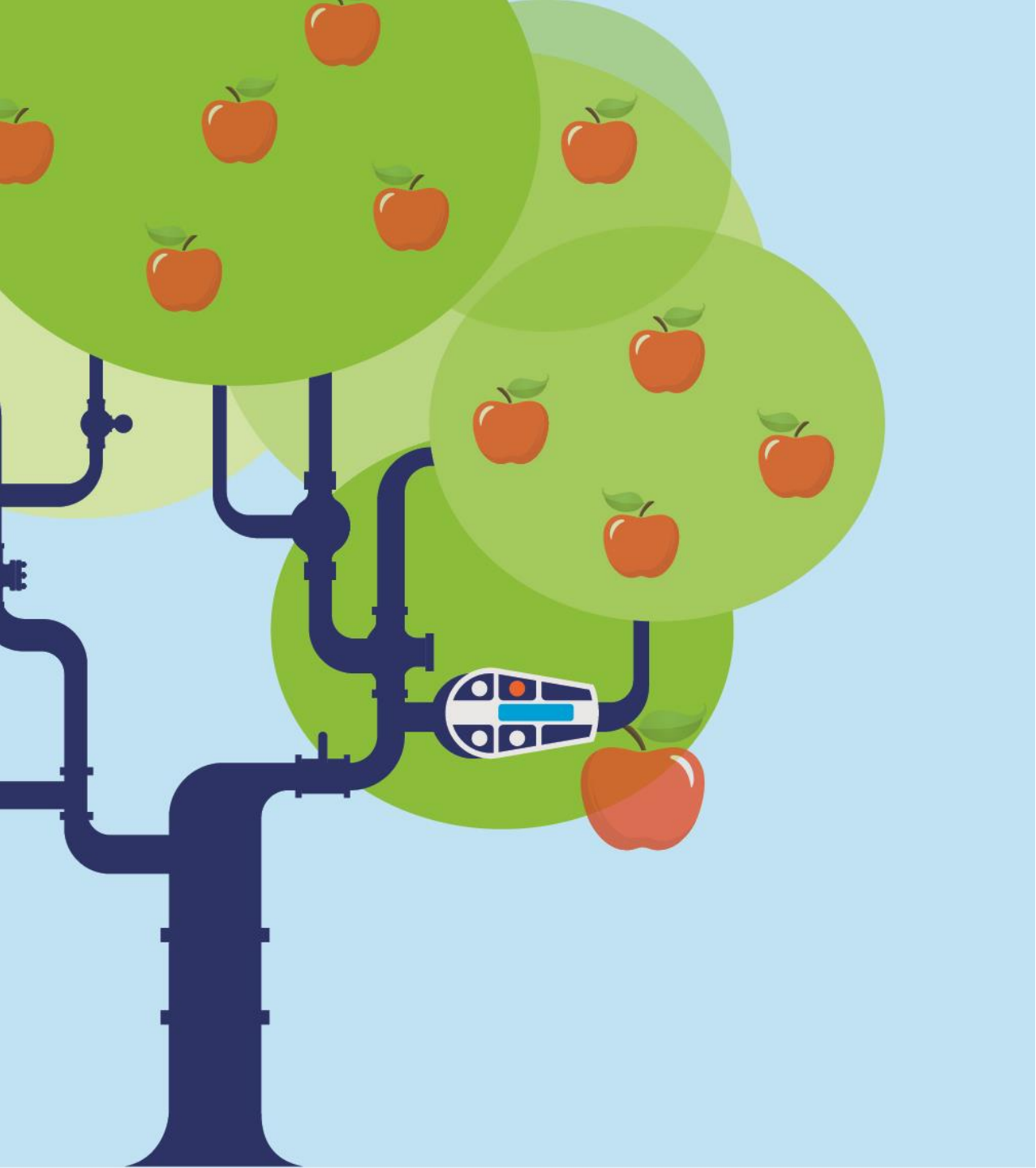
The webinar will start soon

Compressed air leaks: Your low hanging fruit

VPInstruments and UE Systems



Compressed air leaks: Your low hanging fruit

VPInstruments and UE Systems

Menno Verbeek

Director of Sales

- Background:
  - Mechanical Engineer
  - Business Engineering
  - 9 years @ VPInstruments

- VPInstruments develops and supplies energy management solutions to worldwide industry for > 20 years

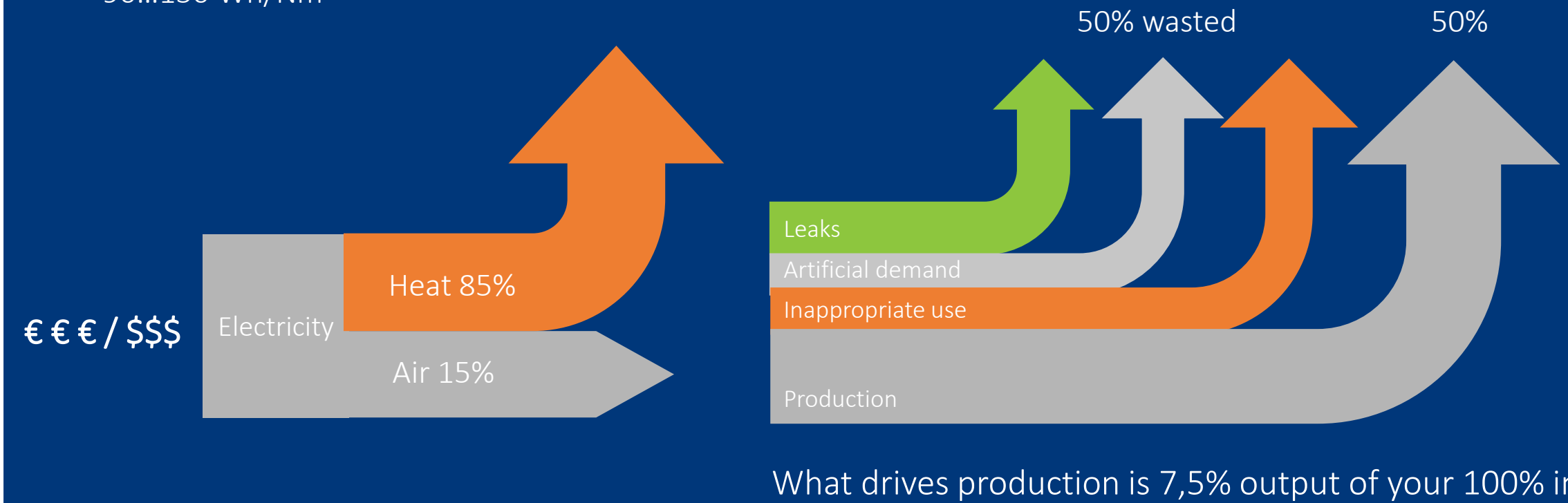
How does this make you feel?

Free air doesn’t exist

- The 3rd or 4th utility within most production companies
- 8 to 10 times the cost of Electricity
- 10 - 30 % of an industrial electricity bill is spent on compressed air
- Misunderstood by many users and engineers
- Holds a high potential for Energy Savings
- Vital to production machinery and processes

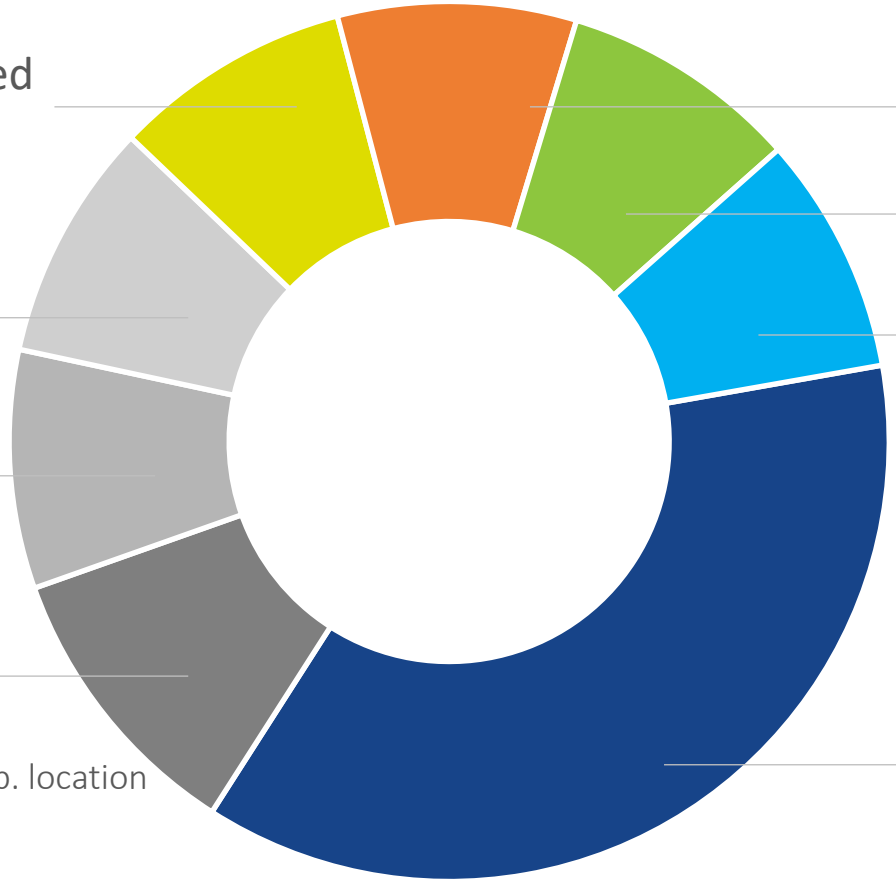
Costs of compressed air

- 8 to 10 x more than electricity!
- 0,015…0,06 Euro per m^3 produce
- 90…150 Wh/Nm^3



What drives production is 7,5% output of your 100% input!!

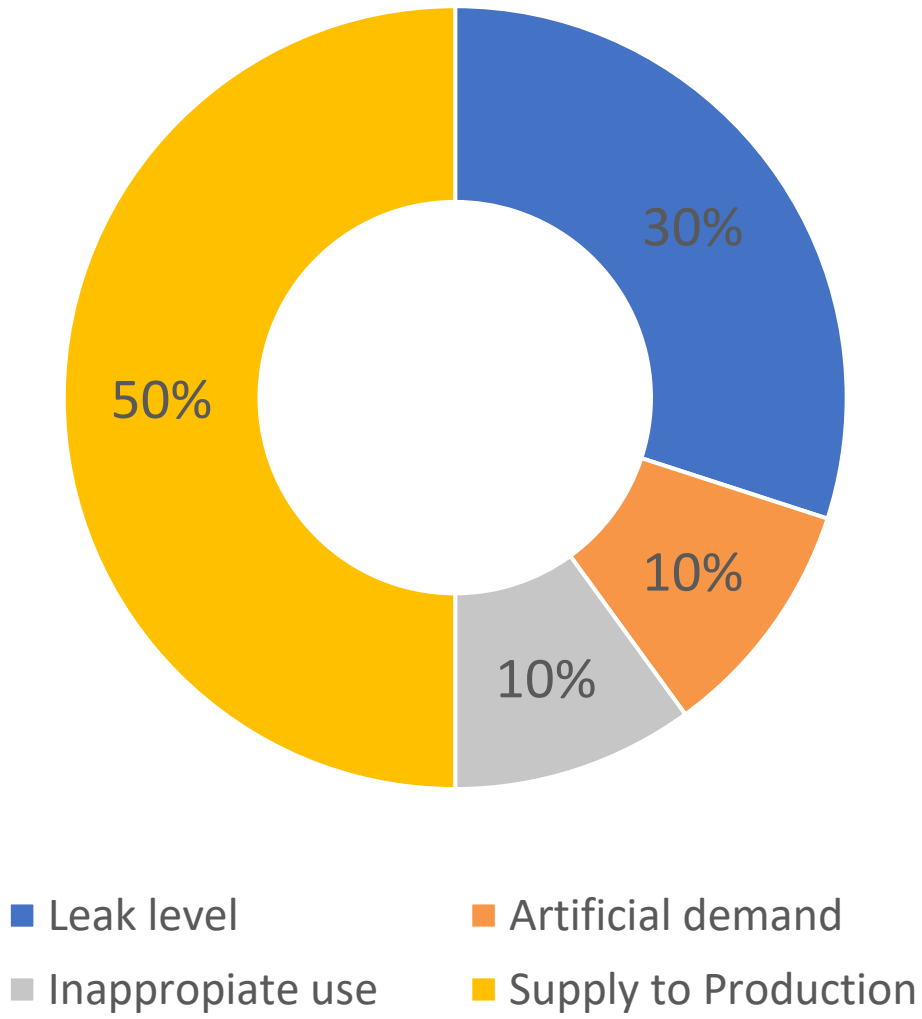
Typical areas of optimization



- Adjustable speed drives
- Recovering waste heat
- Optimize control
- Overall system design
  Piping/storage/comp. location
- Reduce the pressure
- Optimize buffer size
- Eliminate pressure loss
- Reduce air leaks/artificial demand/inappropriate use

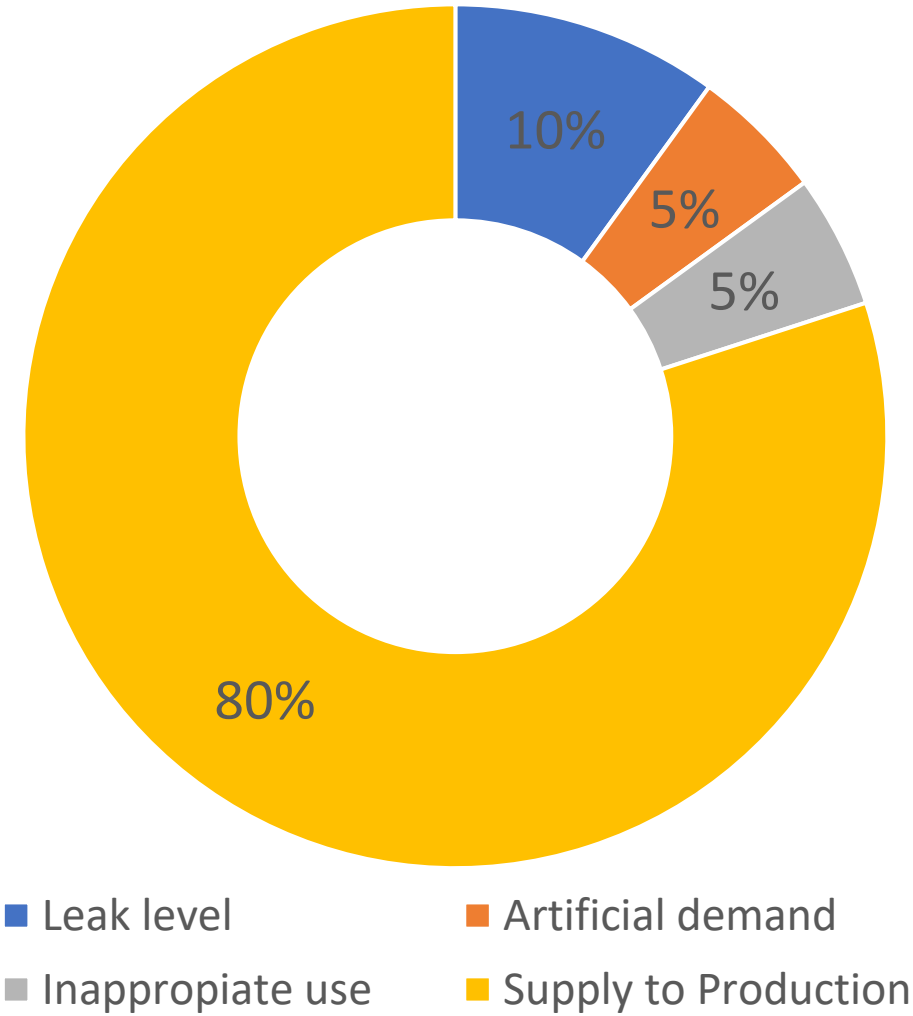
Typical Energy waste in compressed air systems

So far, we've seen only 7.5% of our energy bill supporting production equipment



Increase of effective energy usage

Today we focus on how to get here!
Increase effective use?



Leaks..
They’re
impossible
to see

Methods to locate leaks

The main goal is to not produce what you don’t use and save money!

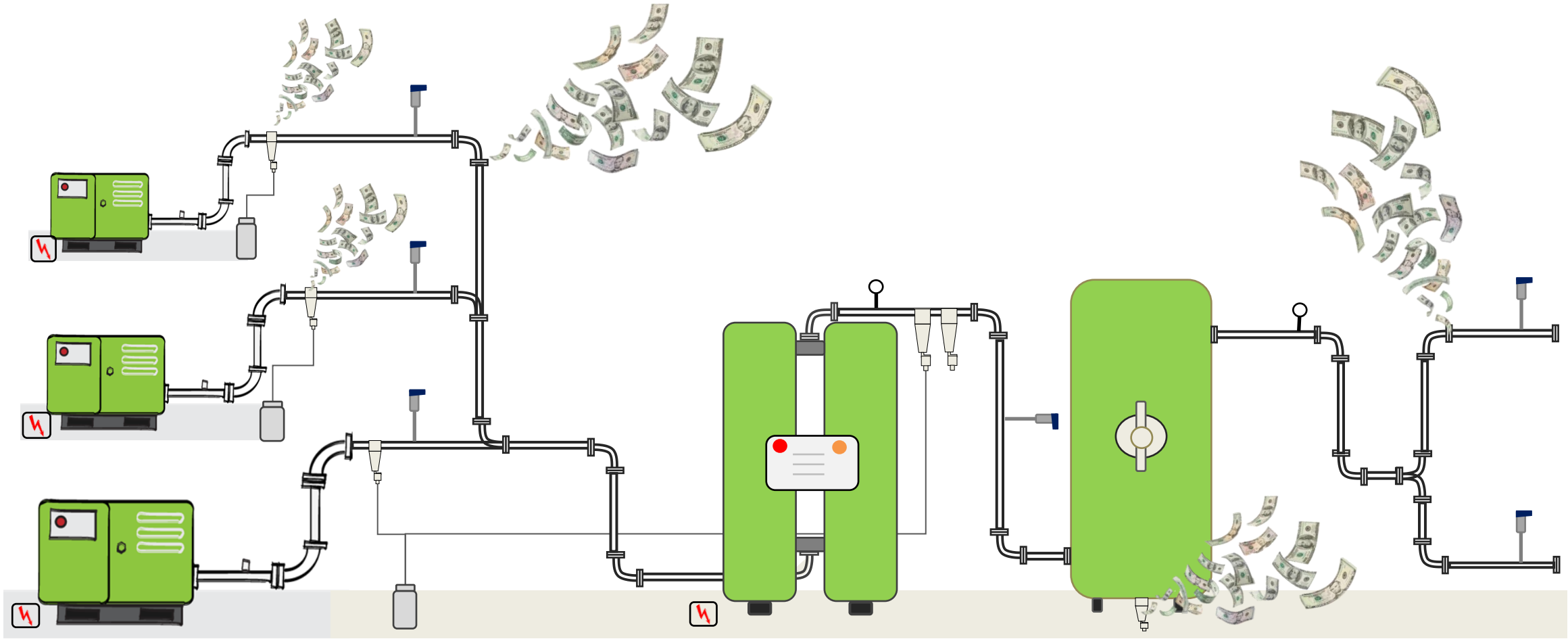
Find, Tag, Fix and Report on leaks. These are not small losses.

- Ultrasound
- Water and soap bubble test
- Estimating by calculating
- Analysing measured and trended data with flow meters

Common problem area’s

- Couplings, hoses, tubes, and fittings
- Disconnects
- Filters, regulators and lubricators (FRLs)
- Open condensate traps
- Pipe joints
- Control and shut-off valves
- Point of use devices
- Flanges
- Cylinder rod packing
- Thread sealants

https://www.airbestpractices.com/system-assessments/leaks/finding-and-fixing-leaks



What does a leak cost

- Operating hours: 8760
- System pressure: 100 PSI / 6,89 bar
- kW Costs: USD 0,10 / EUR 0,08

Hole size		flow in scfm	flow in m3/min	Costs per year	
1/16 ”	1.58 mm	6,49	0,17	$ 1.050,00	€ 846,77
1/8 ”	3.17 mm	26	0,74	$ 4.190,00	€ 3.379,03
1/4 ”	6.35 mm	104	2,94	$ 16.760,00	€ 13.516,13

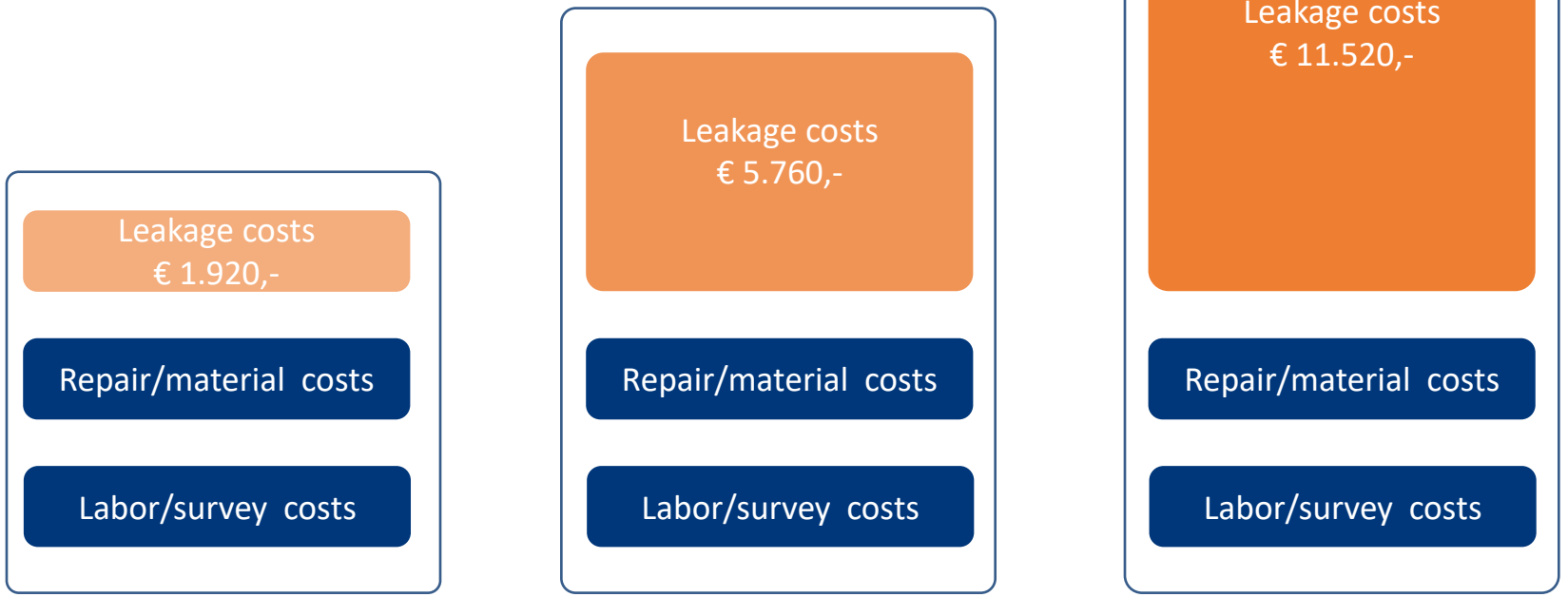
Cost of leakage before repair

Av. Plant consumption: 50 m3/min

Leak rate: 20%

Cost / m3: 0,02 Euro

Prod. Hrs /week: **5 days, 8 hours = 40 hrs /wk**



1 month repair time

3 months repair time

6 months repair time

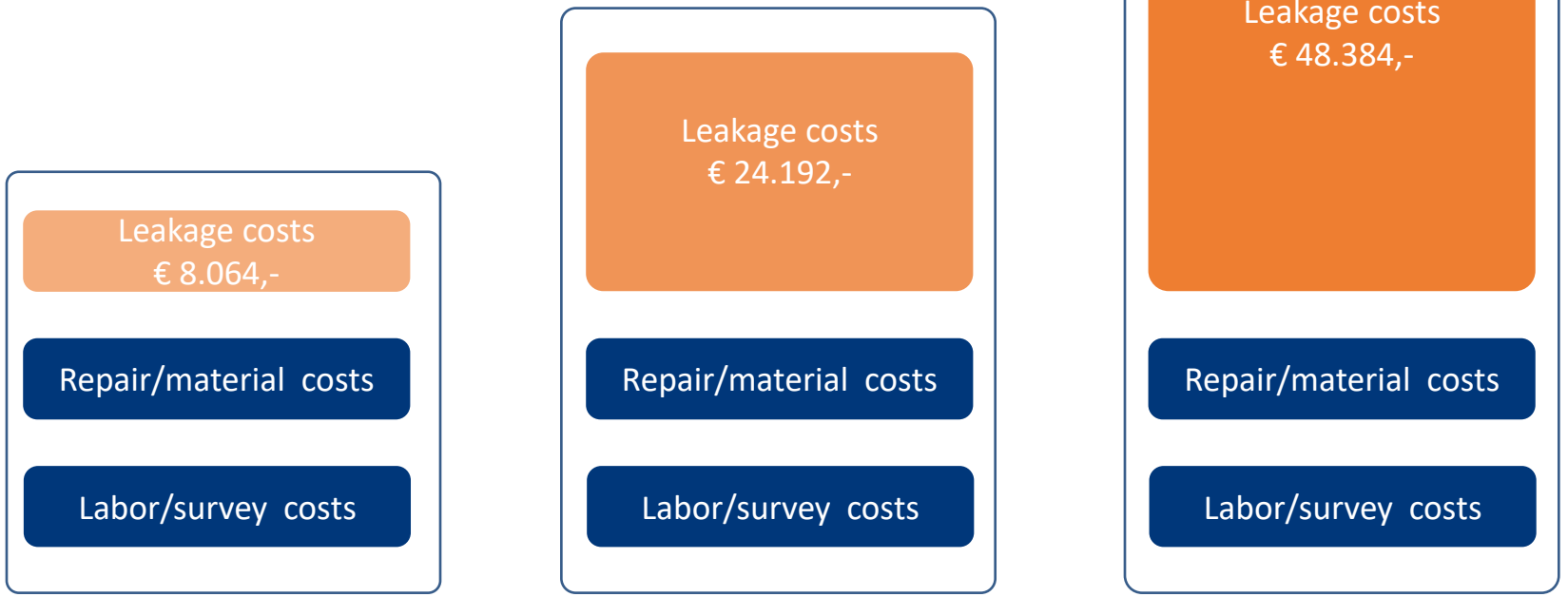
Cost of leakage before repair

Av. Plant consumption: 50 m3/min

Leak rate: 20%

Cost / m3: 0,02 Euro

Prod. Hrs /week: **7 days, 24 hours = 168 hrs /wk**



1 month repair time

3 months repair time

6 months repair time


PROFIT
LOSS

Leaks, they negatively impact profit

- Lost of efficiency
- Additional expense
- Downtime
- Product quality
- Environmental impacts

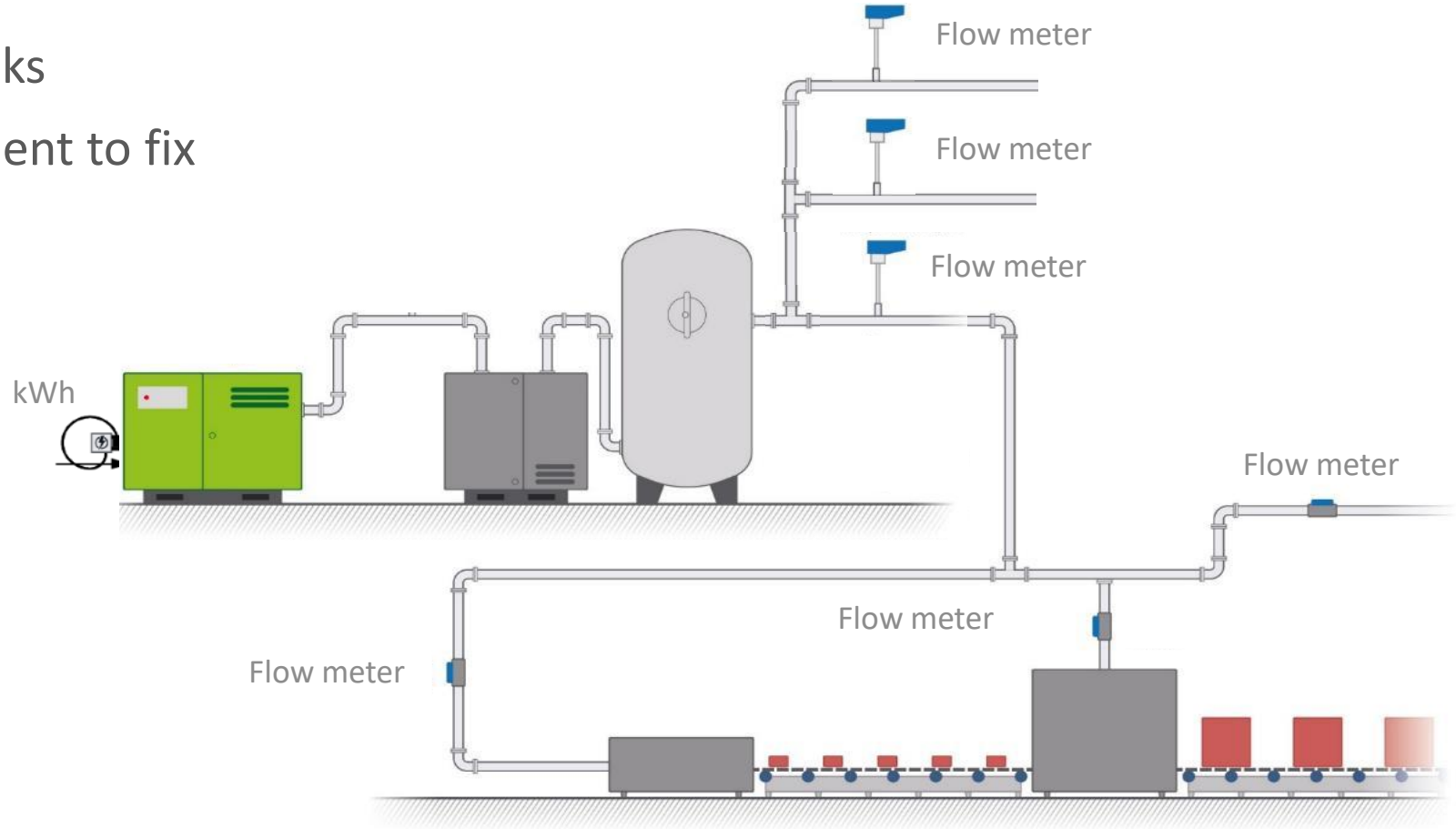
Ways to do leak test of your system

VP INSTRUMENTS

Monitored Compressor operation	Bleed down test	Use recorded data / leak mngt.
• Medium investment, time • Just downtime consumption • No investments required • Does not take inefficiency of compressor into account • No idea where (biggest) leak are • What if can't stop in a 24/7 factory?	• Medium investment, time • Just downtime consumption • No investments required • Does not take inefficiency of compressor into account • No idea where (biggest) leak are • What if can't stop in a 24/7 factory?	• Fast • Repeatable monthly operation • Quantifiable • Up and downtime consumption & for 24/7 ops. • Allocation of larger leaks • Immediate result when fixed • Requires flow meter and monitoring

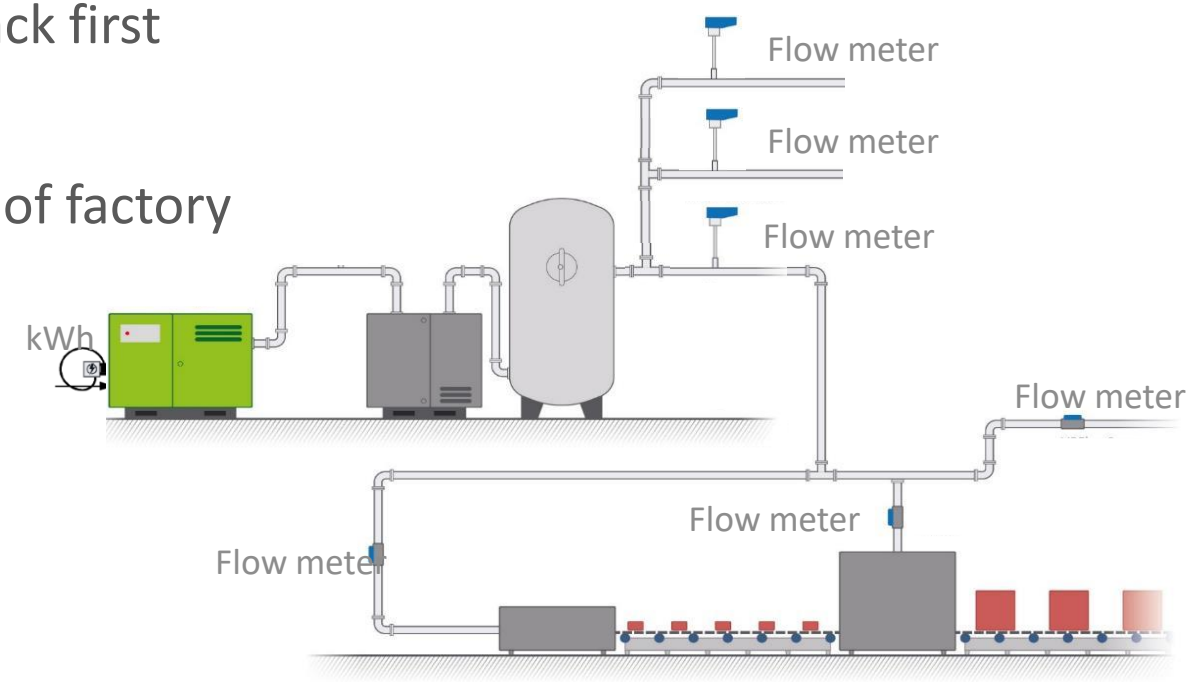
Leak allocation - Easy

- Measured flow in main header when prod. machines are off
- Recorded flow is leak load
- Determine the cost for leaks
- Determine plan & investment to fix



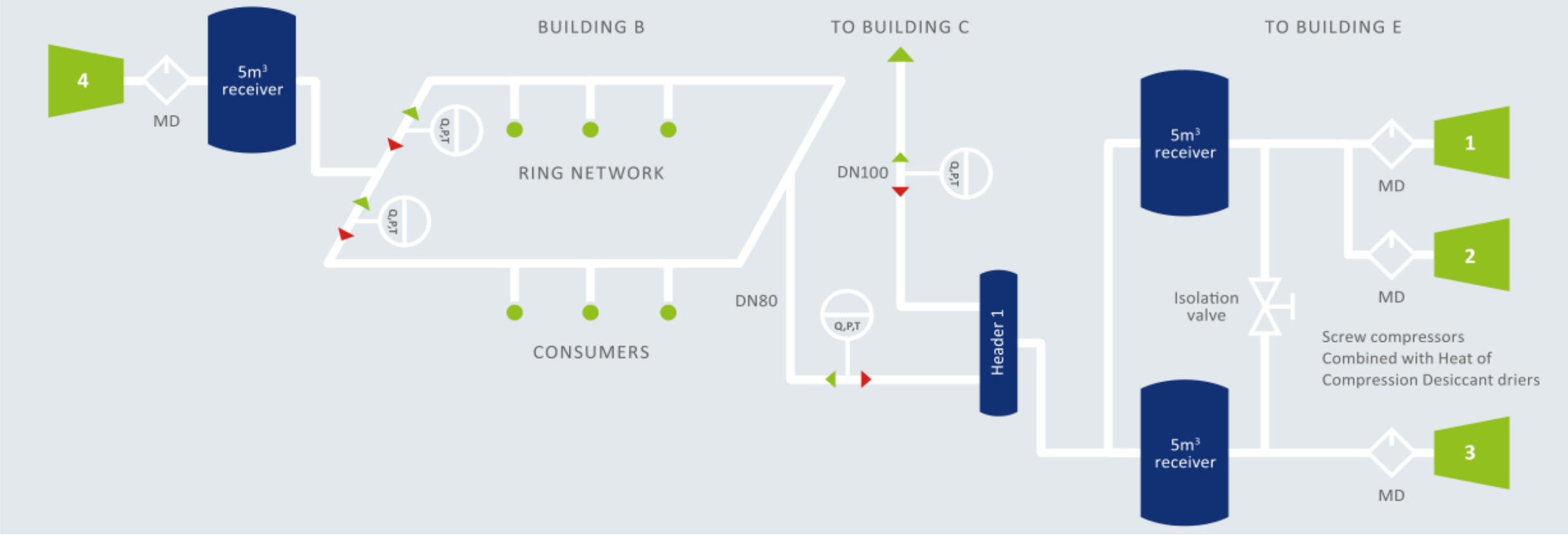
Leak allocation - Advanced

- Measured plant base load in main header and sub lines.
- Recorded flow is base load + leak load (+ inappropriate use + artificial demand)
- Set base line at date X and periodically check for changes in base load level
- Measure flow during shift changes / batch changes
- Do leak surveys in areas with highest payback first
- After mitigation, report the savings
- Compare data with other machines / areas of factory



Please consider…

- Bi-Directional flow
- The higher the pressure the more leaks will leak..

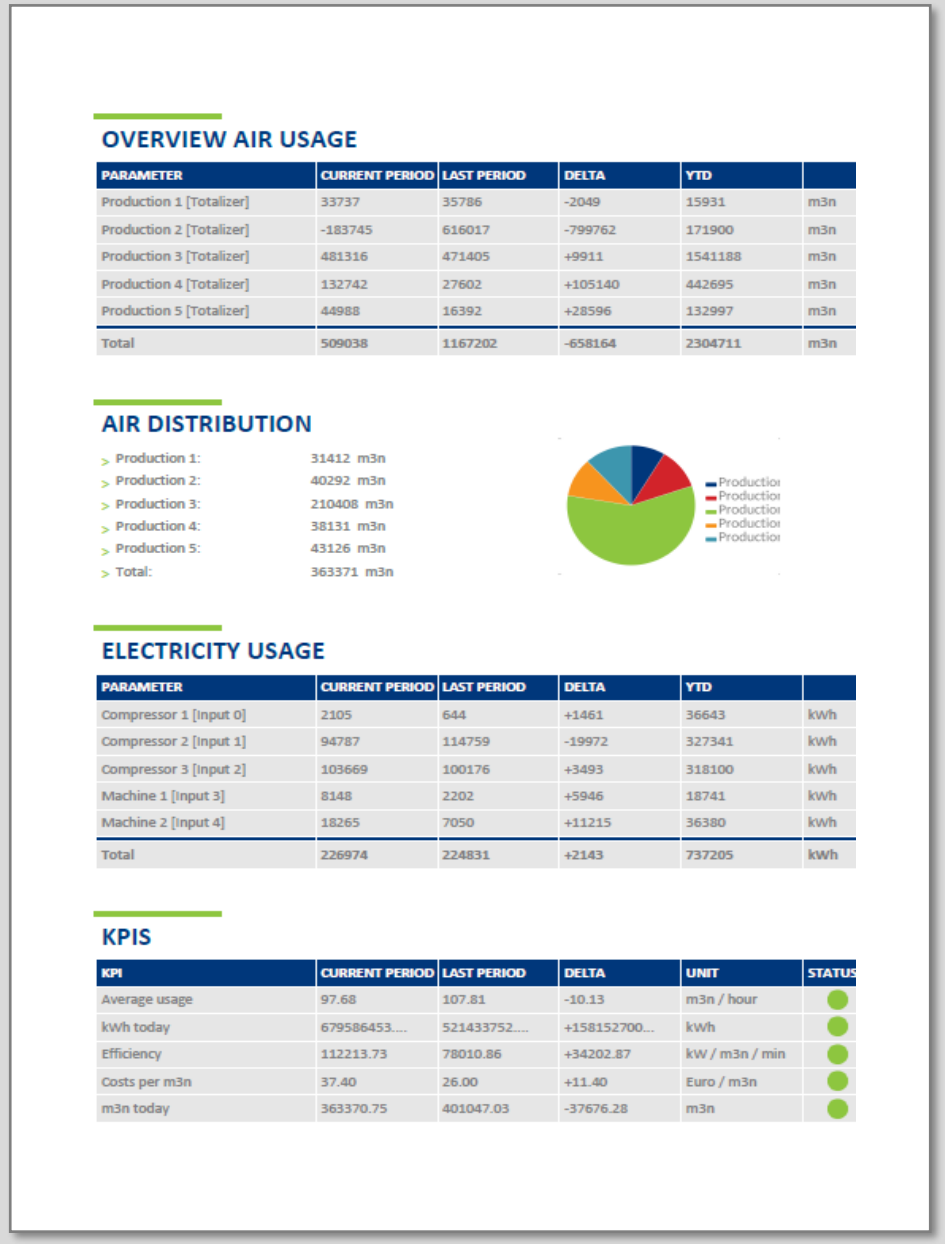


Energy Management Report

By using flow meters and monitoring you can report consumption and record base load changes.

Additional monitoring benefits:

- Predictive maintenance (condition monitoring, leakage management, base load control)
- Make founded decisions for investments based on consumption data & costs
- Monitoring efficiency of compressors and production equipment
- Know your baselines and leak loads
- ISO 50001 compliance



OVERVIEW AIR USAGE

PARAMETER	CURRENT PERIOD	LAST PERIOD	DELTA	YTD	
Production 1 [Totalizer]	33737	35786	-2049	15931	m3n
Production 2 [Totalizer]	-183745	616017	-799762	171900	m3n
Production 3 [Totalizer]	481316	471405	+9911	1541188	m3n
Production 4 [Totalizer]	132742	27602	+105140	442695	m3n
Production 5 [Totalizer]	44988	16392	+28596	132997	m3n
Total	509038	1167202	-658164	2304711	m3n

AIR DISTRIBUTION

- Production 1: 31412 m3n
- Production 2: 40292 m3n
- Production 3: 210408 m3n
- Production 4: 38131 m3n
- Production 5: 43126 m3n
- Total: 363371 m3n

ELECTRICITY USAGE

PARAMETER	CURRENT PERIOD	LAST PERIOD	DELTA	YTD	
Compressor 1 [Input 0]	2105	644	+1461	36643	kWh
Compressor 2 [Input 1]	94787	114759	-19972	327341	kWh
Compressor 3 [Input 2]	103669	100176	+3493	318100	kWh
Machine 1 [Input 3]	8148	2202	+5946	18741	kWh
Machine 2 [Input 4]	18265	7050	+11215	36380	kWh
Total	226974	224831	+2143	737205	kWh

KPIS

KPI	CURRENT PERIOD	LAST PERIOD	DELTA	UNIT	STATUS
Average usage	97.68	107.81	-10.13	m3n / hour	
kWh today	679586453....	521433752....	+158152700...	kWh	
Efficiency	112213.73	78010.86	+34202.87	kW / m3n / min	
Costs per m3n	37.40	26.00	+11.40	Euro / m3n	
m3n today	363370.75	401047.03	-37676.28	m3n	

Best practices for reducing air leaks

- Log, track and verify over time
- Using common or new detection methods
- Take a systems approach
- Leak detection Audit, do it frequently, but let sensors guide you
- Confirm root causes of pressure drops

Compressed Air leaks
Your low Hanging Fruit

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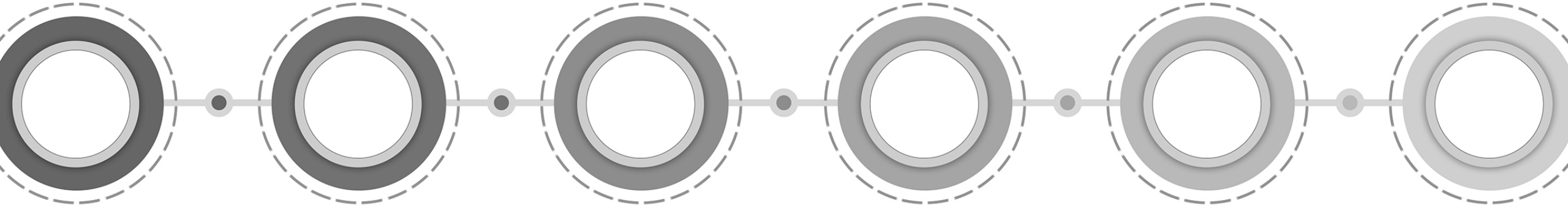
ue SYSTEMS INC
The ultrasound approach



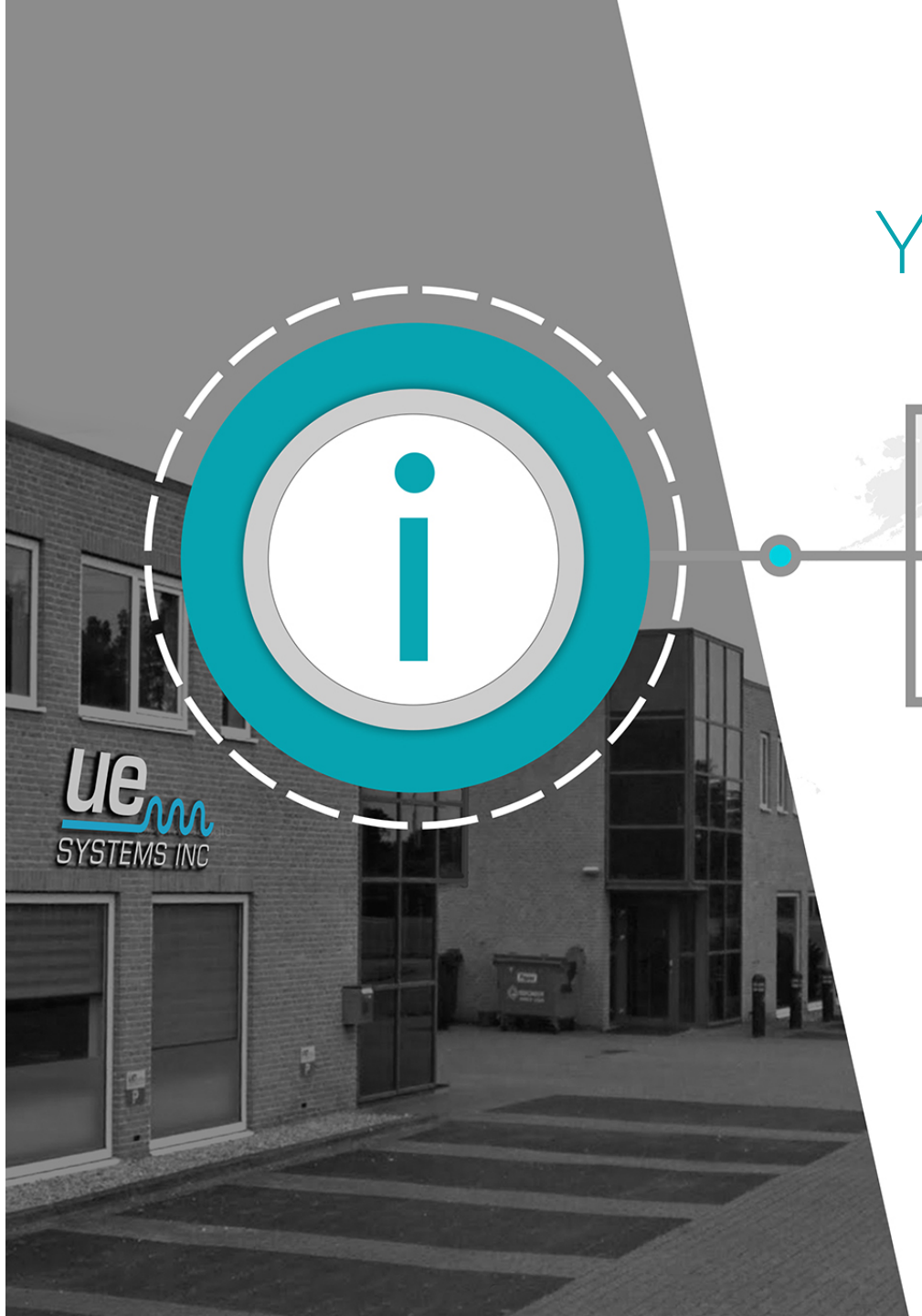
OVERVIEW

UE SYSTEMS — Who are we?

WHY LEAK DETECTION — Why should we use it in the industry

DETECT FAST AND EASY — Finding leaks?

TAG AND REPORTING — Tag and using the leak app?



Your Presenter

Peter Boon

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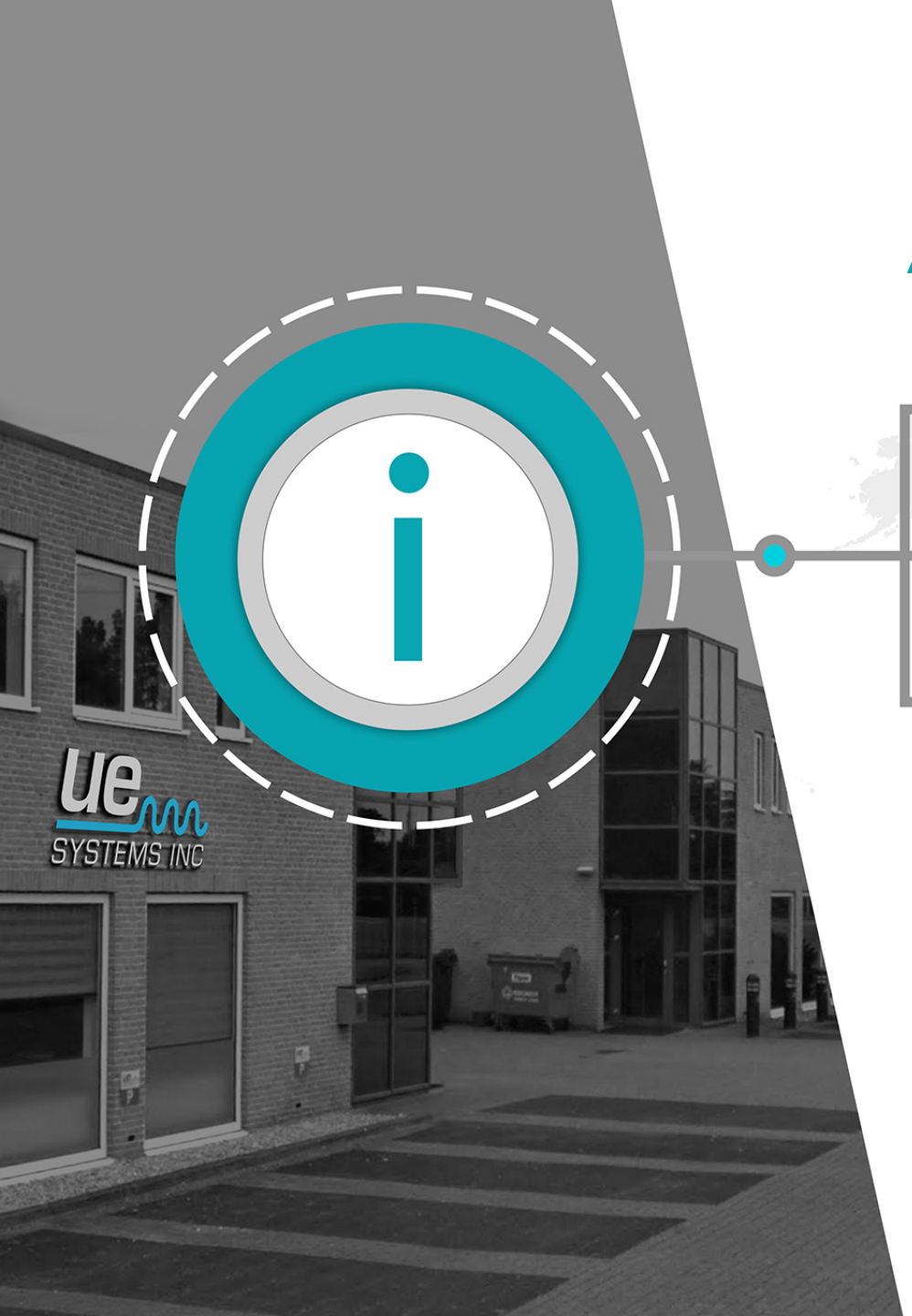
Background Presenter

- Mechanical Engineering
- 6+ years of experience as Senior NDT Specialist
- ICM QUALIFIED Trainer
- Trainer Europe
- Training Manager Europe
- Regional manager Benelux



ABOUT **UE SYSTEMS**

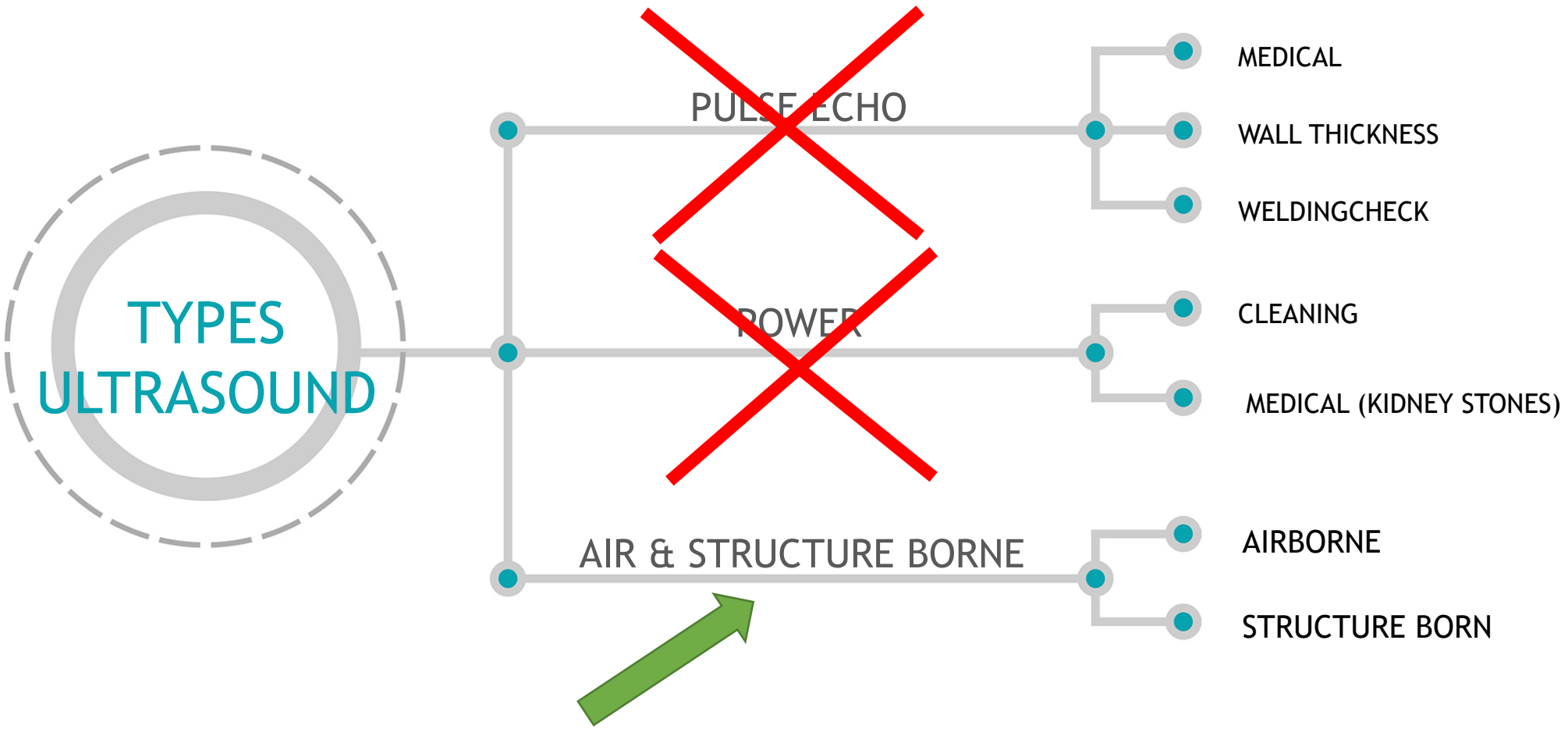
- Founded in 1973, ELMSFORD NEW YORK, USA
- 47+ year experience with ultrasound technology
- Ongoing support from national and international Offices

- Offices in North/South America, Asia, Europe, India & Middle East
- Within Europe – Netherlands, Germany, France, Poland, Italy, Spain, UK.
- Logistics and repair/calibration workshop - Netherlands

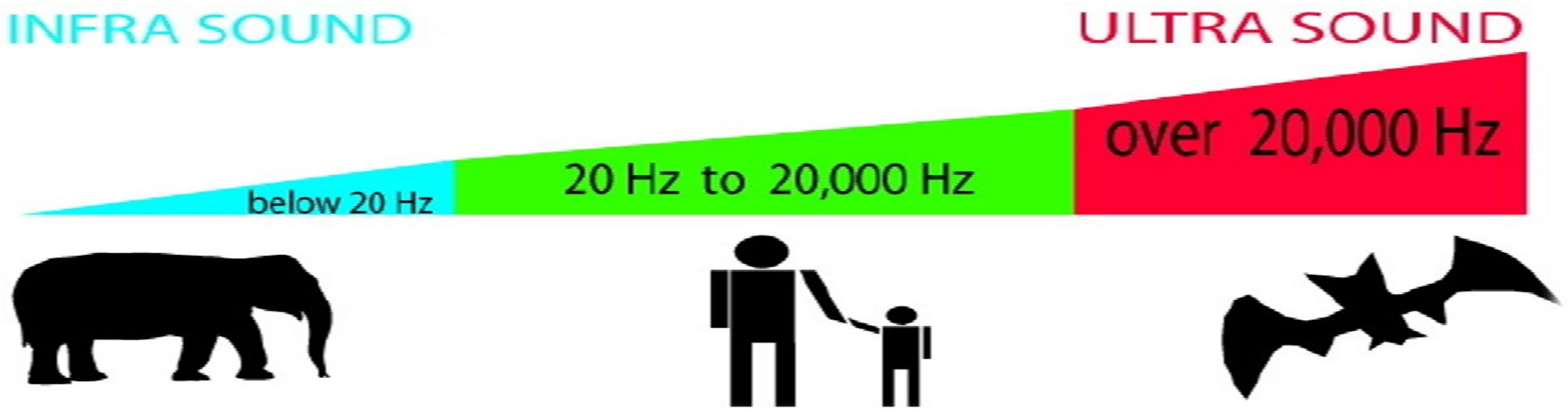
ULTRASOUND TECHNOLOGY

HOW DOES IT WORK?

TYPES OF ULTRASOUND?



What Can Humans Hear?



Sound Is Categorized Into Three Frequency Ranges

1. InfraSonic Range – Below the Human Hearing Capability - Ultra Low Frequency Sound
2. Sonic Range – This is the Hearing Range of Humans – Low Frequency Sound
3. UltraSonic Range – Above the Human Hearing Capability – High Frequency Sound

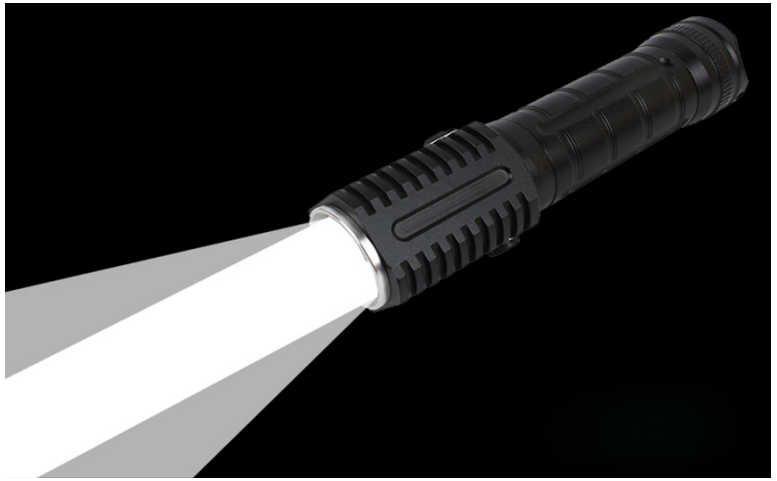
High/Low Frequency Characteristics?

Low Frequency Sound Waves:

- Strong, Powerful Sound Waves
- Can Penetrate Solid Objects
- Multi-directional
- Multiple Mode Conversions

High Frequency Sound Waves:

- Short, Weak Sound Waves
- Can Not Penetrate Solid Objects
- Directional and Locatable
- Single Mode Conversion



ENERGY SAVINGS
LEAK DETECTION

What is the Problem?

- Use of Energy is very high
  - Misuse of air
  - Misapplications
  - Leaks cost money

  - What do we do to solve this?
  - We don’t
  - Walkthrough in the weekend during a stop?

LEAK DETECTION

Leak Detection is at the foundation of the Ultrasonic Technology

Referred to as the “low hanging fruit” of waste identification within facilities today.

LEAK DETECTION FACTS

Leak inspections

- 10-30% of energy loss is related to leaks in the compressed air system!
- Repairing leaks will reduce costs immediately!
- Potential to reduce line pressure
- Can be used in audible noisy environments.
- Report/ quantify

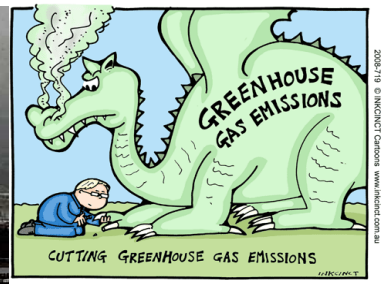
WHY LEAK DETECTION

Why leak Detection?

ECONOMICS:
Leaks cost money

ENVIRONMENT:
CO2 reduction & Special Gasses

SAFETY:
Flammable gasses, explosion



WHY LEAK DETECTION

Air 0,01 Euro per 1m3
Hydrogen 0,4 Euro per 1m3
Helium 3,5 Euro per 1m3
Argon 0,71 Euro per 1m3
Nitrogen 0,04 Euro per 1m3

LEAK DETECTION METHOD

Selection of Leak Detection Method Depends on Key Factors:

- What Type of Leak It Is – Air? Hazardous Material?
- What Size of Leak is Detectable With Ultrasound?
- Accessibility to Leak – Module Selection? Additional Tools?
- Economic Impact or Practicality – Criticality.

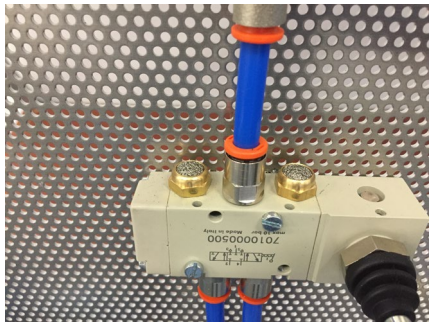
HOW DO WE DETECT A LEAK?

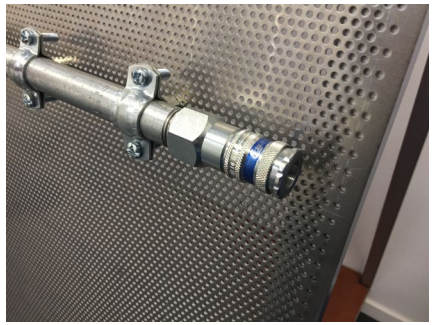
What factors affect detectability?

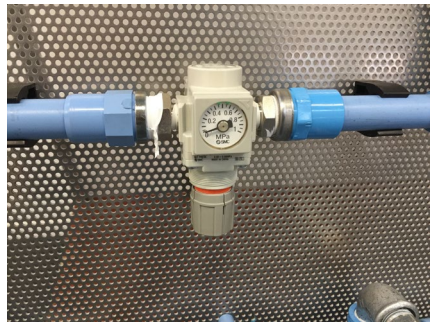
- Pressure differential
- Turbulence
- Shape and size of the orifice
- Viscosity of medium
- Accessibility to leak

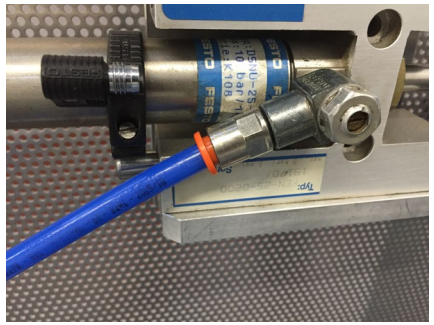
WHAT MINIMUM CAN WE DETECT?

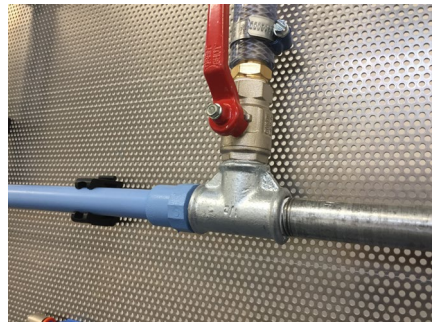
Threshold: 1x 10-2std cc/sec - (1cc/100sec)





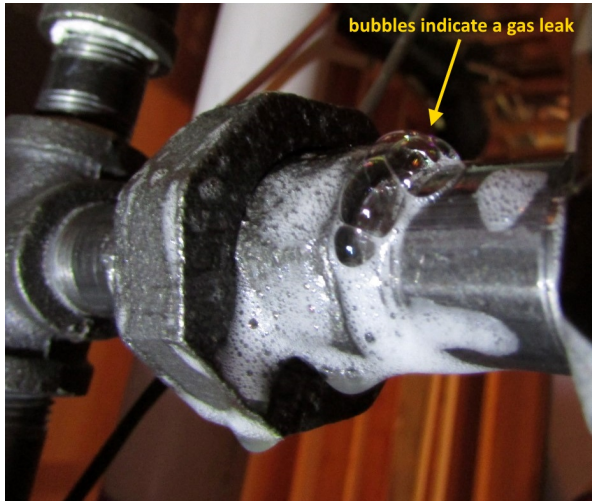




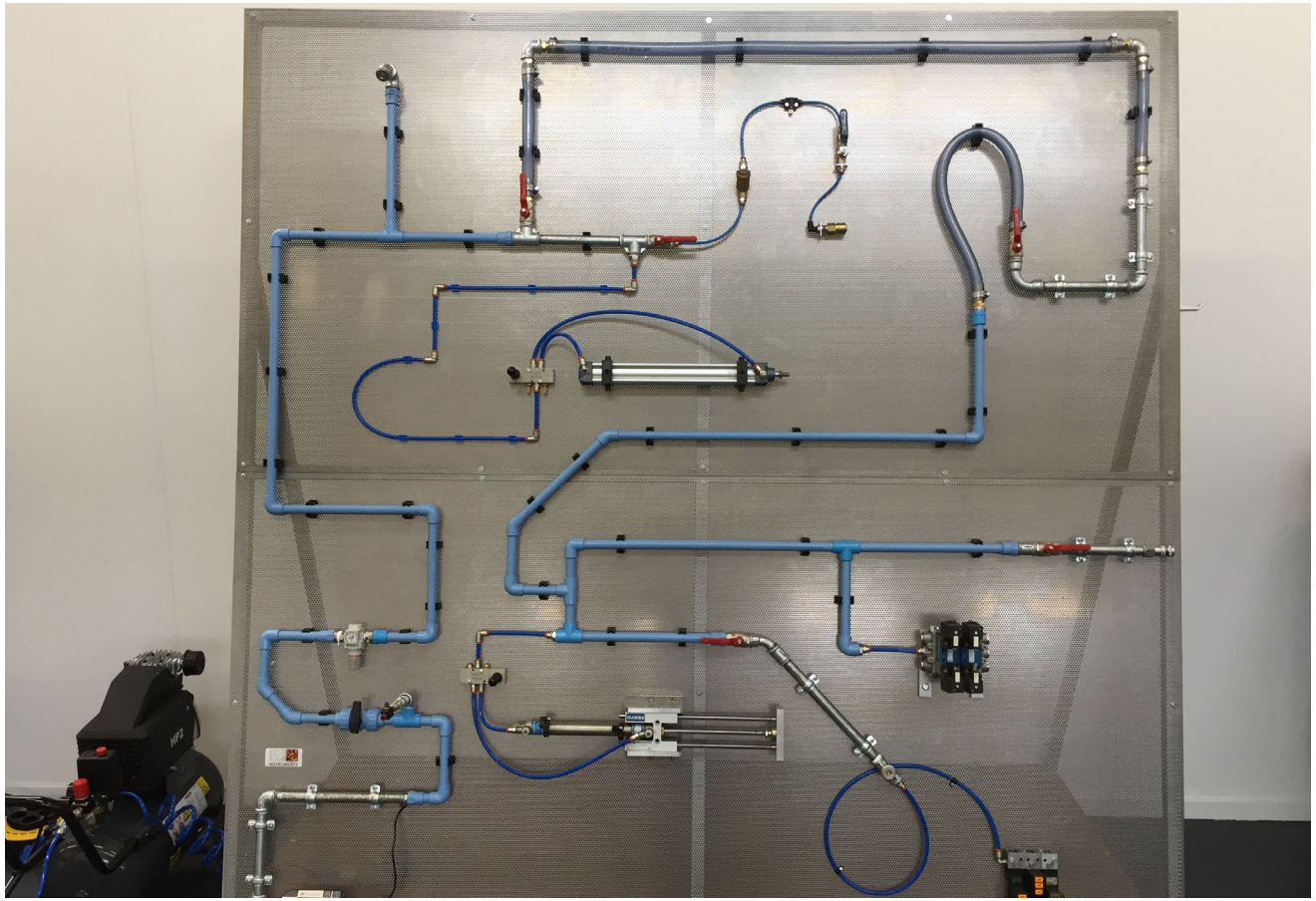


OTHER LEAK DETECTION TECHNIQUES

- **Sniffers**
- **Bubble solution**
- **Gas Camera**



WE HEAR A LEAK!



Is there a Method?

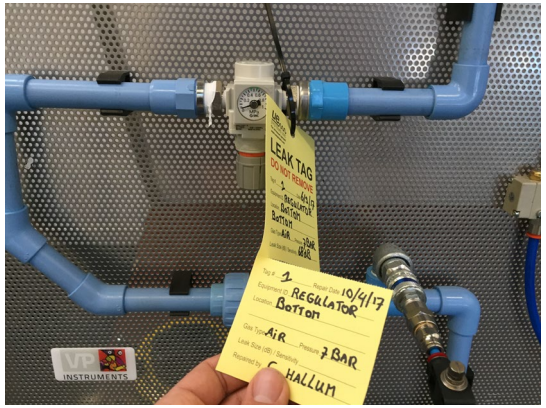
Gross to fine

FAST AND EASY

- Start with a maximum.
- Reduce sensitivity.
- Move closer to the source.
- Use rubber focus probe.
- Listen for the loudest signal.
- Pinpoint and isolate.

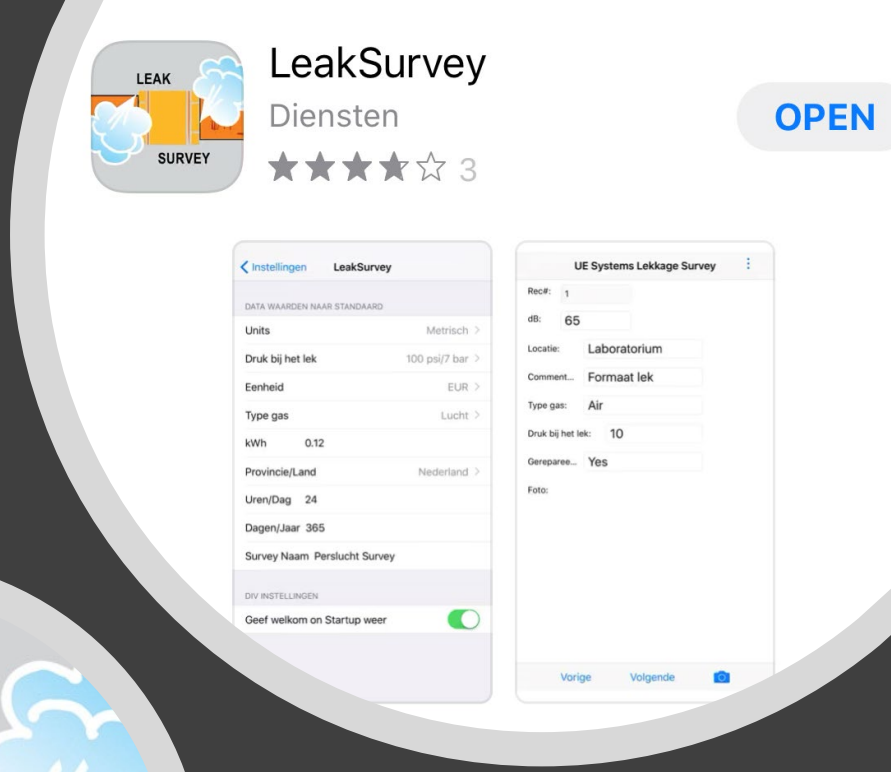
REPORT AND FOLLOW UP!

- Tag the leak
- Create a report
  - Digital photo from the location.



LEAK DETECTION APP

- Quick reporting from the “field”
- Offline use
- Available for IOS and Android
- No pre-installed software needed
- Pictures and data in one report



LEAK DETECTION REPORTING

This is for the year 2021

Cost Calculations		
Location =		
Electricity Cost =	€ 0,12	Per kWh
Air Cost =	€ 0,01	Per 1000 L
Argon Cost =	€ 2,46	Per 1000 L
Helium Cost =	€ 2,46	Per 1000 L
Hydrogen Cost =	€ 2,46	Per 1000 L
Other Cost =	€ 2,46	Per 1000 L

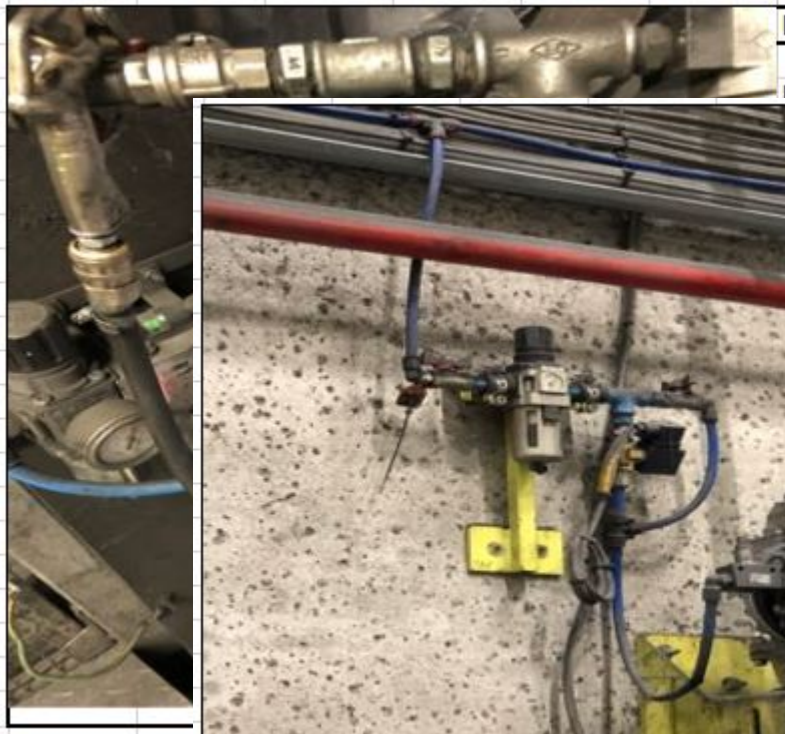
Operational Times	
Hours Per Day	24
Days Per Year	365

March 2012

	Air Leaks Repaired		Argon Leaks Repaired		Helium Leaks Repaired		Hydrogen Leaks Repaired		Other Leaks Repaired		Cost Avoidance			CO_2	NO	SO_2
	LPM	Cost	LPM	Cost	LPM	Cost	LPM	Cost	LPM	Cost	Identified	Repaired	% Complete	Identified	Identified	Identified
	0,0	€ 0,00	0,0	€ 0,00	0,0	€ 0,00	0,0	€ 0,00	0,0	€ 0,00	€ 3.482,80	€ 0,00	0%	19505857	16826	7833951

Record Number	Group Name	Location Name	Type of Gas	Pressure at Leak	dB Reading	Problem Description	Repaired (Y/N)	Work Order Schedule #	Identified Leaks Cost Avoidance	Size of Leak (LPM)	Energy Avoidance (kWh)	CO2 Avoidance (gr)	NO Avoidance (gr)	SO2 Avoidance (gr)
1		fuji seal	Air	5	75	connection	N		€ 1.094,75	149,4	9123	6131266	5289	2462442
2		Mixer	Air	7	69	Regulator	N		€ 1.092,16	149,0	9101	6116766	5276	2456618
3		Mixer	Air	7	50	reducer bottom	N		€ 695,66	94,9	5797	3896146	3361	1564772
4		Shaker	Air	7	45	Coupling	N		€ 600,23	81,9	5002	3361680	2900	1350119

LEAK DETECTION REPORTING



Leak #:	3	Location:	mixer
		Comments:	connector
Leak Repaired:	N		

Leak #:	4	Location:	shaker
		Comments:	reducer
Leak Repaired:	N		
Gas:	Air		
Cost:	€ 600,23		

FOLLOW UP AND CORRECTION!

Make necessary repairs.

Some repairs can be made while scanning.

Fittings tightened, hoses and quick couplers replaced, etc.

Generate work orders for repairs.

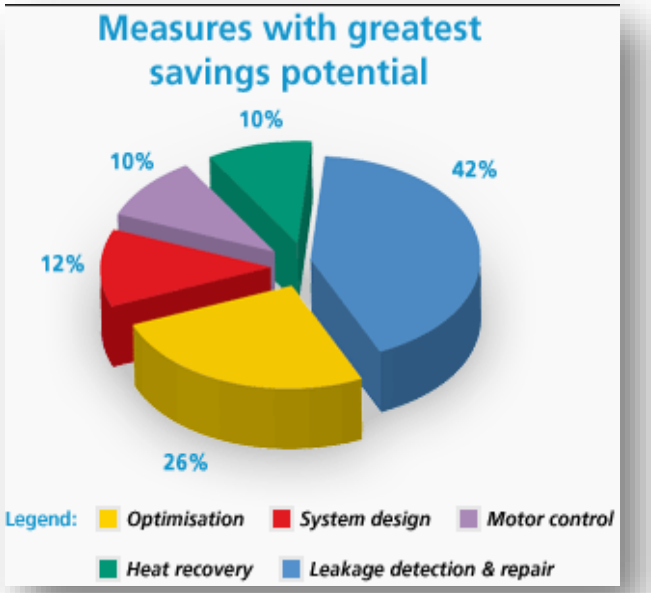
All repairs should be retested to ensure correction.

Conclusion of this webinar

When implementing a Leak Detection Program, it is important to remember compressed air is not free, in fact, compressed air is one of the costliest utilities today.

With the ability to identify waste and energy savings, an inspector has the opportunity to heavily impact an organizations overall savings.

In a recent survey, pressurized material leaks yield the highest value of waste identification within facilities throughout industry.



UE SYSTEMS INC
The ultrasound approach

VP INSTRUMENTS

THANK YOU!

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