



Compressed air optimization in glass factories

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A photograph of an industrial facility, likely a power plant or refinery, featuring large vertical pipes, tanks, and complex piping systems. The scene is illuminated with a warm, orange glow, possibly from industrial lighting. A semi-transparent white box is overlaid on the left side of the image, containing text.

Compressed air:

~ 4.5 % of global electricity consumption

One of the largest industrial energy savings opportunities

Why save compressed air

- 8 to 10 times the cost of Electricity
- Compressed air is 10% - 30 % of the electricity bill of an average industrial company
- Relatively easy to save money "low hanging fruit"



Why is compressed air important

In the glass industry

- Up to 30% of the electricity bill
- In container glass crucial for high quality glass



In the US electricity use for forming is glass is estimated to be 105 kWh/t, of which largest part is for compressed air

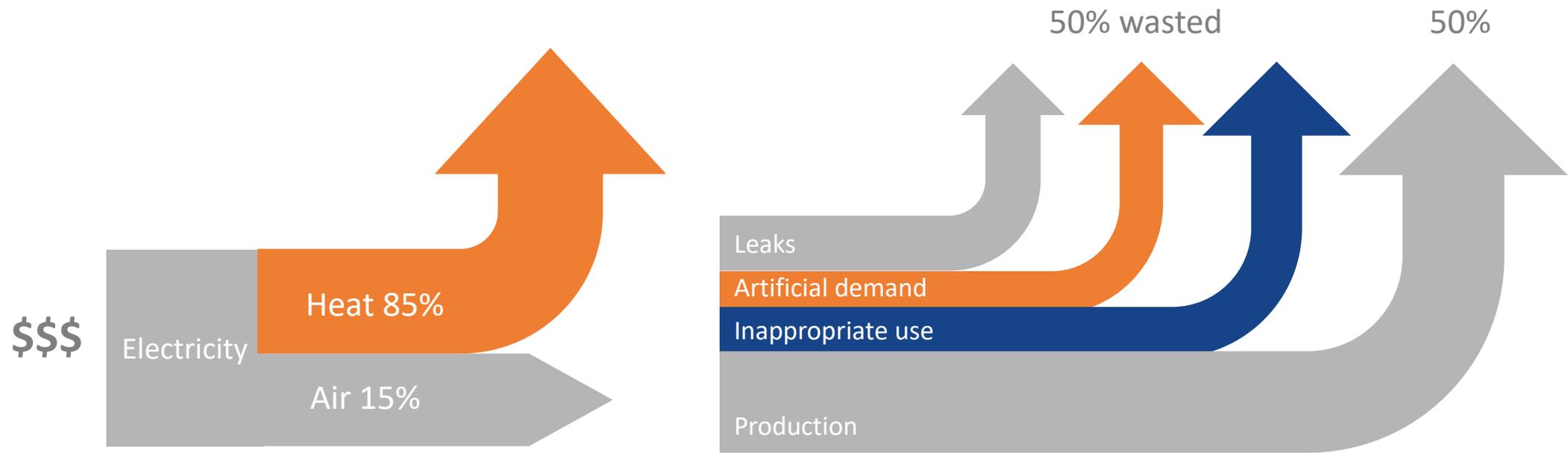
Examples of compressed air use

In Glass Industry

- Production process
 - Forming of containers and specialty glass
 - Lifting of plate glass
 - Cutting, blowing, moving
- Packaging
- Conveyors
- Pneumatic tools



Compressed air: Where does it all go?



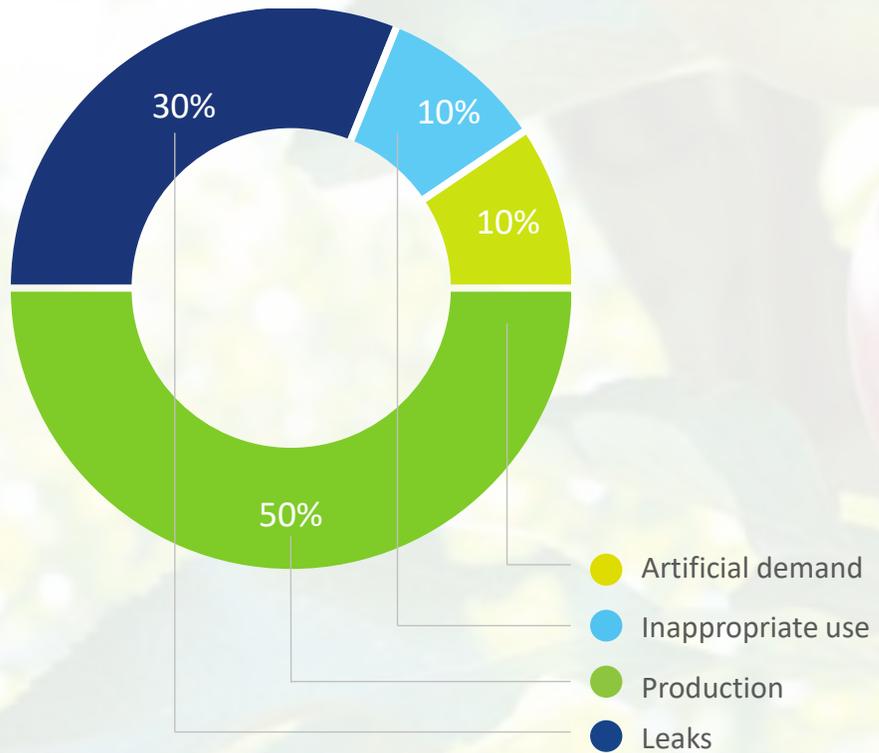
Fact: Compressed Air Energy Costs

More than 75% of the compressor
total cost of ownership over
10 years: **energy costs.**

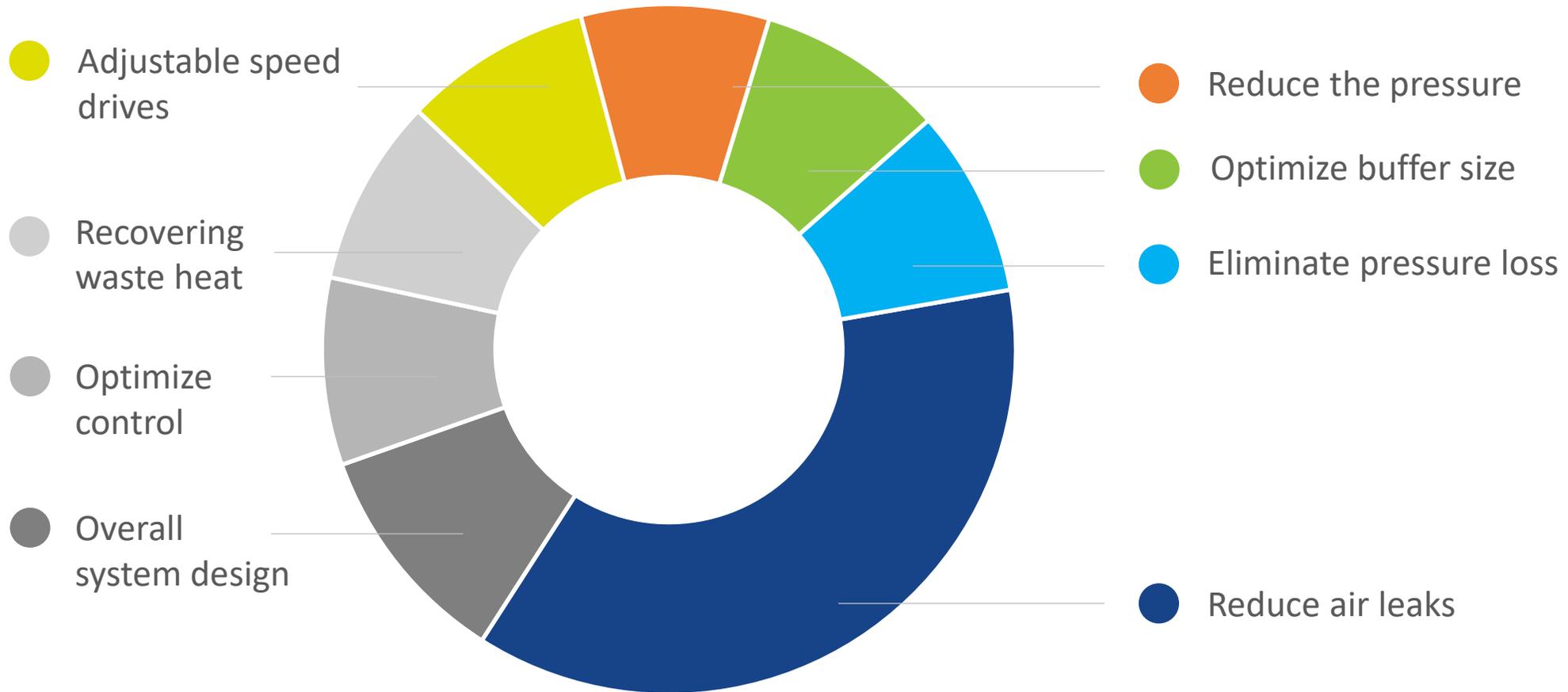


- Equipment
- Maintenance
- Energy

Compressed air Savings potential



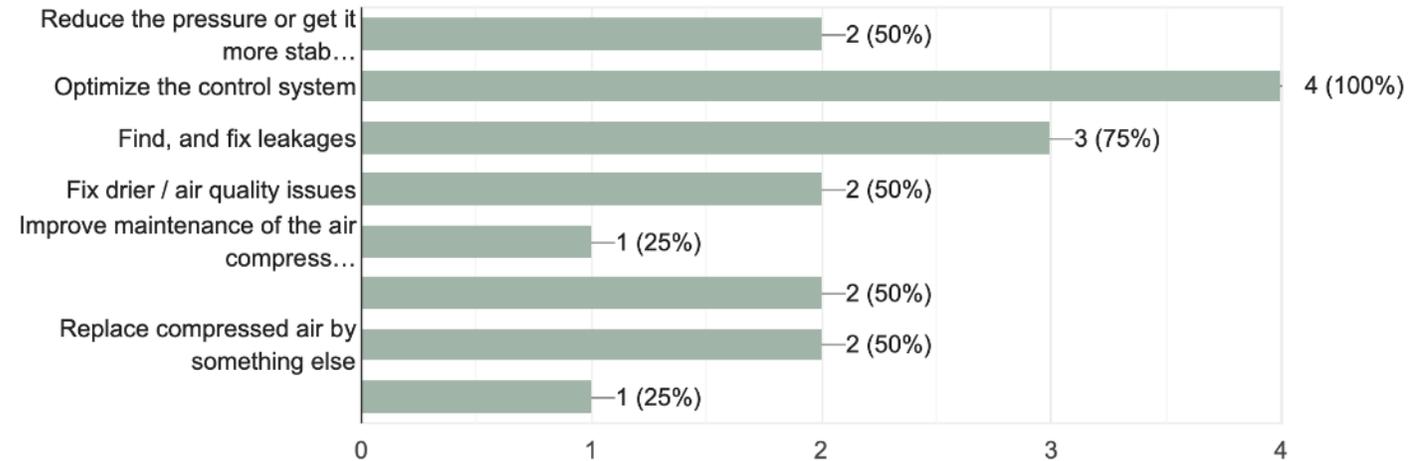
How to save?



Glass container industry

Savings opportunities

- Compressor control/ configuration
- Reducing leakages
- Pressure reduction/ stabilization
- Drier /condensate issues
- Drying low- and high-pressure air
- Filter management/ maintenance
- Alternative energy source
- Other



Glass container industry

Challenges with any project:

- Different stakeholders
- Capex/ Opex budget separated
- Changing behavior
- Internal Politics
- Capacity (maintenance crew)
- Budget / ROI

Drain management

- The low hanging fruit
- A form of leakage and a quality issue
- Often neglected or dealt with in a wrong way
- ROI 3...6 months when properly implemented





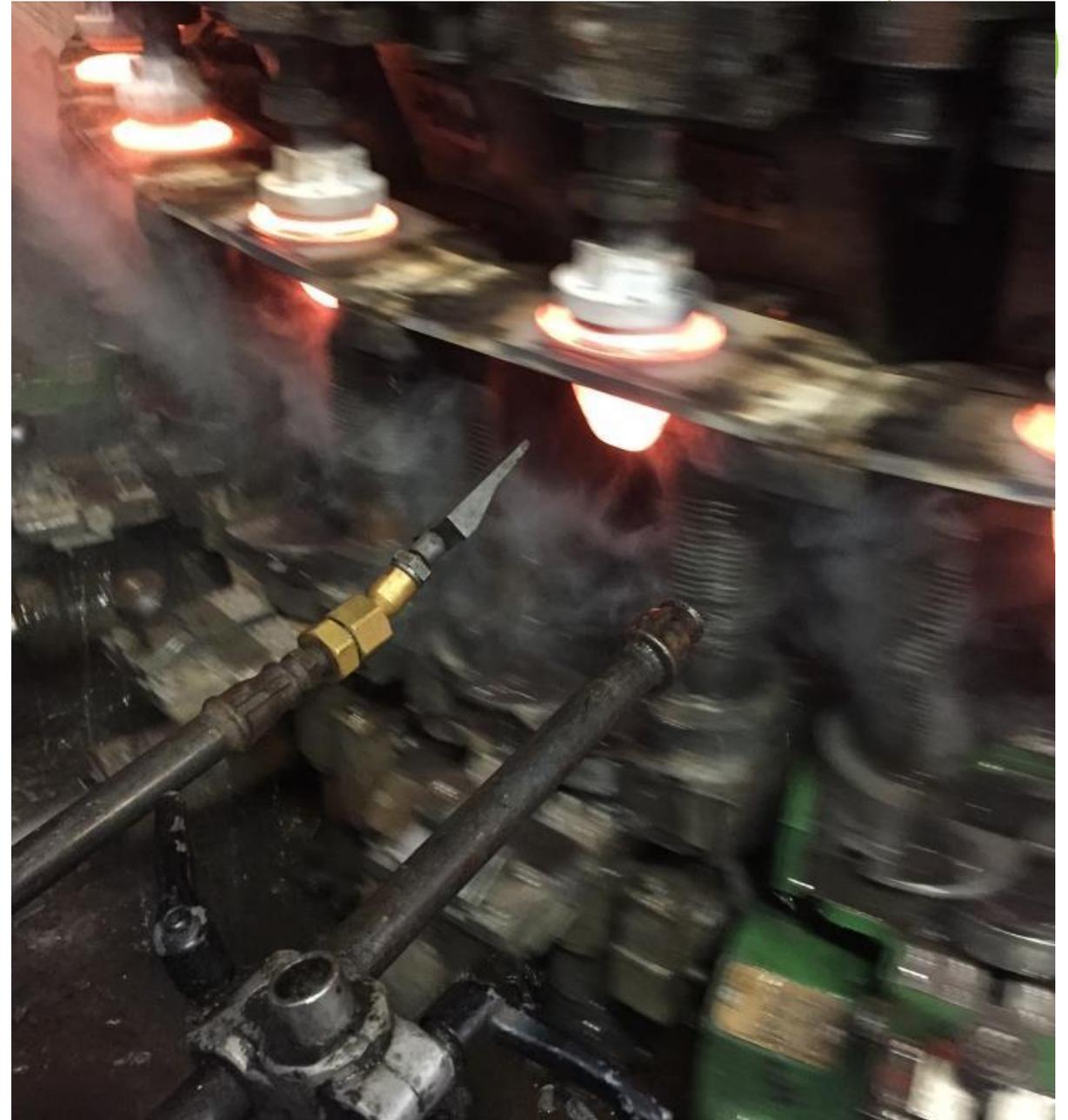
Filter management

- Inlet filters of Centrifugal machines
 - Decrease of inlet pressure: decrease of output flow & decrease of efficiency for same discharge pressure.
 - Beware out environment: dusty roads, trucks etc: Intake location & conditions.
- Downstream filters
 - Proper sizing
 - Preventive maintenance



Replace compressed air

- Alternatives for cooling of molds
 - Blowers
 - Nozzles



Glass container industry

- High- and low-pressure compressors
1.5 to >2 Megawatt in total
- Multiple compressor rooms in one plant
- Blowers for furnace and for cooling purposes
- Vacuum pumps



Measure to Discover and Save

Why measure & monitor?

- Predictive maintenance (condition monitoring, leakage)
- Make founded investment decisions based on consumption data & costs
- Monitoring efficiency of compressors and production equipment
- Know your baseline
- ISO 50001 compliance



Measure to Discover and Save



Power

- Correlation with electricity bill

4-in-1 flow meters: flow, pressure, temperature, total flow

- Flow consumption
- Pressure and temperature level
- Total flow

Dew point sensors:

- Safeguard your equipment and production process

Monitoring systems

- Combine all data in one system with alarms and reports
- Permanent monitoring is key to energy savings

Where to start?

Efficiency monitoring

Air audits/ Leakage management

Cost allocation



Where to start?

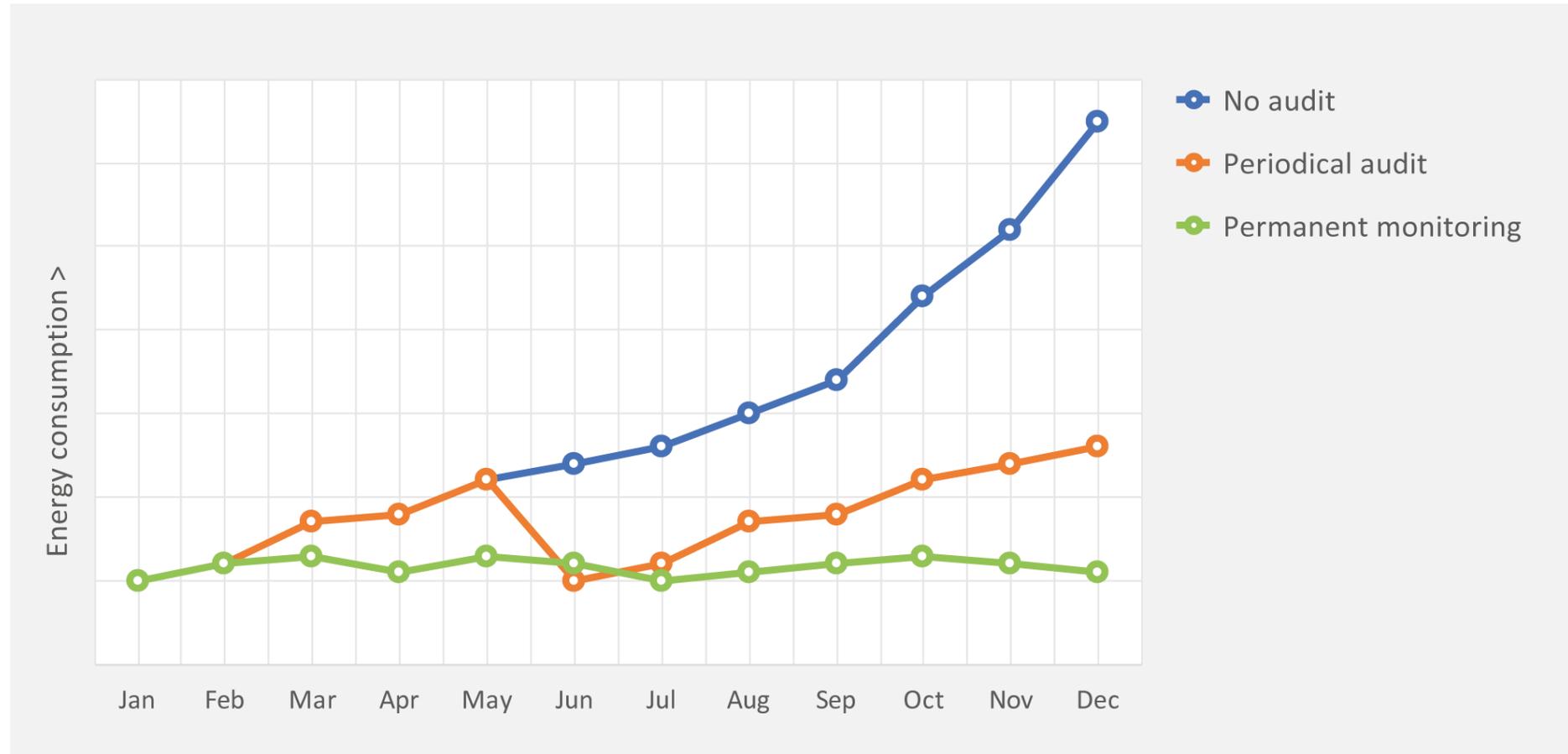
Point of use measurement

Auditing

Pressure loss



Permanent monitoring vs audits



Dutch glass factory ~ 2007

Solution

- Monitoring system with 20 flow meters
- Supply and demand side
- Combined with existing energy management system

Savings:

- Leakage in machines
- Optimization of oven cooling
- Compressor inlet filter maintenance

ROI:

- 1 year
- Total > 200,000 Euro / year

‘Thanks to individual efficiency monitoring on each turbo compressor, we can optimize our maintenance schedule’.

Dutch glass factory

Supply side optimization project

- Control system optimization
 - Lay out
 - New Master Controller
 - Flow meters as input for optimized control
- Total savings > 300 K/ year
- ROI < 12 months



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Step-by-Step

Conclusions

- Compressed air savings is your low hanging fruit
- Compressed air savings increases competitiveness
- Measurements leads to the right optimization decision
- Measurements provides proof of realized savings
- Step-by-step approach
- Permanent monitoring is key to optimum energy savings



THANK YOU!

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