Vacuum Sewer Sanitation Energy Efficiency

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ANTHC

Statewide tribal consortium

Over 3000 employees – Mostly in hospital and health divisions

Division of Environmental Health and Engineering roughly 250 employees

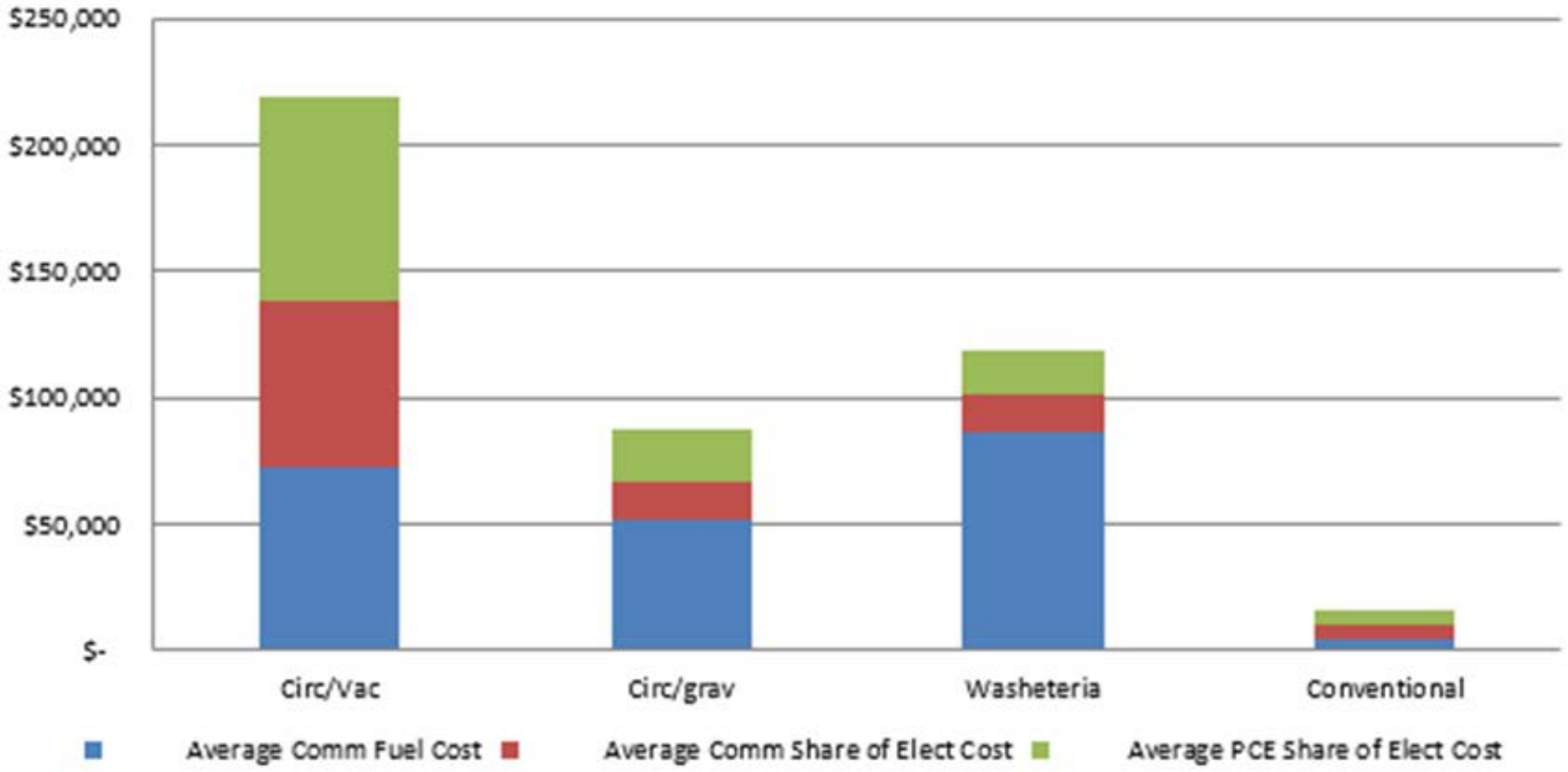
Rural Energy Initiative – 7 employees

Rural Energy Program

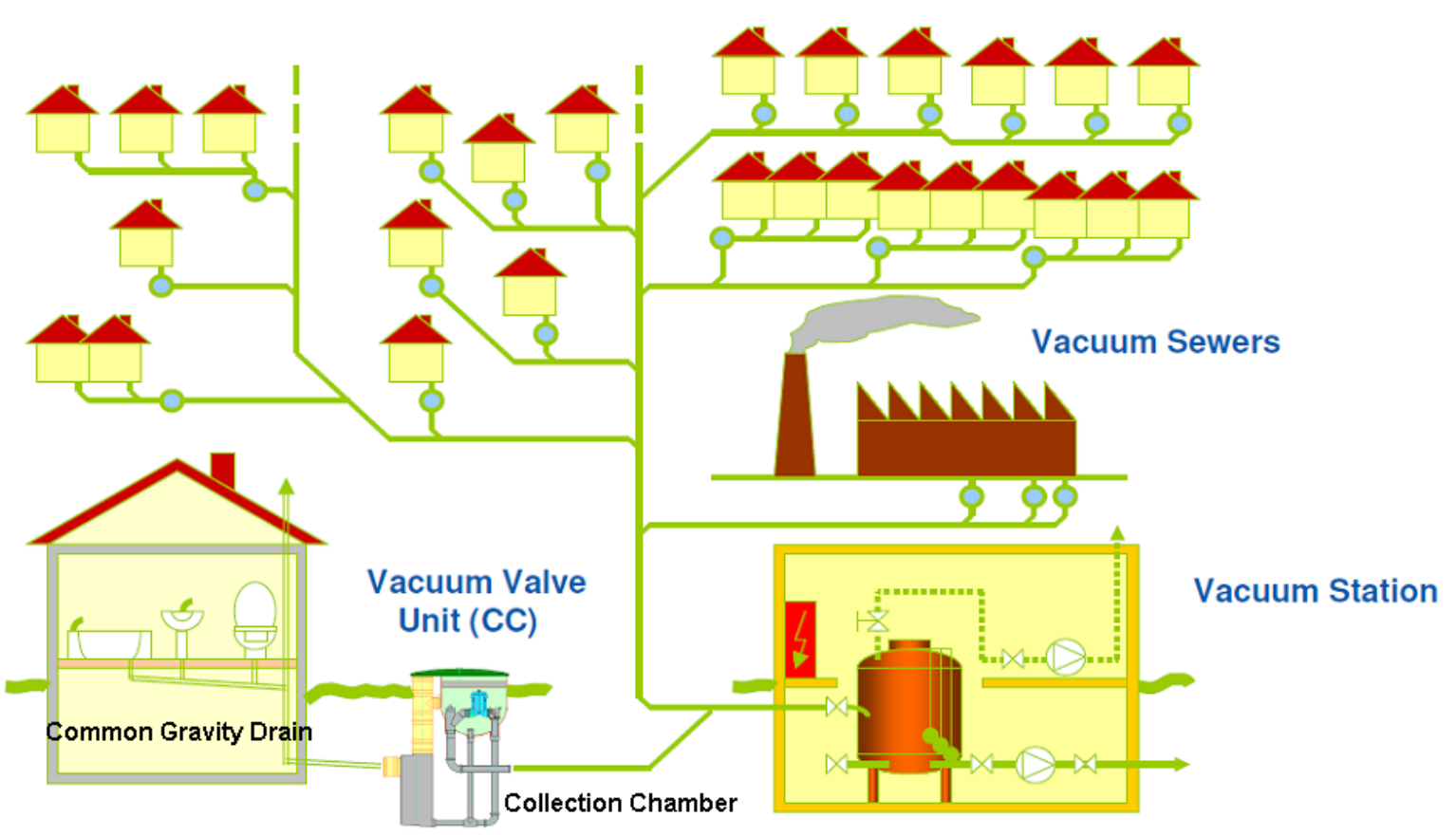
Reducing dependence on diesel fuel and making water and sanitation more affordable and sustainable for rural Alaska through:

- Energy efficiency
- Microgrid optimization
- Integration of alternative energy

Comparison of wastewater sanitation costs



What is vacuum sewer?

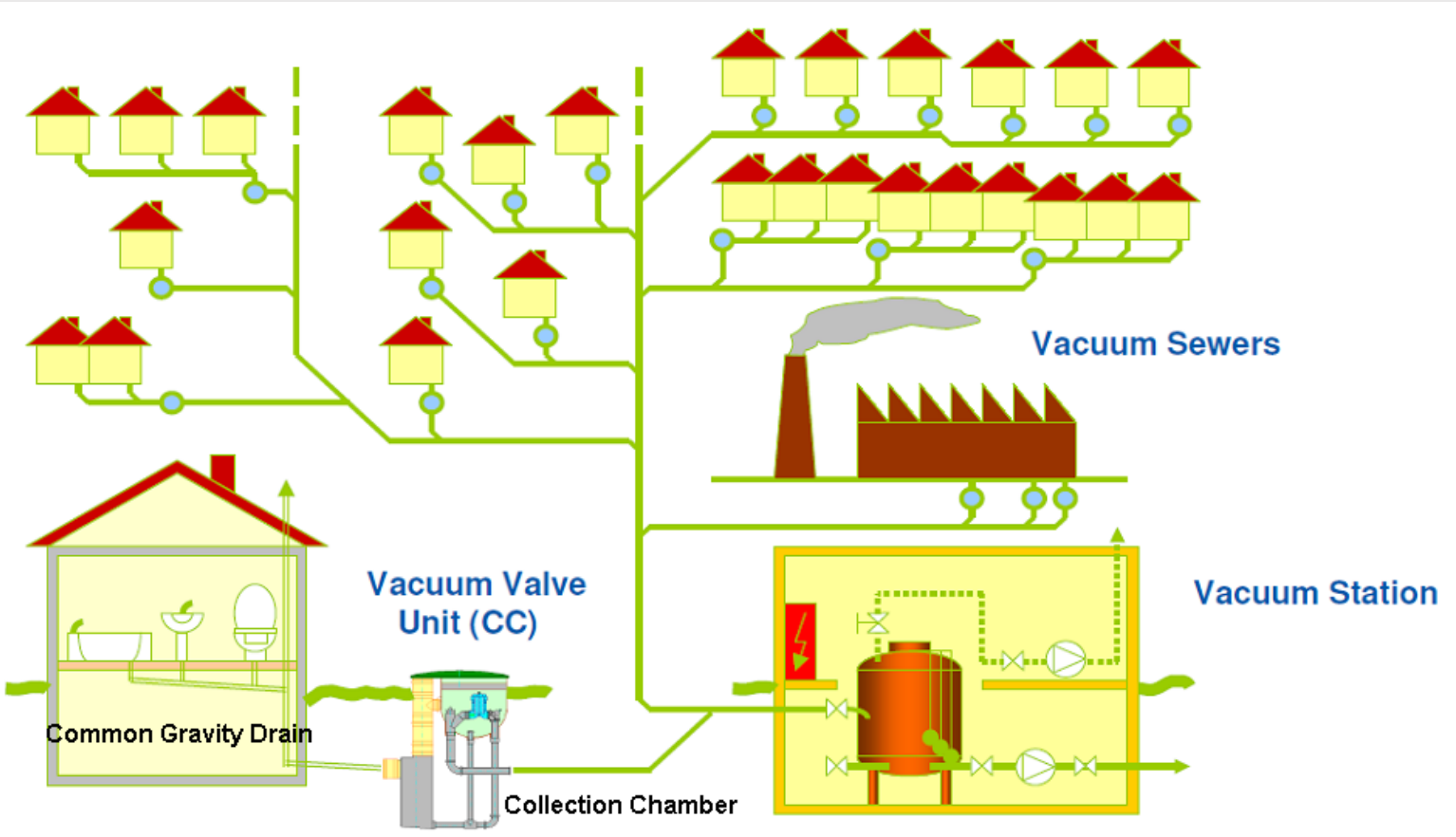


Homes plumbed in typical gravity fashion

Wastewater flows into a individual sump or common sump at atmospheric pressure

When sump gets to certain level, valve between vacuum and sump opens, pulls in wastewater and air, sucking wastewater to collection tank at vacuum station

What is vacuum sewer?



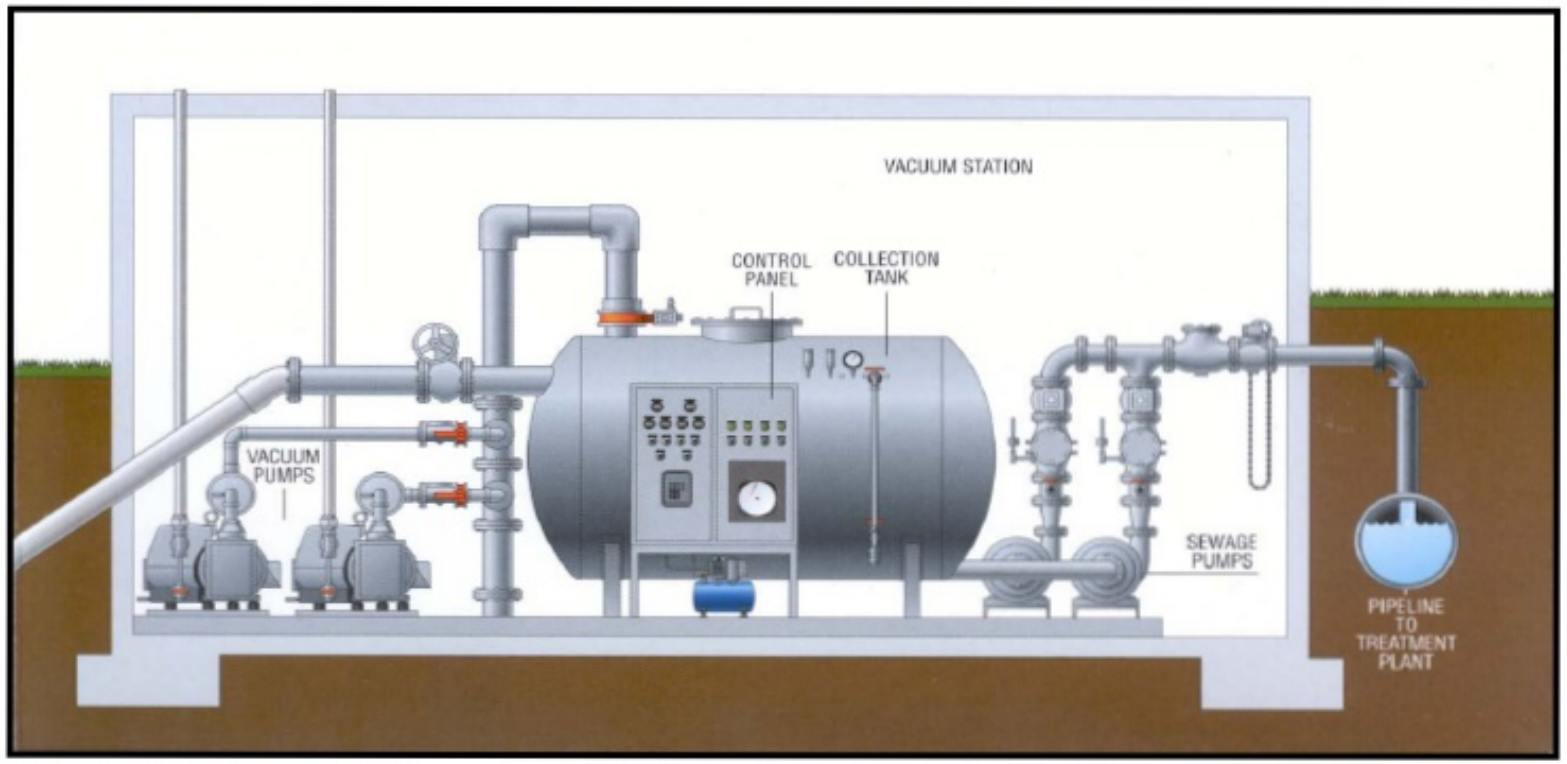
Old technology. First installed in Europe in 1882

Not common in contiguous US

Alaska - Typically used in areas where soil conditions and topography prevent traditional gravity or pressure systems to operate

Collection system “de-pressurized” to around 20 inches of Mercury – around 10psi (standard atmosphere = 14.7psi)

Vacuum Station



Inside vac station, vac pumps “de-pressurize” system

As sumps evacuate, wastewater is sucked to station and gathers in low pressure collection tank

When tank gets to certain level, controls turn on pump to evacuate wastewater to treatment

Noorvik

Located in Northwest Arctic approx. 50 miles East of Kotzebue

Population = 650

Fuel Oil = $5.65/Gal
Electricity = $0.65/kWh (with PCE $0.19/kWh)

Collection system contains mix of gravity, lift stations, and vacuum

Improvements

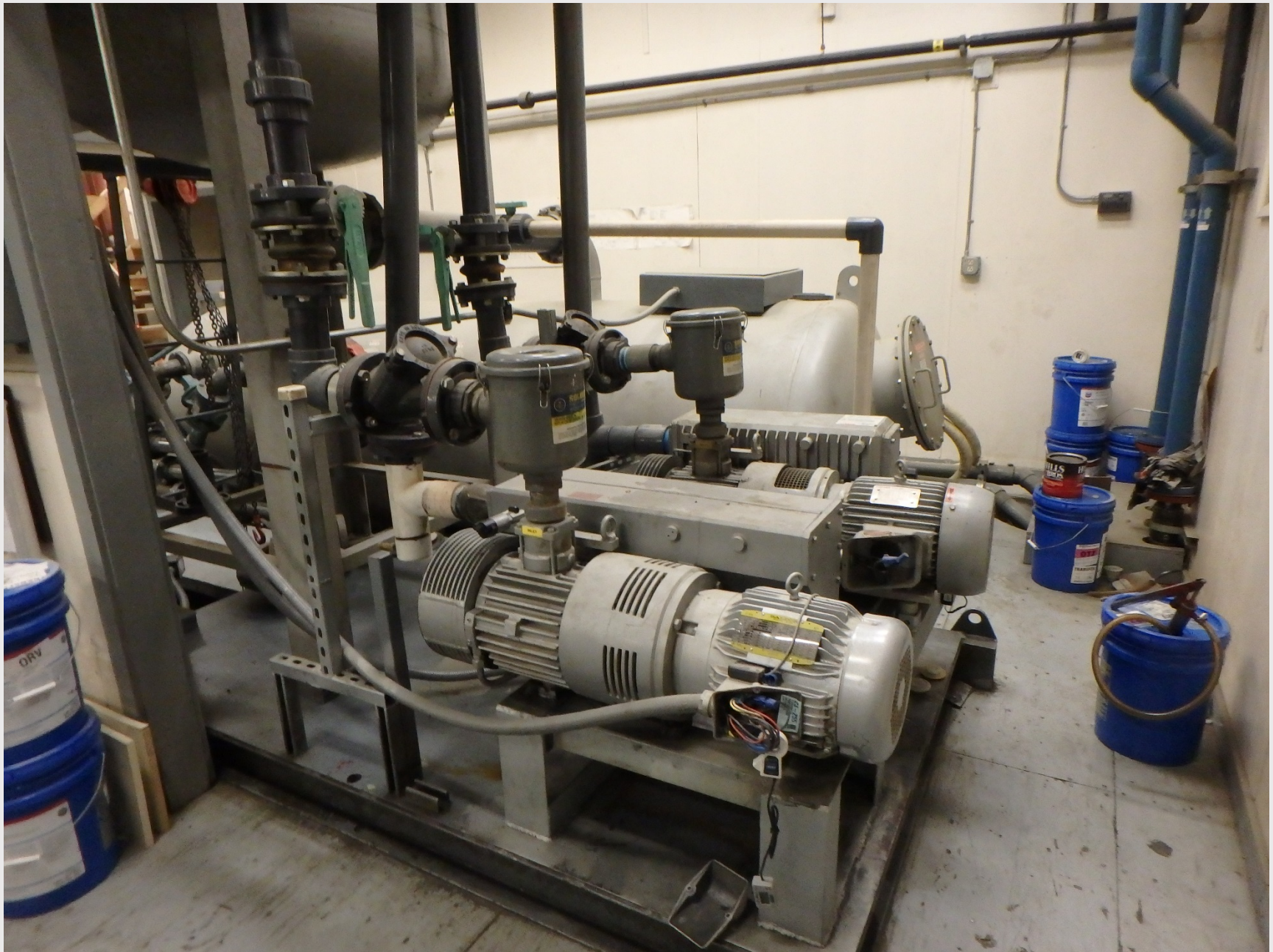
- New oil-less vacuum pumps
- Modulating controls
- Upgraded boiler controls and header piping
- Upgraded all heat adds
  - Controls
  - Control Valves

Cost = $200k
Expected Savings = $50k/yr
Actual Savings = discuss

- 18% reduction in energy use
- Electric rates rose
- Stabilized energy cost
- Data collection

Noorvik Findings	2013	2018	% change	Without Energy Efficiency	% Variance
Electric use	275449	224966	-18%	275449	22%
Electric cost	$39,001.61	$41,813.55	7%	$51,782.72	24%
Average electric rate	$0.14	$0.19	34%	$0.19	0%

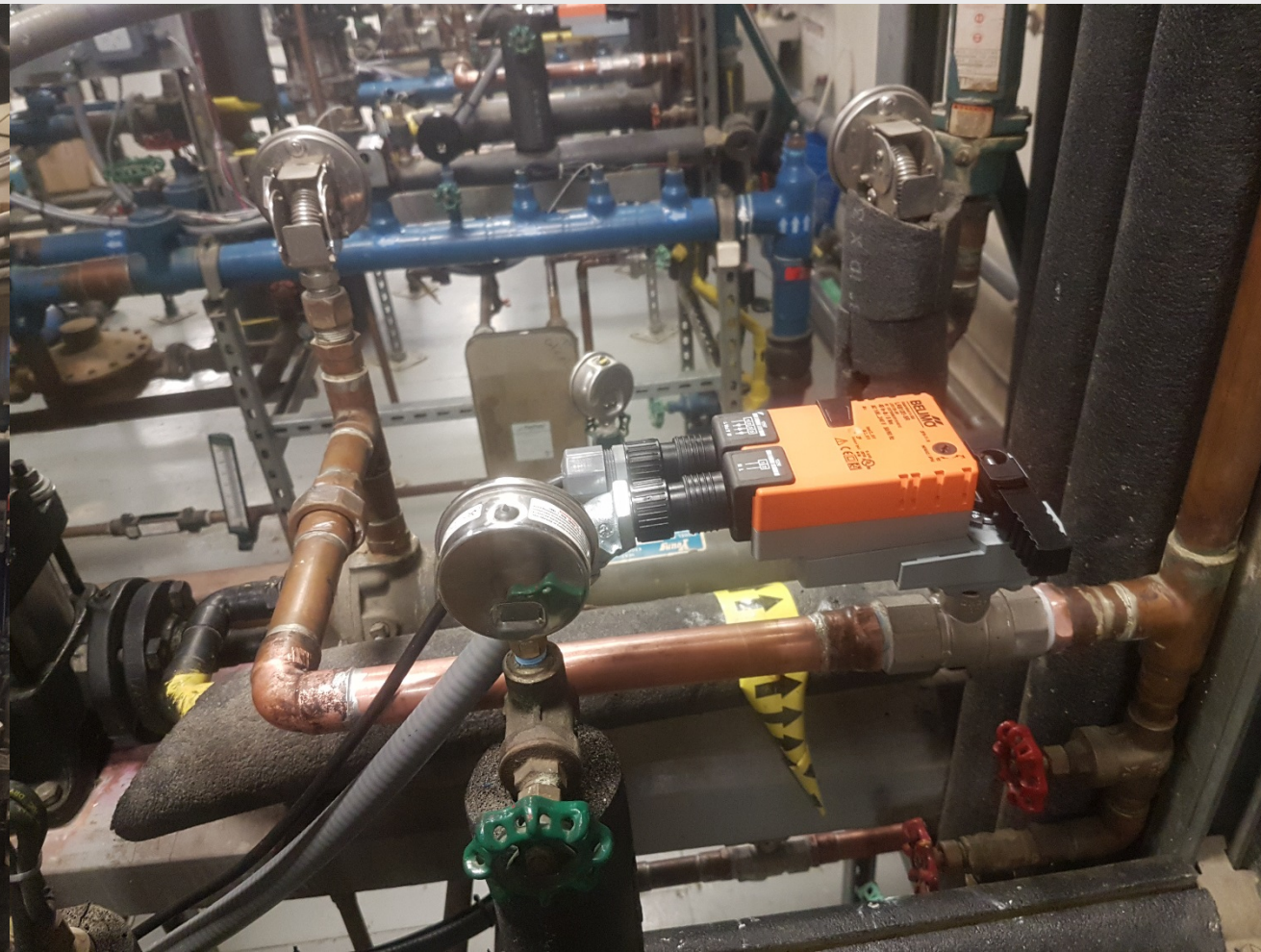
Noorvik – Vac Pumps



Noorvik – Vac Pumps

Noorvik – Vac Pump Controls

Noorvik – Heat Add



Kotlik

Located on northern Yukon River delta approx. 165 miles Northwest of Bethel

Population = 620

Fuel Oil = $4.53/Gal
Electricity = $0.62/kWh (with PCE $0.19/kWh)

Collection system only vacuum

Improvements

- New oil-less vacuum pumps
- Modulating controls
- Upgraded all heat adds
  - Controls
  - Control Valves
- LED lighting in all sanitation facilities

Cost = $150k
Expected Savings = $17k/yr
Actual Savings = discuss

- 17% reduction in energy use
- Electric rates rose
- Stabilized energy cost
- Data collection

Kotlik Findings	2013	2018	% change	Without Energy Efficiency	% Variance
Electric use	13,6765 kWh	11,4196 kWh	-17%	13,6765 kWh	20%
Electric cost	$21,750.35	$21,477.73	-1%	$25,866.25	20%
Average electric rate	$0.16	$0.19	18%	$0.19	0%

Kotlik – Vac Pumps

Kotlik – Heat Add

Alakanuk

Located on southern Yukon River delta approx. 165 miles Northwest of Bethel

Population = 710

Fuel Oil = $4.53/Gal
Electricity = $0.61/kWh (with PCE $0.20/kWh)

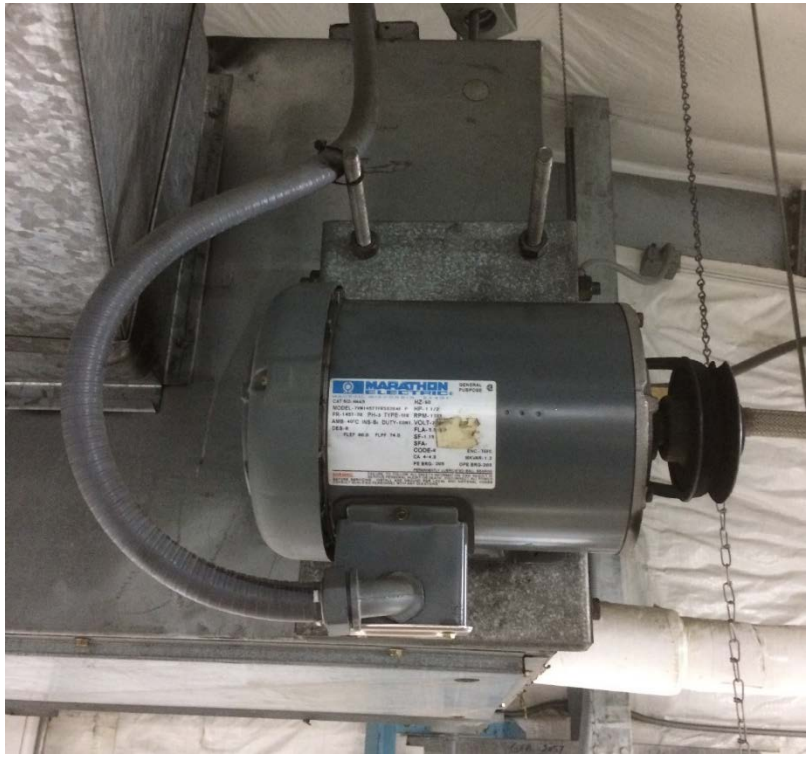
Collection system only vacuum

Improvements

- New oil-less vacuum pumps
- Modulating controls
- Upgraded faulty heat adds
  - Controls
  - Control Valves
- LED lighting in all sanitation facilities
- HVAC Upgrades
- Boiler upgrades

Cost = $275k
Expected Savings = $75k/yr
Actual Savings = discuss

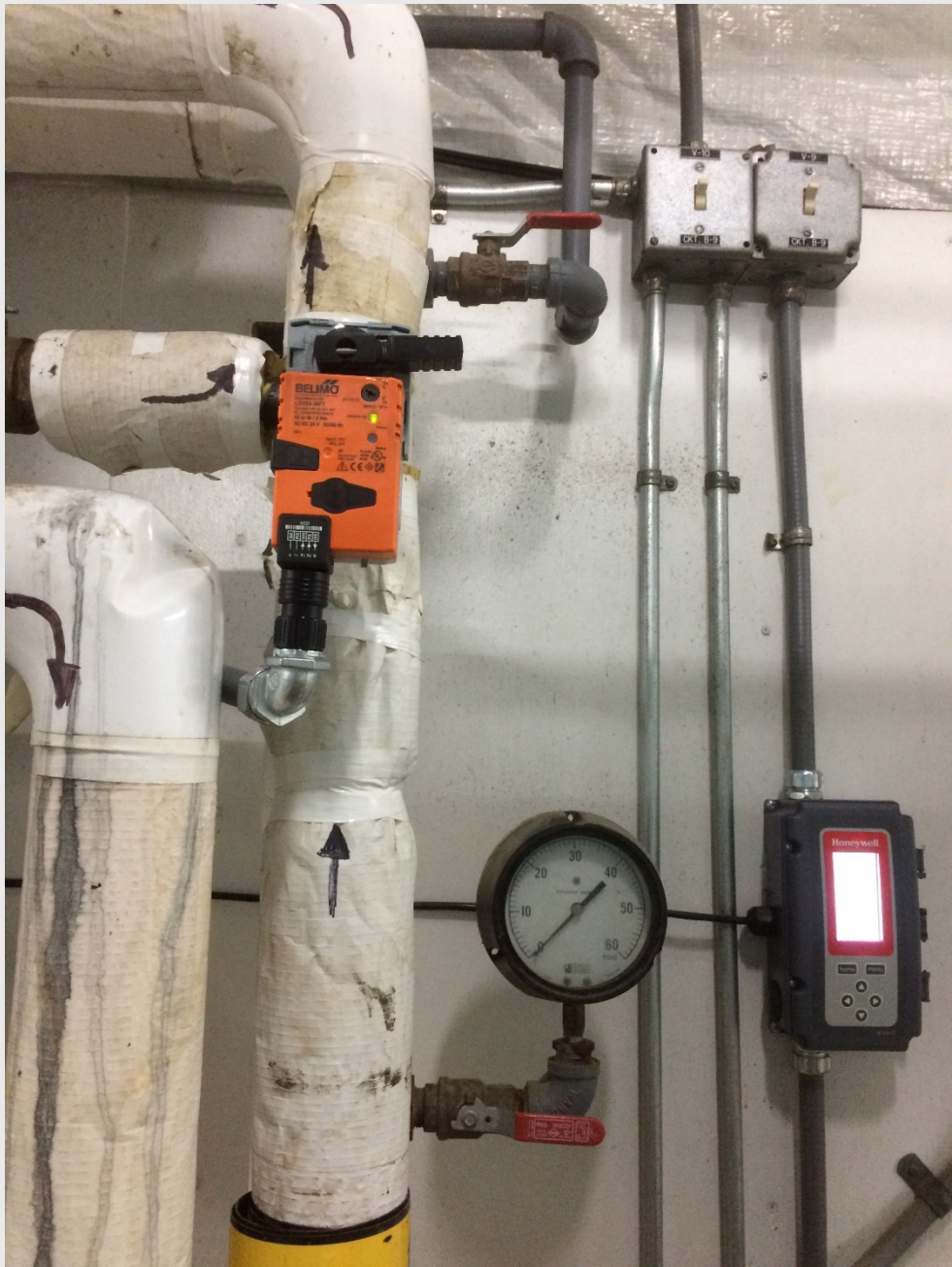
- 15% reduction in energy use
- Electric rates rose
- Stabilized energy cost
- Data collection



Alakanuk Findings	2013	2018	% change	Without Energy Efficiency	% Variance
Electric use	46,354 kWh	39,549 kWh	-15%	46,354 kWh	17%
Electric cost	$7,797.34	$7,671.55	-2%	$9,209.08	20%
Average electric rate	$0.17	$0.20	17%	$0.20	0%

Alakanuk – Vac Pumps

Alakanuk – Heat Add



Alakanuk – LED Lighting

Alakanuk – Boiler Upgrades

Key Figures

- Operations training
- Business training
- Data collection
- Root Cause analysis
  - What are the biggest drains?
  - What are the weaknesses?

Aggregate Community Findings	2013	2018	% Change	Without Energy Efficiency	% Variance
Electric use	458,568 kWh	378,711 kWh	-17%	458,568 kWh	21%
Electric cost	$68,549.30	$70,962.83	4%	$88,013.20	24%
Average electric rate	$0.16	$0.19	20%	$0.19	0%

Shore-up Weaknesses – Connection Points

THANK YOU!

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