

Field GHG Reduction Projects High to Low Bleed Conversions



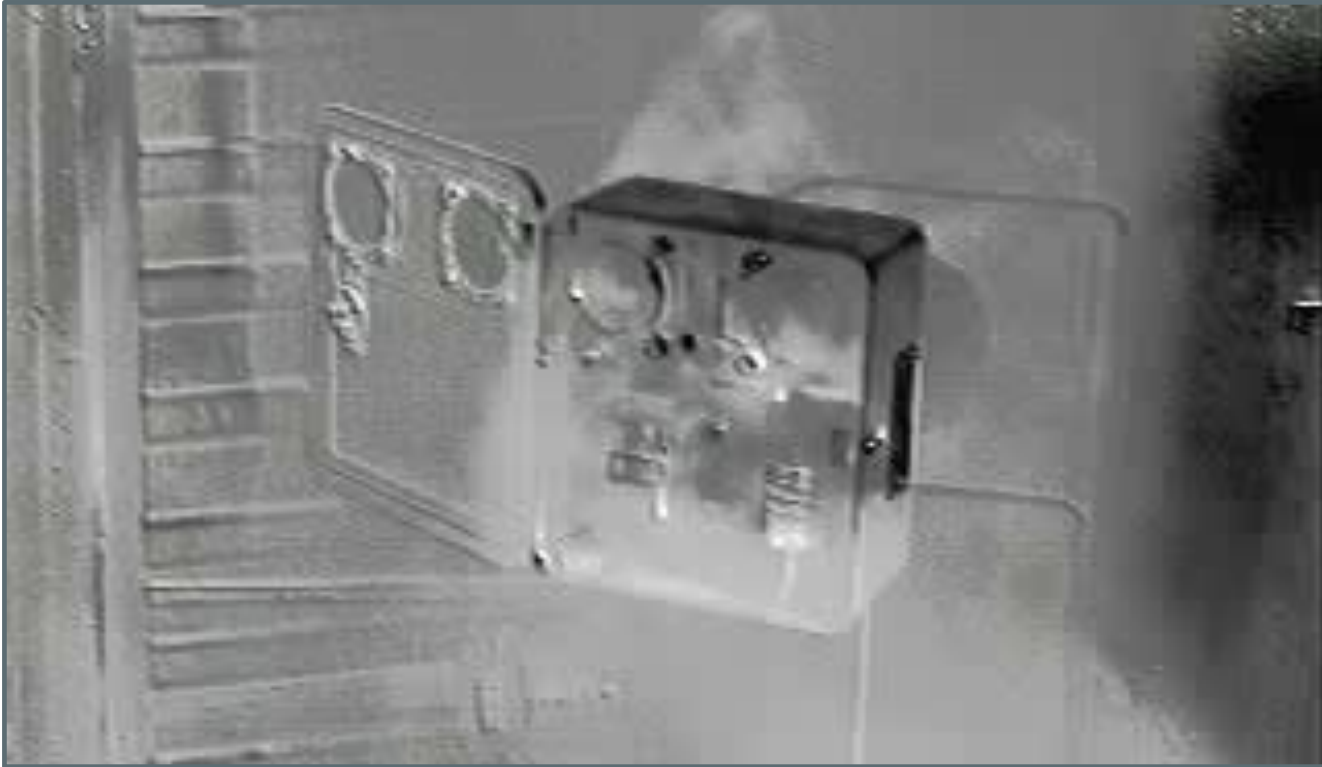
High to Low/No-bleed Instrument Conversion Video

High Bleed Fisher 4150



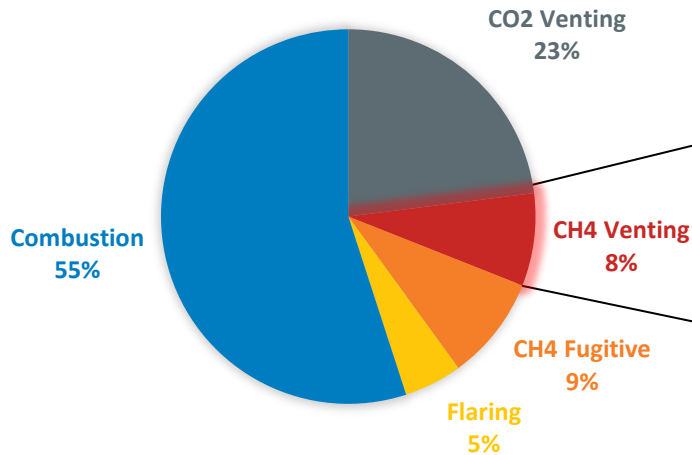


Why target high bleed devices?

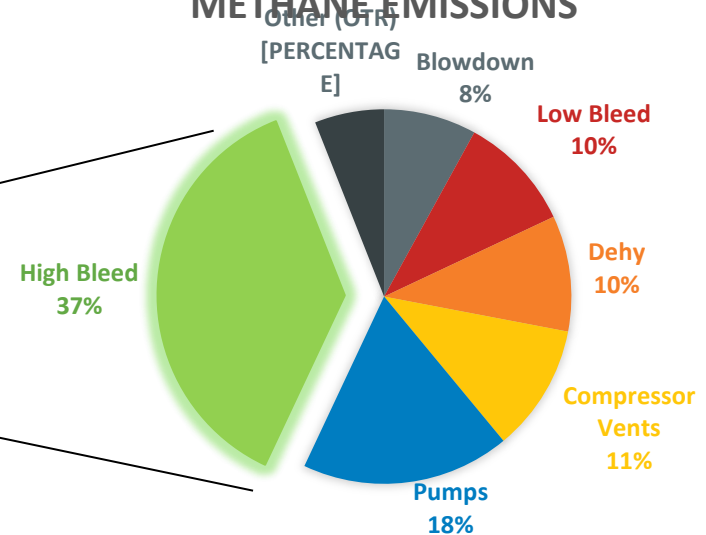


Why Target High

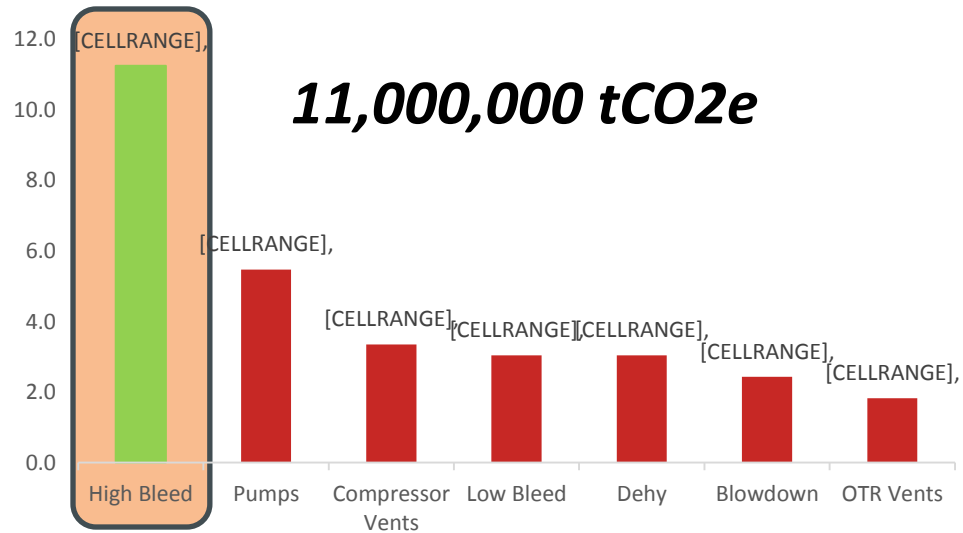
OIL AND GAS EMISSIONS



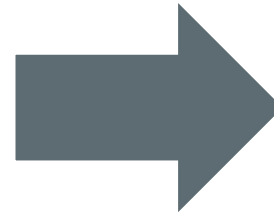
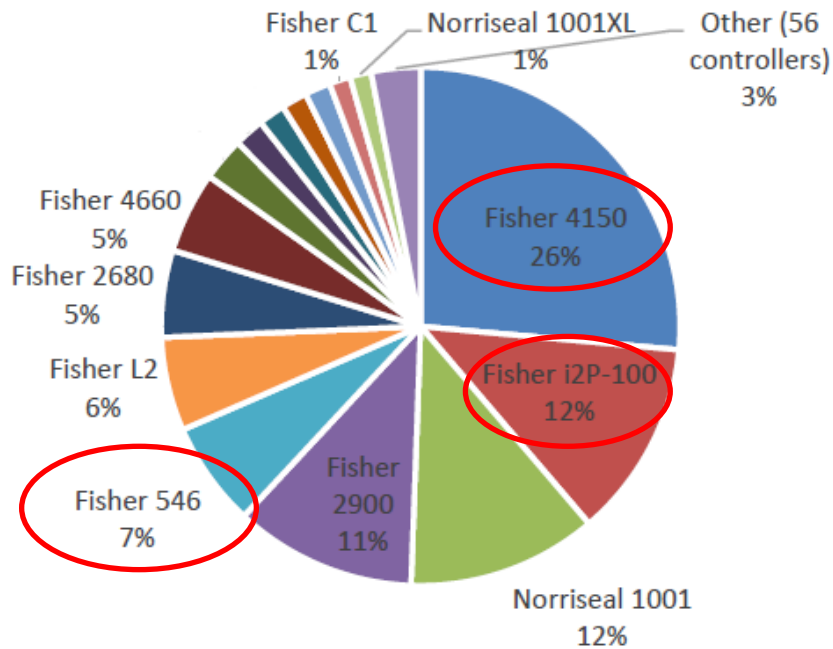
METHANE EMISSIONS



30.4 MtCO₂e of Methane Vented in Alberta

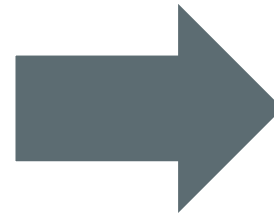


Program Outline



Fisher 4150 swapped for a C1 Pressure Controller

Fisher 546 swapped for i2P-100 Transducer.
i2P-100 High Bleed to Low Bleed Retrofits

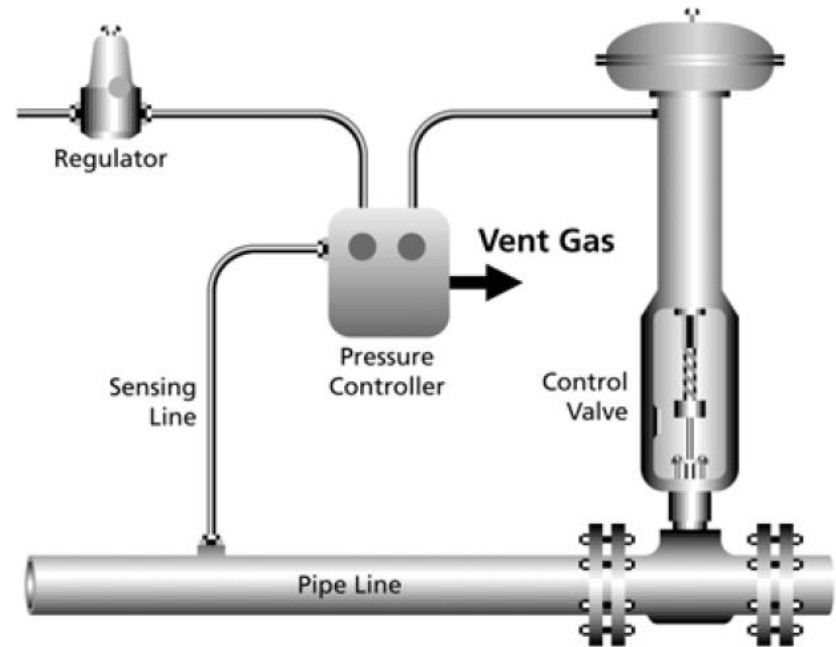




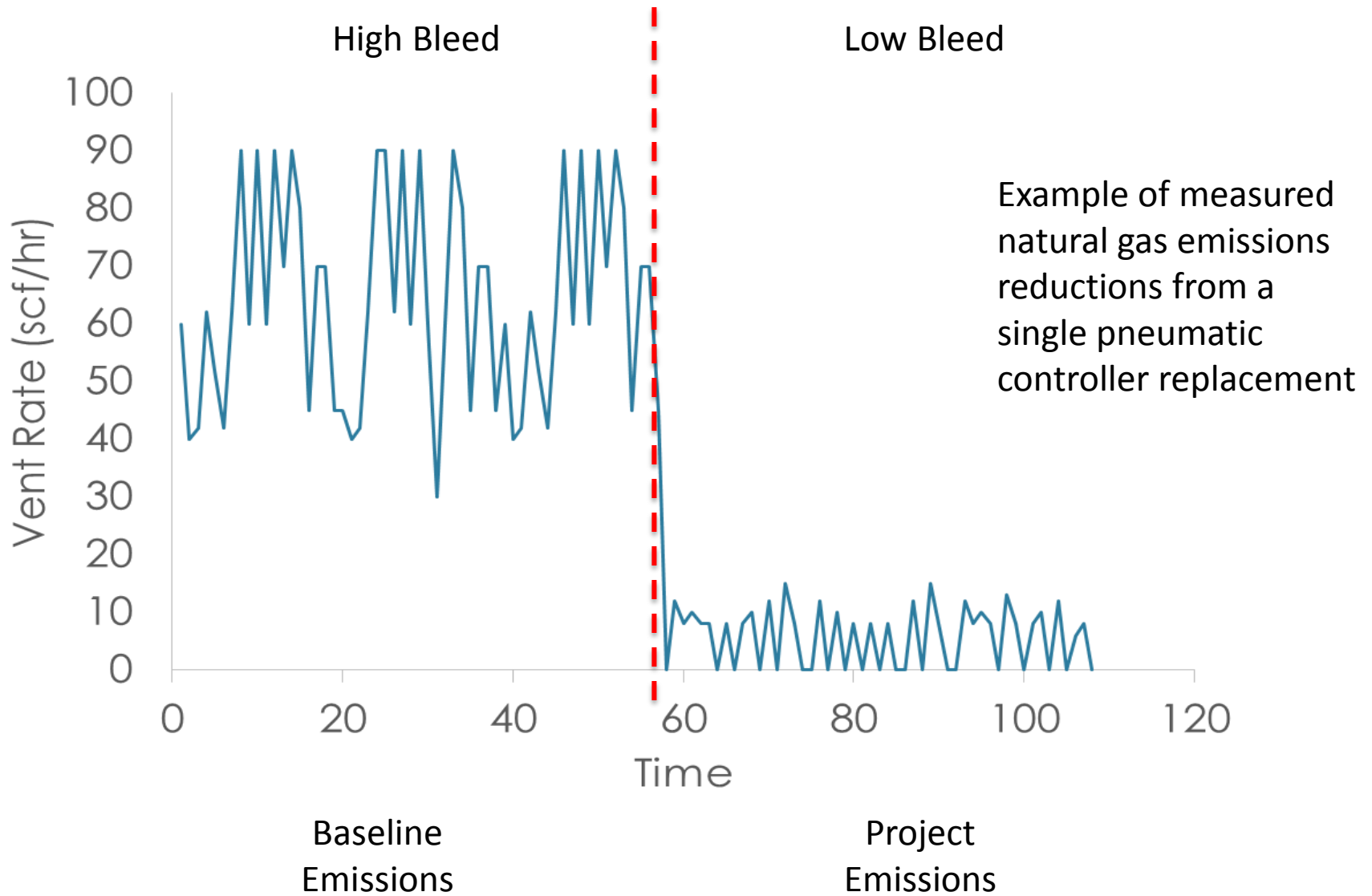
- 10 Years with Spartan Controls.
- Currently a Project Manager and Technical Specialist.
- His efforts to reduce instrumentation fuel gas use have helped meet increasingly stringent environmental regulations, while improving process performance, reliability and safety

Technology Description

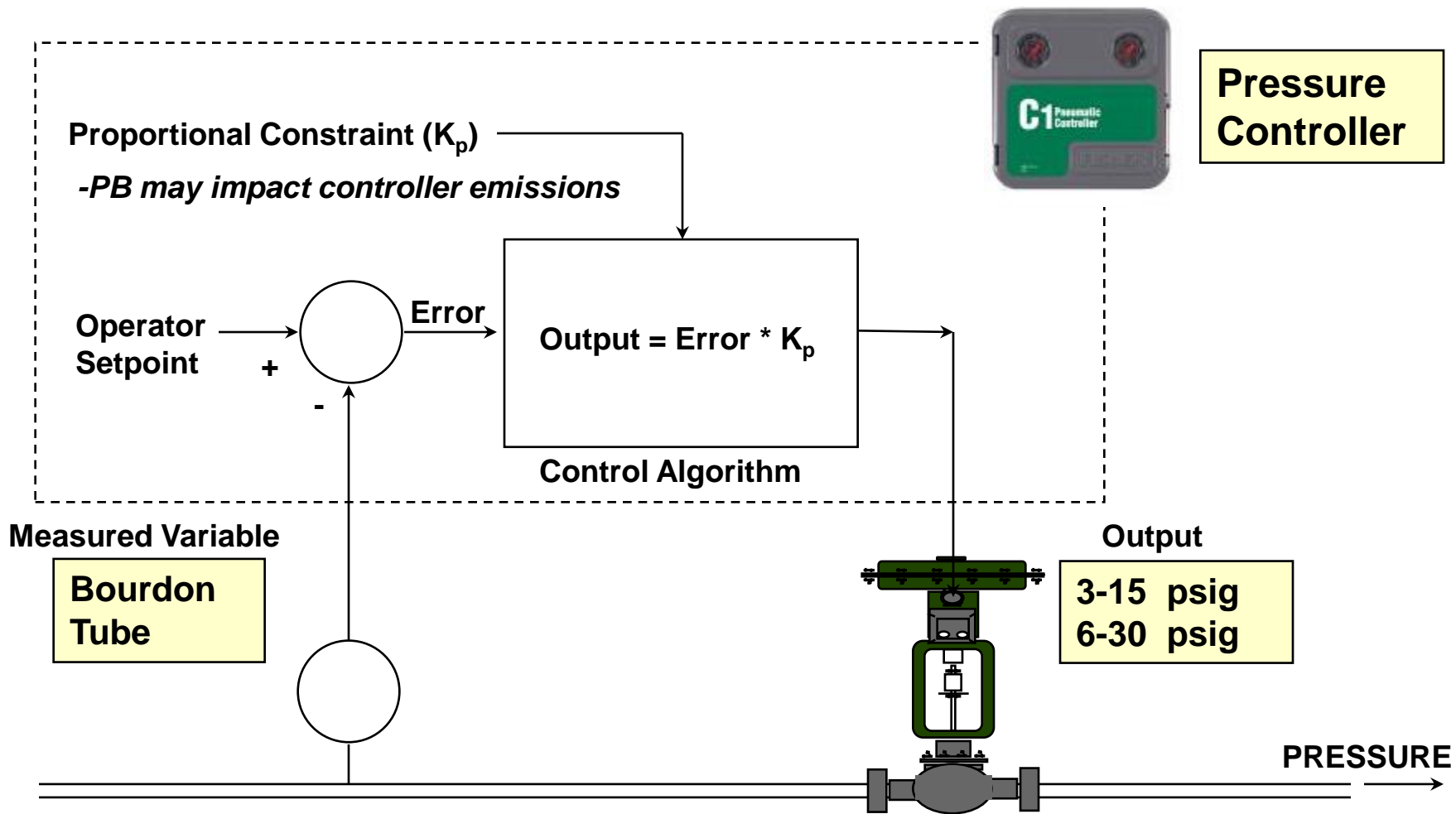
- Remote oil and gas sites use pressurized fuel gas for process control (Gas Driven Instruments)
- Newer gas driven instruments have lower gas consumption than older models)
- Three options used to improve performance:
 - Replace like for like (4150 to C1)
 - Replace like for like (546 to i2P-100_(l))
 - Retrofit kits (i2P-100_(h) to i2P-100_(l))



High vs. Low – What Does That Mean?



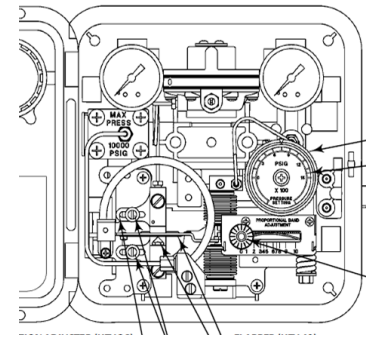
What Does a Pressure Controller Do?



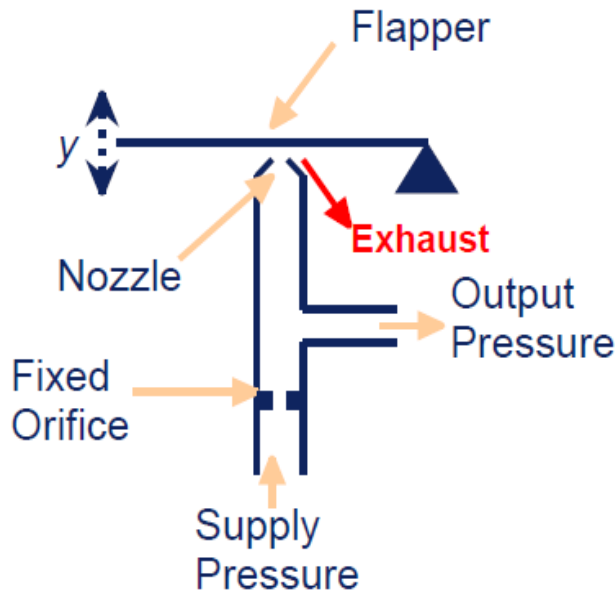
Pneumatic level loops are used in over 95% of oil and gas field separators

How a Pneumatic Pressure Controller Works

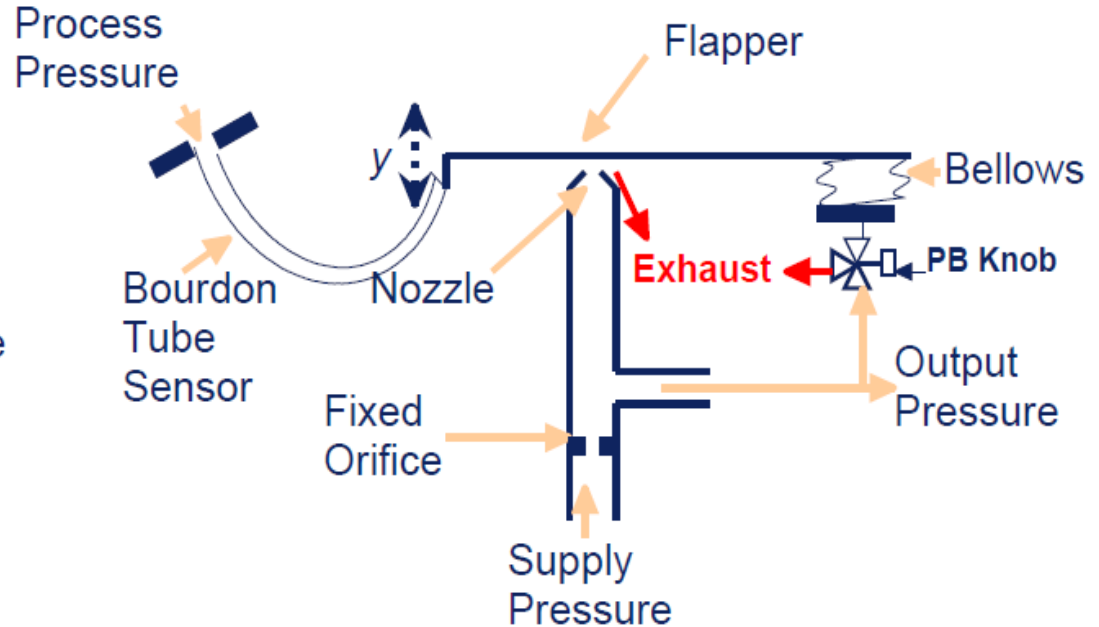
- Readily available fuel gas is used as a signaling medium to provide a variable output pressure to a throttling device
- The flapper-nozzle displacement sensor forms the basis of many pneumatic devices



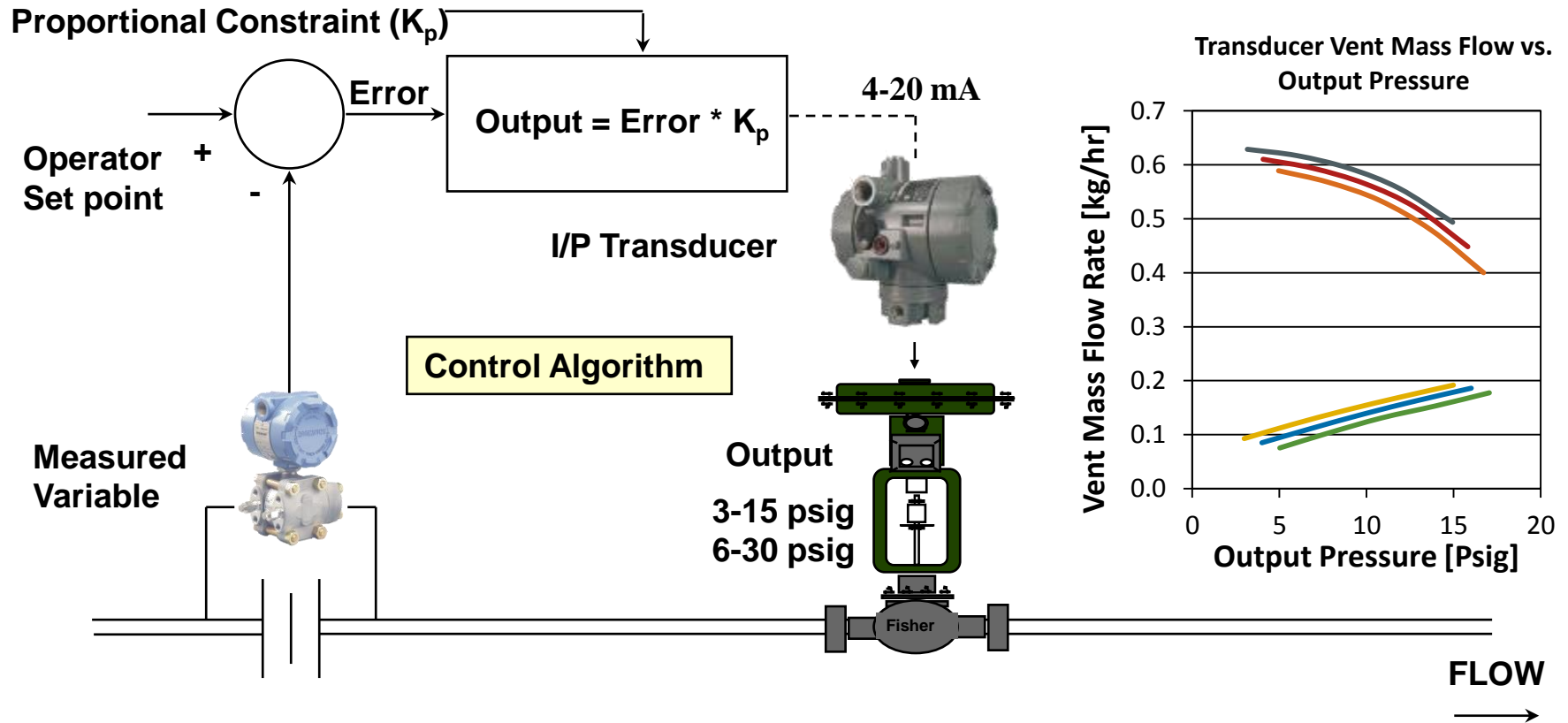
Basic Nozzle Flapper



Proportional Controller



What Does a Transducer Do?



i2P-100 Steady State Air Consumption -SCFH(2)

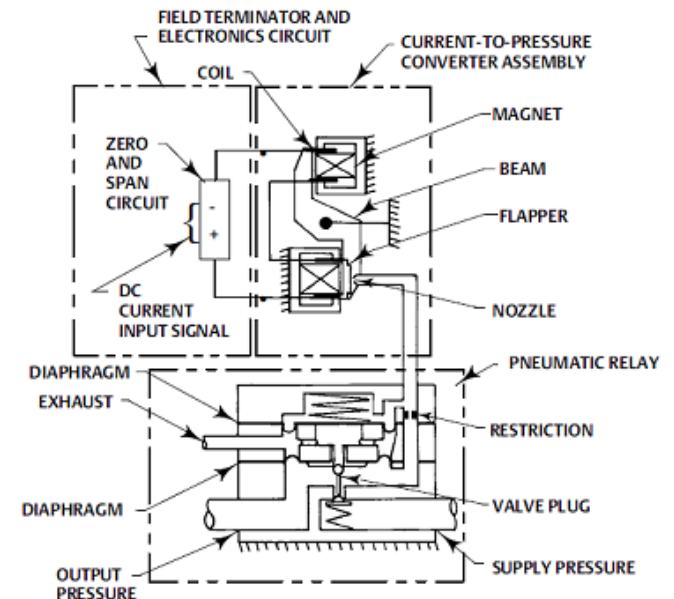
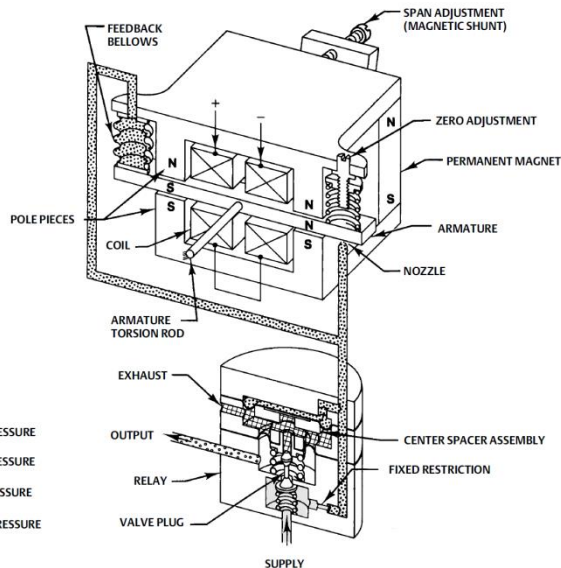
Restrictor	0.012 inch											
Output	3-15 psig (20 psig supply pressure)						6-30 psig (35 psig supply pressure)					
Input	4 mA		12 mA		20 mA		4 mA		12 mA		20 mA	
Gas	Air	Nat. Gas	Air	Nat. Gas	Air	Nat. Gas	Air	Nat. Gas	Air	Nat. Gas	Air	Nat. Gas
SCFH	2.03	2.64	2.11	2.75	2.79	3.62	2.84	3.70	3.11	4.04	4.44	5.77

How a Transducer Works

- Old high bleed mechanical transducer uses a torque motor, nozzle-flapper and pneumatic relay
- High-capacity transducer relay vents more gas from fully pressured casing



- Redesigned low bleed transducer uses a converter module and two moving coils
- The integral relay provides the high capacity necessary to drive pneumatic control valves





Did
1062
53,100
\$2.09

project life*

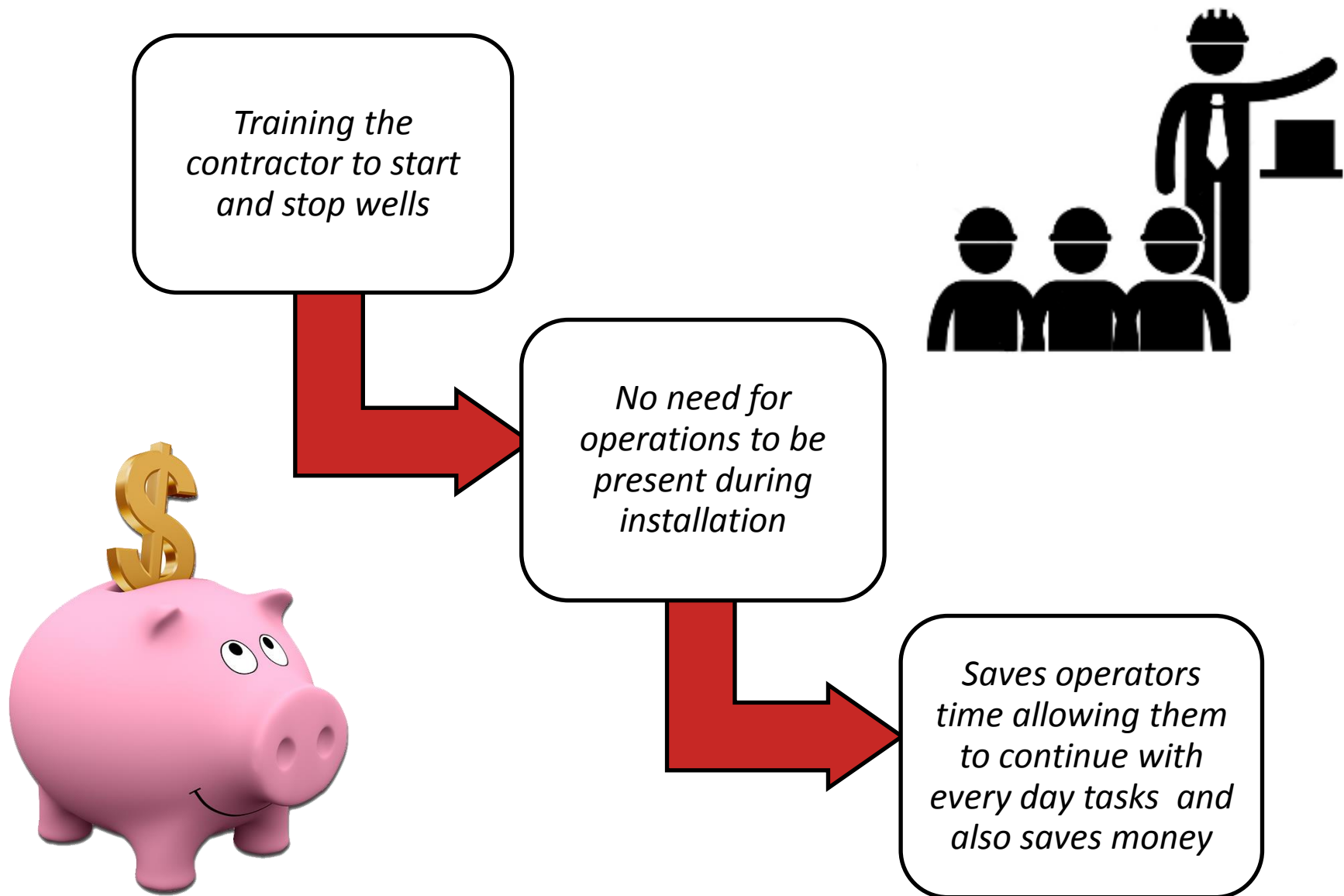
- Field Exec
 - 1000 in
 - Approxi
 - 2-4 con
 - ≈ \$1750
- Environm
 - 50 tCO₂
- Additiona
 - Fuel gas
 - Improve
 - Modern

171 USED HIGH BLEED CONTROLLERS!!

Successes & Learning

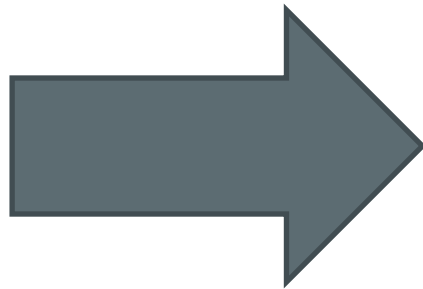


Golden Nugget #1 – Contractor Coaching



Golden Nugget #2 – Database Development

- We have so many but where are they?
 - *WE DON'T KNOW!!*
- Database to track all pneumatic devices at each well-site visited by the contractor



Controller

Cap-Op Controller ID# : CC690004

Controller Type :

Make :

Model :

Retrofit installed : Yes No

Controller Serial #:

Year of Manufacturing :

Supply Pressure :

Controller Action :

Condition of Controller :

Gas Type :

Quality of Gas : N/A

Liquids Content : N/A

Sweet or Sour : N/A

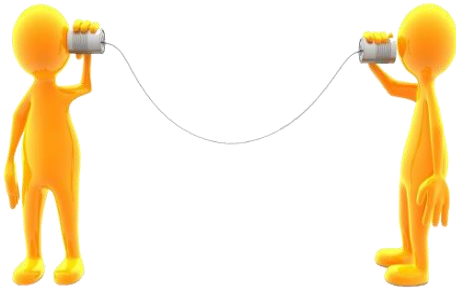
Notes :

Not knowing what's out there means you can't be 100% sure of what you will need

Have a stocked truck
&
Staggered shipments



Road Blocks & Challenges



Communication & Tracking

- Project Progress
- Operations Feedback



Obtaining an accurate wellsite list



Having no back-up

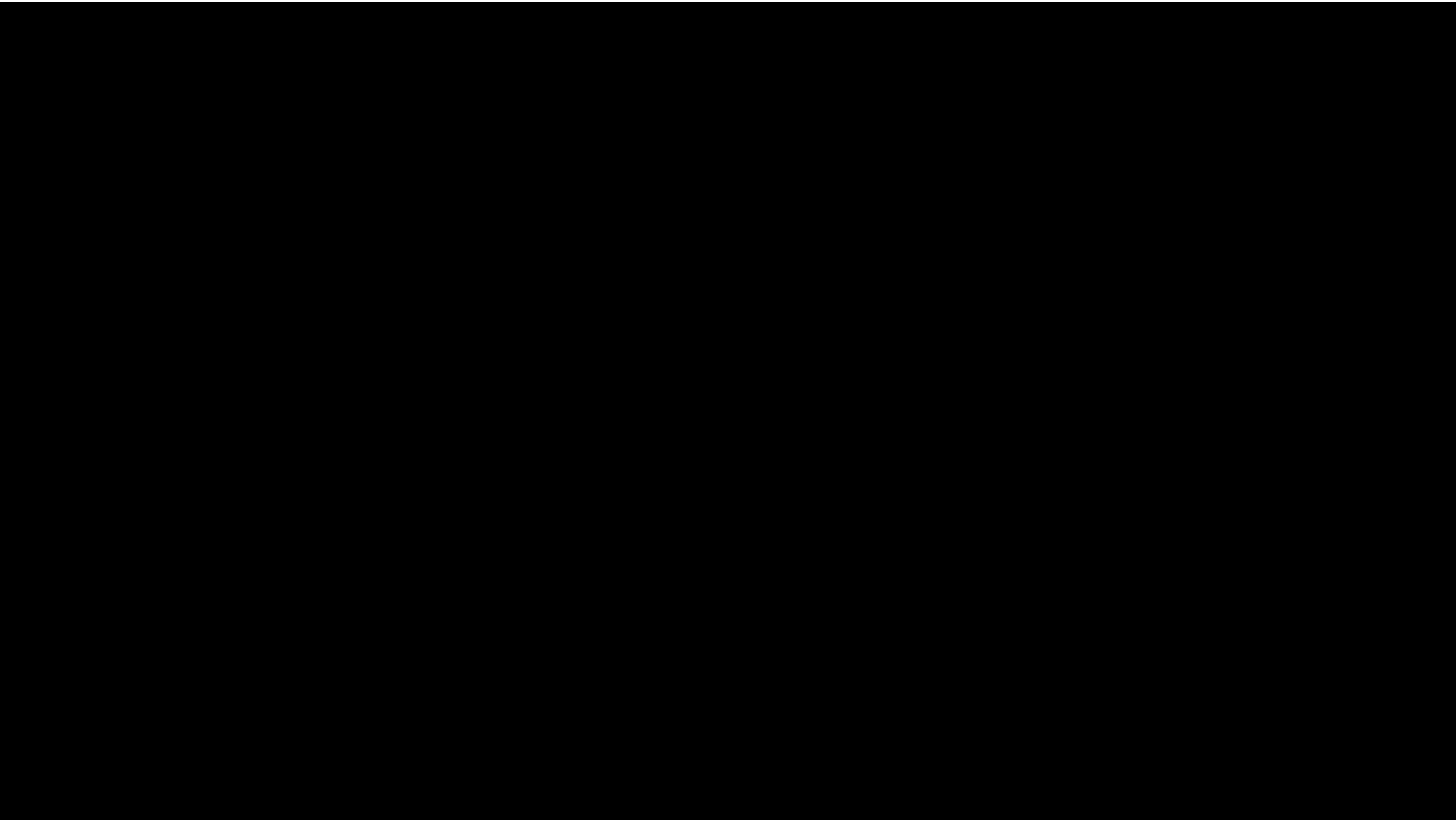
- Contractor replacement
- Delayed

Field GHG Reduction Projects

Solar Chemical Pump Conversions



Solar Chemical Pump Video



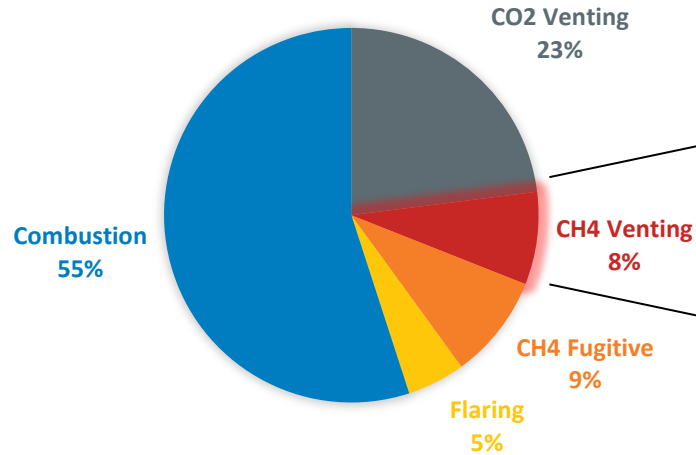
Pneumatic Chemical Pump



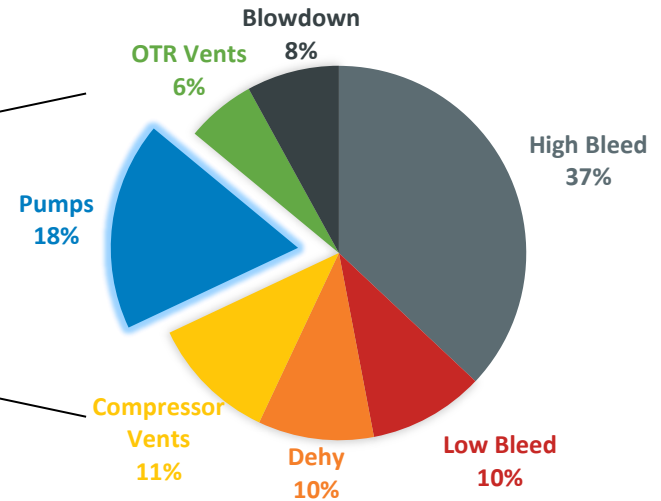
N-Seal Secondary Containment Adaptor, mikemci3 <https://www.youtube.com/watch?v=hsXKHwxia6k>

Why target Pneumatic Pumps?

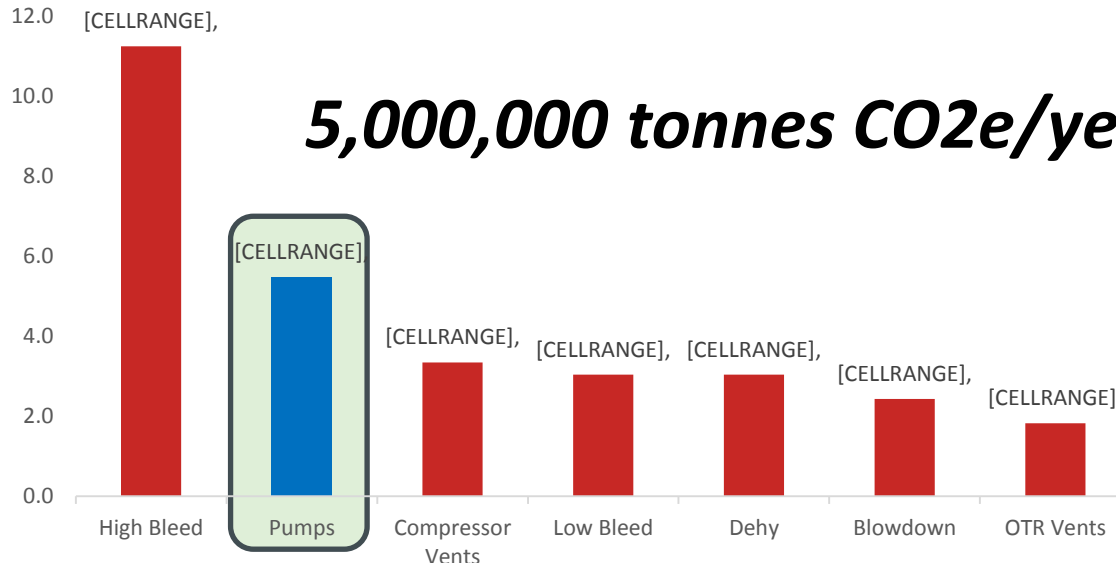
OIL AND GAS EMISSIONS



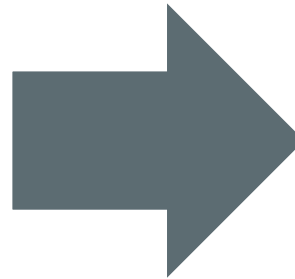
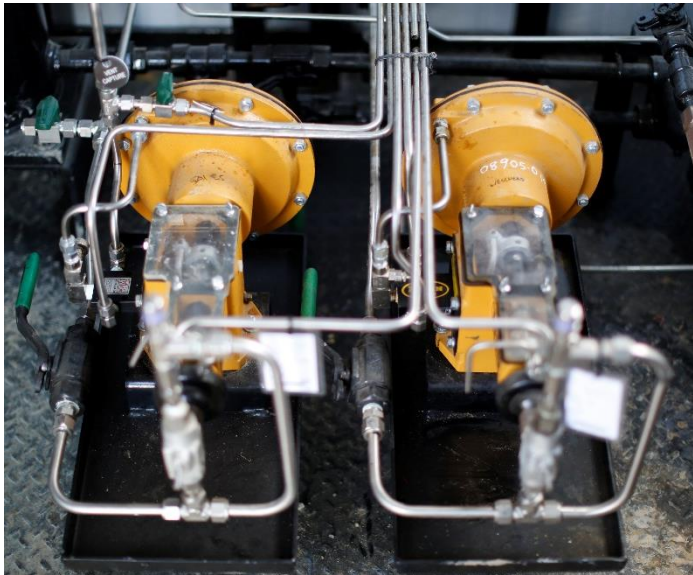
VENTING EMISSIONS



30.4 MtCO₂e of Methane Vented in Alberta



Removing Pneumatic Chemical Pumps and replacing them with Solar Powered Chemical Pumps





- BJ started his professional career working as an electrician, where he gathered field experience in process and control systems, before he moved into a technical sales role.
- In 2013, BJ joined Sirius Instrumentation and Controls Inc.
- He is currently working as a Product Line Specialist, which includes elements of technical support, sales, operations and field service.

Technology Description

Solar chemical pump technology - a combination of solar panels, lead-acid batteries, a pump controller and electric motor are used to inject precise amounts of chemical into processes at well-sites or facilities.



- Solar Energy
- Converted to Electrical Energy
- Stored in Batteries
- Powers Controller
- Controls a DC Motor
- Drives a Pump
- Moves Chemical

Technology Description

Conventional Pneumatic Pump Technology

- Vents methane to the atmosphere each pump stroke (**GHG emissions**)
- Lack of chemical injection precision (over/under-injection, pneumatic supply quality)
- Requires frequent intervention (speed adjustment, tightening/replacing packing, leaks)
- Limited “smarts” capability (on/off SCADA integration)
- 1940’s technology still widely used today!
- Vast operating/maintenance knowledge

WE CAN DO BETTER!!!

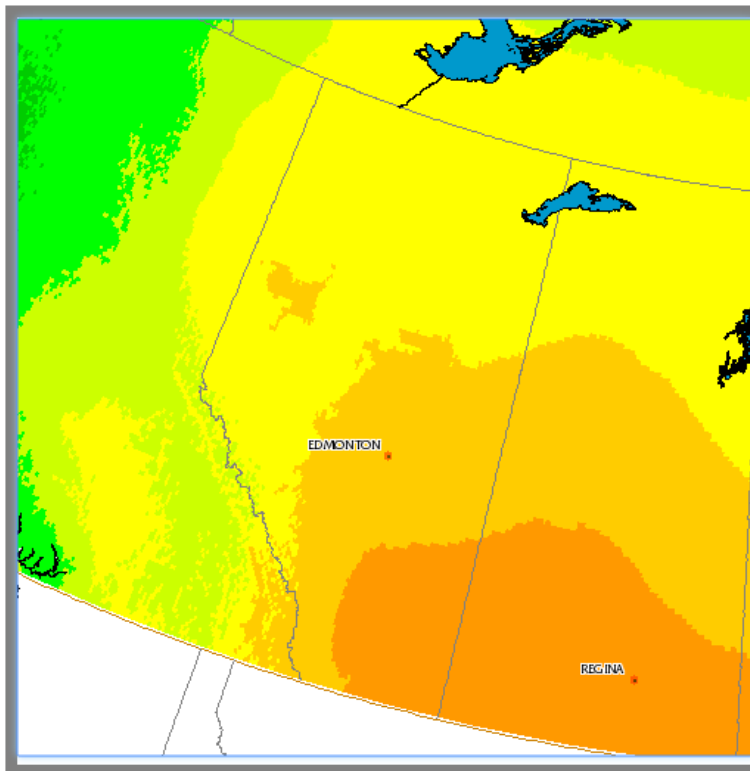
Solar Pump Technology

- A modern **Emission-free** technology
- Precise chemical injection (reduces chemical wastage)
- Some solar pump packages integrate an improved/re-designed pump (multiple seals)
- Pump controllers are “smart” (dynamic SCADA integration, offset credit data recording)
- Starting to be implemented on a larger-scale



Technology “best practices”

- Solar system design (spend the extra \$\$ up front)
- Ensure your panels are installed vertical, due south
- Do your homework. Trial a number of different make/models.



Legend

Photovoltaic potential (kWh/kW) South-facing, tilt=latitude Annual	
0 - 500 kWh/kW	Blue
500 - 600	Dark Blue
600 - 700	Light Blue
700 - 800	Teal
800 - 900	Green
900 - 1000	Light Green
1000 - 1100	Yellow-Green
1100 - 1200	Yellow
1200 - 1300	Orange
1300 - 1400	Dark Orange
1400 +	Red




0 160 320 480 km

Source: Natural Resources Canada (PV Potential and Insolation), <http://pv.nrcan.gc.ca/>

Scorecard – Realizing the Win-Win

	Said	Did
Installations	50	86
GHG Reduction (tCO ₂ e/year)	6,183	12,040
Cost Abatement (\$/tCO ₂ e)	\$6.07	\$4.78

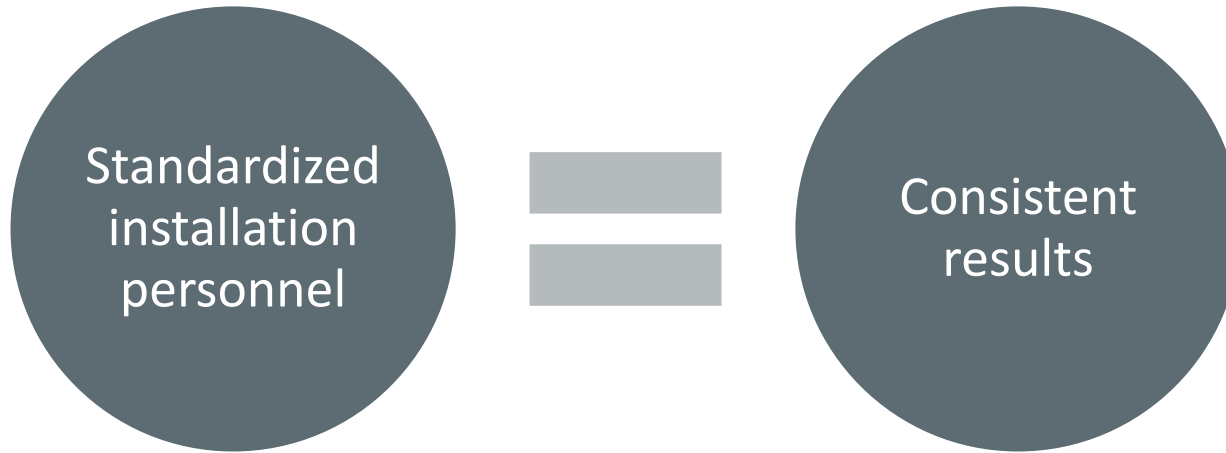
Based on 20 year project life

- Field execution experience 
 - 86 installs in the 5 years of the program
 - Install of one Solar Pump takes between 1-2 days
 - Approximately \$15,000 per install
- Environmental Benefits 
 - Each pump removes about 140 tCO₂e/year
- Additional Benefits 
 - Fuel gas savings of about 45 scfh
 - Reduces chemical wastage
 - Possibility for Carbon Offsets under the Revised Quantification Protocol for Methane Venting Reductions

Successes & Learnings



Golden Nugget #1 – Standardization

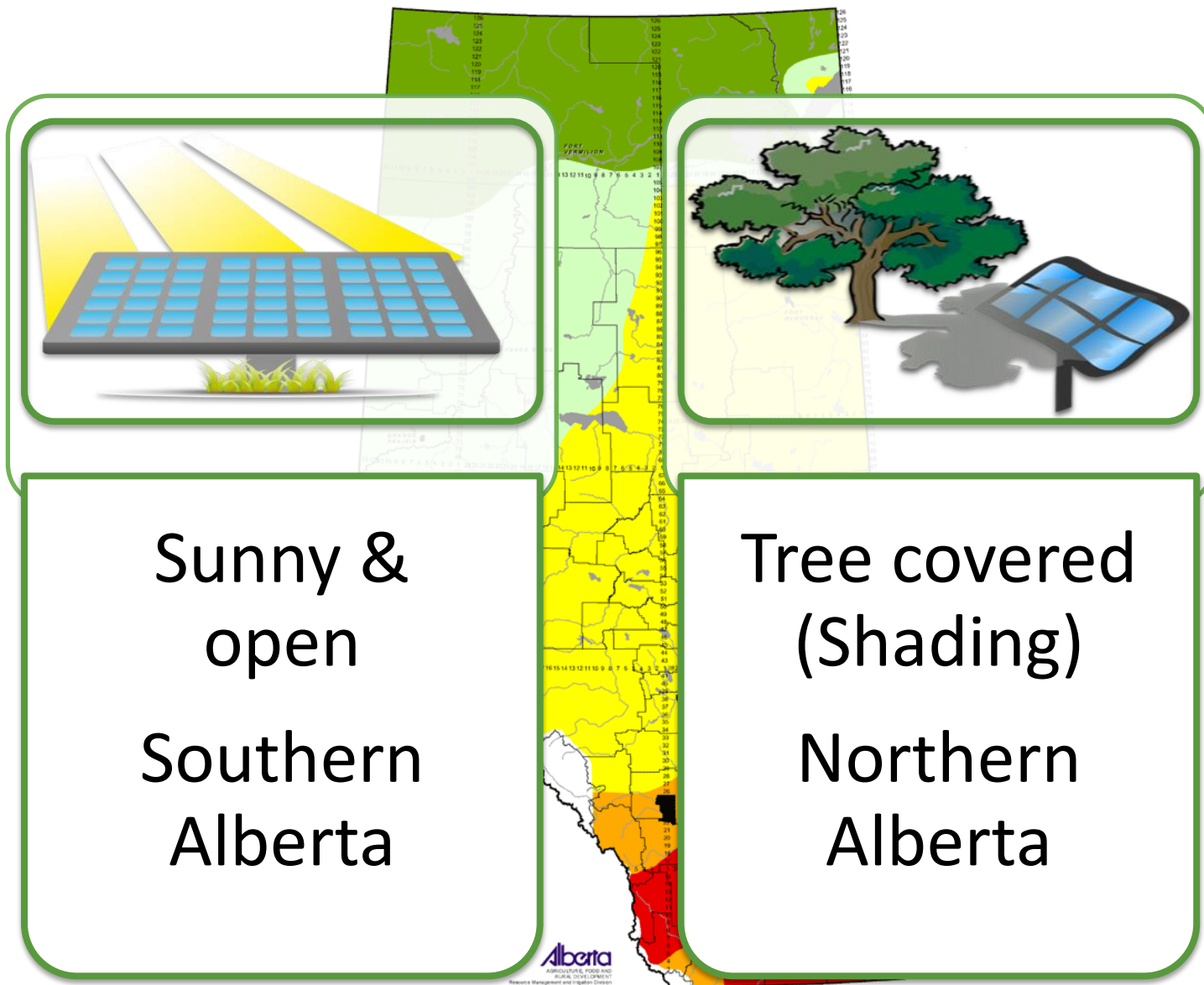


Golden Nugget #2 – Keeping Operators Up-to-Date

- Provide opportunities for training
- Promote relationships between vendor and operations
- Provide ongoing field support



Golden Nugget #3 – Fit for Purpose



Sunny &
open
Southern
Alberta

Tree covered
(Shading)
Northern
Alberta

Agriculture Land Resource Atlas of Alberta [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex10305](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex10305)

Road Blocks & Challenges

- Location, location, location



- Resistance to change



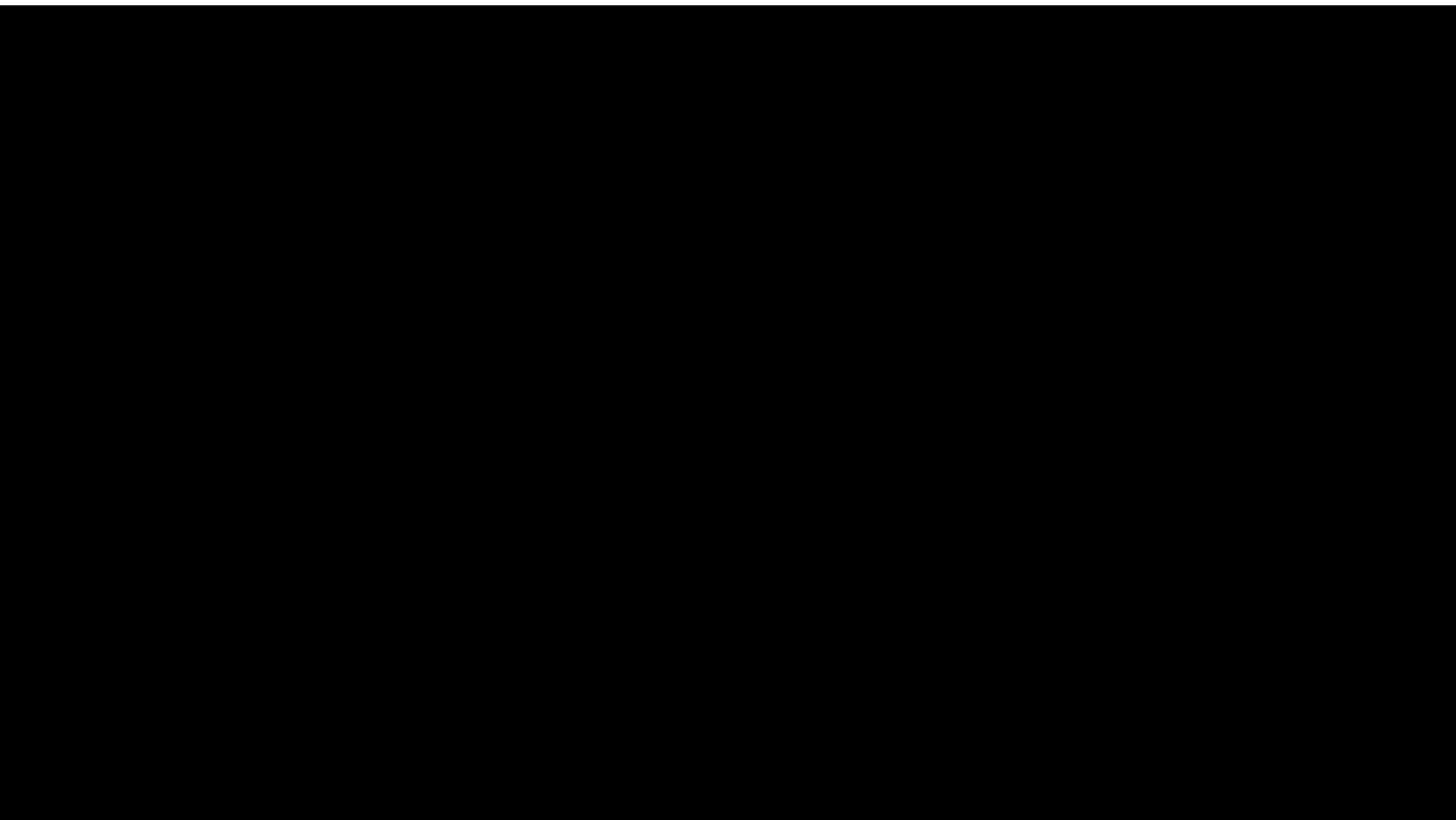
- Theft of panels and batteries



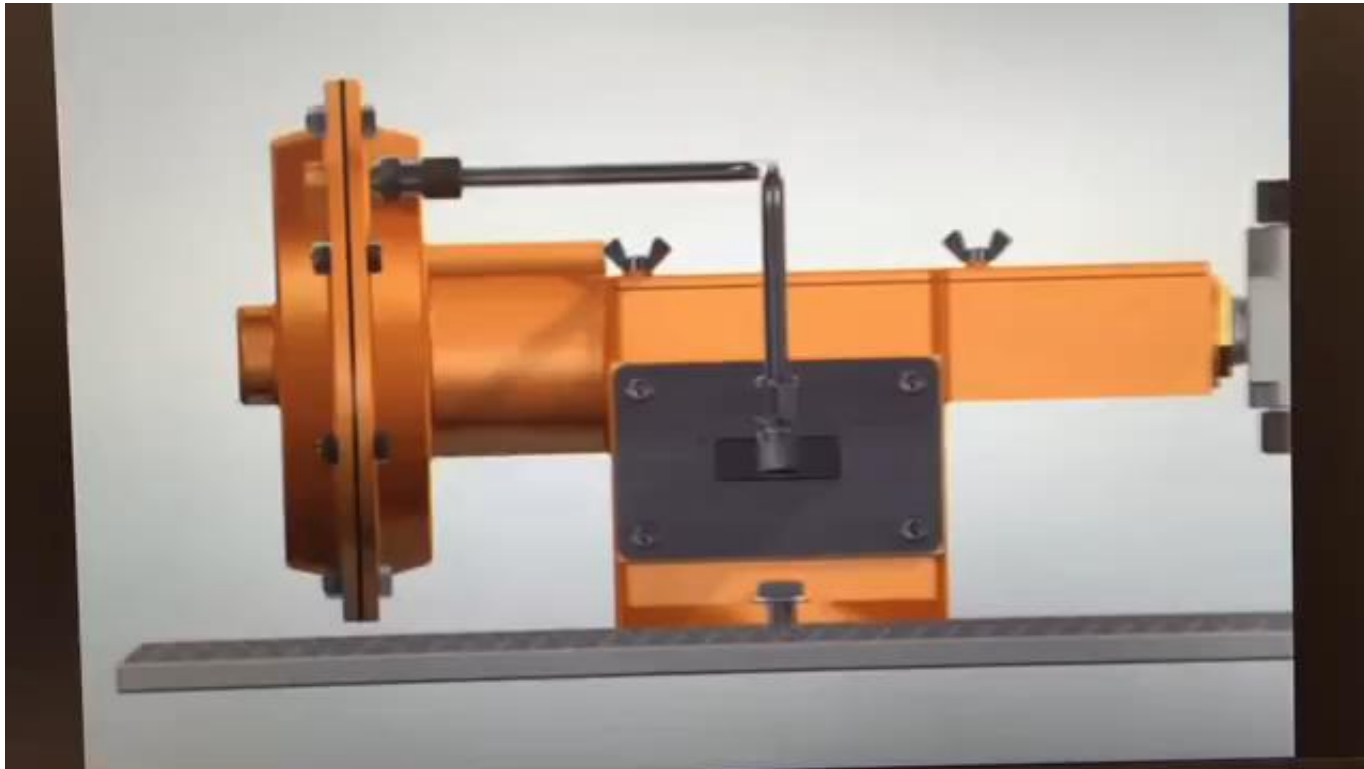
Field GHG Reduction Projects Vent Gas Capture at Wellsites



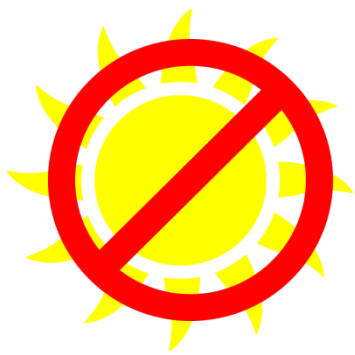
Vent Gas Capture Video



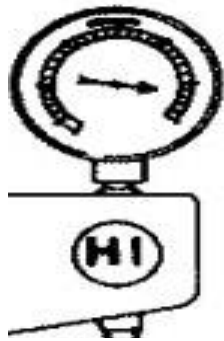
Why Vent Gas Capture?



Why Vent Gas Capture?



High latitudes = ↓Sun + ↑Trees

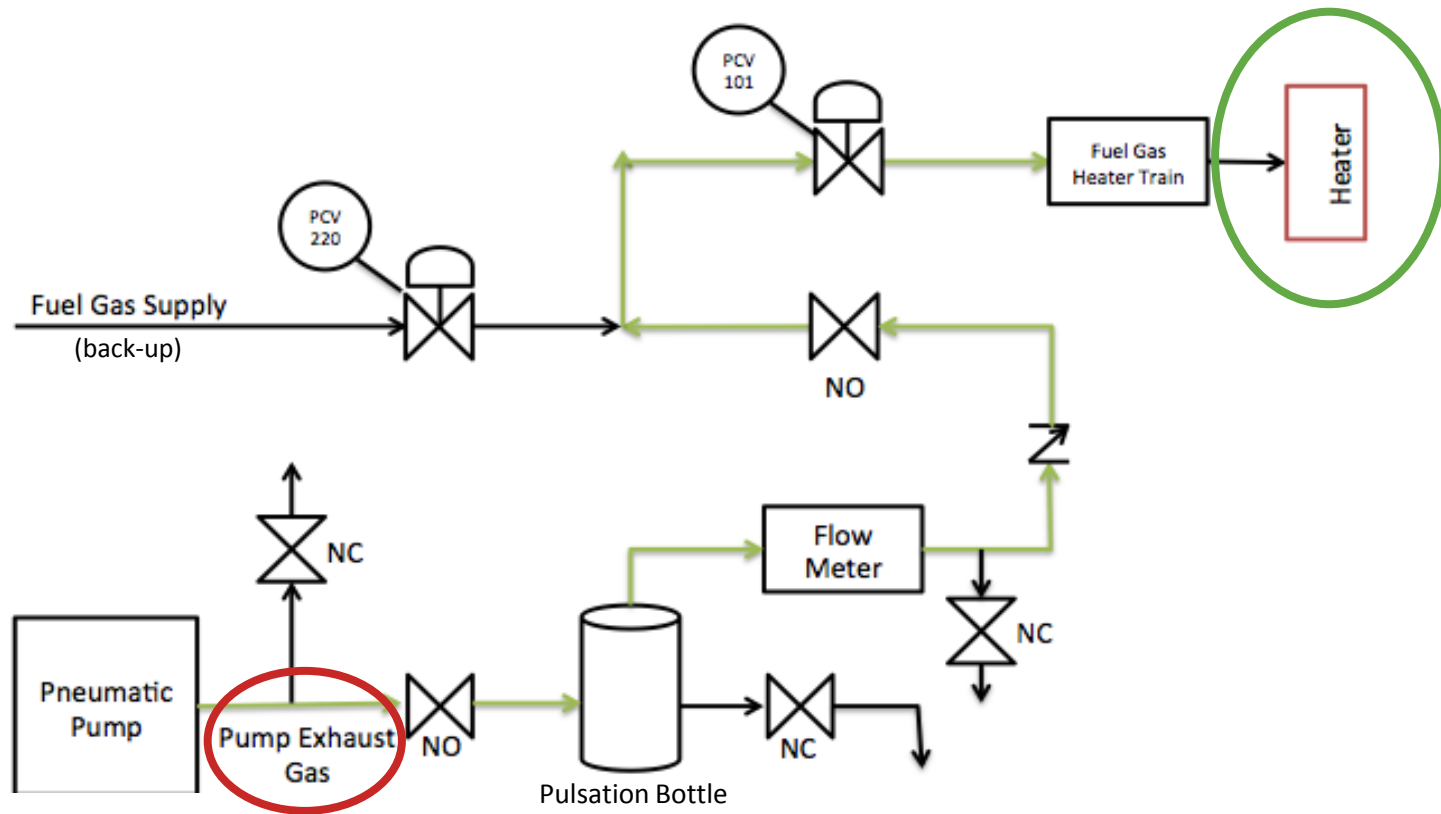


Start up = high pressures & rates



Resistance

Vent Gas Capture System






Field Installation





TECHNOLOGY SCORECARD & REALIZING THE WIN-WIN

	SAID	DID
Installations	100	15
GHG Reduction (tCO ₂ e/year)	4,416	675
Cost Abatement (\$/tCO ₂ e)	\$1.70	\$4.96

- Field execution experience 
 - 15 installs through CCEMC program
 - 1 week procurement, 1 day install
 - ≈ \$6,000 per install
- Environmental Benefits 
 - System eliminates ≈ 45 tCO₂e/year
- Additional Benefits 
 - Fuel gas savings of about 12 scfh
 - Meter for credit verification
 - Familiar equipment

Successes & Learnings



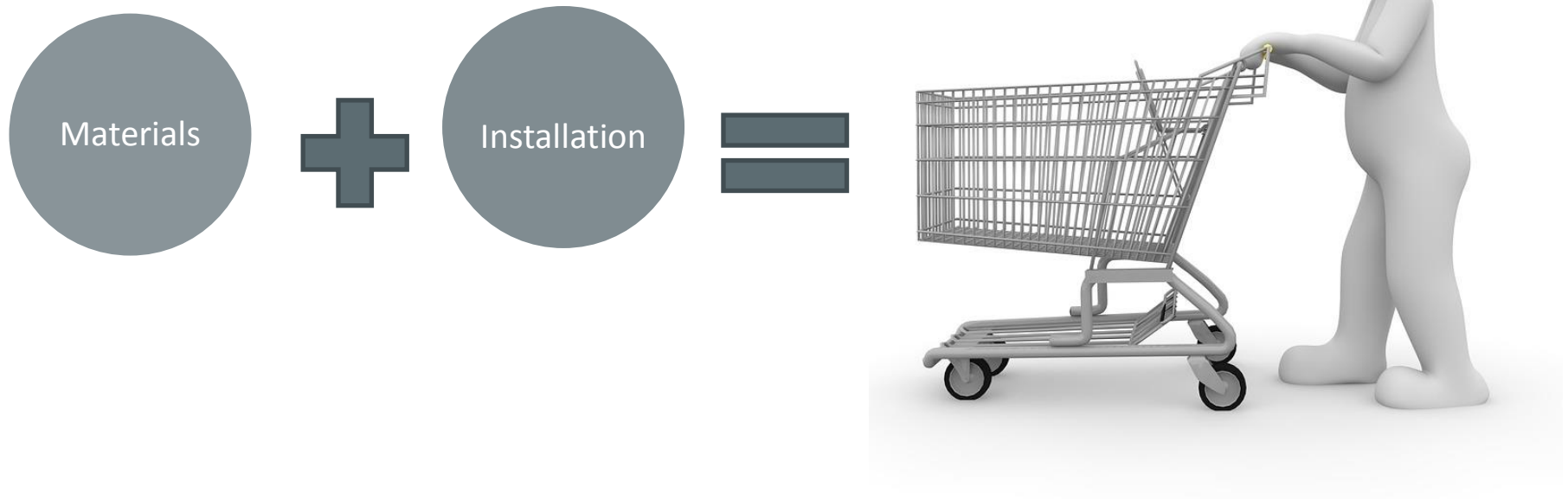
Golden Nugget #1 – Flexibility

Provides you with another way to reduce the emissions from pumps

There are many ways to achieve the same goal



Golden Nugget #2 – One-stop-shop



Golden Nugget #3 – Meter

Add the meter to your design for credit verification under the Revised Quantification Protocol for Methane Venting Reductions



Road Blocks & Challenges

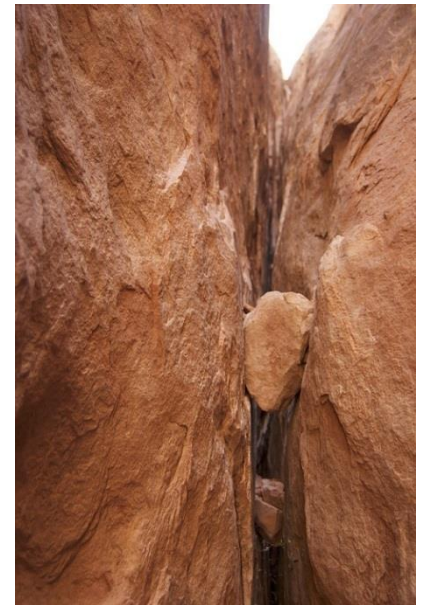
Seasonal Application



Back Pressure



Limited Space Available



PANEL DISCUSSION

