Compressed-Air Systems

Operating Costs, Efficiency Opportunities, and Incentives

October 8, 2025

Agenda

1. Introductions
2. Overview of compressed-air systems
3. Energy use and efficiency opportunities
4. Incentives available
5. Case studies
6. Discussion

Q&A at any time!

Today's Subject Matter Experts

Jesse Remillard – Custom Program manager

- Registered state of Maine Professional Engineer
- Nearly 15 years experience reviewing, evaluating, and managing C&I Incentive programs
- Compressed Air Challenge graduate

Ridgeline Energy Analytics – Custom Program delivery team

- Complete technical reviews required for all Custom incentive awards and payments.
- Led by Dave Korn, Chris Zimbelman, and Nick Collins – all with extensive experience supporting a wide variety of incentive programs.

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Compressed Air System Review

Why do we need compressed air and what are the major system components?

Why Do We Need It?

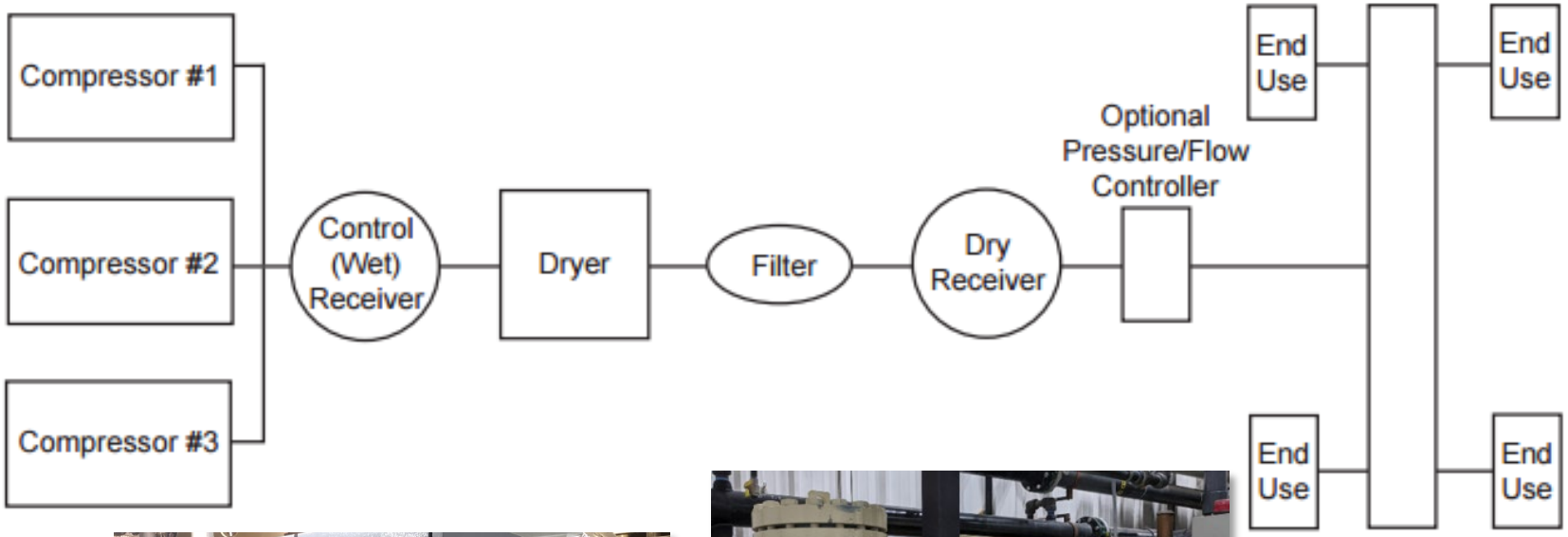
Compressed air is ubiquitous in industrial facilities and often seen as a fourth utility in addition to electricity, fuel, and water. More often than not, it is a critical asset for manufacturing or production processes.

Common Applications:

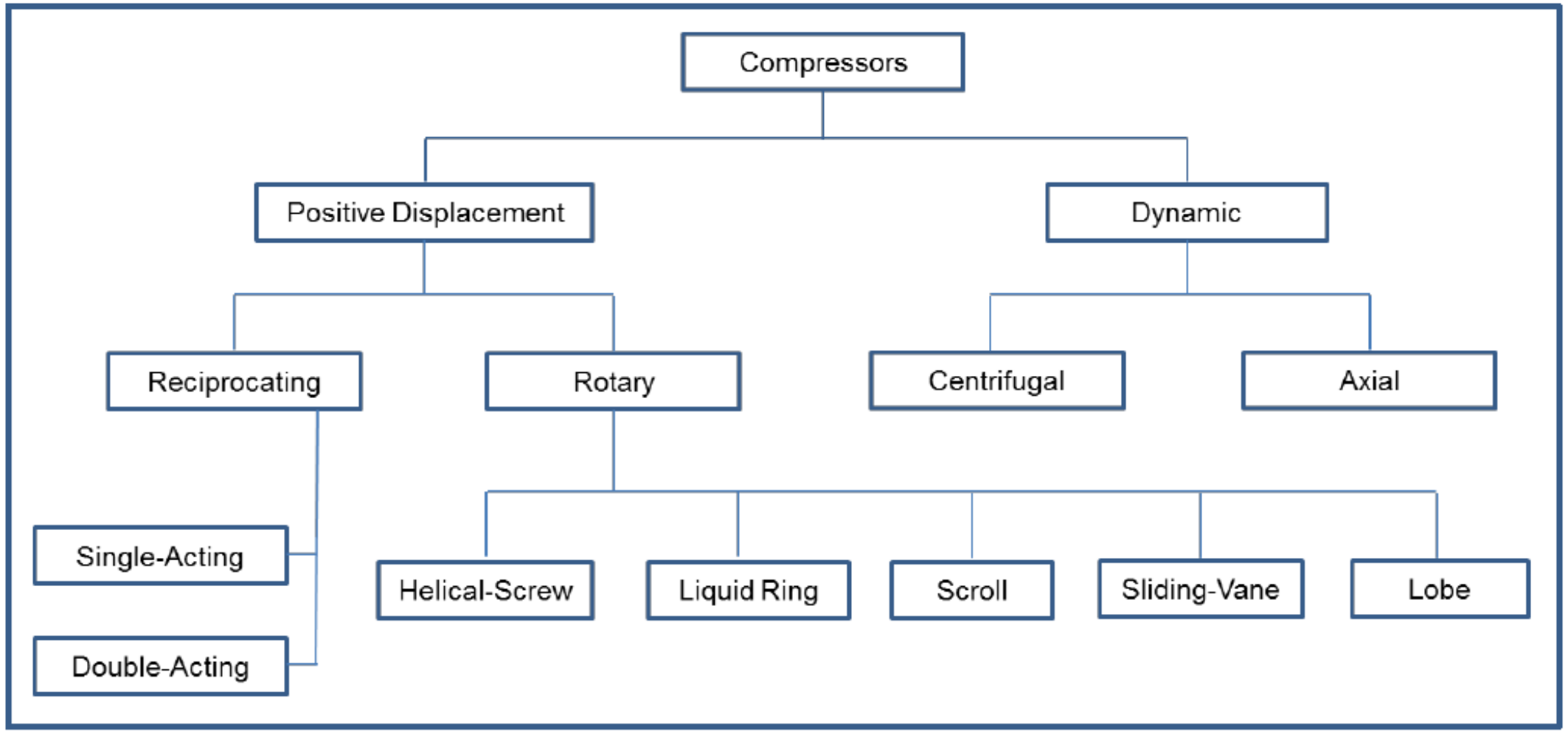
- Sawmills;
- Injection molding;
- Production line conveying, controls, or actuators; and
- Pneumatic tools or specialty equipment.

How do you use your compressed air?

How Does Compressed Air Work



Types of Air Compressors – Prime Movers



Source: Improving Compressed Air System Performance: A Sourcebook for Industry

Types of Dryers

Compressed-air dryers are usually required to remove moisture from compressed air, which can damage certain end-use equipment. There are three general types of dryers:

- Refrigerated
- Desiccant
- Heated

Compressed-Air Storage or Receivers

- Air receivers are an essential component of a compressed-air system that help maintain steady pressures to end uses, as well as protect from pressure drops associated with intermittent high-demand events.

- They can also improve the operating efficiency of load/unload compressors.

- Adequate storage (gallons/CFM) is essential for compressed-air system operations.

Operating Cost and Efficiency Opportunities

Compressor Performance Curves

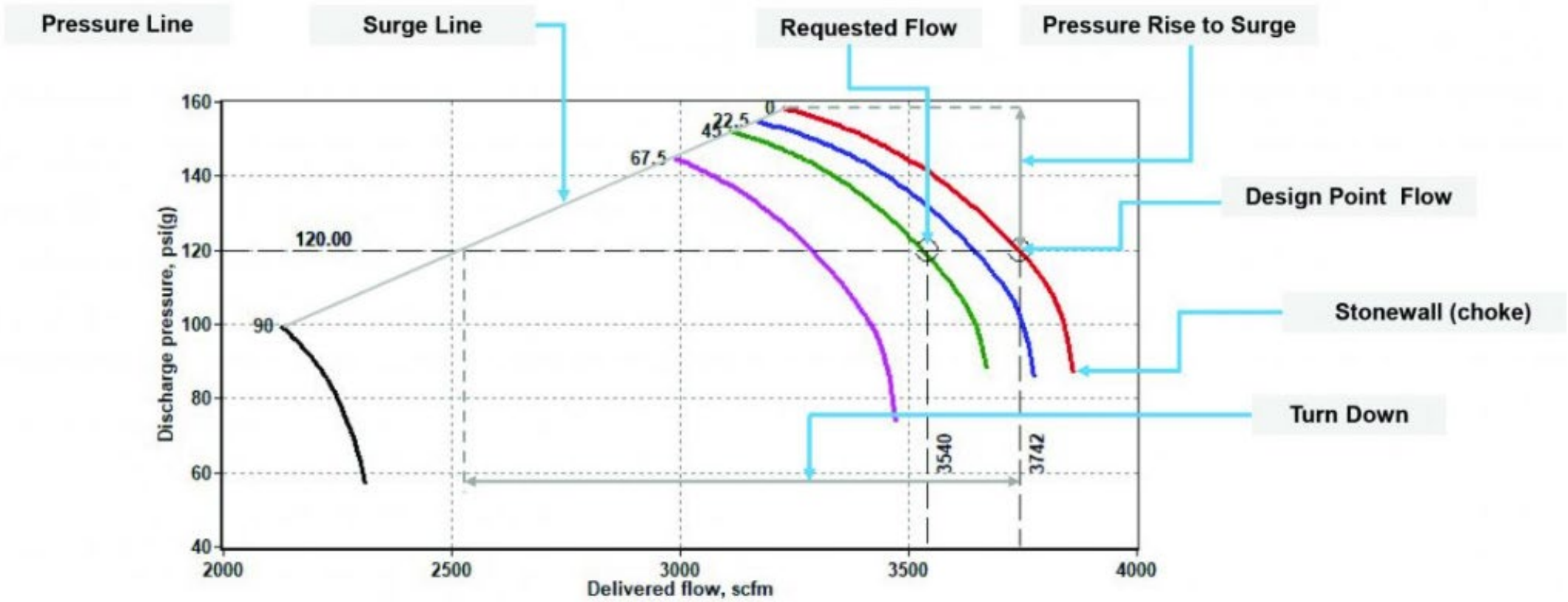
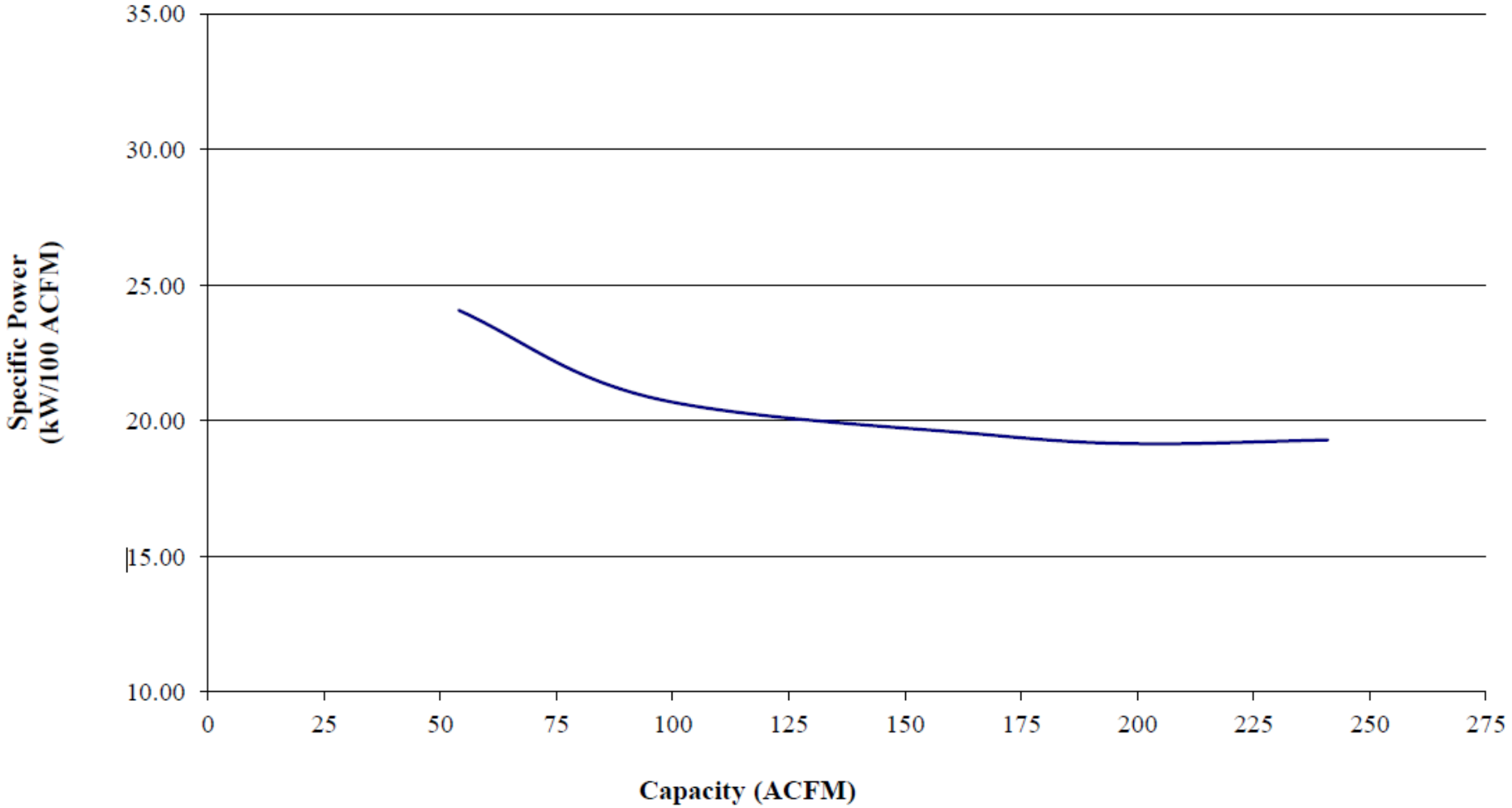


Figure 1. (Image courtesy of the Compressed Air and Gas Institute.) Click here to enlarge.

Compressor Specific Power



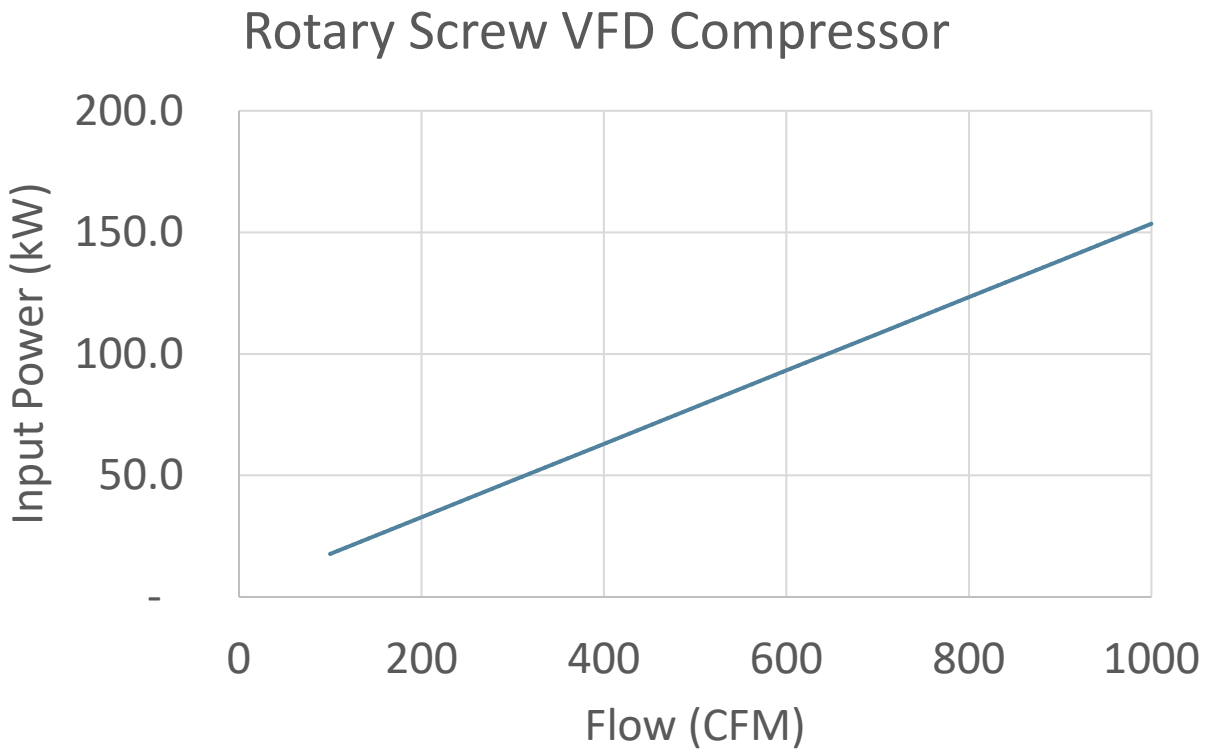
Sample VFD rotary compressor specific power curve.

Source: https://www.cagi.org/performance-verification?ap4=1_3

Compressor Operating Costs – Why You Should Care?

To calculate the cost of compressed air, use the following formula:

Cost ($/year) = motor bhp x .746 x hours of operation (per year) x electric rate ($/kwh) / motor efficiency



kW/100 CFM	CFM	kW	Cost per hour	6000 hours
17.7	100	17.7	$3.54	$21,263
16.4	200	32.8	$6.56	$39,371
16.0	300	47.9	$9.58	$57,479
15.7	400	63.0	$12.60	$75,586
15.6	500	78.1	$15.62	$93,694
15.5	600	93.2	$18.63	$111,802
15.5	700	108.3	$21.65	$129,910
15.4	800	123.3	$24.67	$148,018
15.4	900	138.4	$27.69	$166,126
15.4	1000	153.5	$30.71	$184,234

Low-Cost Efficiency Measures

- Compressed-air leak survey and repairs
- Eliminate inappropriate end uses or reduce operating pressure (end uses that could be accomplished by other means such as blowers, motors, or manual labor).
- Zero loss condensate drains
- Compressor sequencing or controls

Rule of Thumb: 2 psi pressure reduction = 1% less energy usage

High-Cost Efficiency and Incentive Opportunities

- High-efficiency, variable-speed compressors
- Refrigerated cycling dryers
- Heat recovery
- Larger size piping

Discuss with your preferred vendor!

Efficiency Maine Incentives

Prescriptive and Custom Commercial and Industrial

Prescriptive Incentives

- Compressors generally < 90 HP, max incentive per compressor of $10k
- Must operate at least 1,000 hrs per year

High-Efficiency Compressor Systems

- $80-$110 (incentive varies by system horsepower)

High-Efficiency Dryers

- $250-$1,300 (incentive varies by dryer capacity)

Air Compressor Receivers (compressor control)

- $180-$3,500 (incentive varies by receiver capacity)

Low-Pressure Drop Filters (compressor control)

- $40-$200 (incentive varies by system horsepower)

Air-Entraining Nozzles (compressor control)

- $7 per nozzle

- VFD and load/no load compressors – per HP incentive.
- Dryer incentives per unit depending on size
- Receiver incentive per unit depending on size
- Filter incentives per unit depending compressor size (HP)

Prescriptive Application Process

Preapproval required for all incentives greater than $5,000.

https://www.efficiencymaine.com/at-work/compressed-air-incentives/

1. Reach out to a Qualified Partner (QP) - https://www.efficiencymaine.com/at-work/qualified-partners/
2. QP submits equipment specifications and application to Efficiency Maine.
3. Efficiency Maine reviews and issues preapproval notice.
4. Project implemented.
5. QP submits invoice.
6. Efficiency Maine issues payment.

Custom Incentives

- Compressors generally > 90 HP
- Must pass Efficiency Maine's cost effectiveness test (benefit to cost ratio)
- Minimum incentive of $10k unless facility demand less than 400 kW

Custom Program Incentive Calculation:

- $0.28 per kWh saved annually, up to:
- EUL or NC: 75% of incremental cost, or Retrofit: 50% of total cost, but not more than:
- What leads to a 1.0 yr simple payback based on blended average rate, or:
- $1,000,000 per fiscal year

EUL = end of life
NC = new construction
Incremental cost = difference in cost between high efficiency equipment and low efficiency equipment/baseline

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Compressed-Air Leak Survey Program

	Size	Flow Rate (cfm)	Cost per Year
●	1/16"	6.5	$1,046
●	1/8"	26	$4,190
●	1/4"	104	$16,784

Costs calculated using electricity rate of $0.10 per kilowatt-hour, assuming 8,760-hour operation, a perfect orifice at 100 psi, and an efficient compressor.

Incentives:

- 50% of survey and leak repair costs up to $40,000.

Eligibility:

- Preapproval required prior to survey.
- Compressed-air system must operate at least 2,000 hours per year.
- Total horsepower (HP) of compressors must be greater than 50 HP.
- Modulating compressors must have controls converted to load/no load.
- All non-variable speed drive compressors must be equipped for auto dual-control timed stop auto restart controls.
- System must have at least 5 gallons of storage per CFM if load/no load.
- Permanent compressed airflow metering must be installed at the main distribution header with the ability to trend and export flow data

Program description and application: https://www.efficiencymaine.com/compressed-air-leak-surveys/

Compressed-Air Leak Survey Application Process

1. Ask your preferred vendor for a proposal.
2. Complete two-page application form and submit with proposal to Efficiency Maine Custom Program.
3. Custom Program delivery team reviews and follows up with any clarifying questions; incentive preapproval issued.
4. Leak survey and repairs completed. Flow metering installed if not already in place.
5. Survey audit report and receipts of payment submitted to Efficiency Maine.
6. Payment issued based on 50% of total cost up to $40,000.

Case Studies

Case Study #1

Project: two rotary VFD compressors, a cycling refrigerated dryer, two receiver tanks, zero loss drains, controls and piping improvements to allow reduction of operating pressures.

Scenario: End-of-life replacement

Additional cost for high-efficiency system: $300,000

Incentive: $180,000

Annual energy savings:

- 700,000 kWh/year electric

Return on investment:

- Less than two years after incentive

Case Study #2

Project: included a 650 HP reciprocating compressor, new cycling refrigerated dryer, additional receiver tank and sequencing controls.

Scenario: Retrofit

Project cost: $1.5M

Incentive: $730,000

Annual energy savings:

- 3,500,000 kWh/year electric

Return on investment:

- About 2 years after incentive

Case Study #3 – Just Completed

Project: includes a variable speed rotary-screw compressor and removal of the old compressor.

Scenario: End-of-life replacement

Incremental cost over baseline: $42,000

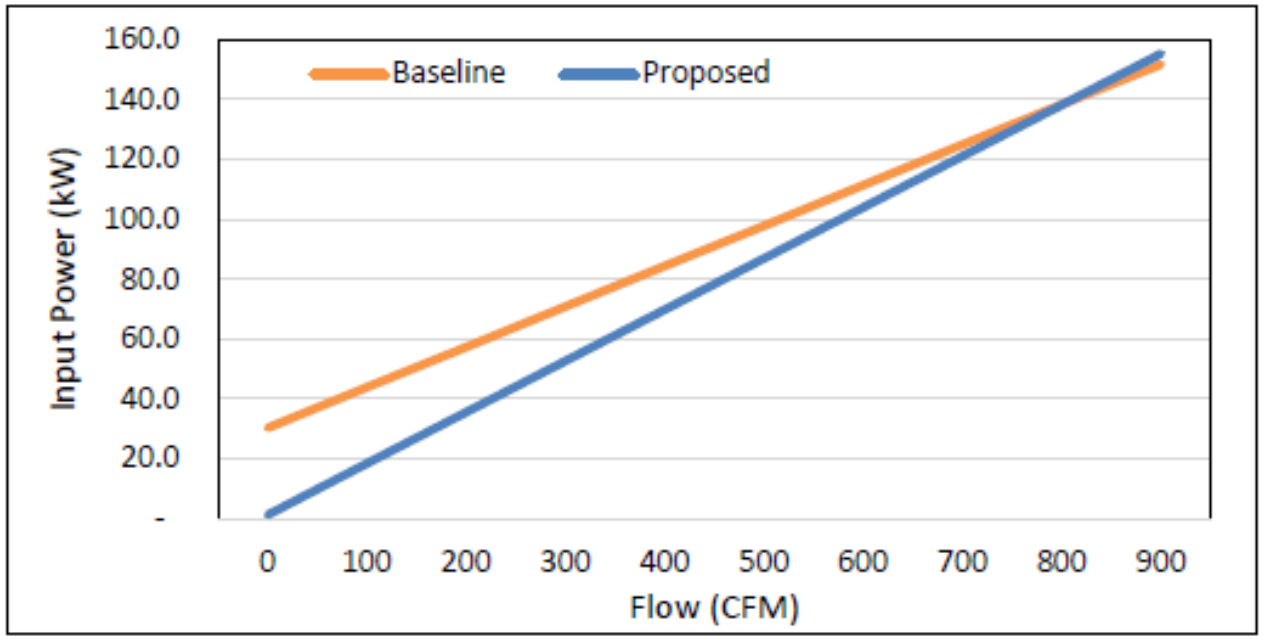
Incentive award: $21,000

Annual energy savings:

- 120,000 kWh/year electric

Estimated return on investment:

- 1 year after incentive



Case Study #4 – In Progress

Project: includes two rotary-screw compressors, removal of two end-of-life, fixed-speed compressors and relocation of one existing variable-speed compressor, plus necessary sequencing controls

Scenario: End-of-life replacement

Incremental cost over baseline: $155,000

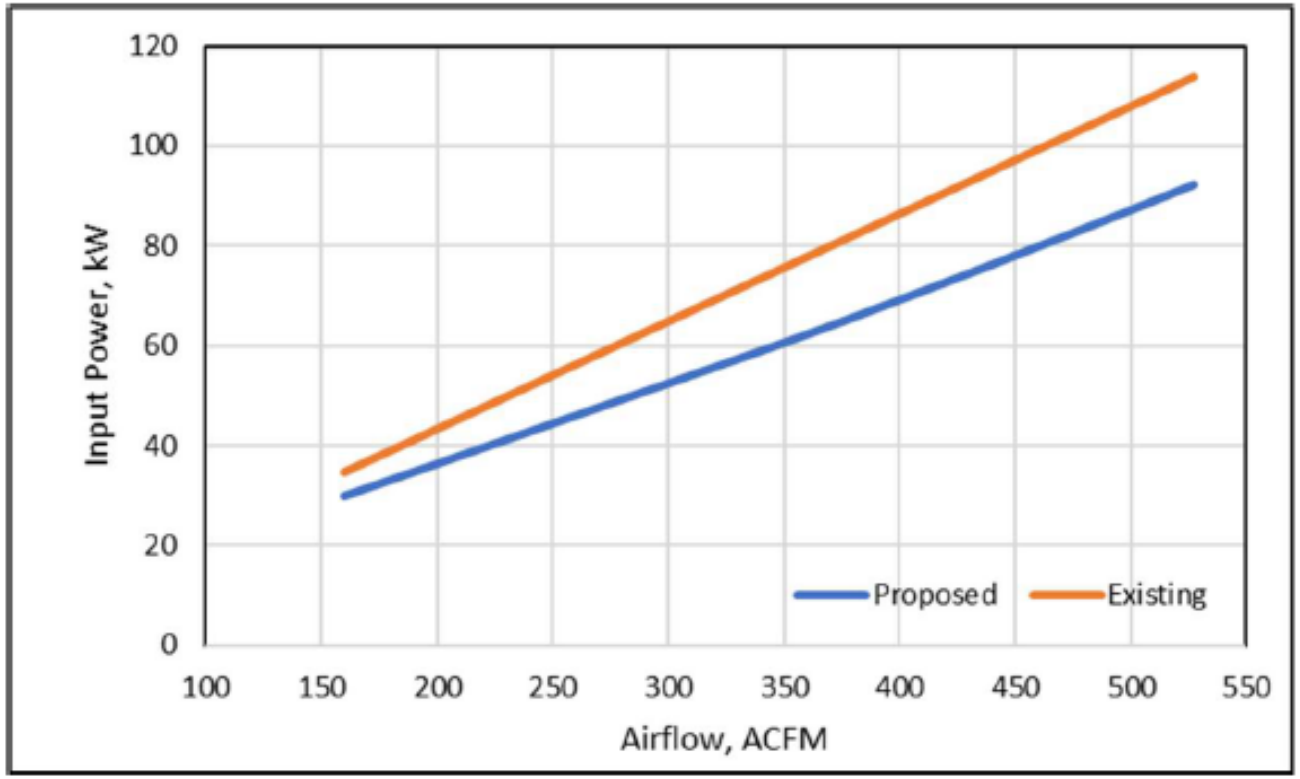
Incentive award: $51,000

Annual energy savings:

- 170,000 kWh/year electric

Estimated return on investment:

- 3 years after incentive



Q&A Discussion