CALMS

GLOBAL CONTROL - LOCAL SUPPORT

Problems detected and solved with CALMS

before-after events

TOWARDS ZERO

COMPRESSED AIR MANAGEMENT

List of problems in compressed air detected and solved by CALMS

- Excessive system pressure
- Control setup - optimisation issue
- False starts
- Pressure drops
- Excessive motor starts
- Service problems with inlet valve
- Control gaps

- Leakage rate – at various percentages
- Excellent efficiency VS Terrible efficiency or hIgh cost VS low cost
- 100% loaded VS 5% loaded or similar scenario
- VSD too small
- Vibration problems
- Filter problems – differential pressure too high
- Before after scenarios with pressure flow controller
- Roots blowers vs. variable speed turbo blowers

Reducing system pressure - reduce power but not specific power

PROJECT SUMMARY

Customer: Food company Marbo Pepsico

Problem:

CAS with 5 oil-free screw compressors one VSD compressor and control system, had poor specific power and too high pressure set at 8.6 bar avg.

Solution:

Set compressors and control system to operate at lower pressure

Summary:

- Pressure reduced for 1.8 bar
- Low investment - short ROI 1 month
- Power drop was 12%, but flow drop was 15% -> Specific power did not change

SAVINGS 7980 €/year for energy

Pressure issue

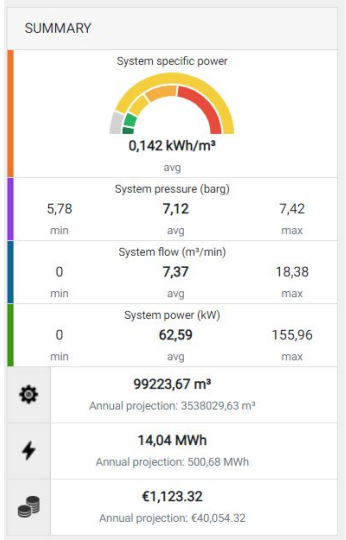
PROJECT SUMMARY

Customer: Corrugated Packaging company

Problem:

High energy consumption due to fluctuating high system pressure

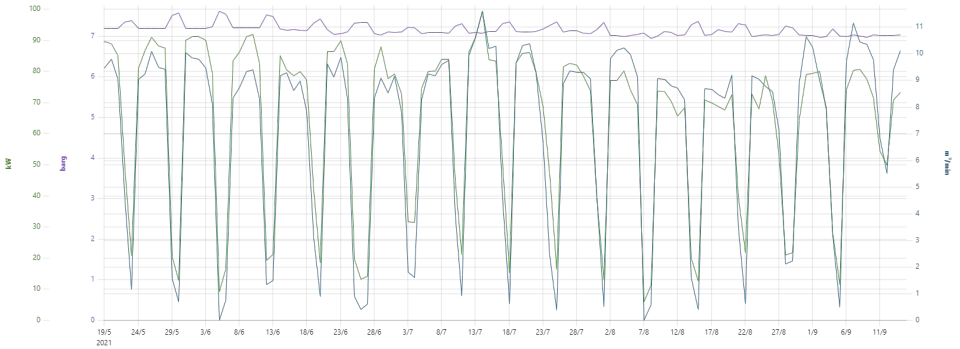
Solution:
Optimise corrugated sheet production and set master controller at a lower setpoint while closely monitoring critical pressure with alarms set to sms and e-mail



Summary:

- Reduce pressure requirement on some of the larger users in the sheet production
- Low investment - short ROI 1 month
- Reduced energy consumption: 4 %

SAVINGS 2000 €/year for energy



Control system issue

PROJECT SUMMARY

Customer: Paper mill company PG

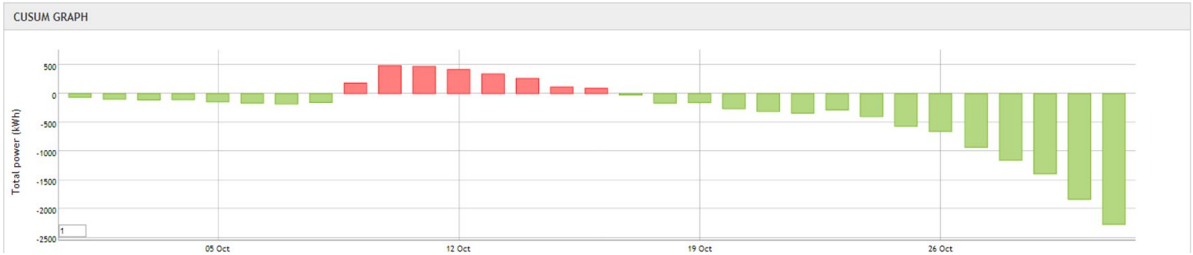
Problem:

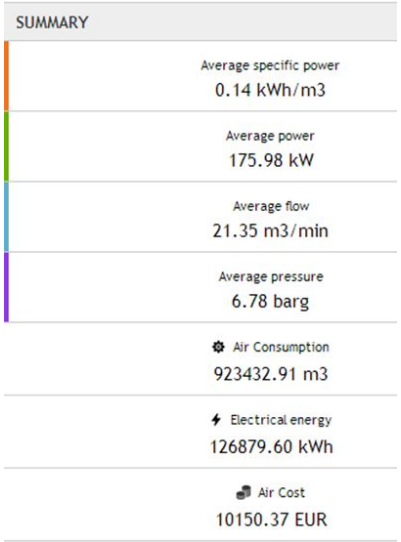
CA system with 4 oil-free screw compressors 132, 110, 75 and 55kW and control system had poor specific power.

Solution:
Optimise and set master controller with new sequences, timers and flow profiles from permanent monitoring

Summary:
- Reduce unnecessary compressor starts and loads
- Low investment - short ROI 1 month
- Reduced energy consumption: 6 %
- Specific power drops from 0.14 to 0.135 kWh/m3

SAVINGS 4200 €/year for energy





System design problem - replacing too big fixed speed compressor with smaller VSD

PROJECT SUMMARY

Customer: Beverage company Coca-Cola Croatia

Problem:

CA system with 3 identical 110 kW fixed speed oil-free compressors, customer wanted to replace broken one with new one the same size. Based on energy audit we identify the need for 45kW VSD compressor. System specific power consumption was very poor 0.2 kWh/m3

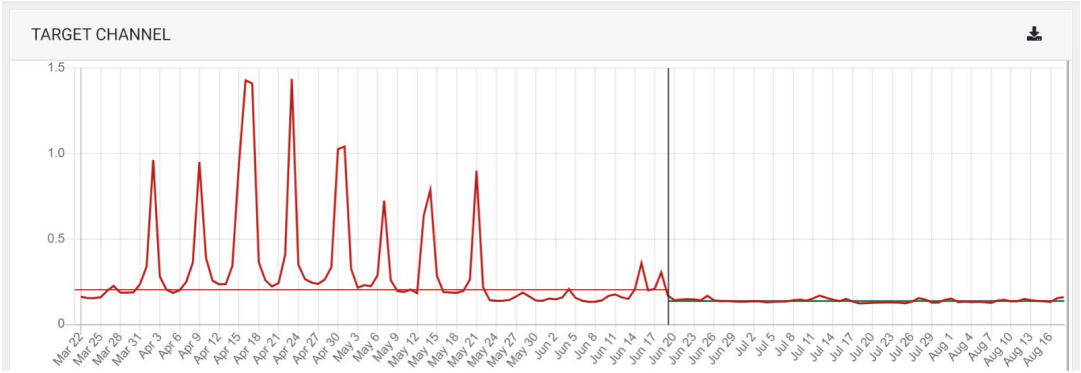
Solution:
Customer decides for 75kW VSD and permanent monitoring

Summary:

- Reduce unnecessary compressor starts and loads
- Only one compressor can cover complete flow profile -but compressor is still too big
- Reduced energy consumption: 32 %
- Specific power drops to 0.14 kWh/m3

SAVINGS 15.746 €/year for energy and 4800 €/year for maintenance

Average value before event (kWh/m³)	0.203
Target value (kWh/m³)	0.135
Average value after event (kWh/m³)	0.140
Duration of ROI (elapsed / expected)	51.8 / 2 months (2,591%)
Investment	€12,000.00
	€200.00 per day of return period
Savings until now	€67,972.69 (566% of inv.)
	on average €43.72 per day



Excessive compressor starts and compressor break down

PROJECT SUMMARY

Problem:

Chemical plant with high changes in demand causes too many compressor starts and stops, VSD cannot follow demand changes. Low pressure and hot discharge means no receivers
with 3 x Centac and 1 x Screw VSD

Solution:

Additional 10 m3 receiver

Summary:

- Reduced energy consumption
- Increased reliability
- Decreased service cost (smaller compressors and better operation)

SAVINGS 16.600 €/year

System design problem - too many too big compressors, too small receivers - waste presses

PROJECT SUMMARY

Customer: Chemical Plant Cinkarna, Slovenia

Problem:

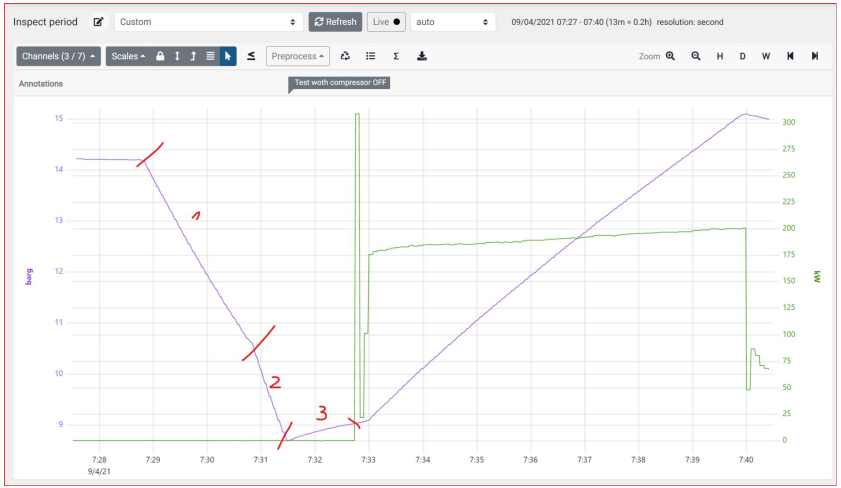
CAS has receivers 30 m3, 3 compressor 200kW, 20 bar 23m3/min and 4 end-users waste presses using the same air for two processes: drying and removing waste - huge air demand for very short period of time
Two units broke because of too many starts and water in lubricant

Solution:

Based on audit and simulation, 2 compressors replaced with 45 kW units and another 10 m3 receiver. Compressors will be in operation without too many starts and demand will be covered from receivers.

Summary:

- Reduce compressor starts
- Reduce longer idle operation and low temperature with condensate in oil problems
- Reduced energy consumption: more than 21 %



Purple is pressure and green is compressor power (the only one in operation) for one presses test.

We identify that first process(1) last 120sec and calculated flow 55m3/min, removing process(2) last 35sec and calculated flow is 85m3/min.
So no compressor needed for complete press operation, but what happened in segment (3). All valves were closed so no demand , no compressors in operation , but pressure rise for 1 bar -> temperature drop effect.

SAVINGS from 3.400 €/year only for energy savings

Compressor inlet valve issue - causing unnecessary starts and high energy consumption

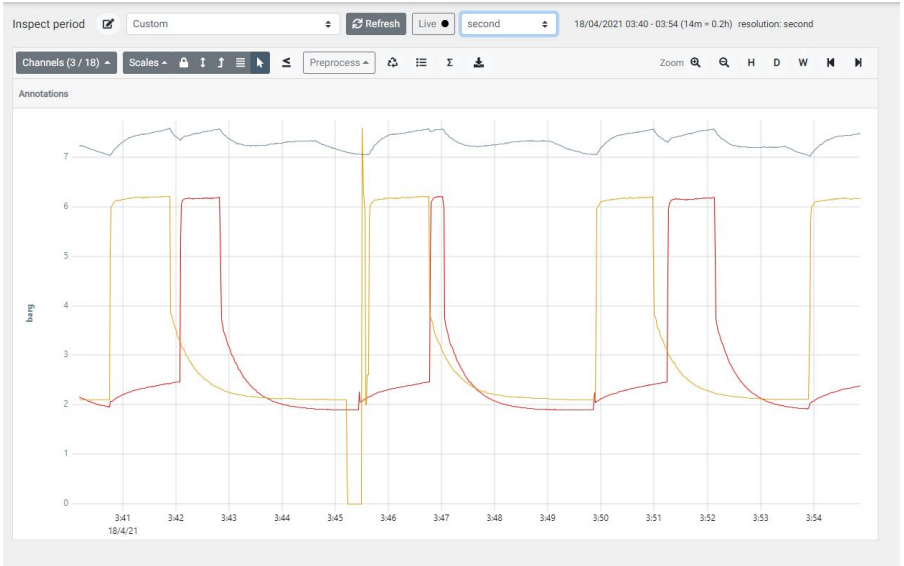
PROJECT SUMMARY

Problem:

CA system has 2 identical 75kW fixed speed compressors and one 75kW VSD compressor with master controller. Demand has not changed significantly, but second fixed speed compressor starts to run. Assumption was that master controller failed.

Solution:

Analysing data with live scope mode with 1 sec resolution reveals that control system is working correctly, but lead compressor 1(red line) tries to load as it should but could not load for almost 2 min, so control system started lag compressor 2 (yellow), based on pressure drop (gray)
Replace sticking inlet valve



Summary:

- Prevent unnecessary compressor starts
- Diagnose control system
- Reduce number of starts - longer compressor life
- Reduced energy consumption: more than 11 %

SAVINGS from 3.400 €/year only for energy savings

CFC energy savings

PROJECT SUMMARY

Customer: DC Motor production company

Problem:

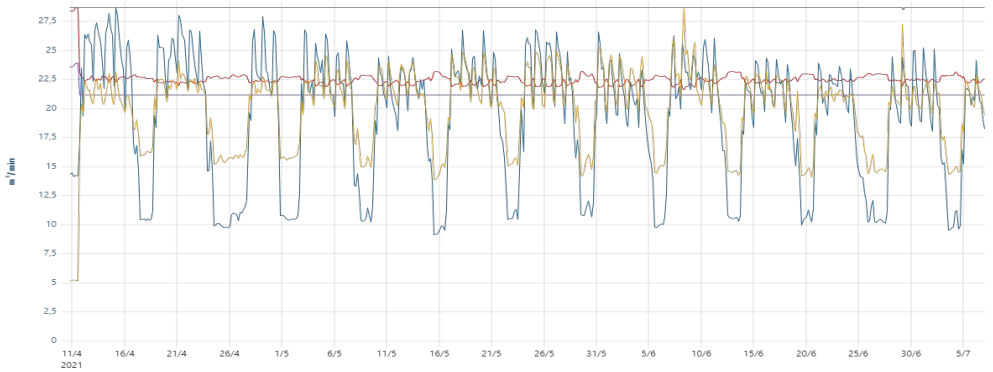
Fluctuating High pressure in production hall

Solution:
Optimise pressure setpoint of the newly acquired flow controller to lower compressed air production costs

System pressure (barg)		
6,08	**6,51**	7,49
min	avg	max
System flow (m³/min)		
0	**19,21**	30,00
min	avg	max

Summary:

- Slowly reduce header pressure in the hall while persistently monitoring pressure
- Low investment - short ROI 1 month
- Reduced energy consumption: 5 %
- Pressure reduction from 6.9 to 6.5 bar(g)



SAVINGS 4700€/year for energy

Waste water treatment inefficient roots blower - replaced with variable speed turbo blowers

PROJECT SUMMARY

Problem:

Inefficient operation with on-off roots blowers in WWT plant identified with CALMS audit

Solution:

Replacement with turbo variable speed blowers

Summary:

- Reduced energy consumption: more than 27 %
- Oil-free System -> 100% oil-less air
- Discharge Temperature 20 °C lower -> Aerated water temperature increase less than 3 °C
- Precise control: 1m /min -> Protect for excessive aeration
- Noise level: 82dB @ 1m (Before 105 dB)
- 30% less space required
- Integrated frequency drive -> better O2 control

SAVINGS 17.888€ * 3 blowers =53.664 €/year

Leak management - survey and repair program in tyre manufacturing plant

PROJECT SUMMARY

Problem:

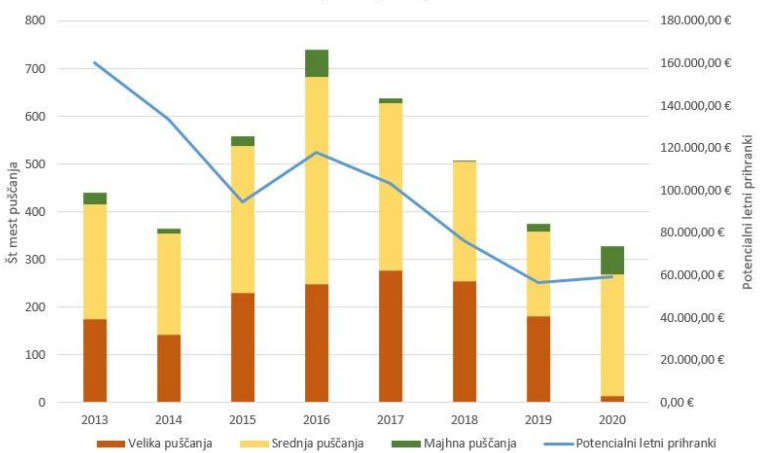
Tyre manufacturing plant is a huge compressed air consumer, with more then 2.5MW installed power. Compressors can't follow demand changes due to too many air leaks.

Solution:

External yearly leak survey and internal all over the year repair management system

Summary:

- Reduced energy consumption: more than 6 %
- Reduced air consumption
- Reduced CO2 emissions
- Increased safety
- Increased savings



SAVINGS from 55.000 €/year achieved with leak management