
Compressed Air Dryer Maintenance and Monitoring

Loran Circle
Consultant
Keynote Speaker

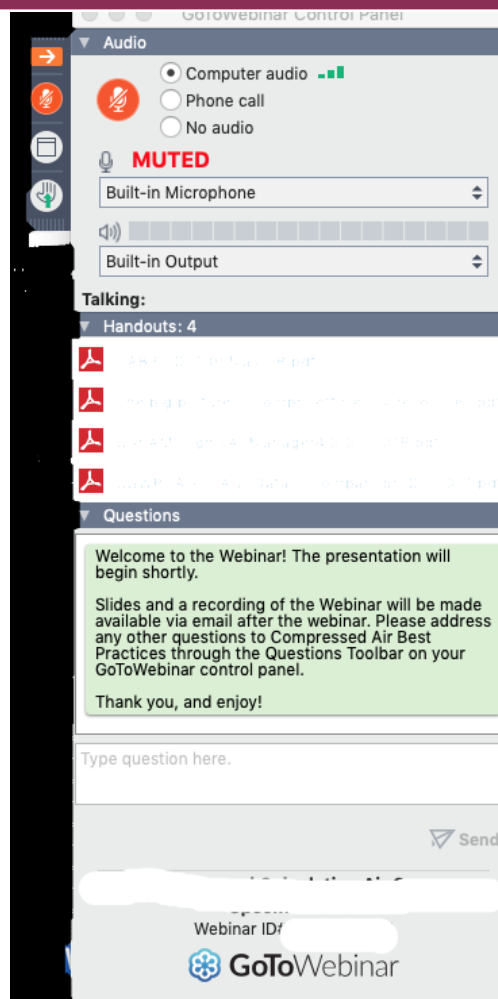
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Q&A Format



- Panelists will answer your questions during the Q&A session at the end of the Webinar.
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- Direct all questions to Compressed Air Best Practices® Magazine

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Handouts

Reliable | Efficient | Innovative

Product Portfolio
components and engineered systems for compressed air and gas treatment

Truth in Compressed Air **BEKO**

Measurement Technology

METPOINT®
precision instruments for compressed air monitoring

Truth in Compressed Air **BEKO**

CALMS Air Inc.

CALMS
YOU SAVE. WE OPTIMIZE.

www.calms.com

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Europe-Nordic: +46-31-797-19-16
USA: +1-646-5522375

CALMS CALMS is an independent compressed air optimization platform that introduces modern information technology and advanced energy services

Features

- Compressed Air Monitoring, Audit, Assessment, Asset Management and PLC Control System **in one place**
- **User friendly** plug-and-play devices
- Broad utility monitoring
- **Smart** leak management system
- Automatic alarms, warnings, reports and **improvement opportunities; AUTO ANALYSERS**
- Analysis and reports on customer demand
- Possibility of expanding software upgrading
- Multiple data ports options
- **Compatible with ISO9001 Energy Management System**

Benefits

- **Energy efficient**, reliable and sustainable
- **Saves time and money**
- **Improve energy consumption prediction**
- Improved environmental image and investment process
- **Improve and track your KPI's**
- Indispensable tool for performance contracting projects
- Gain valuable information for different company departments
- **Reduce CO2 emissions**

Sustainable, Safe & Reliable On-Site Utilities Powering Automation

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

December 2023

Measurement

30 Best Practices 2023 EXPO Show Report

- When to Repair vs. Replace Your Vacuum Pump
- Evapeo Celebrates at Global Sales Conference
- Crimping Pipe Nozzles for Improved Efficiency
- Aeration Blowers at Weftec 2023

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All materials presented are educational. Each system is unique and must be evaluated on its own merits.

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BEST PRACTICES
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COMPRESSED AIR / VACUUM / COOLING

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Compressed Air Dryer Maintenance and Monitoring

Introduction by
Compressed Air Best Practices® Magazine



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About the Speaker



Loran Circle
Consultant

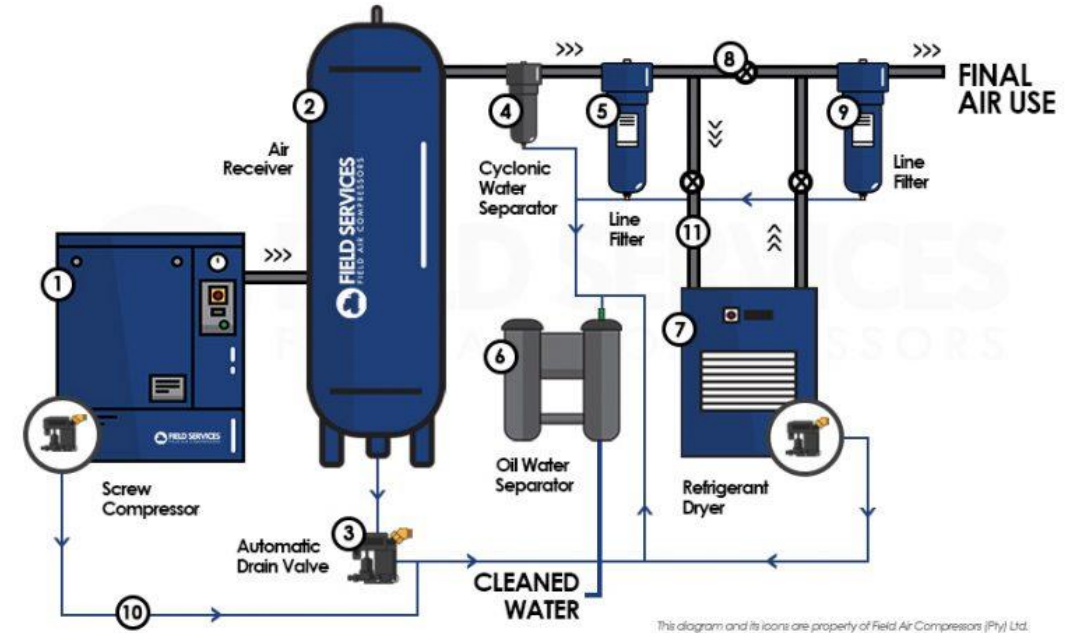
- DOE Certified Airmaster+
- Air Systems Consultant

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Air Dryer System

- Compressor
- Receiver tank (if necessary)
- Pre Filter
- Refrigerated dryer rough (.3 micron) coalescing prefilter. Fine (.01 micron) coalescing after filter.
- Desiccant dryer: rough (.3 micron) coalescing prefilter. Second prefilter coalescing fine (.01 micron) after filter. PARTICULATE filter on discharge of desiccant dryer.

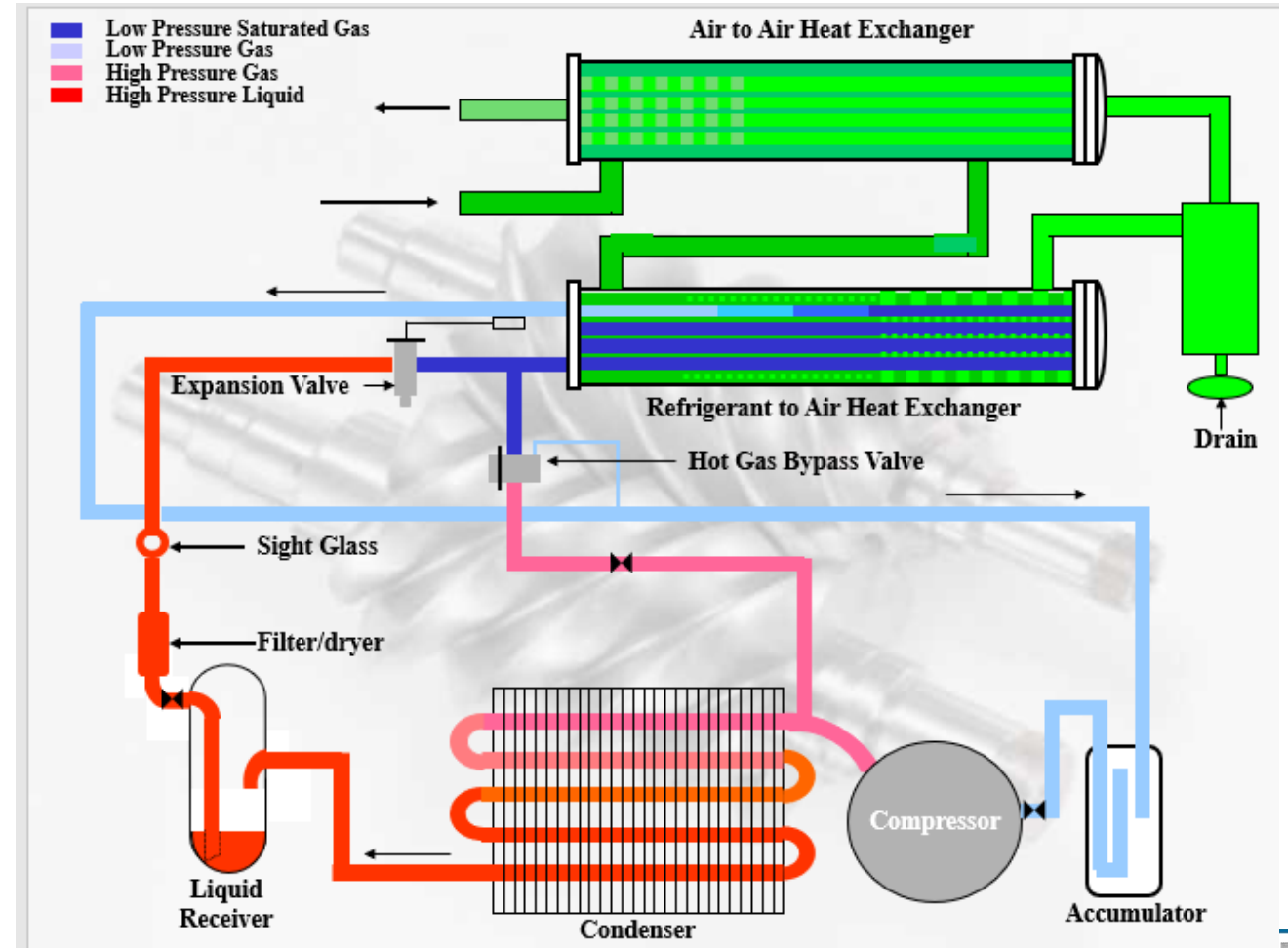


Refrigerated Dryer Circuit

Make sure condenser is clear of dirt and debris

Use a coil cleaner to remove grease and dirt

Observe drains for water.



Refrigerated Dryer Maintenance and Troubleshooting

Problem: Moisture in system

Is it at the first drop as it goes into Plant?

Or at the end of the distribution line?

First drop? Chances are traps are plugged. Look for water removal from traps. Clean traps.

End of line? Check for temperature differential by measuring the incoming and discharge temperature.

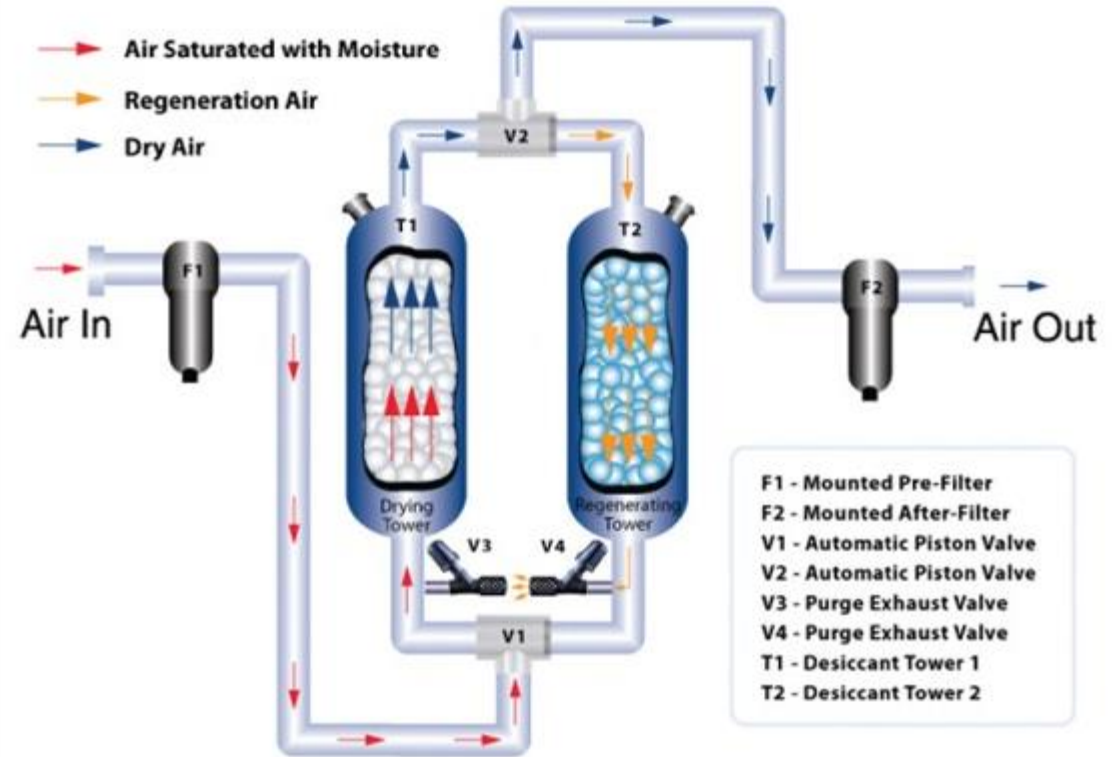
No differential? Refrigeration circuit down



Desiccant Dryers

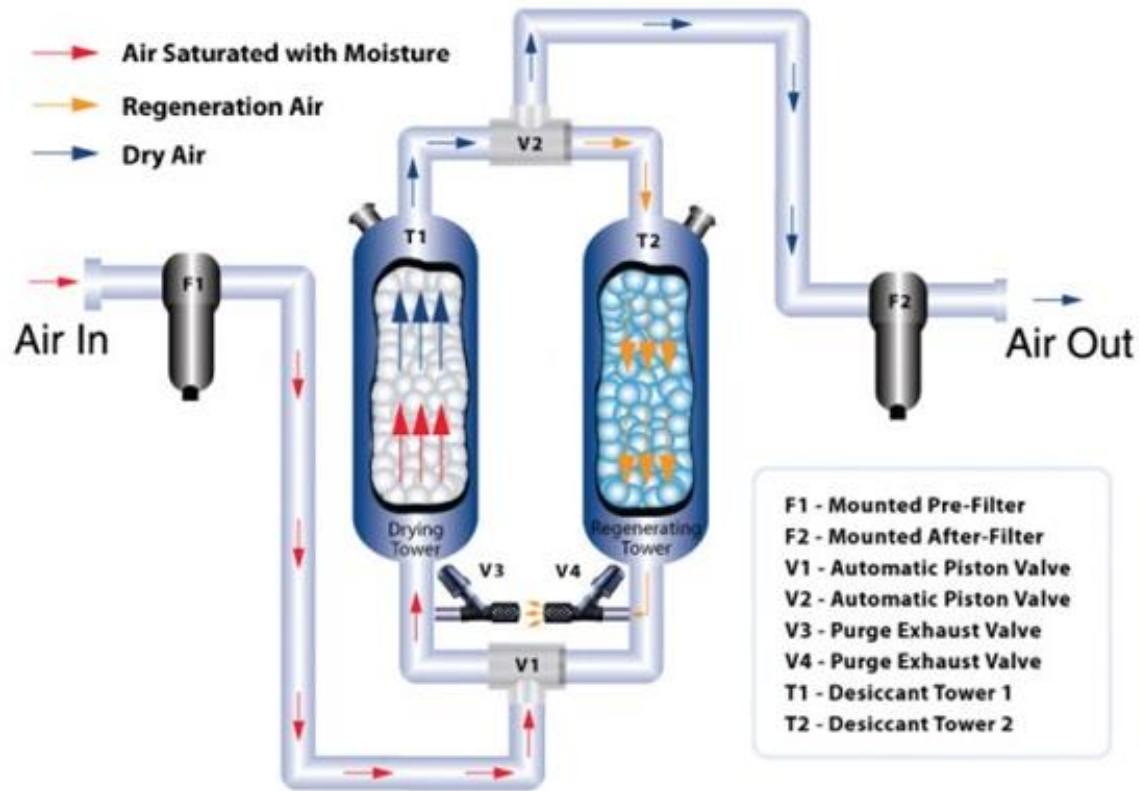
- Desiccant dryers do not remove water
- They remove moisture vapor
- Heat reactivated dryers
- Water in water out
- Needs water in suspension (humidity)
- Check tower switching

How It Works

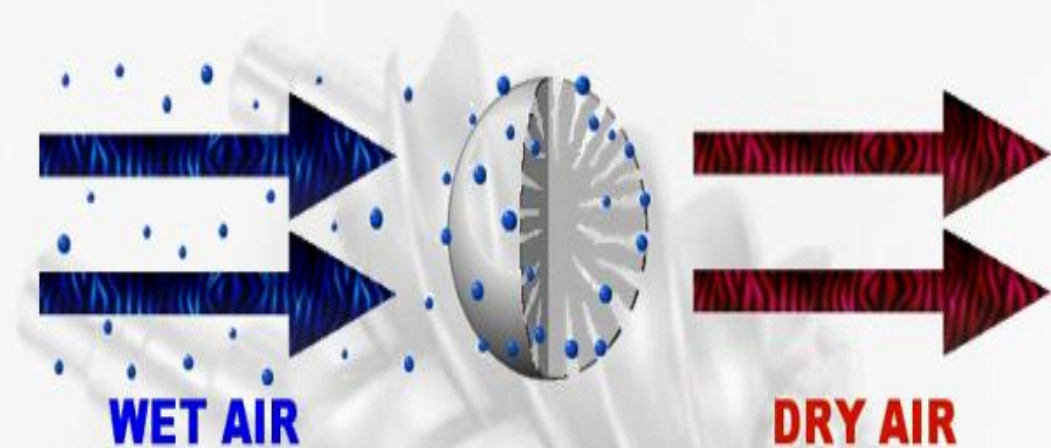


Desiccant Dryer Flow Chart

How It Works



Drying by Adsorption



Most Important Part of Dryer Maintenance

- Filtration
- Differential Pressure
- Monitoring
- Observing
- Cleaning condenser unit on refrigerated dryers
- Maintaining traps on refrigerated dryer

Thanks For Attending

- **Loran Circle**
- **Compressed Air Systems Consultant**
 - **Certified DOE AIRMaster plus**
 - **Poland Ohio**
 - **832-906-0469**

About the Speaker



Luciano De Oliveira
BEKO Technologies

- Product Manager Measurement & Instrumentation and Refrigerant Dryers, BEKO Technologies
- Product Manger with BEKO Technologies since 2022
- 15+ Years of experience in the high pressure compressed air industry (PET Blow molding)

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BEKO TECHNOLOGIES USA

Ensuring Dry Air Quality

Unveiling the Power of Data with Sensors and Data Loggers

Luciano de Oliveira – Product Manager
Refrigerant Dryers and Measurement & Data Logging

Summary

- Application requirements
- Dryer Selection
- Measurement and Data Logging



HOW TO START

Application Requirements

- Pressure dew point / moisture
 - ✓ Determination of the temperature at which water vapor condenses to water at the current operating pressure



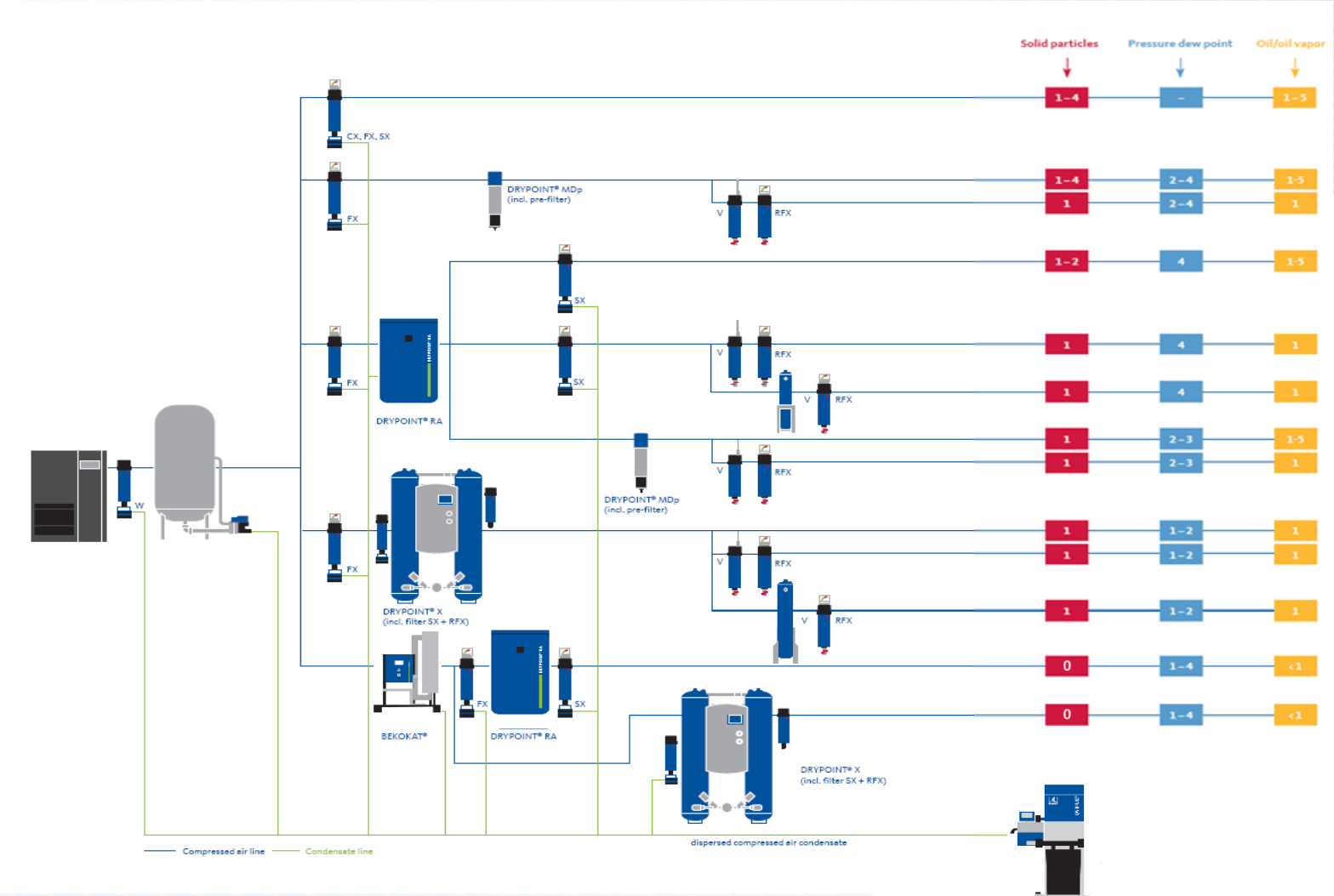
WHAT DO YOU NEED

Application Requirements



WHAT SOLUTION DO YOU NEED

Equipment Selection



WHAT DRYER DO YOU NEED

Equipment Selection



ANSI/ISA
(S7.0.01-1996)

ISO Class
(8573-1:2010)

PDP
(°F)

60 °F

50

45

37

-4

-40

-100

6

5

4

3

2

1

DRYPOINT® M PLUS

DRYPOINT® RA

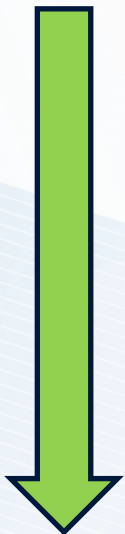
DRYPOINT®

Membrane dryer

Refrigeration dryer

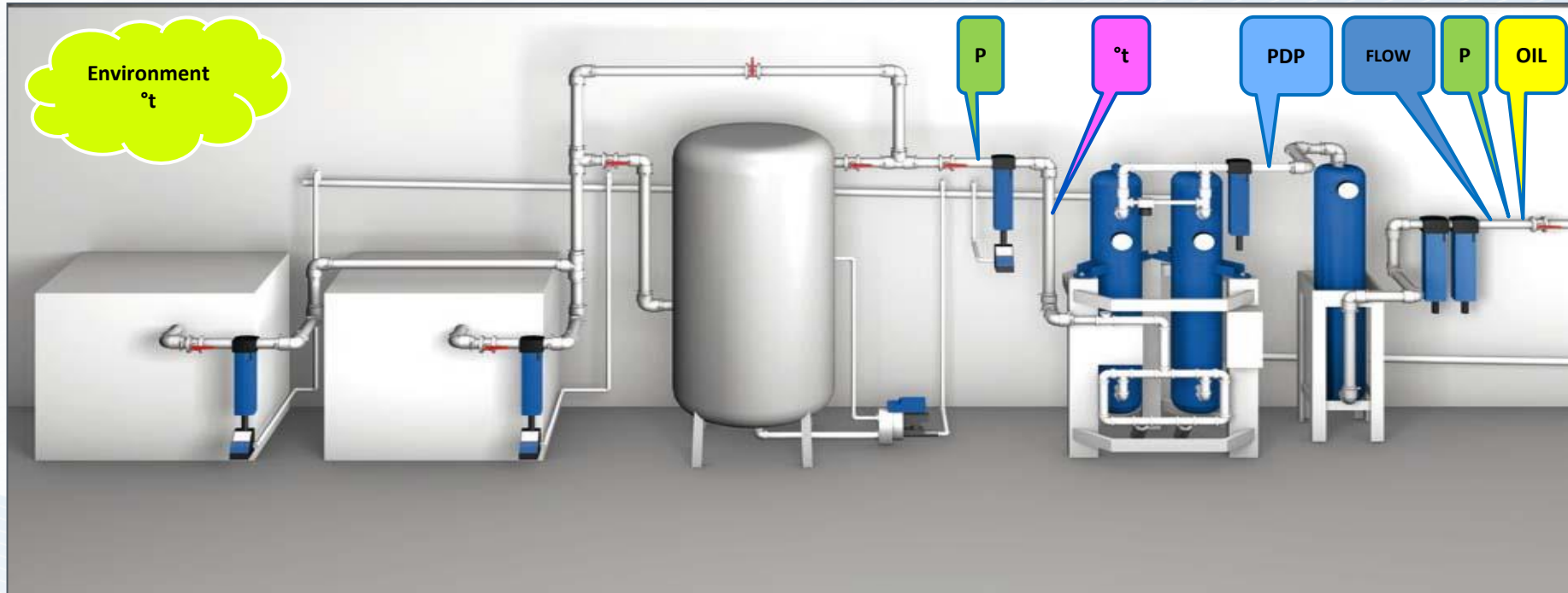
Air Flow Rate

Desiccant dryer



HOW TO VERIFY AIR IS DRY

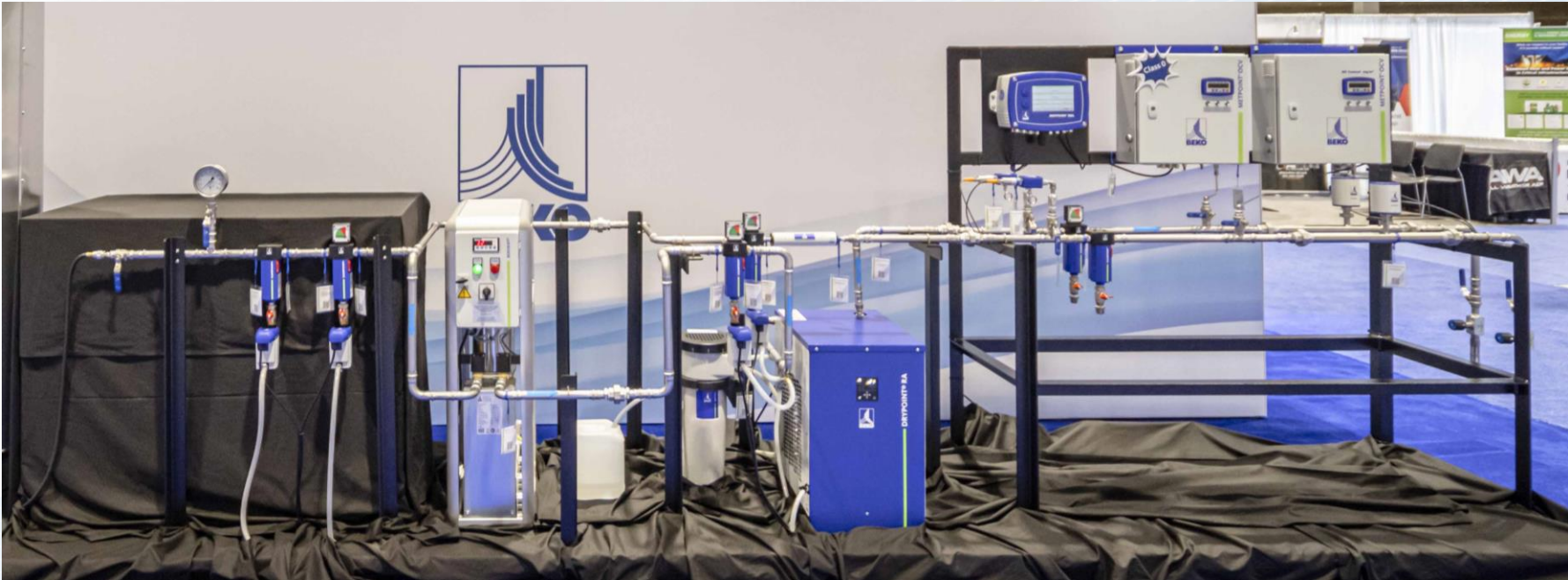
Measurement and Data Logging



Suggested installation points

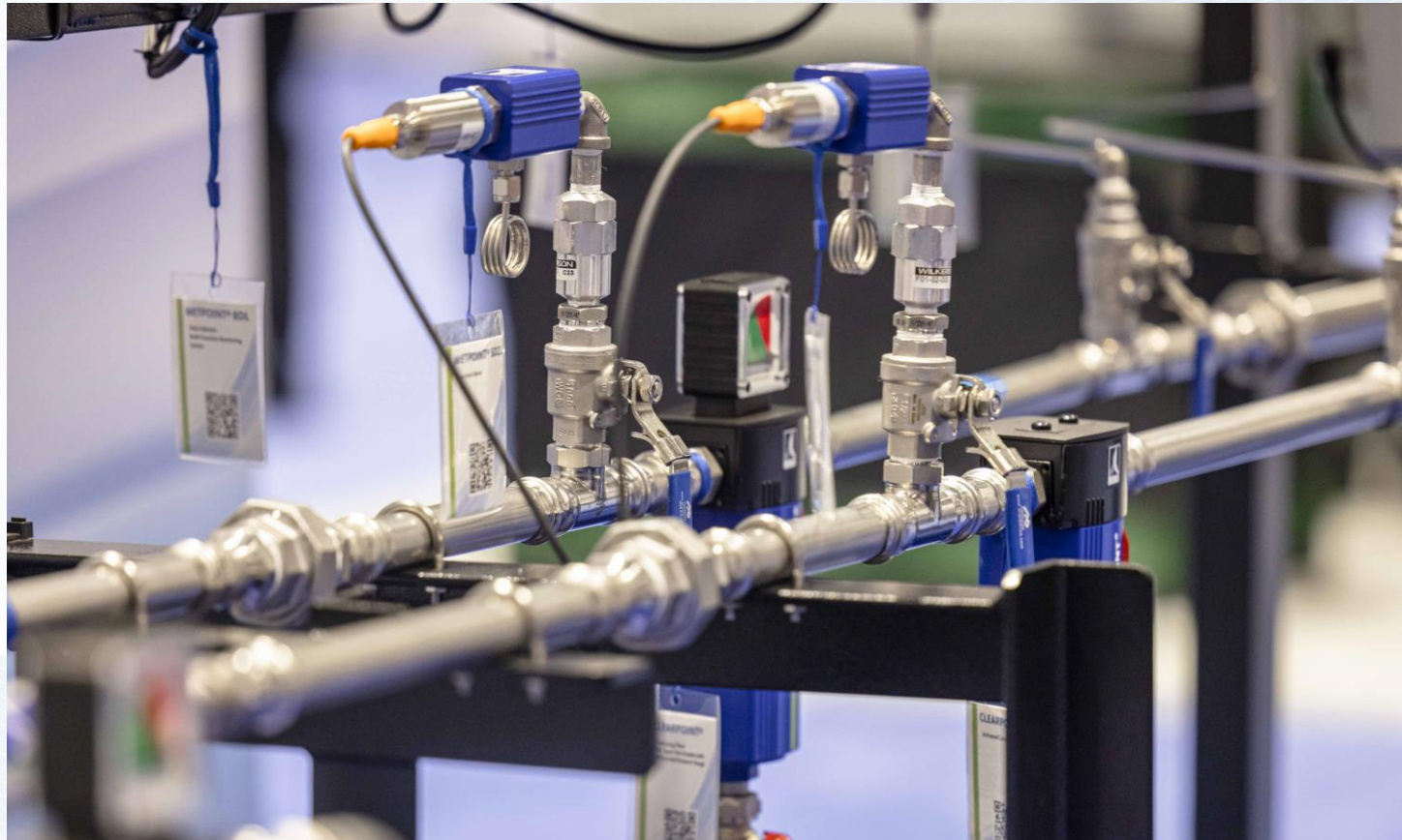
HOW TO VERIFY AIR IS DRY

Measurement and Data Logging



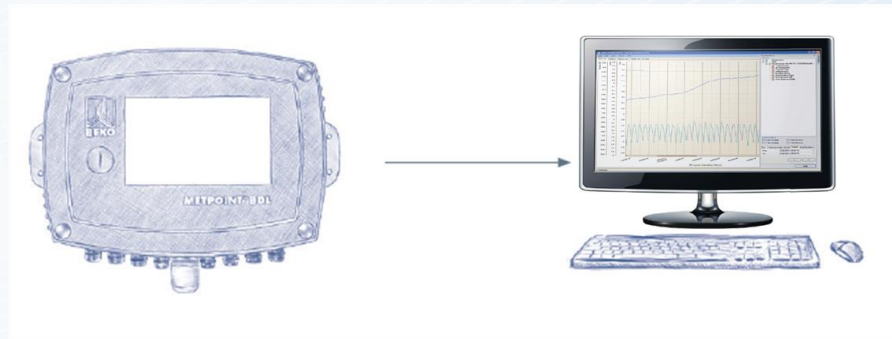
HOW TO VERIFY AIR IS DRY

Dew Point Sensors



HOW TO REPORT

Measurement and Data Logging



Plant



Local

Global



Thank you for your
attention!



About the Speaker



Gorazd Bregar
CALMS

- Founder and CEO, CALMS
- >30 years of active involvement in the compressed air industry
- Founder of HPE company that is focused on compressed air solutions and services
- Co-Founder of CATZ - Compressed Air Towards Zero coalition of independent CA experts

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ADVANCED REMOTE MONITORING AND CONTROL OF AIR QUALITY WITH HELP OF AUTO ANALYZERS AND AI

Interesting findings with correlation analysis

Gorazd Bregar

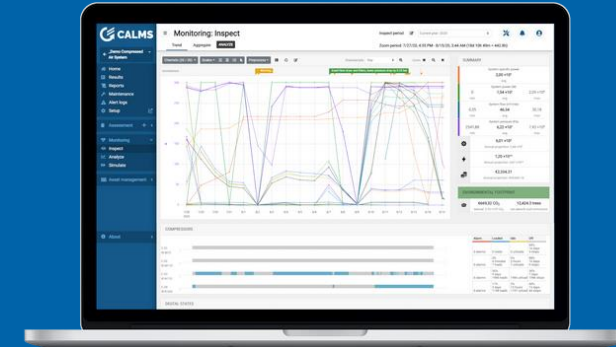
December 2023

Independent Compressed Air Management System

ABOUT US

- Independent Compressed Air Management System for continuous improvements and energy savings with AI Auto Analyzers
- Since 2008, team of CA experts Worldwide and software developers,
- Holistic, Action driven, Independent, Engagement
- Based on CSA837, support for ISO 11011, 50001, 55000 compliant
- Supported by independent experts coalition CATZ Worldwide
- CALMS Offices: USA, Slovenia, Sweden
- 1200+ systems Worldwide

Certified by:

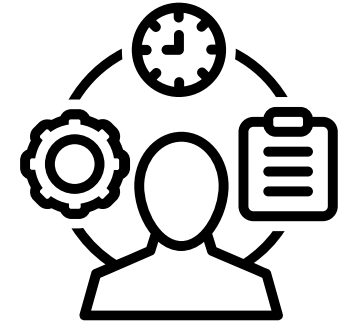


GLOBAL CONTROL - LOCAL SUPPORT

ENERGY MANAGEMENT VS ENERGY MONITORING. WHY IT IS IMPORTANT TO KNOW THE DIFFERENCE?

MANAGEMENT SOFTWARE

Energy management systems provide a proactive approach to reducing energy consumption, establish a culture of energy efficiency, and offer a wide range of features for tracking and analyzing energy usage. The best practice is to look for a management system with a holistic approach.



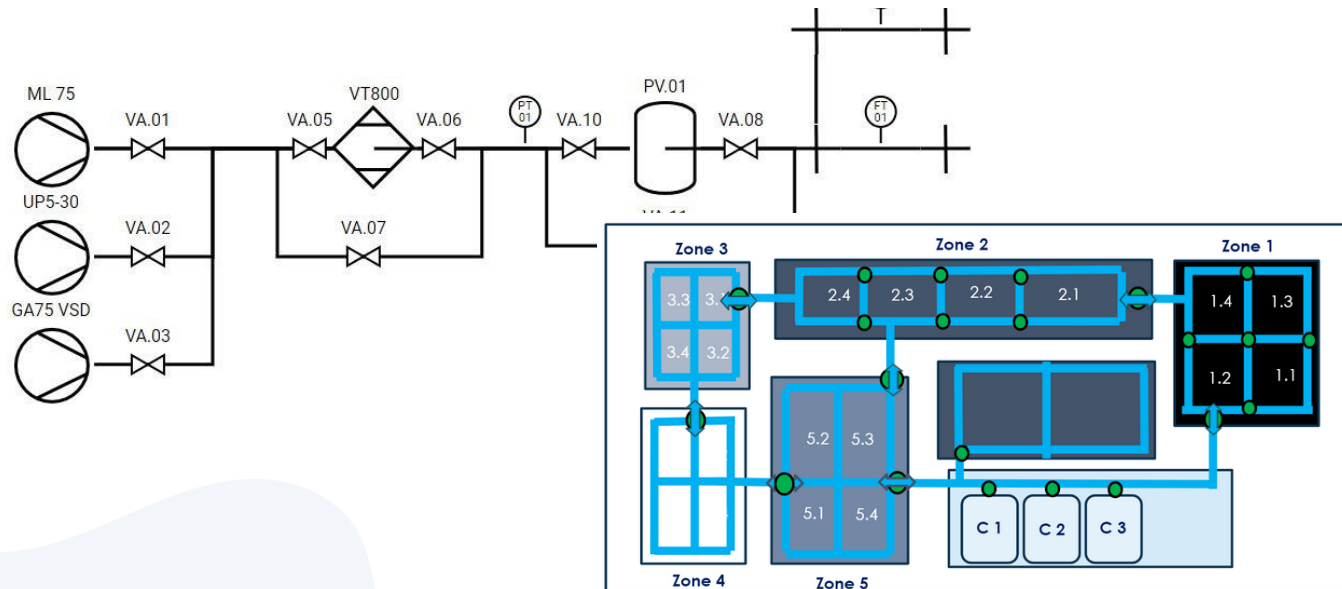
MONITORING SOFTWARE

Energy monitoring is a reactive approach to energy efficiency that involves tracking and analyzing energy consumption in real-time or near-real-time. The main goal of monitoring is to identify patterns and opportunities for improvement. However, it is important to note that it does not address the root causes of energy inefficiency.



COMPRESSED AIR MANAGEMENT

- DATA ACQUISITION MANAGEMENT
- ENERGY PERFORMANCE MONITORING
- ENERGY ANALYTICS AND INSIGHTS
- ADVANCED ENERGY OPTIMISATION
- EVENTS AND CARBON TRACKING
- ENERGY COST MANAGEMENT
- ASSET MANAGEMENT



- System assessment
- Waste management
- Ongoing optimization
- Connect with independent expert
- Target monitoring
- Support for ISO 50001 compliant
- Establish KPIs
- Benchmarking
- SCADA view
- Compare to the best in class
- Zone monitoring and smart waste management
- Insights of CA systems
- Energy forecast
- Asset management
- Purchasing support & E-bidding
- Analysis tool, correlation, M&T, Cusum...
- Simulation-digital twin ...

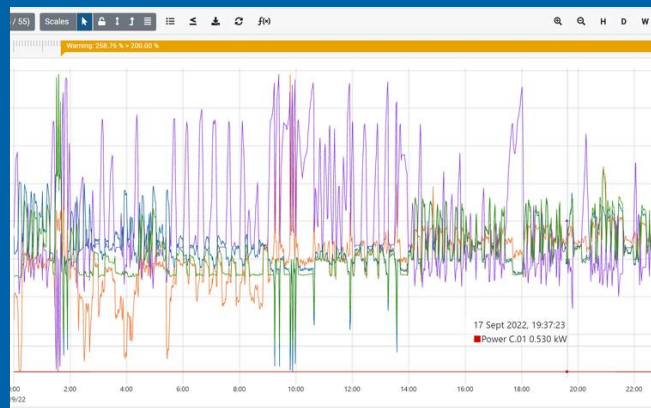
AI & AUTO-ANALYZERS IN COMPRESSED AIR SYSTEMS

Artificial intelligence & Auto-analyzers in compressed air systems are looking for the same fruit, just higher up.

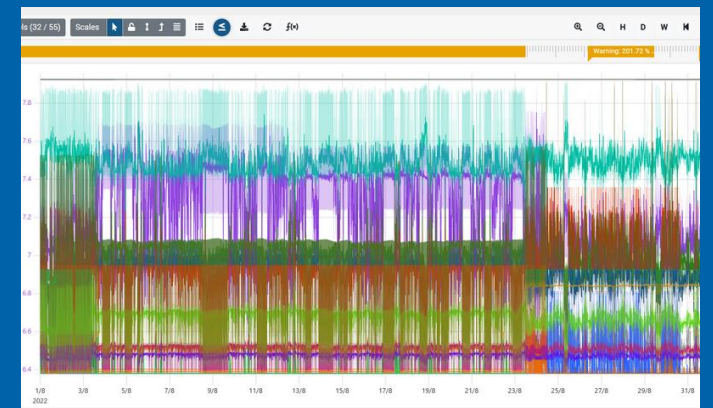
- Human Experts have a clear understanding of the fundamentals but do not have the resources to go through all the collected data.
- Big data and algorithms must now do the hard work.
- As available data on compressed air systems increases, the possibilities of finding additional savings also increase.



Human analysis window 1h / 1s / 5 ch



Human analysis window 1d / 1m / 5 ch



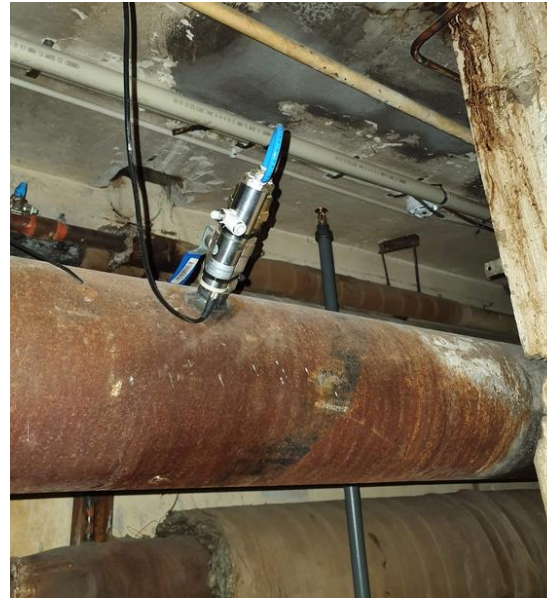
Computer analysis window 1y / 5s / 50 ch

AIR QUALITY FROM INTAKE TO THE USER

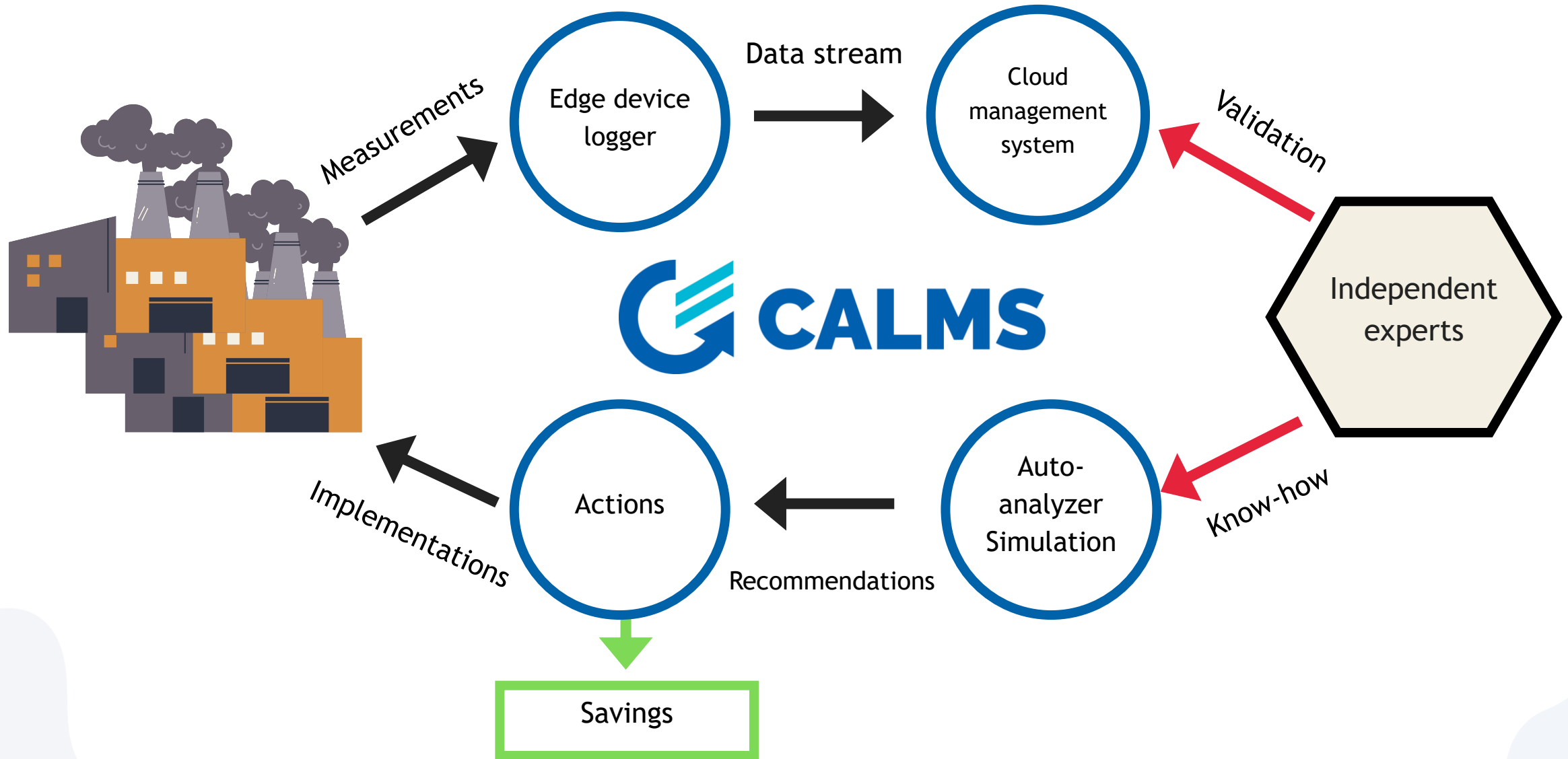
- Water
- Dust-particles
- Oil



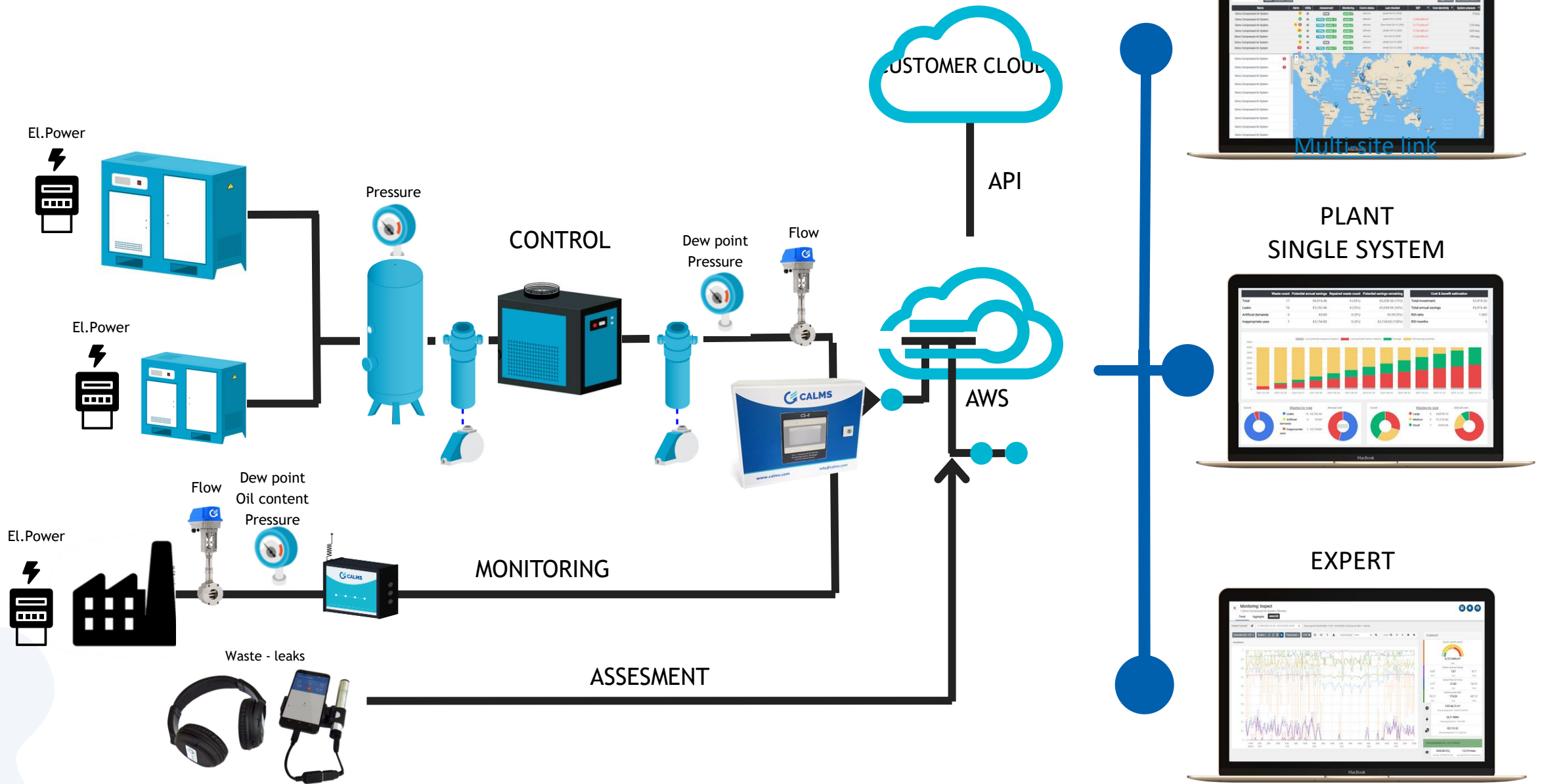
- Dew point
- Oil content
- Particles
- Temperature



AUTO ANALYZERS PROCESS LARGE AMOUNTS OF DATA PRODUCED BY CLOUD-BASED MONITORING SYSTEMS.



COMPRESSED AIR MANAGEMENT



AUTO-ANALYZER WILL PROVIDE RESULTS IN A CLEAR AND EASY-TO-UNDERSTAND FORMAT

OPPORTUNITY CARDS



3 Audit

2 cards

- Change dryer type**
30 h 19.4K \$ 2 t
- Install pressure drop indicators**
20 h 8K \$ 771 kg

Change dryer type

Audit Critical priority

Reliability score +6%

Financial score --

Sustainability score --

Current situation:

Heatless dryers are expensive to run as they expend a lot of air for normal operation. HL1500 dryer has high PDP spikes during tower switching. Very high PDP > +13C for over 15min when flow is high. Existing dryer is old, valves are not working and it is too small without back up. Also drains on wet receiver need replacement (lot of water).

Opportunity:

Consider replacing adsorption dryers with refrigeration or HOC dryers which can improve system efficiency and reliability. Consider using point of use dedicated air treatment for lower dew point requirements. Based on the demand side audit we suggest using refrigeration dryer capacity 60 m3/min - low cost of operation and there is no need for very low PDP.

What will be saved annually:

- 30 h ± 10 h Problems
- 19.4K \$ ± 1K \$ Potential savings
- 2 t ± 96 kg CO2 emissions
- 86 ± 4 Trees

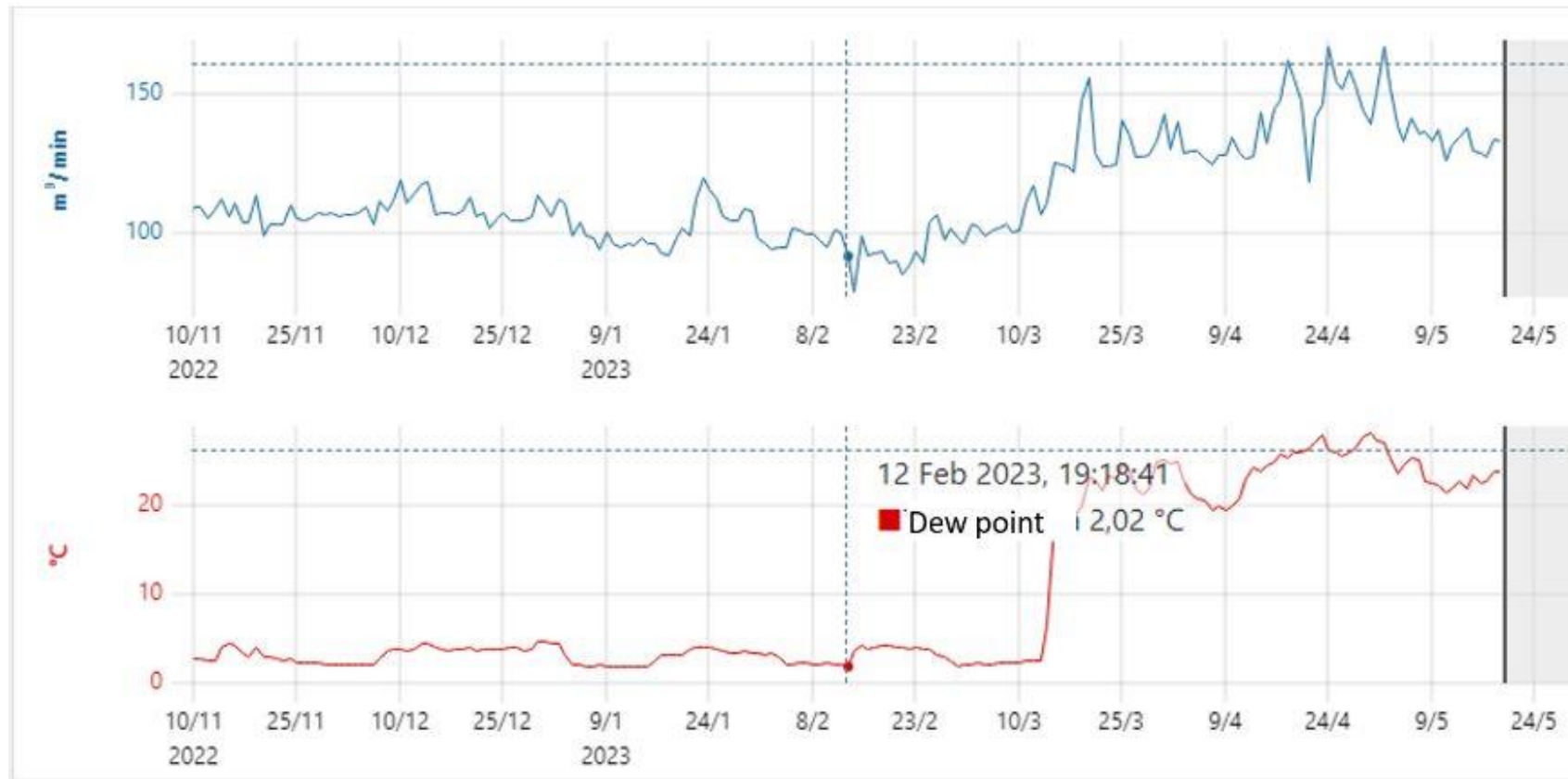
What is the investment:

- 28K \$ ± 0 \$ Investment
- 1 year ± 17 days Return

Created by : GorazdB @ CALMS Air Inc.
3 December 2023 17:53

Resolve in audit

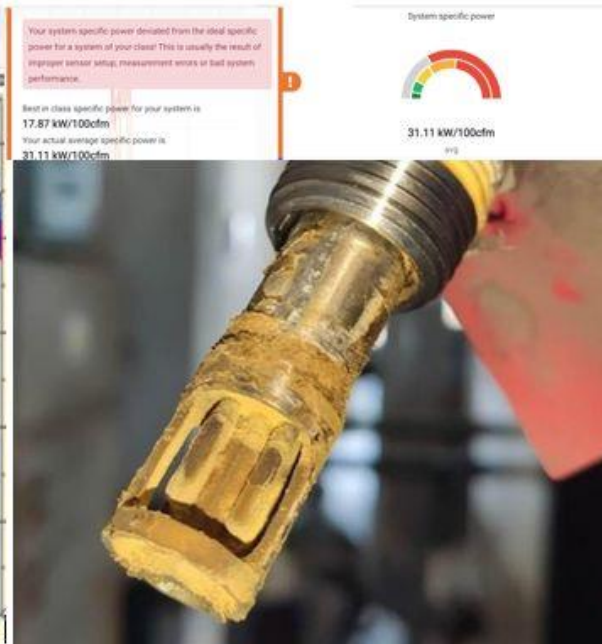
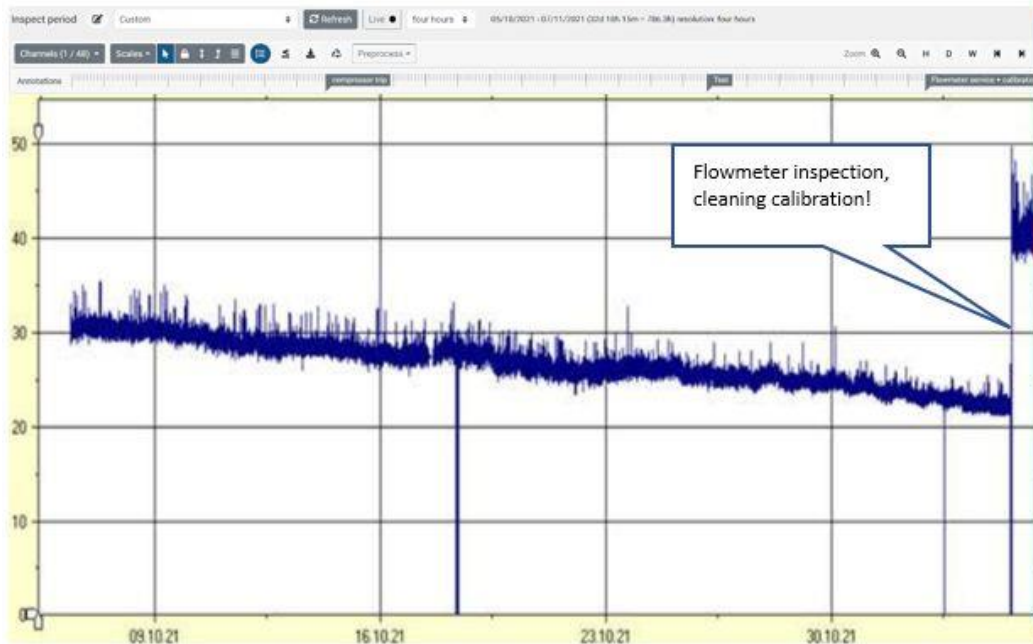
ALARMS & WARNINGS MONITORING BASED



ACTION OPPORTUNITY CARDS MANAGEMENT -AUTO ANALYSER BASED

AUTO ANALYSER:

Comparing CALCULATED FLOW and MEASURED FLOW



Action opportunity card

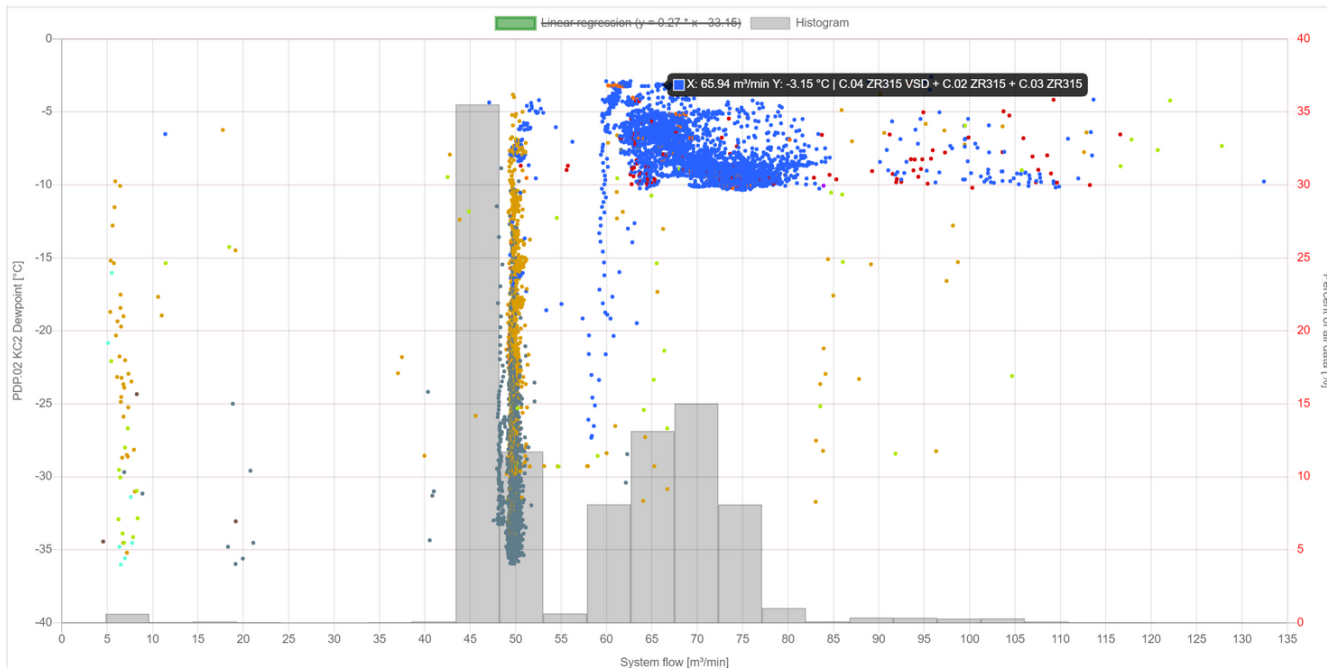
Flow sensor drift

Verify/Calibrate.

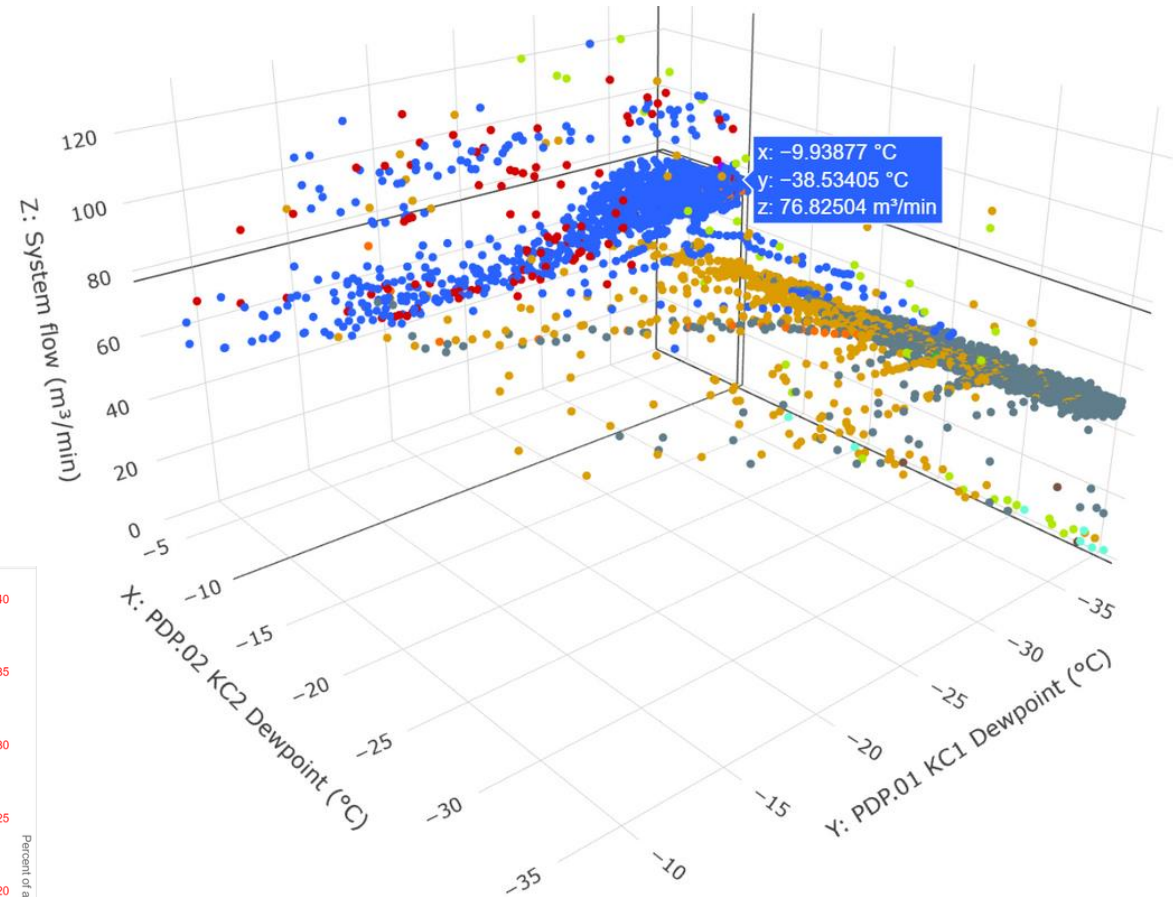
CORRELATION ANALYSIS

Dew point 1 & 2 analysis
based on compressors operation and flow

2D



3D



- C.04 ZR315 VSD W-8.6 + C.02 ZR315 + C.03 ZR315 (3919 | 45.31%)
- C.03 ZR315 (3101 | 35.85%)
- C.02 ZR315 + C.03 ZR315 (969 | 11.20%)
- (371 | 4.29%)
- C.04 ZR315 VSD W-8.6 + C.03 ZR315 (115 | 1.33%)
- C.04 ZR315 VSD W-8.6 + C.02 ZR315 + C.03 ZR315 + C.01 ZR315 (112 | 1.29%)

ASSET MANAGEMENT EQUIPMENT MAINTENANCE

TCO

0 Demo CALMS ▾

Equipment **Equipment list** Maintenance log

Compressor	Description	Date	Total running (h)	Total loaded (h)	Maintenance interval	Remaining time	Maintained by	Added by		
C.01 Compair160 CH160		7 Dec 2022	0	0	4000 running h or year	3894 running h or 2 days	Uroš Šučur @ CALMS	Uroš Šučur @ CALMS	+	▾
C.03 Compair 132 CM132	Service B 4000h	15 May 2022	43788	41277	2000 running h or year	Overdue or Overdue	user#U-SHOOW007	user#U-DAEJ8BIE	+	▾
C.02 IR RSe75n IR RSe75n	Level A kit 2000h	15 May 2022	67233	61222	8000 running h or year	3320 running h or Overdue	user#U-AF7SHEIY	user#U-DAEJ8BIE	+	▾
C.04 Kaeser 132 DSD 200 - 125 psig / 460V/3ph/60Hz	Plan B 4000h service, AF, OF, dP check oil sample good	5 Dec 2023	15666	12766	4000 running h or year	4000 running h or year	Invalid userId	GorazdB @ CALMS Air Inc.	+	▾
C.05 Compair L160 L160	Start-up - commissioning report 21-22	5 May 2023	8	6	150 running h or year	150 running h or 5 months	Invalid userId	GorazdB @ CALMS Air Inc.	+	▾
Dryer	Description	Date	Total running (h)		Maintenance interval	Remaining time	Maintained by	Added by		
D.01 SPX FS1040	Clean and service 8000h	5 Dec 2023	28671		year	year	Invalid userId	GorazdB @ CALMS Air Inc.	+	▾
D.02 EP506	Service 8000h - element change	5 Dec 2023	12988		year	year	Invalid userId	GorazdB @ CALMS Air Inc.	+	▾
D.01	Cooler replace,dP, R410	5 Dec 2022	35009		6 months	Overdue	GorazdB @ CALMS Air Inc.	GorazdB @ CALMS Air Inc.	+	▾
Filter	Description	Date			Maintenance interval	Remaining time	Maintained by	Added by		
F.01	Element replace dp > 25psi	3 May 2023			year	5 months	Uroš Šučur @ CALMS	Uroš Šučur @ CALMS	+	▾
F.03	Filter element, drain clean	5 Nov 2022			year	Overdue	GorazdB @ CALMS Air Inc.	GorazdB @ CALMS Air Inc.	+	▾
F.04	Filter element	5 Dec 2021			year	Overdue	GorazdB @ CALMS Air Inc.	GorazdB @ CALMS Air Inc.	+	▾

0 Demo CALMS - TCO_2023-11-22_15:57:32 Dryer TCO A & B

Save | Home | Report | Duplicate | Add (2/2) | Use custom weights | Hide performance bars

Design data

Electricity cost: 0.12 USD/kWh

Operating hours: 8000 hours/year

Design flow: 1.01223 bar, 0°C, 0% RH

Design capacity: 28800000 m³/min

Design pressure: 7.5 bar

Type

Control type: Dryer A

Cooling type: Dryer B

Stage: Manufacturer

Rated pressure: Model

Capacity: A

Provider capability: B

Full load power: 15 kW (59% (1.685k))

Power at zero flow: 4 kW (16% (0.535k))

Specific power: 0 m³

Isentropic efficiency: 0 m³

Motor efficiency: 0 m³

Noise level: 0 m³

Warranty period: 5 years (100%)

Loaded percent: 80%

Unloaded percent: 20%

Compressed air volume per year: 0 m³

Cost of energy per year: US\$28,990.08 (59% (1.721k))

Maintenance cost per year: US\$8,100.00 (3500 USD) (4600 USD) (79% (1.314k))

Overhaul cost (in 10 years): US\$30,000.00 (12000 USD) (18000 USD) (67% (1.5k))

Purchase investment price: US\$83,600.00 (36000 USD) (46800 USD) (79% (1.275k))

TCO after 1 year: US\$120,690.08 (US\$58,636.00) (US\$62,054.08) (52% (1.055k))

TCO after 5 year: US\$269,050.40 (US\$145,980.00) (US\$123,070.40) (46% (1.186k))

TCO after 10 year: US\$484,500.80 (US\$267,160.00) (US\$217,340.80) (45% (1.229k))



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THANK YOU !
Any questions ?
gorazd@calms.com

Compressed Air Dryer Maintenance and Monitoring

Q&A

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January 2024 Webinar

How to Boost the Energy Efficiency of Rotary Screw Air Compressors



Andrew Smith, P.E.
SMARTCAir
Keynote Speaker

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Thursday, January 11, 2023– 2:00 PM EST

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