Rosemount DP Flow Applications for Compressed Air

Find DP Flow Wireless Applications in Energy Systems and Secondary Flow

- Compressed Air
- Steam Distribution
- Natural Gas
- Cooling Water

Customer's Largest Expenditure is Energy and They May Not Be Monitoring Usage

"It takes ***8 hp of electricity to produce 1 hp*** of compressed air."
Plant Services Magazine

"For some, energy costs constitute as much as ***25 percent of their total operating costs***, and even small improvements can have a dramatic impact on their bottom line."
Control Global Magazine

Typical refinery costs:
16% manpower
41% maintenance
and raw materials
43% energy costs
National Energy Education Development Project

"Air systems older than five years often ***lose up to 25%*** of their flow to leaks."
Chemical Processing Mag.

62% of European manufacturers surveyed spent more than ***€100 million annually*** on energy, only ***9% are doing real time monitoring*** of energy consumption.
Sustainableplant.com

You Can't Manage What You Don't Measure

5 Key Utilities

Chilled Water

Natural Gas

Steam

W. Water

A. Air

G. Gas

E. Electricity

S. Steam

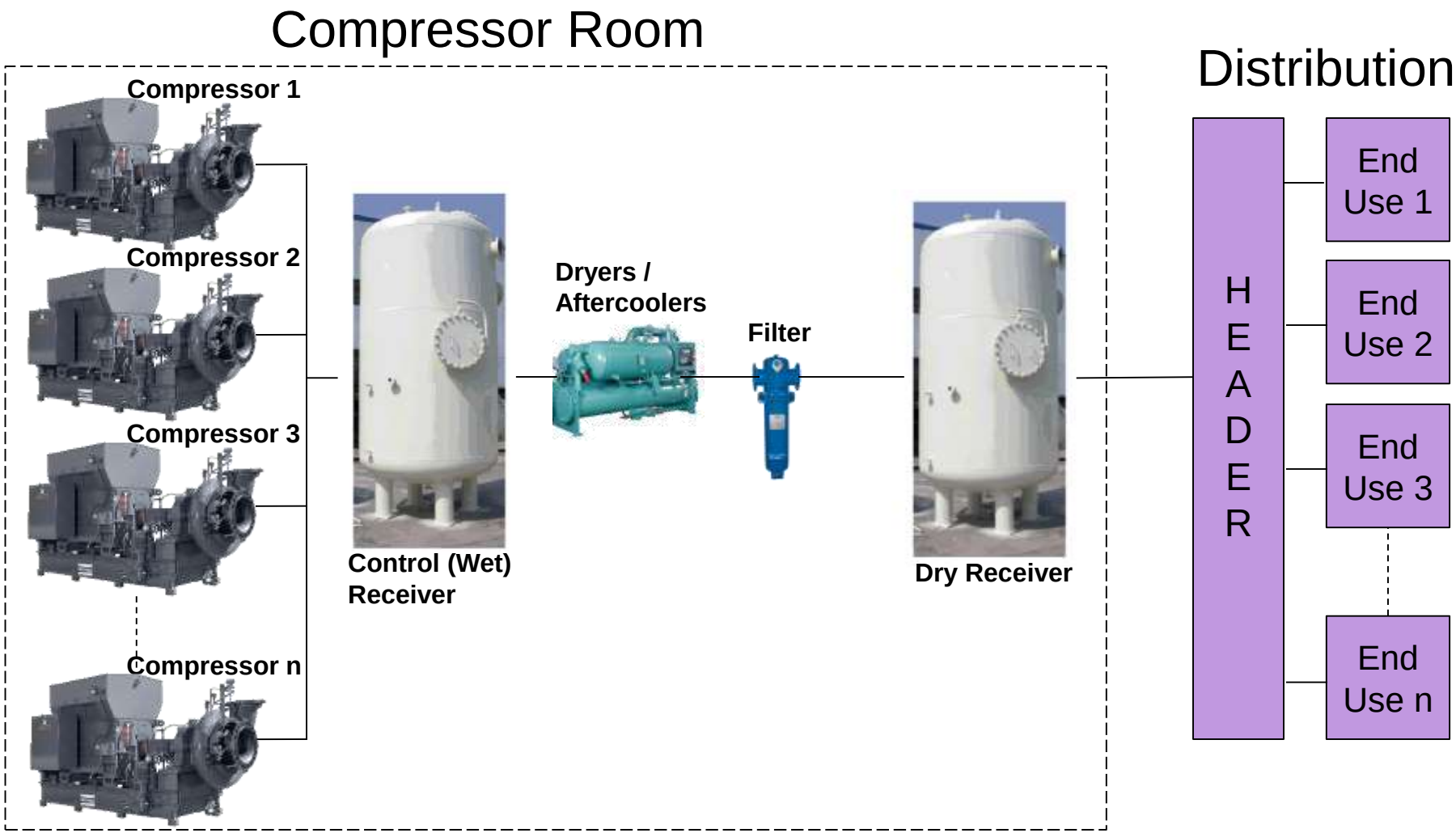
Compressed Air

Electricity

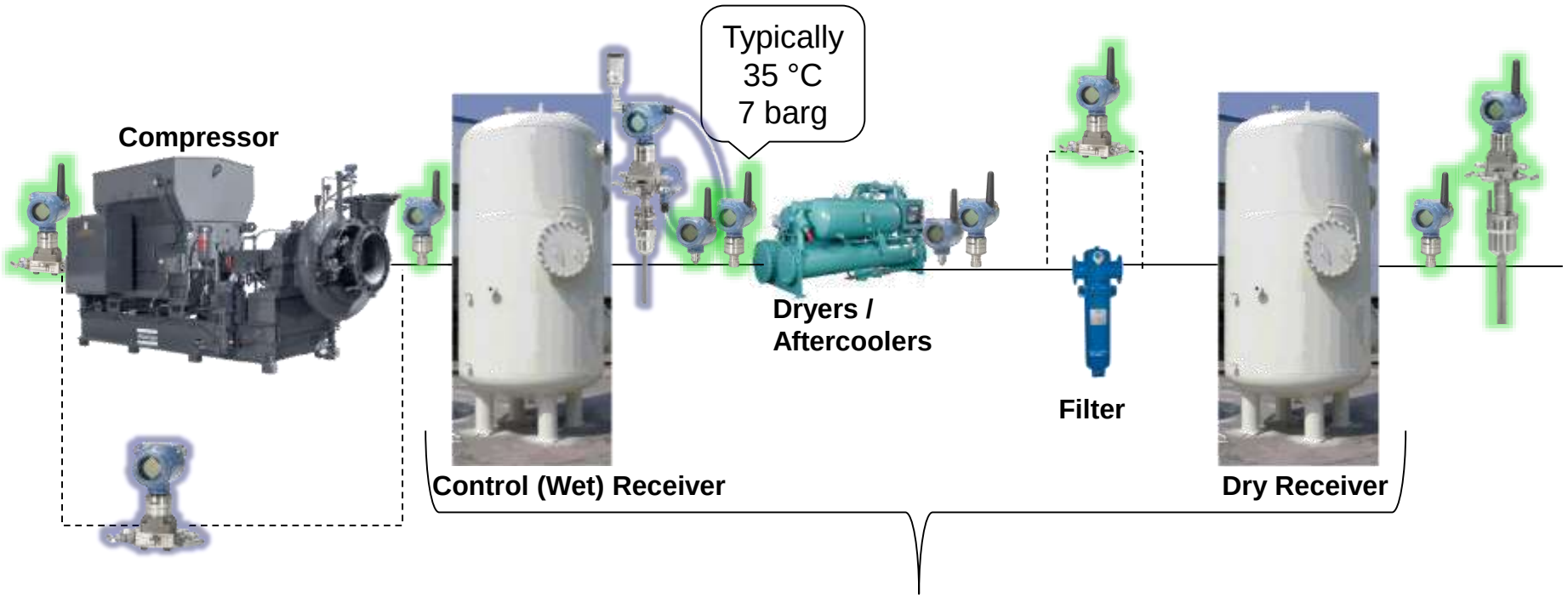
Balance & Benchmark

- Objective: Benchmarking to identify areas for energy improvement
- Determine baseline to improve upon
- To benchmark, must energy balance first
  - Energy In = Energy Out
  - All energy (used or else) must be accounted for
  - If data is not reliable, it won't be used

Compressed Air System Overview



Compressor Room Measurements



Are your customers monitoring these points?

Compressor Room Equipment
Compressor

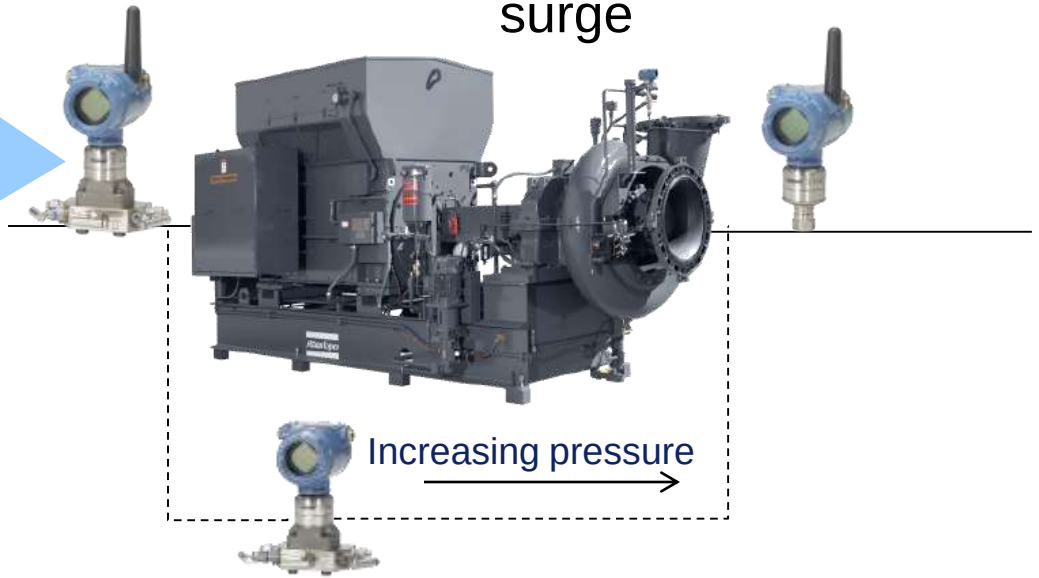
Compressor Key Facts

- Most large, industrial compressors are centrifugal or rotary screw
- Plants have multiple compressors typically with an output for each between 1500-4500 SCFM (2500-7500 Nm3/h) or even larger

Measurements

- Monitor DP across the inlet filter to know when it should be replaced with a clean filter
- Monitor pressure at the outlet of each compressor to baseline/monitor it's performance
- Wired control point – DP across compressor to watch for compressor surge

If the drop across the filter increases by .72 PSI (50 mbar), ***air flow is reduced by 5%*** without significant reduction in input power



Compressor Room Equipment
Wet Receiver

Wet Receiver Key Facts:

- Stabilizes System Pressure
  - Delivers and stores short term demand
- Controls the Compressor Output
  - Reduces pressure changes in the system due to varying demand
- Dampens Pulsation
  - Eliminates the pressure pulses from reciprocating compressors
- Separates Liquids from the Air
  - Separates condensate and oils from flow stream

Measurements:

- Monitoring flow after the Wet Receiver provides a better measure as the pulsation from the compressor will be dampened
  - Possibly a wired point if customer is controlling the compressor based on this measurement

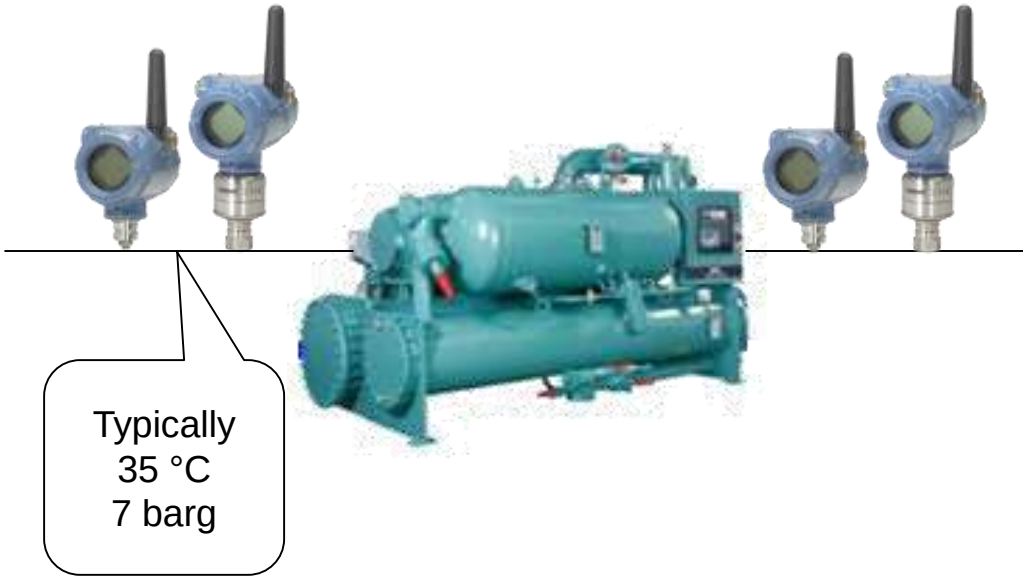
Compressor Room Equipment
Dryer/Aftercooler

Dryer/Aftercooler Key Facts:

- Removes condensate and oils from air and cools it
- In the US, CAGI uses standard ADF-100
  - Defines inlet conditions of 100 °F at 100 PSIg
  - Pressure drop must be less than 5 PSI
- The EU uses ISO-7183
  - Defines inlet conditions of 35 °C at 7 barg

Measurement

- Monitor pressure and temperature before and after the dryer to ensure optimal performance of the dryer



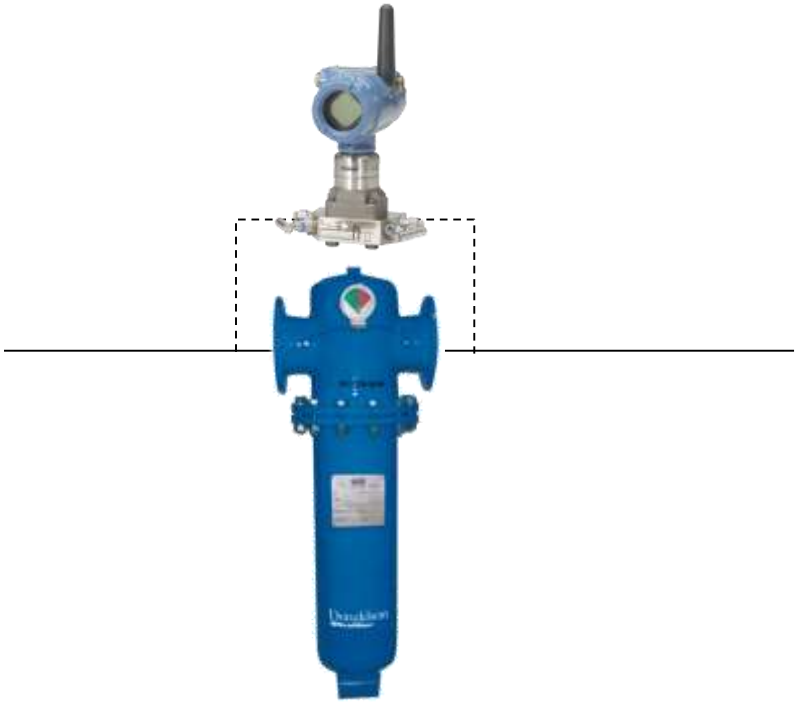
Compressor Room Equipment
Pipeline Filter

Pipeline Filter Key Facts

- Removes condensate from air and oil introduced by the lubrication used in the compressor
  - Some compressors may not require oil and will not need a line filter in the system.

Measurements

- Monitor DP across the pipeline filter to know when it should be replaced with a clean filter



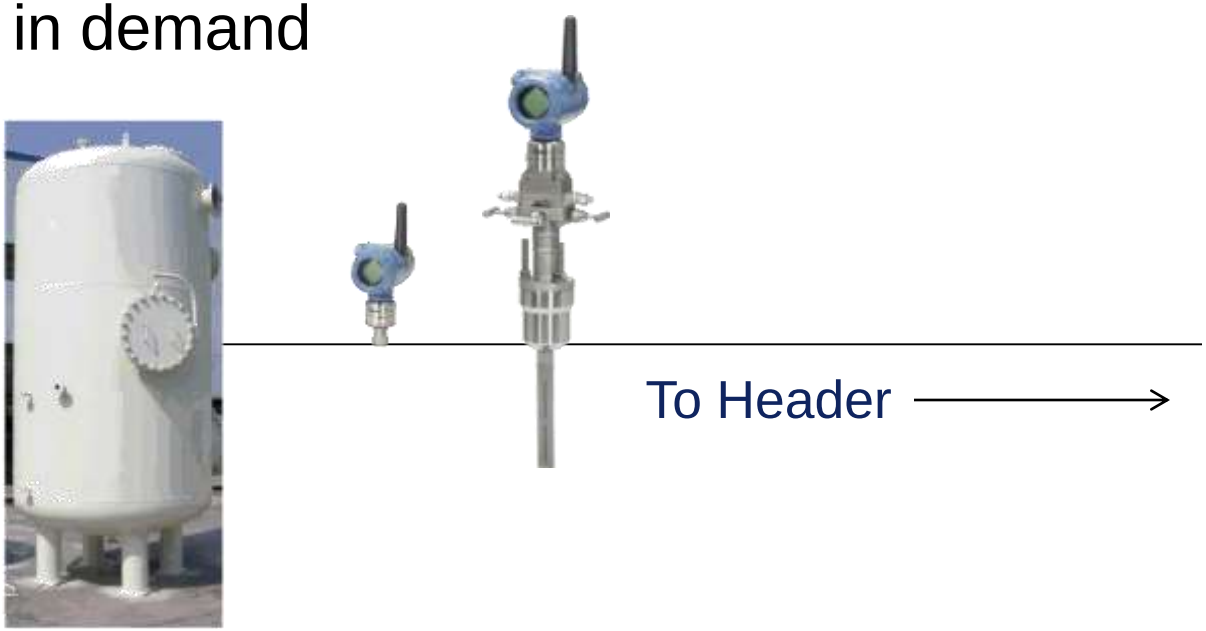
Compressor Room Equipment
Dry Receiver (Storage Air Receiver)

Dry Receiver Key Facts:

- Stabilizes System Pressure
  - Delivers and stores short term demand
- Stores compressed air to meet spikes in demand

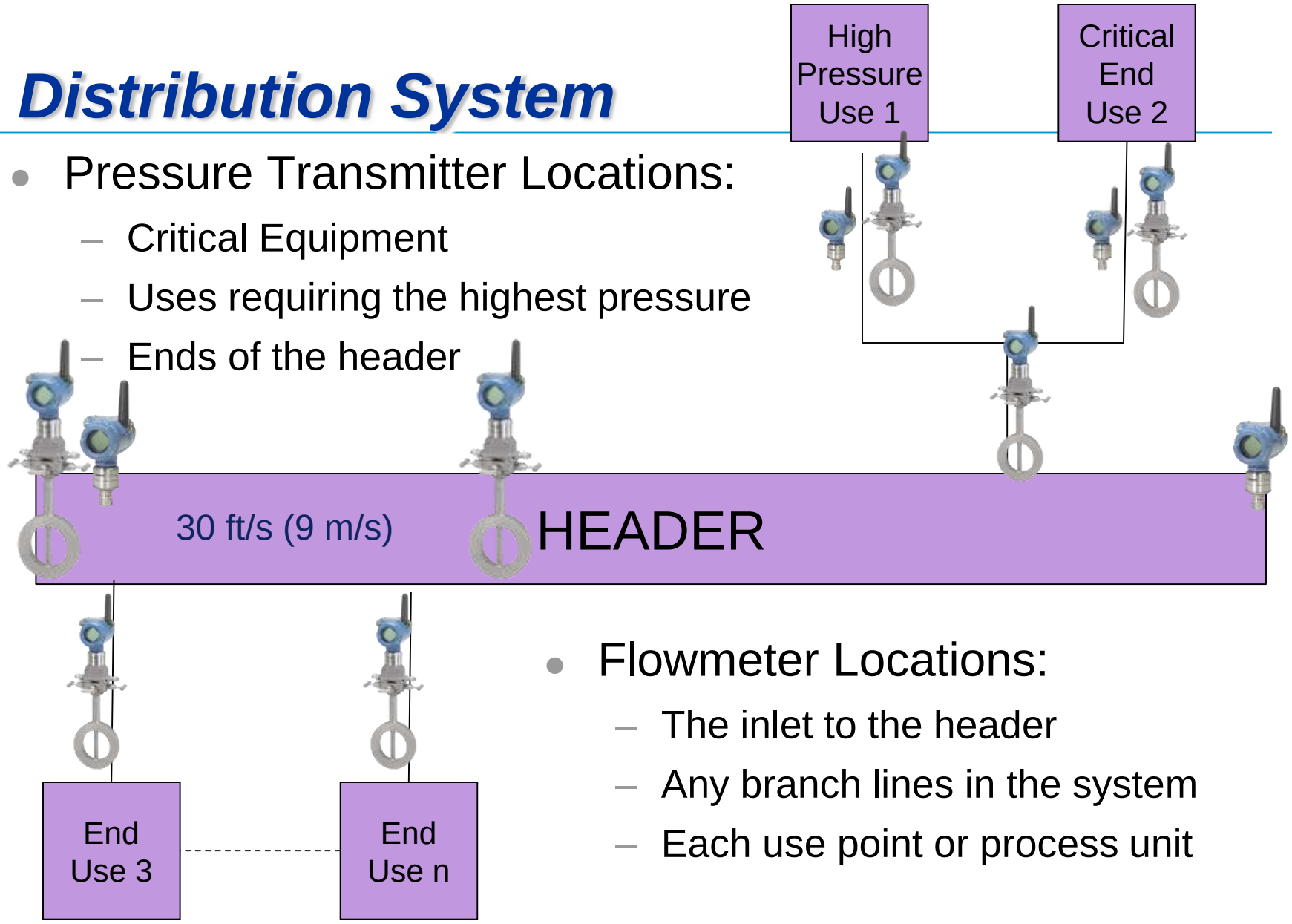
Measurements:

- Monitor flow and pressure at the outlet of the compressor area to understand total air usage by the distribution stystem



Distribution System

- Pressure Transmitter Locations:
  - Critical Equipment
  - Uses requiring the highest pressure
  - Ends of the header



- Flowmeter Locations:
  - The inlet to the header
  - Any branch lines in the system
  - Each use point or process unit

Compressor Monitoring is a Great Application For Wireless

- Some compressors are still monitored manually
  - Operator rounds and infrequent inspection
  - Wireless Flowmeters provide more frequent data for establishing baselines and trends
- All points are monitoring only, none are used for control or need fast update rates

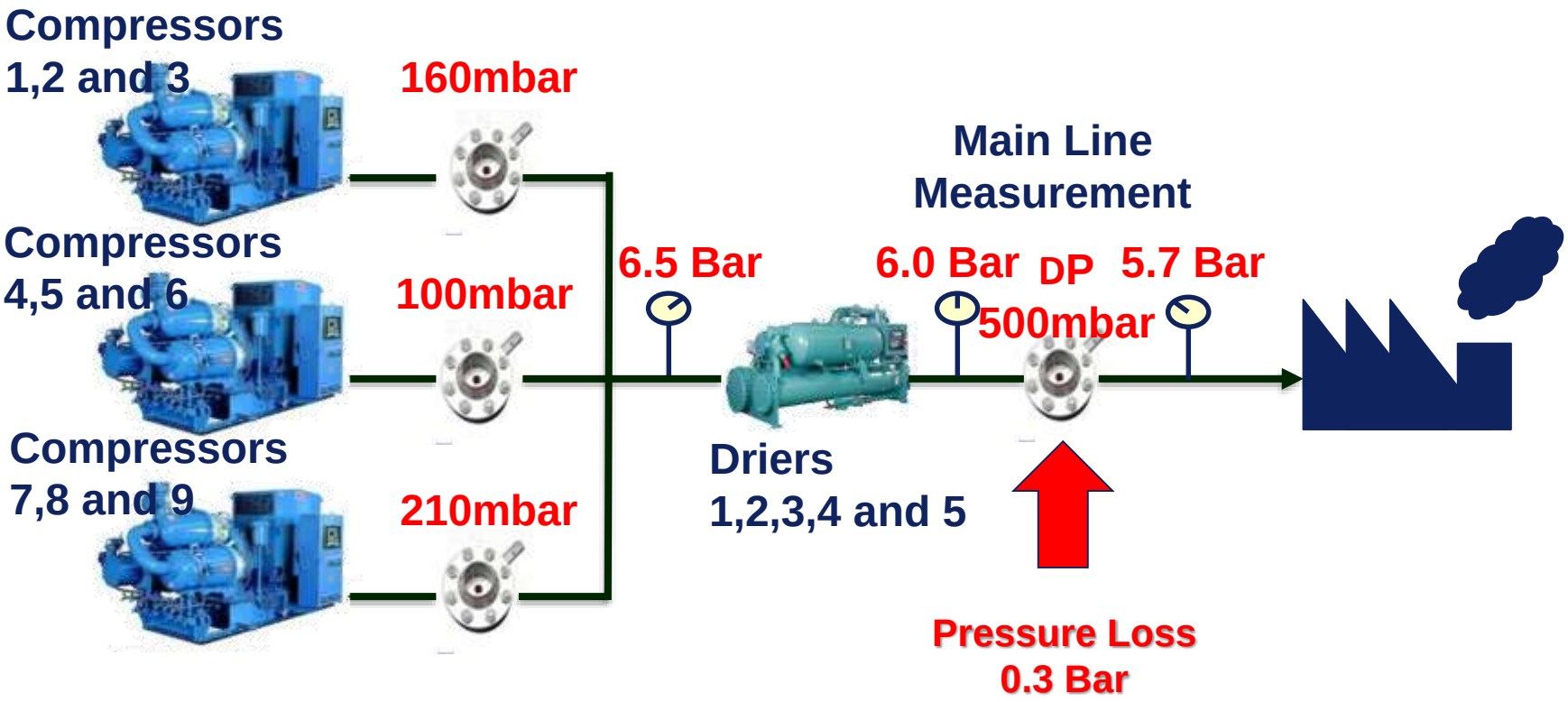
Proven Result: Smart Wireless Minimizes Capital Costs for Online Monitoring of Air

- CHALLENGE
  - Maintain the reliability of plant and instrument air
  - Buildings that house the compressors and room are very old
  - Need cost effective solution to continuously monitor pressure, temperature, and flow going to both the plant air system and the instrument air supply system
- SOLUTION
  - Nine smart wireless transmitters, including wireless 648 temperature and 3051S pressure transmitters and flowmeters
  - Continuously monitors compressor health
  - Automatically triggers alarm if compressor efficiency begins to decrease, or if there is loss of pressure or flow
- RESULTS – Reduced plant downtime
  - Live trending of compressor data helps optimize uptime
  - Saved over $50,000 per year in operations costs
  - 73% savings in CAPEX costs ($125k in wiring)

Proven Result: Chemical Manufacturer in Brazil Reduces the Cost of Compressed Air with Annubar® Flowmeters

- CHALLENGE
  - The manufacturer added capacity to their compressed air system over time and costs were increasing rapidly
  - Shortages in air could lead to failure of pneumatic equipment
  - Orifice plates created high permanent pressure loss in the system
- SOLUTION
  - Ten 3051SFA Annubar Flowmeters
  - Continuously monitors the output of each of the nine compressors and the main line
- RESULTS – Reduced Pressure loss and Reduced Energy Costs
  - Reduced electricity costs by $750k / year
  - Increased the efficiency of the compressed air system 10%
  - Improved line pressure at the remote locations

Measurement of Permanent Pressure Loss in compressors with Orifice Plates



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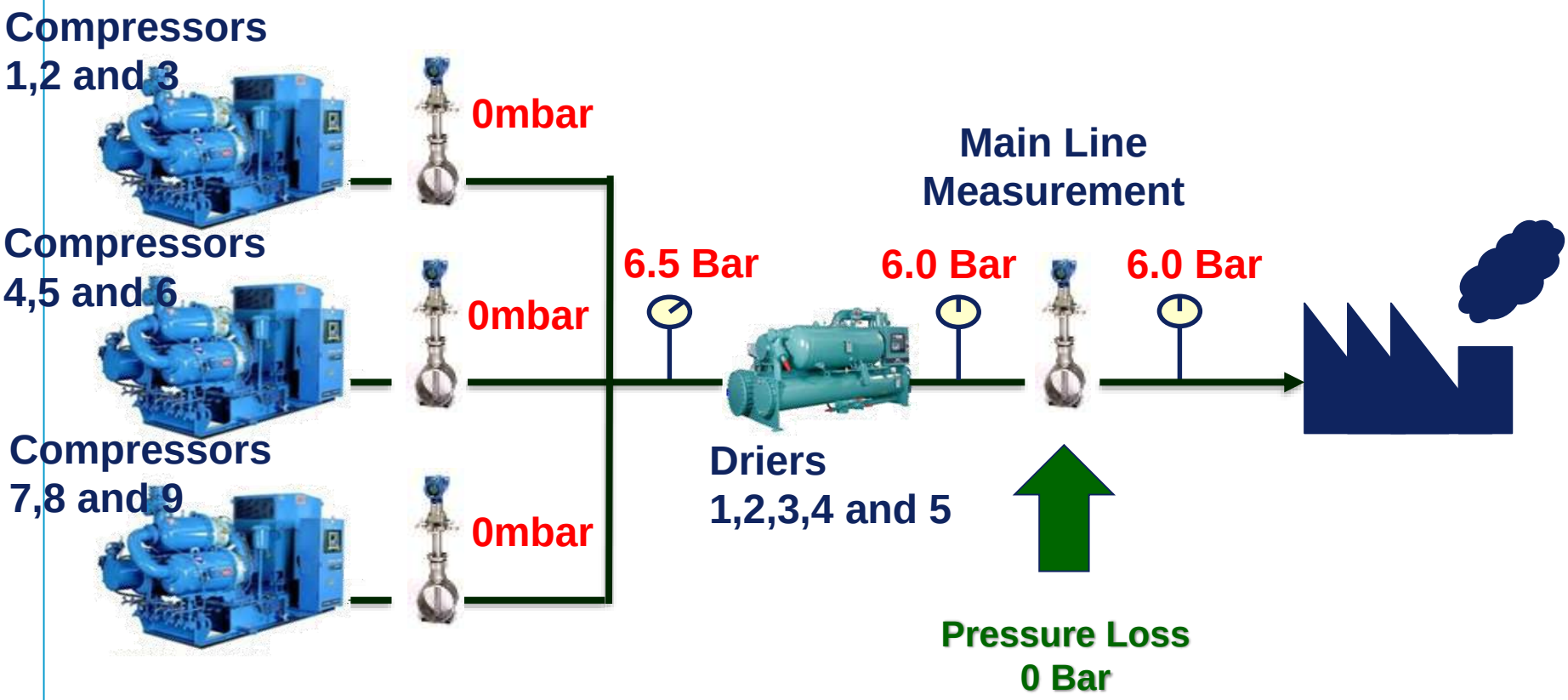
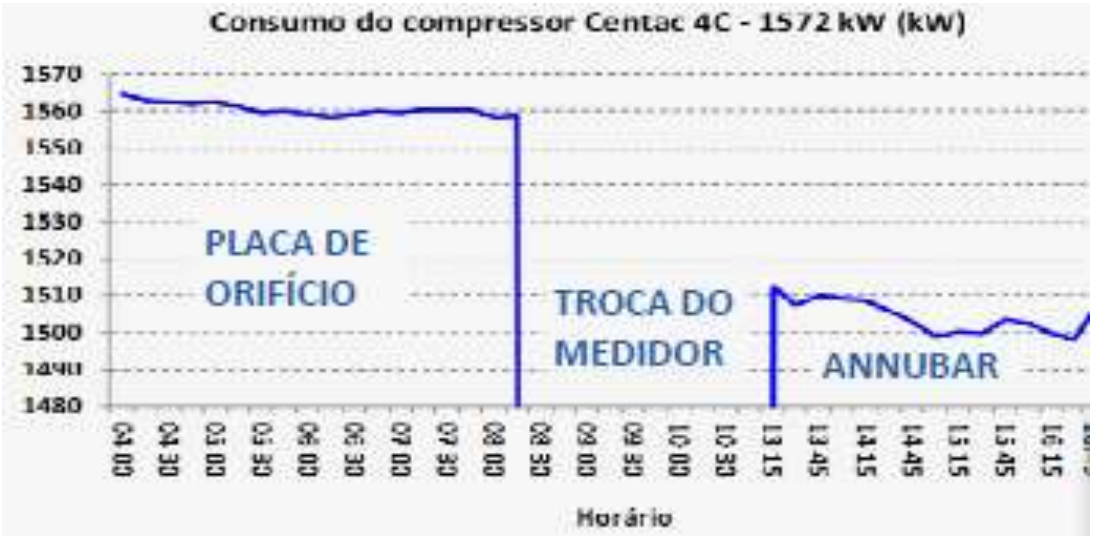
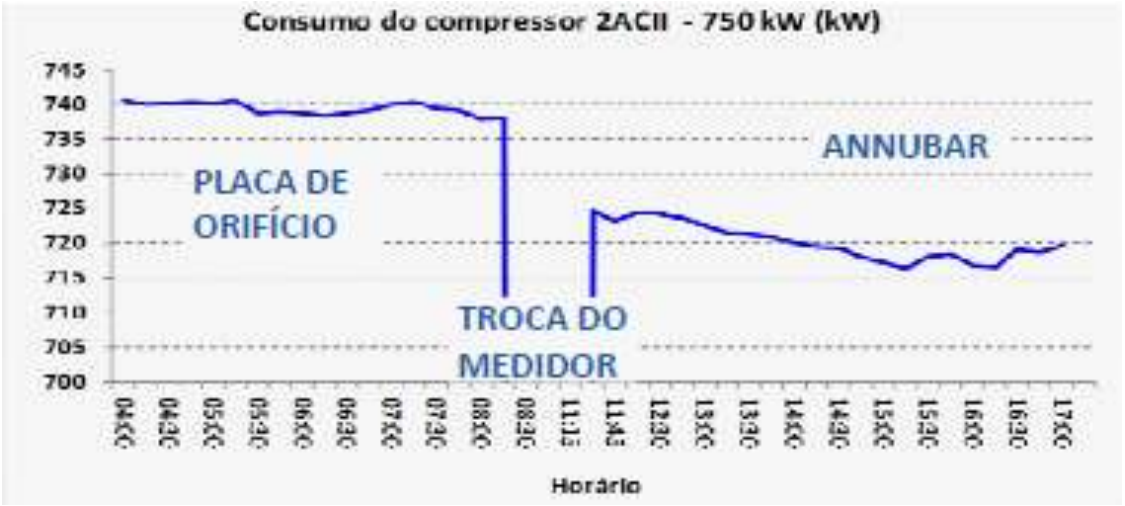


Energy Consumption was Immediately Reduced After Annubar Flowmeters were Installed





Business Results Achieved

Month	Energy Consumption	Air Generation	Energy/Air Generation
	kWh	Nm3	kWh/Nm3
Jan	5,044,600	36,967,403	0.1365
Feb	5,229,210	37,631,024	0.1390
Mar	5,802,761	42,551,856	0.1364
Average	5,358,857	39,050,094	0.1373
Apr	5,297,713	41,267,896	0.1284
May	5,507,883	43,887,892	0.1255
Jun	5,490,038	43,607,199	0.1259
Jul	5,919,062	48,439,632	0.1222