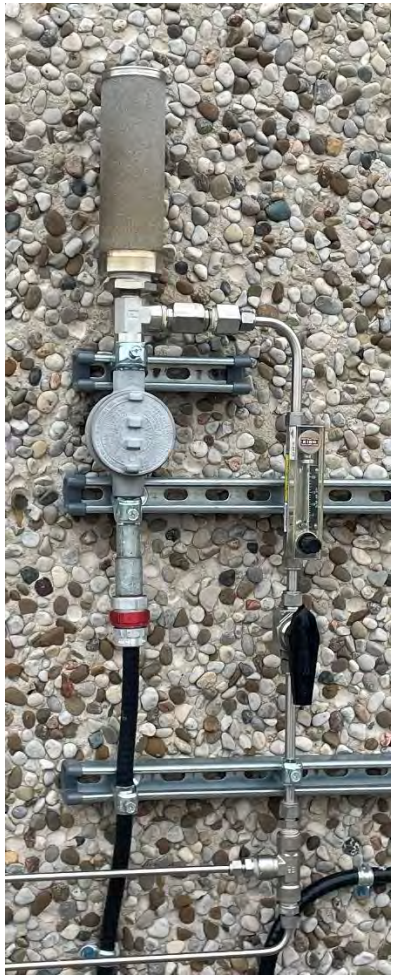
- Devices generally have very small venting profile, (5 years of operations for 1 ton of CO2)
- To transition to a low carbon operation, this methane should be combusted to CO2 prior to venting.
- There is an end-of-pipe solution to do this.
- Catalytic Combustion

## Catalytic combustor installation, Before and After:



# Lessons Learned:

- Awareness of electrical service requirements and classification.
- Analyzers have 4 vent lines, not one.  2 of them vent methane, the others vent calibration gases.
  - Important to identify the vent outlets correctly.  We used check-valves to  allow both methane vents to flow to the analyzer, while preventing back-flow.  Not sure if this was 100% necessary
  - Use soap and check type of gas with gas detector.
- The outlet of the catalytic combustor is hot.  A guard has been ordered for future installation.
- Future installations will use a vented 3-way shut-off valve to allow analyzer to continue venting while catalytic cartridge is being changed during maintenance.
- Purchase of analyzer does not include associated equipment and shut of valves.
  - Worked with vendor to create a standard package of valves and tubing, to order with the combustor
- Little bubble meter on tubing is very helpful to confirm if the combustor is actually working.
  - On future installations we will try to install it inside the building, not outside, it seems to not be water tight.
- Resource constraints – finding funding for pilots.



# Next Steps

## Pneumatic odorant pump installation

- Try to install the same device on a gas pneumatic odorant pump.
  - Tentative site has been identified.
  - Used station RTU information to confirm maximum winter stroke rate does not exceed catalytic combustor capacity
- Concern here is back-pressure due to the discrete nature of the vented release.
- Set up will be tested in our odorant lab prior to field deployment.

# Operational Changes - Maintenance venting

## Turbine and Filter inspections

- Reducing vented profile by bleeding to downstream pressure prior to blowdown.
- station pressure sensor lines to provide bleed pathway.


# Operational Changes - Lessons Learned:

- Minimize facility design changes.
  - Can existing fittings be used?
  - Use existing tools – are there approved hoses?
- Receive approval from Engineering for new procedure
  - Implement as pilot to empower field staff to implement change.
- Add consideration to general operating procedure for assets.
- Part of the change is a culture change.
  - It is always easier to vent then to recover gas.

# Actuator Emissions

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# Valve Actuators

- **What is an Actuator?**
  - Mechanical devices used to control valves, dampers, and other mechanisms in industrial systems
  - Convert energy (usually electrical, hydraulic, or pneumatic) into motion.
  - Common types include linear and rotary actuators.
  - Examples: electric motors, hydraulic pistons, pneumatic cylinders.
    - **Electrical Actuators:**
      - Typically powered by electricity, converting it into mechanical motion.
    - **Hydraulic Actuators:**
      - Operate by pressurizing hydraulic fluid.
    - **Pneumatic Actuators:**
      - Utilize natural gas.

## What are Actuator Emissions?

- Actuator emissions are the release of gases into the atmosphere during the operation of actuators, as valves are opened/closed
- Actuator emissions are predominantly methane

## Types of Emissions

- **Direct Emissions:**
  - Noise pollution, especially in older or poorly maintained systems.
  - Heat dissipation in the form of wasted energy.
  - **Venting in Pneumatic Actuators:** Release of process gases (predominantly methane) during operations.
  - **Hydraulic Fluid Release**: Unintentional release of hydraulic fluids due to any leaks in hydraulic actuators.
- **Indirect Emissions:**
  - From energy consumption (especially for electric actuators).
  - Related to the carbon footprint of electricity generation.
  - **Thermal and Electrical Emissions**: Heat and electricity consumption, which indirectly contribute to emissions from power generation.

## Comparison of Emission Profiles

| Actuator Type | Pros | Cons |
|---|---|---|
| **Hydraulic Actuator** | - High force and torque output. | - Requires hydraulic fluid, which can leak. |
| | - Operates in high-load applications. | - Bulky and heavier system. |
| | - Can withstand harsh environments. | - Expensive installation and upkeep. |
| **Pneumatic Actuator** | - Quick response time. | - Noisy operation. |
| | - Simpler, lightweight, and cost-effective. | - It can lead to pressure loss if there is an upstream leakage. |
| | - Suitable for applications requiring rapid movement. | - Requires compressors and conditioning units. |
| **Electric Actuator** | - Highly precise positioning and control. | - Limited force and torque output compared to hydraulic actuators. |
| | - Quiet and clean operation. | - Sensitive to environmental factors such as moisture and dust. |
| | - Energy-efficient in continuous operation. | - May require complex electrical wiring and control systems. |

## Case Study: Success in Reducing Emissions

- **Example of Ottawa Gate station**
  - Enbridge initiated a project to determine design requirements for the Ottawa gate station in order to minimize emissions from control valves.
  - There are 3 main strategies when it comes to reusing existing infrastructure to reduce the emissions

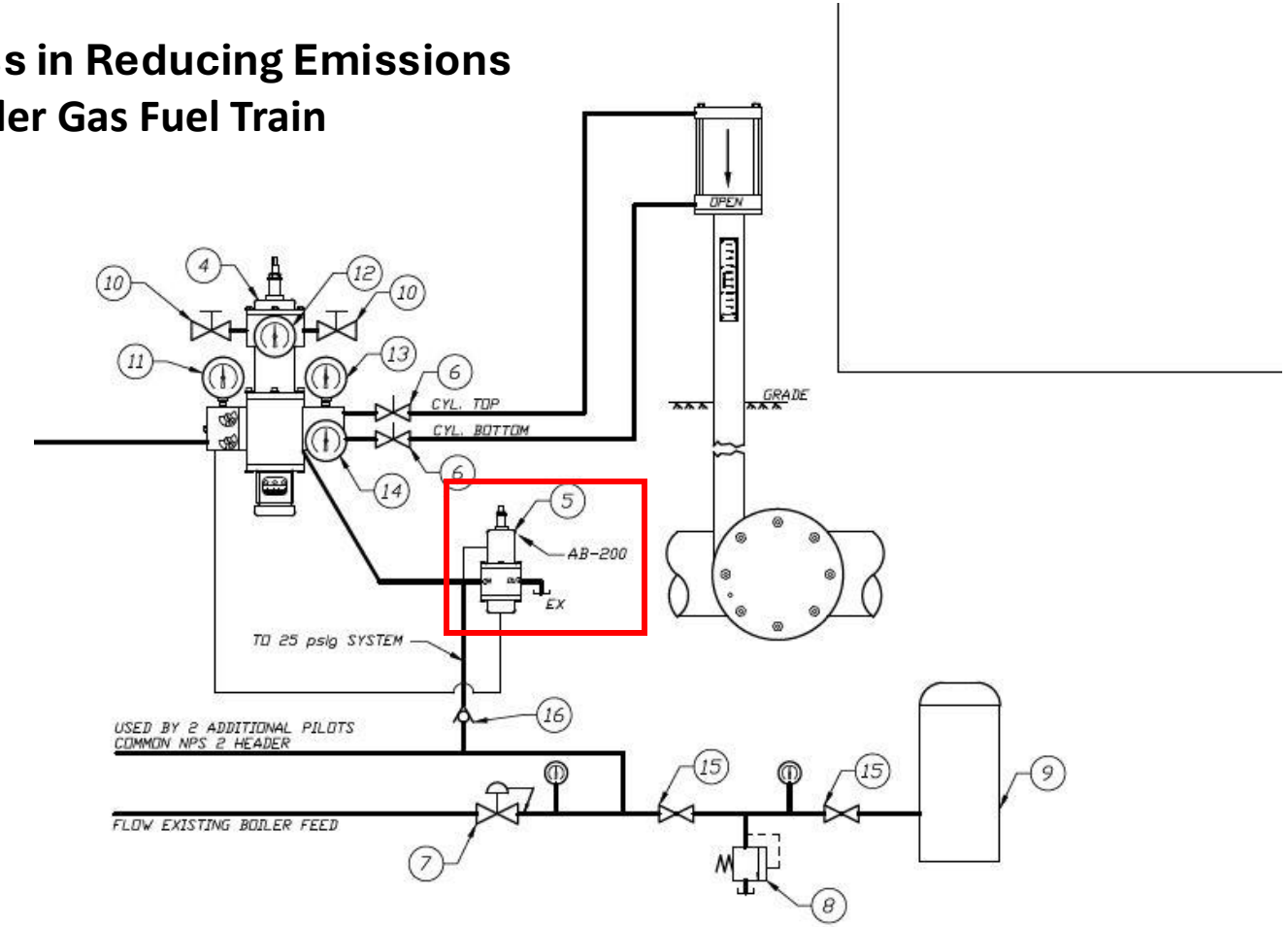
## Case Study: Success in Reducing Emissions

**Strategy 1** was to bleed the gas into a downstream IP pressure system network being the most ideal scenario.

**Strategy 2** was utilizing the bleed gas into a boiler fuel gas system being the second choice.

**Strategy 3** was utilizing the bleed gas as a supply line to feed its own catalytic heater being the least preferable.

**Case Study: Success in Reducing Emissions**
**Option 2 Bleed to Boiler Gas Fuel Train**




AB Valve primarily has 2 functions:

- It has a sense line on the inlet side where if you lose the supply to the power gas, it vents to atmosphere if the delta P across the inlet to the outlet drops by 10 psig.
- It also has a second sense on the outlet where if the delta P increased by 10 psig, it will also vent to the atmosphere.

# Ottawa Gate Station

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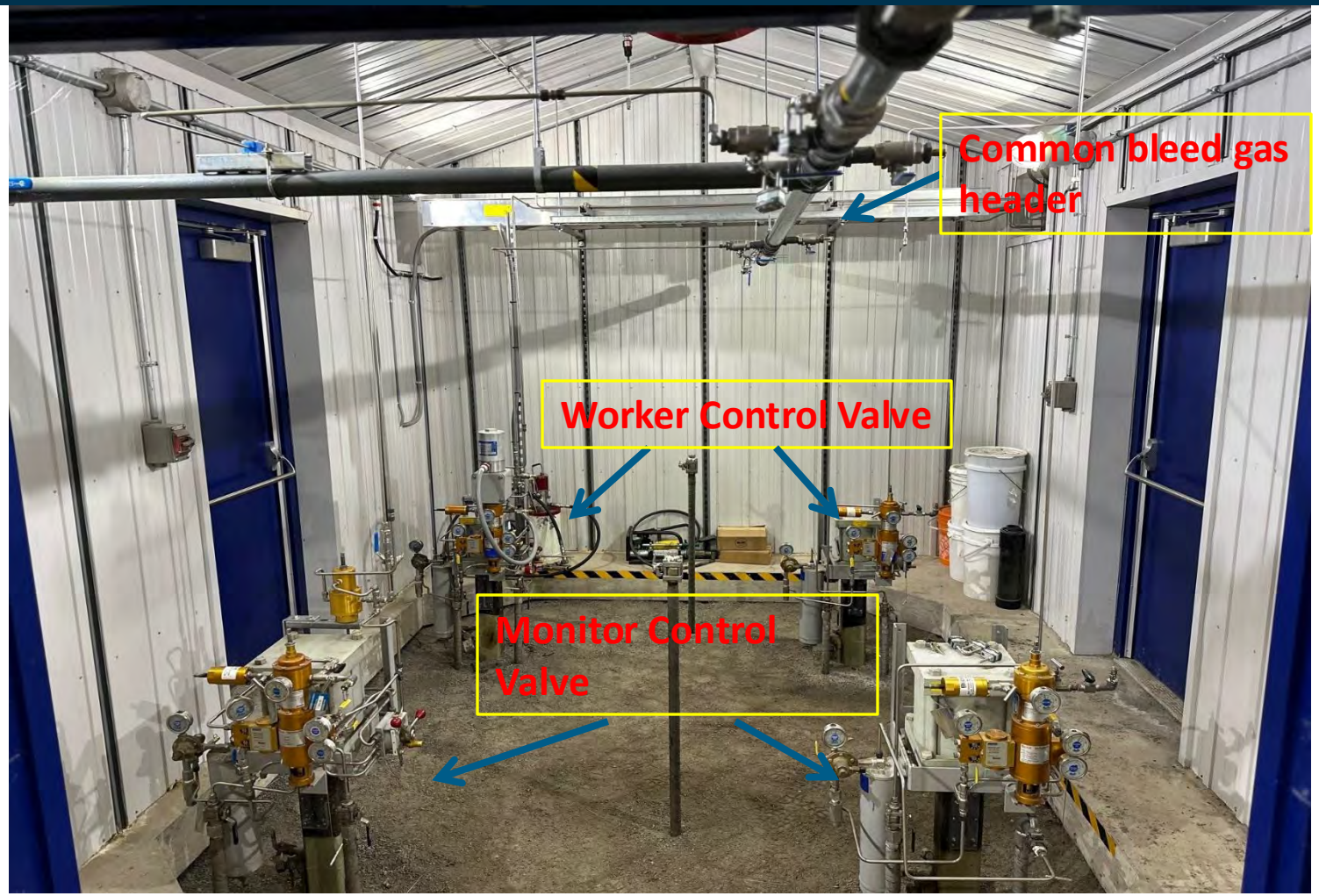


- This photo shows each operator (Worker) Control valve bleeding into a common header.
- The monitor (Over Pressure Protection) control valve bleeds to atmosphere and is independent of the above operation in case of an over pressurization scenario.

# Ottawa Gate Station

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- This photo shows the NPS 2 common header bleed line existing into a NPS 1 line to the boiler fuel train
- It is also showing the existing relief valve that used to vent previously.

## Case Study: Success in Reducing Emissions

- This resulted in 66% reduction in emissions specific to the control valve bleed modification.
- This change in bleed modification resulted in a more efficient functioning of the control valve operation.

## Challenges

- It was difficult to determine what the venting profile was for the actuators before the installation of the system, because the actuators were vented directly to atmosphere.
- In order to overcome this challenge, we were able to determine the amount of gas saved by isolating the header and timing how long it takes for it to pressurize.

## Conclusion

- Reducing actuator emissions is an important step in reducing Enbridge's emissions and meeting targets.
- By implementing low-emission technology, proactive maintenance, reviewing design standards, and monitoring systems, industries can significantly cut emissions.
- Efforts are ongoing to identify simple, effective methane emission reduction opportunities. Employees in any role can contribute to these efforts, they simply need to be encouraged to share ideas.
- Let's take an action towards a greener, more sustainable future.

# Q&A