

1st October 2020



The new E-series from Ingersoll Rand

Ground breaking premium efficiency oil free compressors from 75 – 160 kW



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O'Neill Industrial



Your presenters today

- Dr David Bruchof - Product Manager Europe Oil Free GDL
- Graham Read - Oil Free Product Manager Industrial Compressors Europe



Introduction – IR At-A-Glance

EXPERIENCE
+ HISTORY

300⁺
YEARS

40⁺
BRANDS

IR IRCO.COM
NYSE TICKER

50⁺
COUNTRIES

MORE THAN
GLOBAL EMPLOYEES
16,000

GLOBAL
CUSTOMERS

100,000

COLLABORATIVE SOLUTIONS

Understanding our customers' businesses and developing solutions that make them successful



SERVICES CARE PACKAGES

Solutions and value to each customer segment



YOUR TRUSTED
PARTNER FOR
COMPRESSION
TECHNOLOGY
AND SERVICES



High-performance products and a total system approach to maximize efficiency

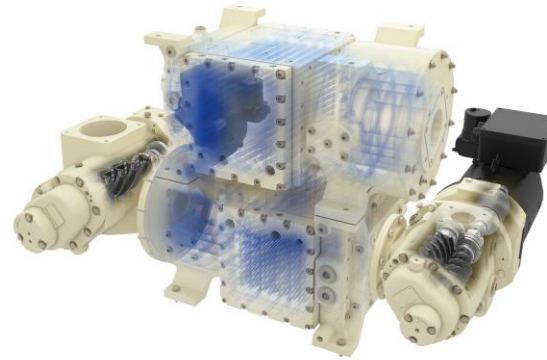
EFFICIENCY &
PERFORMANCE



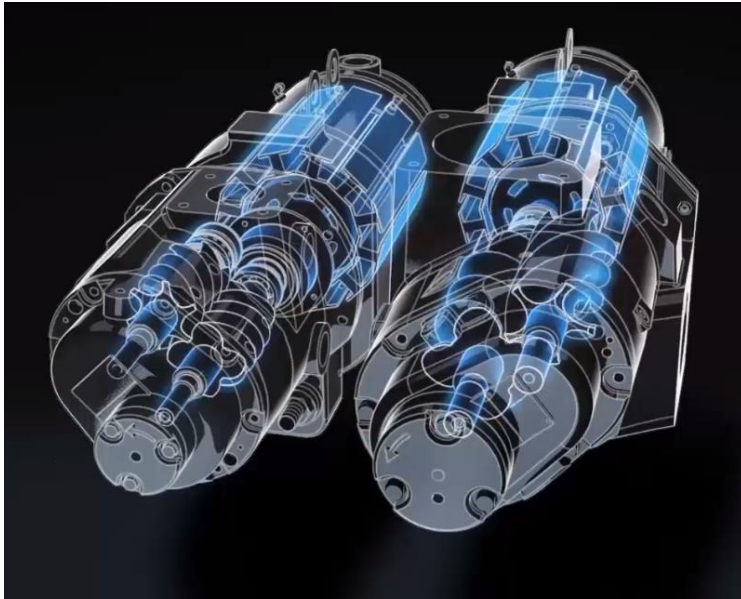
Reliable products backed by dependable support

RELIABILITY
FOR LIFE

1. Innovative drive concept for highest efficiencies



Innovative drive concept for highest efficiencies



Features

- High efficiency permanent magnet motors **better than IE4**
- Individually and directly driven air ends
- Only **dual drive** compressor with **no gear box** required (digital gearbox)
- Grease lubricated

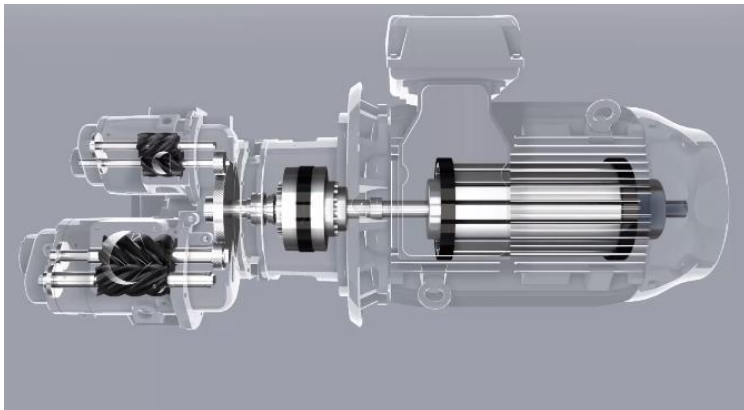
Benefits

- Up to **13% savings on power consumed** versus the nearest competitor
- **No oil** for motors or gear box required



Superior Drive Design

- Traditional oil free compressors are driven by a single motor. Using a gear box this in turn drives both the Low pressure & High pressure air ends, gearboxes require oil & create friction that equates to energy loss.



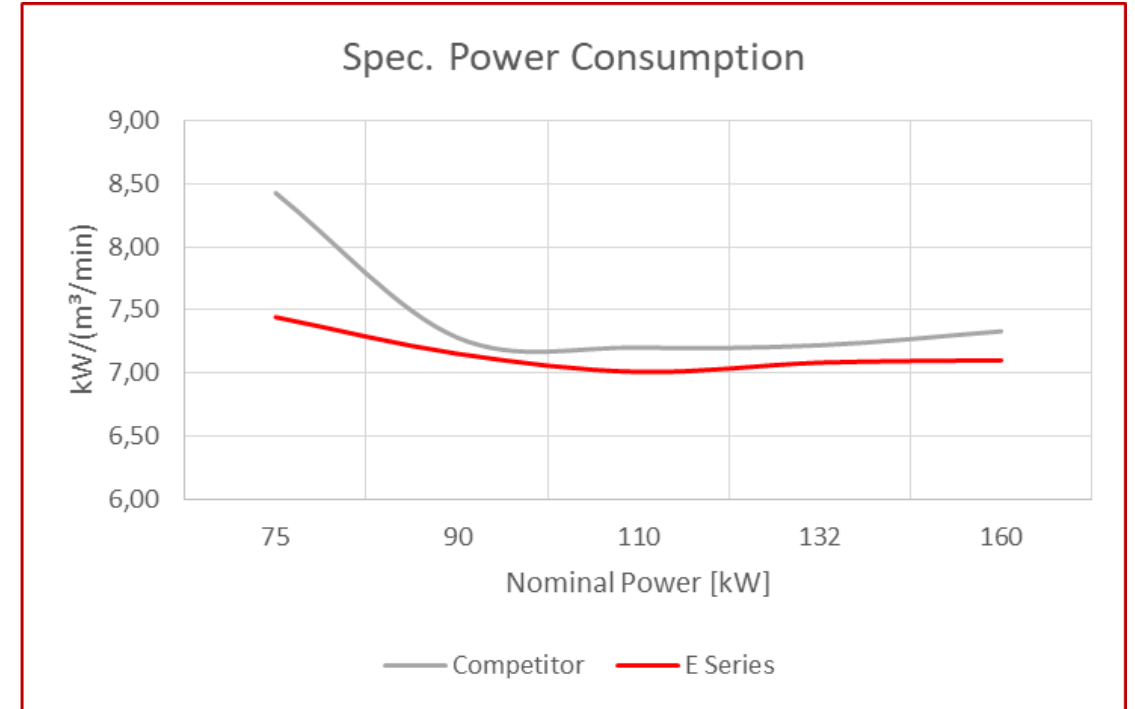
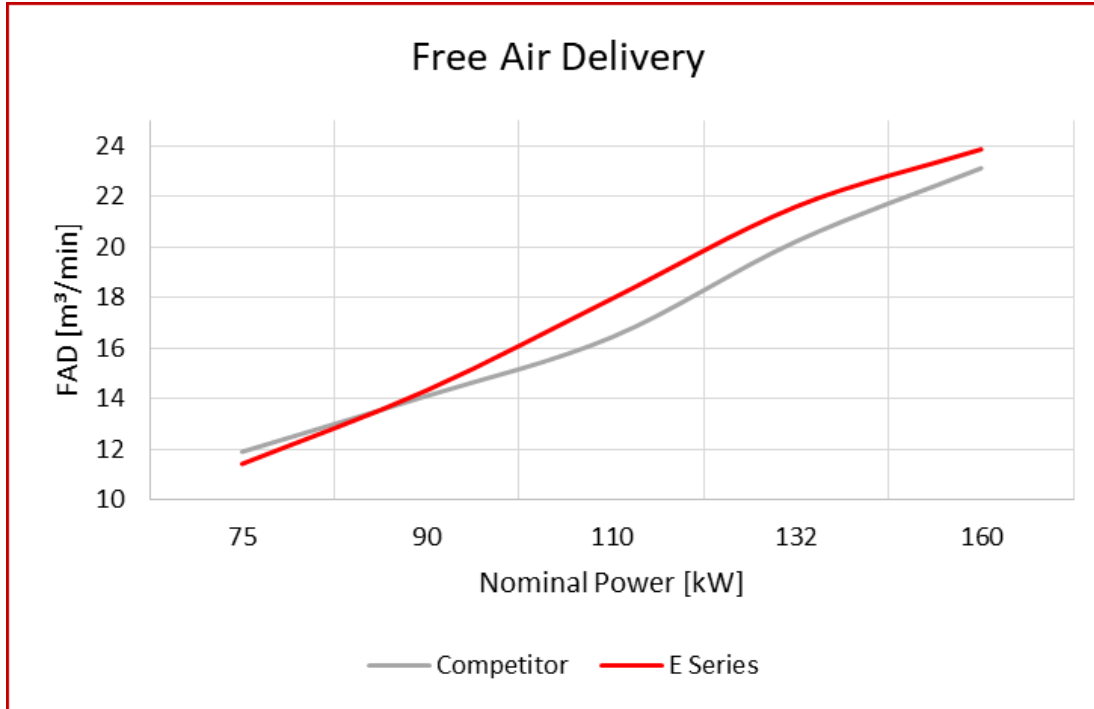
Designed in 1970's

- E Series uses ultra-high efficiency motors which **replace the gearbox**, and the single motor.
- This allows the airends to turn at different speeds, to maximise efficiency at all outputs.



Designed in 2016

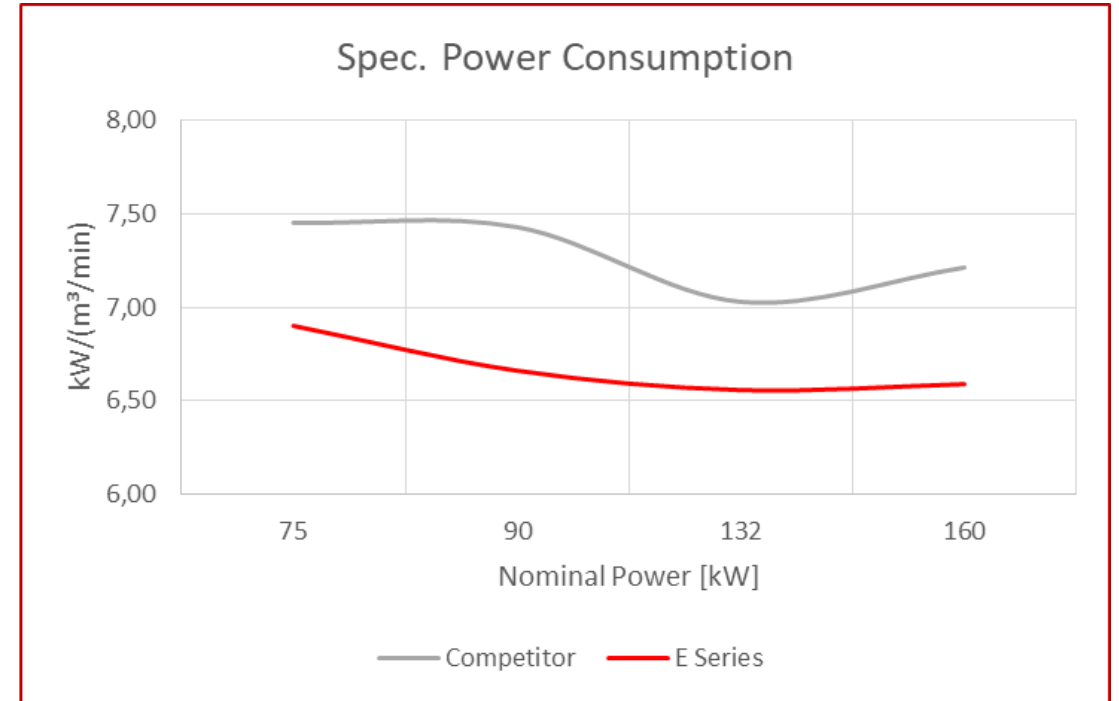
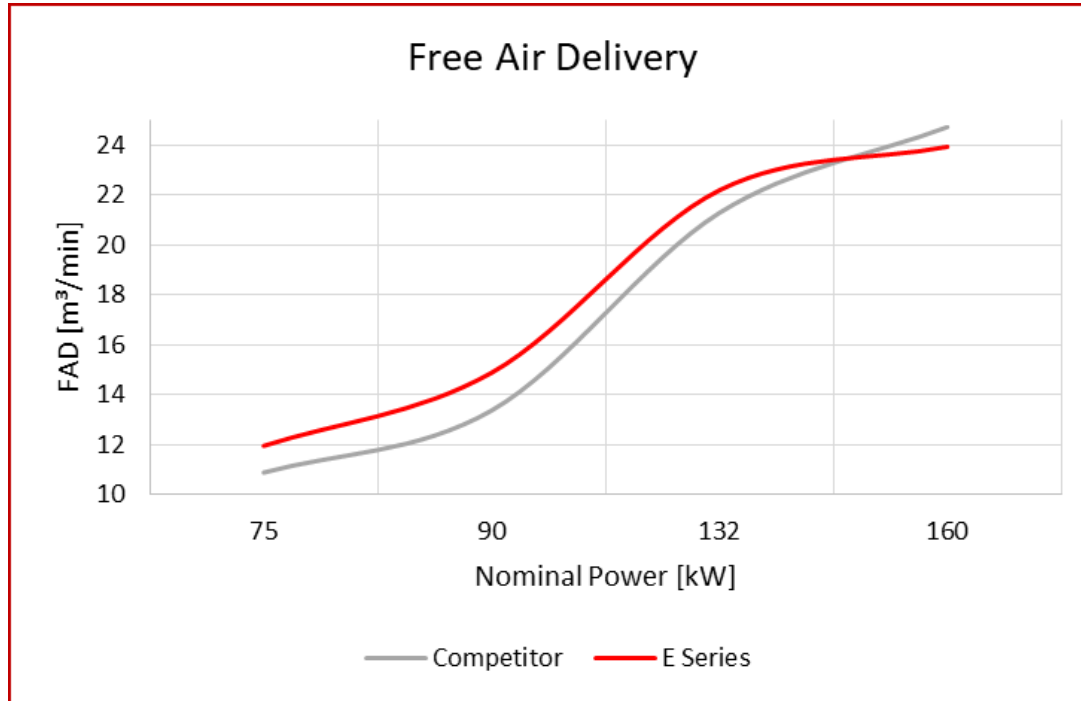
Performance – Competitive Comparison E Series **air-cooled @8,6bar**



Key Finding's

- E Series provides more compressed air at less specific power consumption compared to competition over the whole range
- ROI Opportunity Competition 160VSD v E160ne A @ average 85% capacity 8760 hours a year @ € 0.1kW/hr
 $7.3 \text{ kW}/(\text{m}^3/\text{min}) - 6.8 \text{ kW}/(\text{m}^3/\text{min}) = 0.5 \text{ kW}/(\text{m}^3/\text{min})$ $20.27 \text{ m}^3/\text{min} \times 8760 \times 0.1 \times 0.5 = \text{€ } 8878 \text{ saving per annum}$

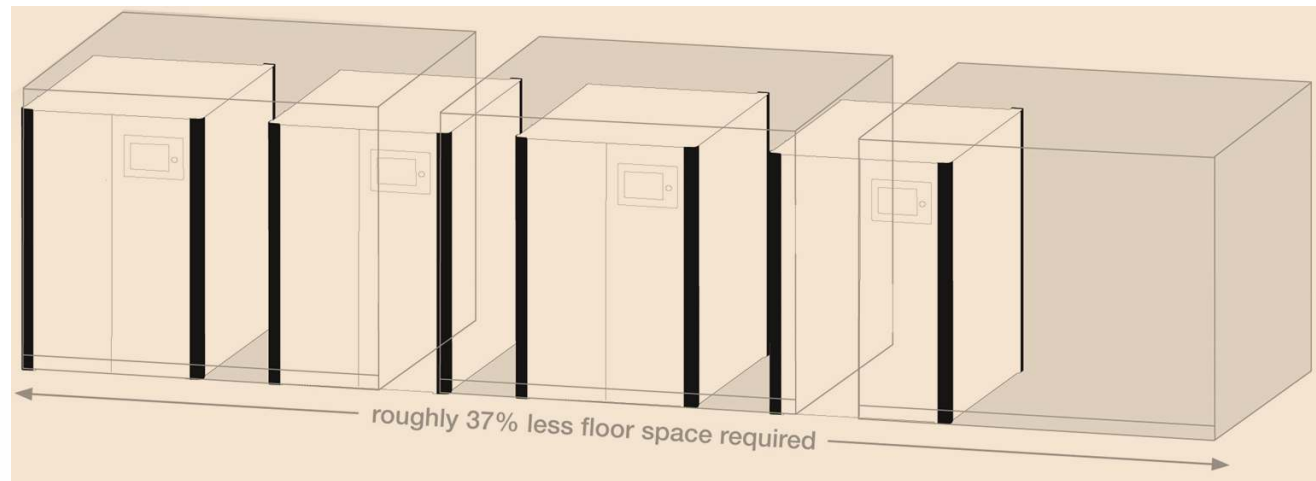
Performance – Competitive Comparison E Series **water-cooled @8bar**



Key Finding's

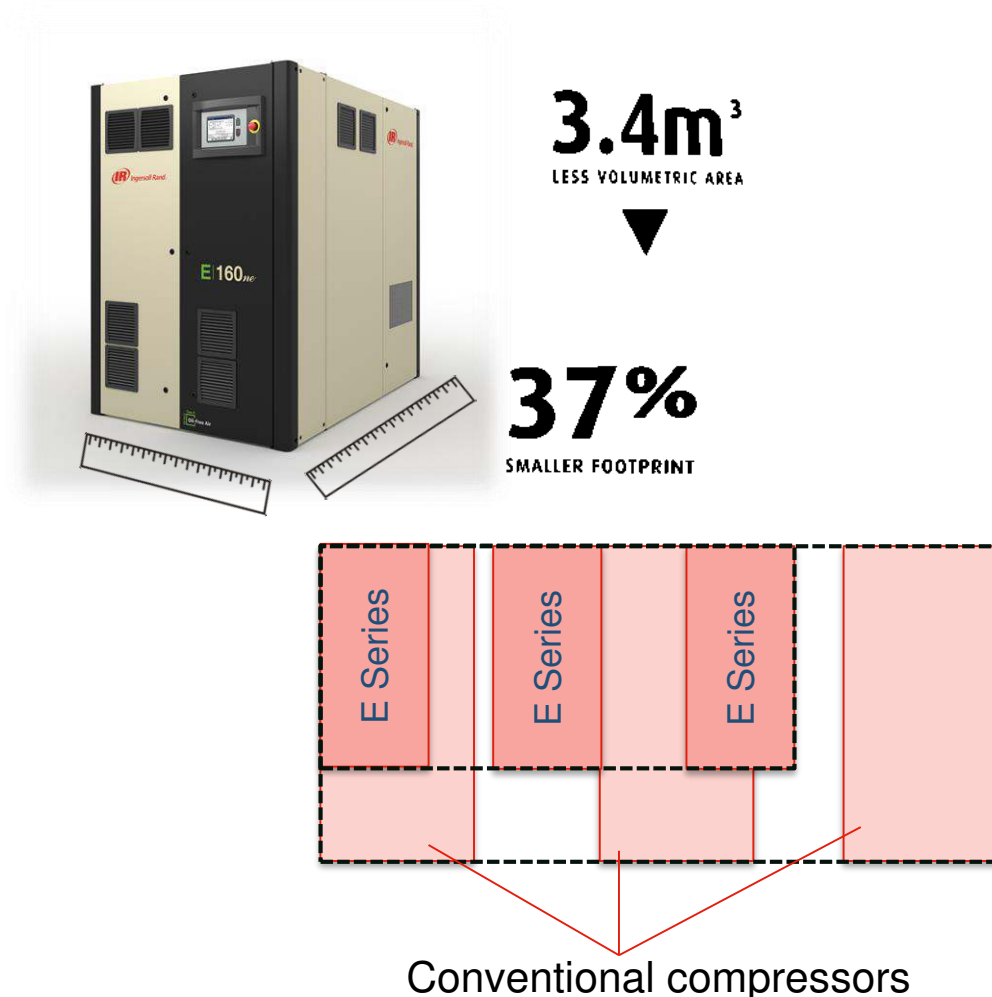
- E Series provides compressed air at less specific power consumption compared to competition
- ROI Opportunity Competition 90VSD v E90ne W @ average 90% capacity 8760 hours a year @ € 0.1kW/hr
 $7.43 \text{ kW}/(\text{m}^3/\text{min}) - 6.66 \text{ kW}/(\text{m}^3/\text{min}) = 0.77 \text{ kW}/(\text{m}^3/\text{min})$
 $13.39 \text{ m}^3/\text{min} \times 8760 \times 0.1 \times 0.77 = \text{€ } 9031 \text{ saving per annum}$

2. Smallest Footprint



Smallest Footprint

Compact design



Features

- **Best-in-class footprint**, 37% smaller than industry standard
- 3,4 m³ less volume than industry standard

Benefits

- Considerable building & real estate savings
- Multiple E Series can be grouped closer together allowing even bigger space savings

Smallest Footprint

Footprint Competitive Comparison E Series **water-cooled**

	Model	Length mm	Width mm	Height mm	Foot Print M Sq.
	IR E Series	2.044	1.394	1.922	2.84
	AC ZR160	2.540	1.650	2.201	4.19
	Kaeser DSG20-2 SFC650	3.345	1.750	2.385	5.8
	IRN160K-OF	2.547	1.881	2.4386	4.8



Best in Class – Installation Advantage

2. Smallest Footprint

Footprint Competitive Comparison E Series **air-cooled**



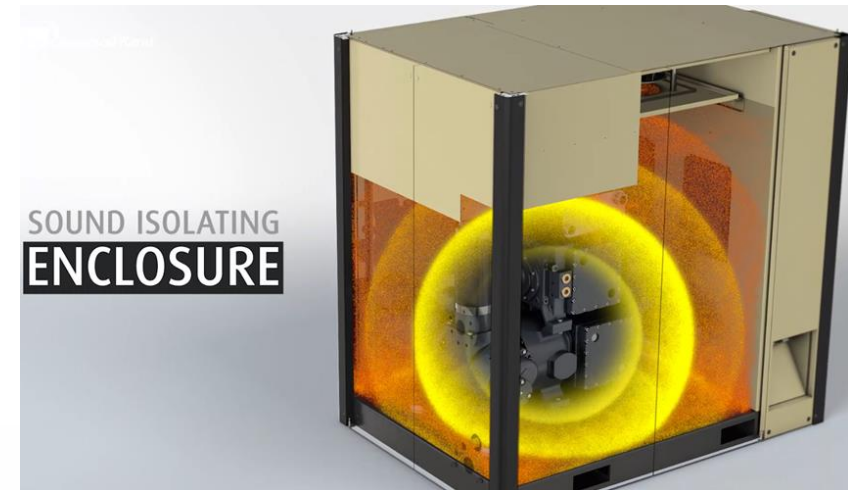
Model	Length [mm]	Width [mm]	Height [mm]	Foot Print [m²]
IR E Series	3.313	1.394	1.922	4,62
D-Series D160RS-8A	2.597	1.744	2.001	4.52
Atlas Copco AC ZT160 VSD	4.040	1.650	2.008	6.67
Kaeser DSG 260-2 SFC	3.435	1.750	2.385	6,0
Ingersoll Rand IRN160K-OF	2.547	1.885	2.435	4.8



Key Findings

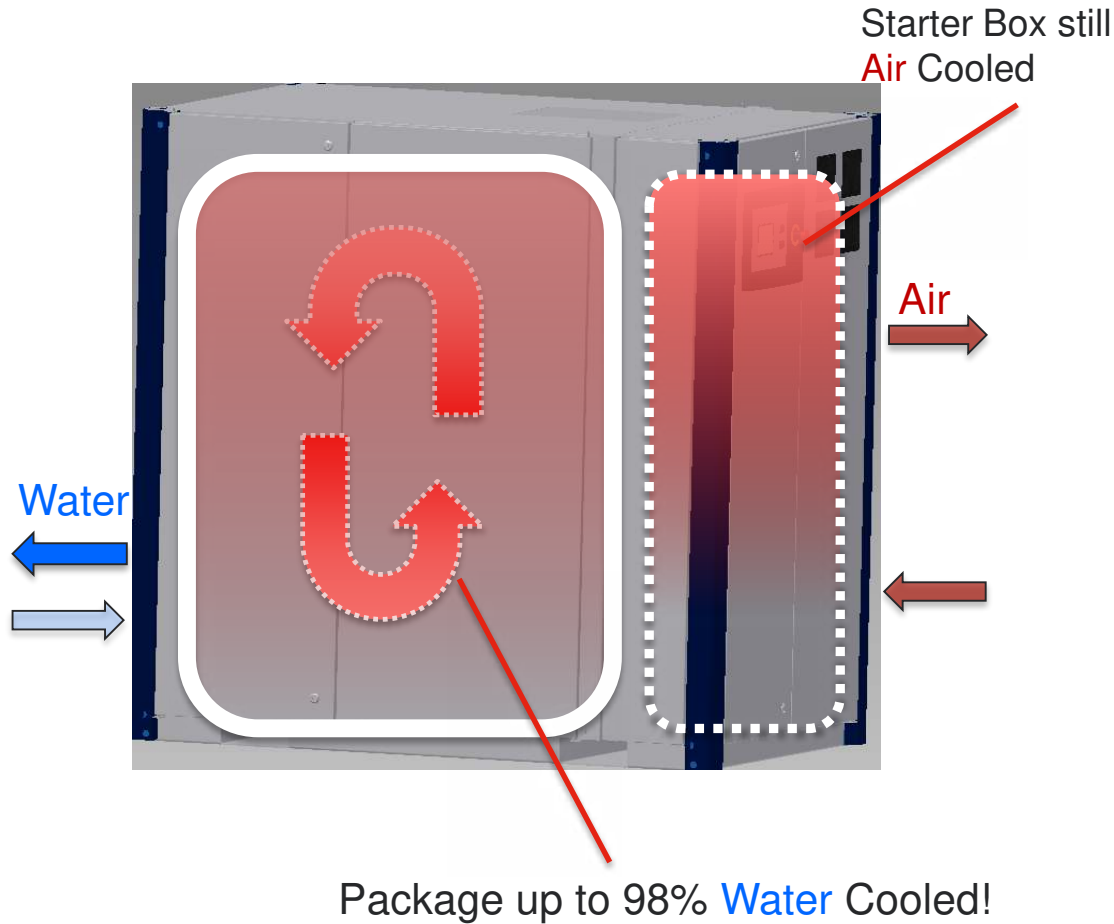
- Ingersoll Rand E Series and IRN160K-OF have better footprint than main competition

3. Lowest noise levels



Lowest noise levels

Unique closed package design



Features




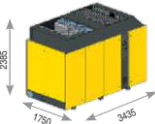

- All internal components water-cooled:
 - Intercooler
 - Aftercooler
 - Air end jacket cooling
 - Internal circuit (GD utility model)
 - Electrical motor
 - Inverters
 - Thermal radiation from air end / coolers etc.
- No opening to environment


Benefits

- Best-in-class noise level
- Easy installation (no customer ducting required)
- Up to 12% more heat available for heat recovery than competition

Lowest noise levels

Noise Level Comparison E Series **air-cooled** (160 kW RS)

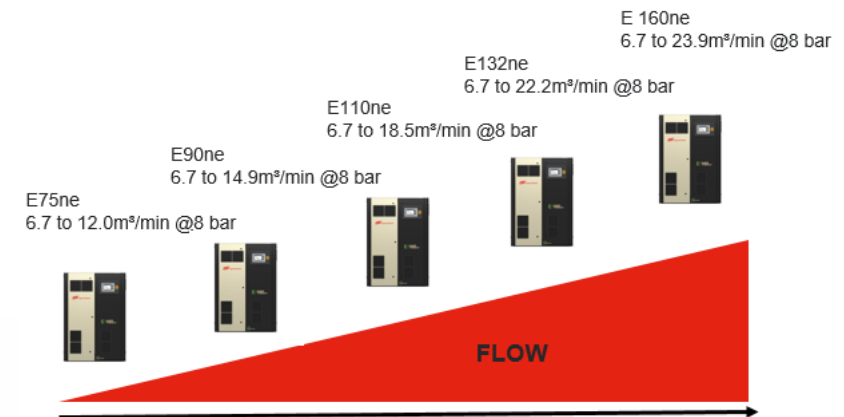
	Model	Noise [dB(A)]
	IR E Series air-cooled	70
	D-Series D160RS-8A	78
	Atlas Copco AC ZT160 VSD	74
	Kaeser DSG 260-2 SFC	80
	Ingersoll Rand IRN160K-OF	79



Key Findings

- E Series is by far best-in-class in terms of noise level!

4. Full upgradability between 75 and 160 kW



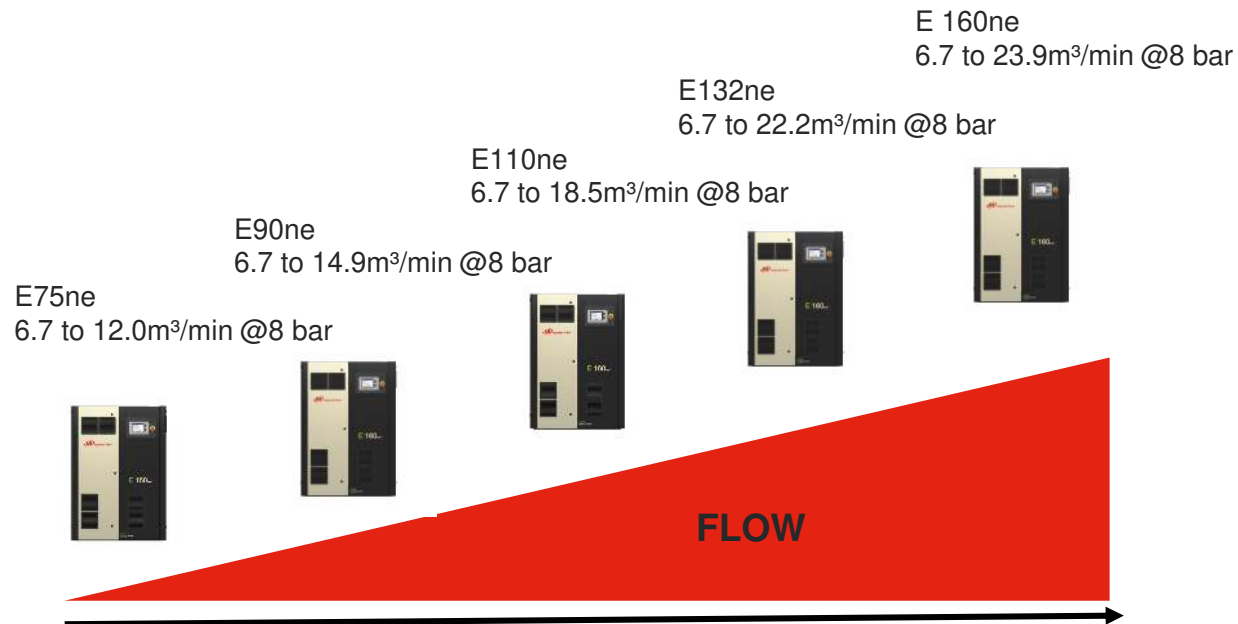
Full upgradability between 75 and 160 kW

Full Upgradability



**Do you know your future
compressed air demand?**

**As your business grows, your
compressed air demand will rise!**



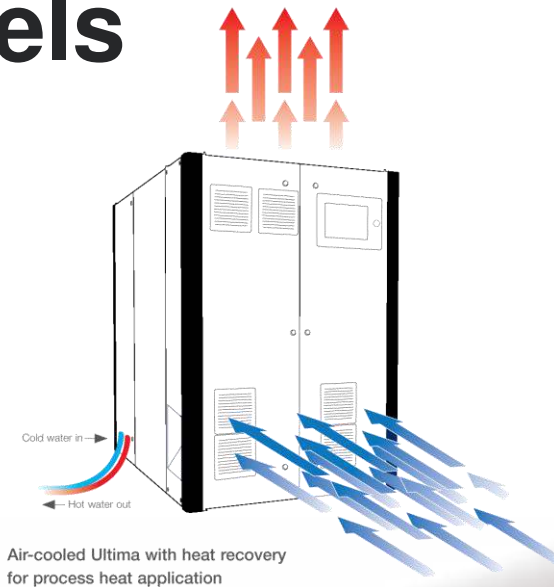
Features

- Flexible adjustment of nominal power and compressed air delivery to changing demand
- Immediately available

Benefits

- Much cheaper than an investment in a new/additional compressor
- No delivery time
- No downtime for installation and commissioning

5. Optional Heat Recovery on both Air-cooled and Water-cooled Models



Optional Heat Recovery on both Air-cooled & Water-cooled Models

E Series: Solutions for Heat Recovery

	E - Series water-cooled			E - Series air-cooled
	Integrated Heat recovery*	Heat recovery+	E-max	Integrated Heat recovery
Internal thermal management to achieve cooling water outlet temperatures up to 90 ° C	●			●
Control of the cooling water outlet temperature		●	●	●
Control of the heat recovery temperature on customer side			O	
Control of backup cooling water flow			O	● **
Heat exchanger for heating the customer's water			●	●
Backup heat exchanger			●	●
Visualization of the current and accumulated heat recovered			●	●
Water pump			●	●
Compressed air aftercooler	O	O	O	● ***



● Standard

O Optional

*For E Series, this option is part of the standard scope of supply.

**The two radial fans of the air-cooled E Series serve as additional / emergency coolers if necessary

***In most cases the air-cooled E Series already has a sufficiently low air outlet temperature of max. 12 K above ambient temperature

Optional Heat Recovery on both Air-cooled & Water-cooled Models

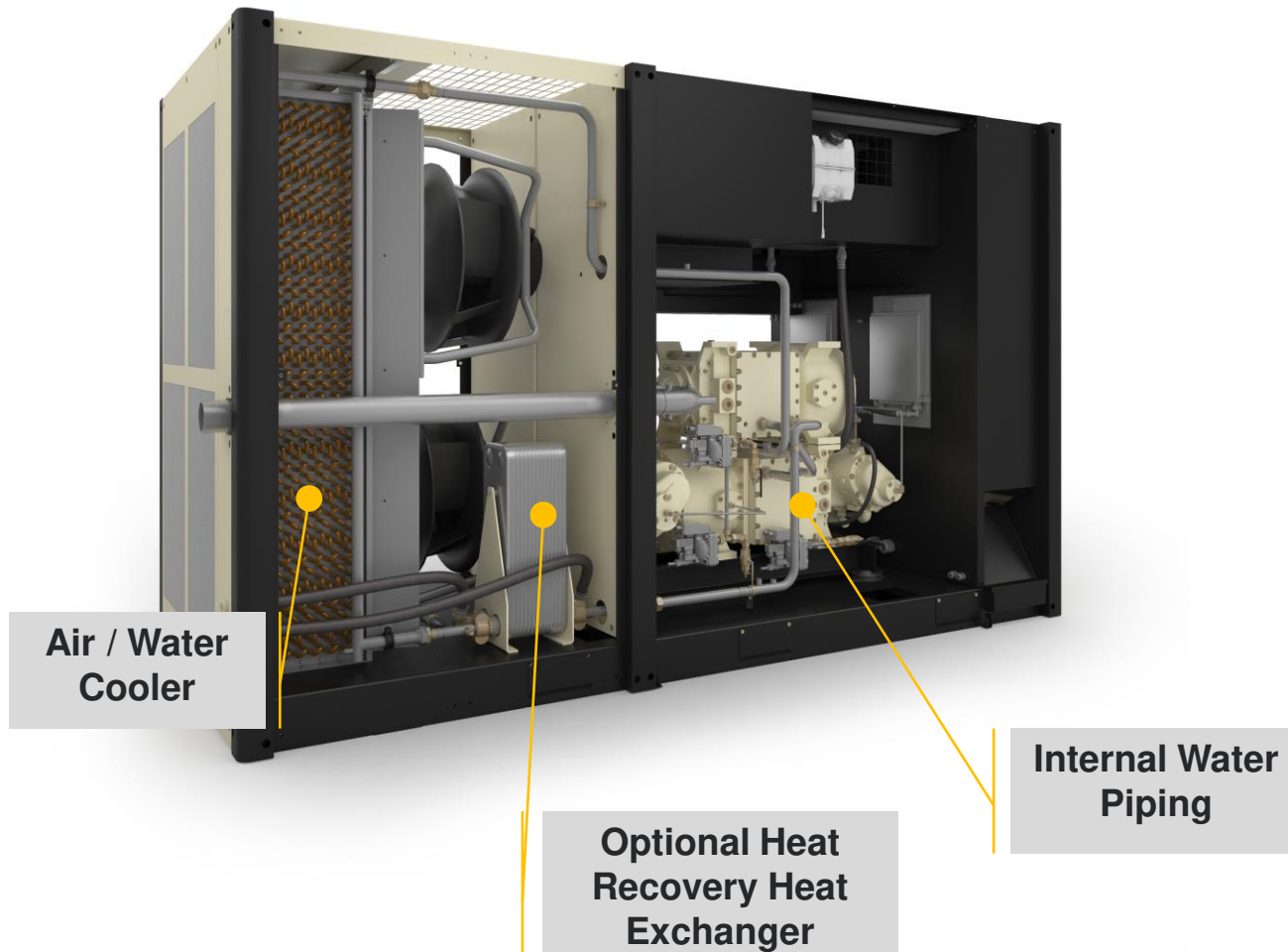
E-max – Turnkey heat recovery solution for water-cooled E Series

- **"Turnkey" Heat Recovery solution** that does not require any complex process engineering or external sourcing of single components
- Heat exchangers, pump, control, **all in one box**
- Usable water temperatures of **up to 85°C**
- Applicable to **E Series**
- Numerous **additional options**



Optional Heat Recovery on both Air-cooled & Water-cooled Models

E Series Air-cooled with Heat Recovery



Features

- **First and only** air-cooled oil-free compressor on the market with optional heat recovery
- Usable temperatures up to 85°C

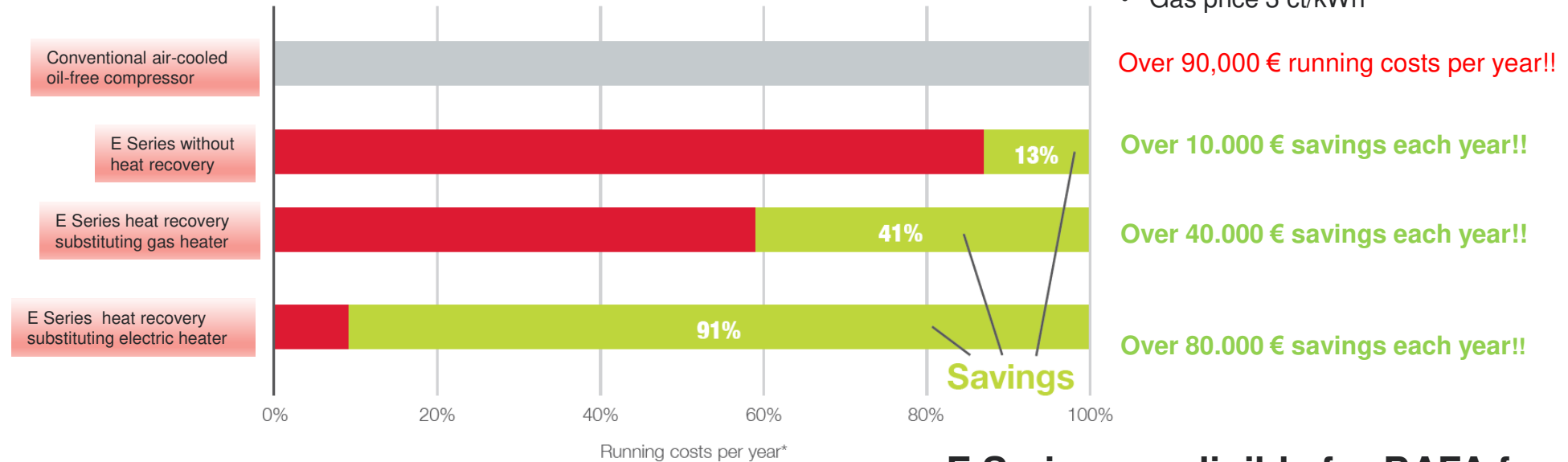
Benefits

- Thousands of € savings each year
- Turn key solution with all required components included in the compressor package



Optional Heat Recovery on both Air-cooled & Water-cooled Models

Economic Evaluation

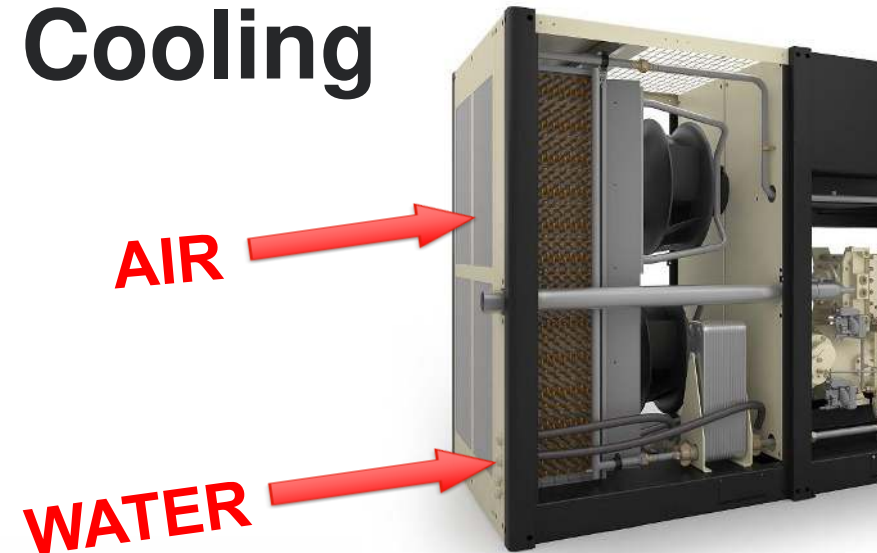


E Series are eligible for BAFA funding in DE

- **98% of the energy spent can be recovered**
 - **Up to 80.000 € annual savings compared to competition!!**
 - **TCO Opportunity E160ne A @ 40.000 € saving per annum (with heat recovery substituting gas heater & specific energy saving)**
- Monthly Lease Investment* (including service care) 2.880 € a month for E160ne A Monthly Saving 453 €**

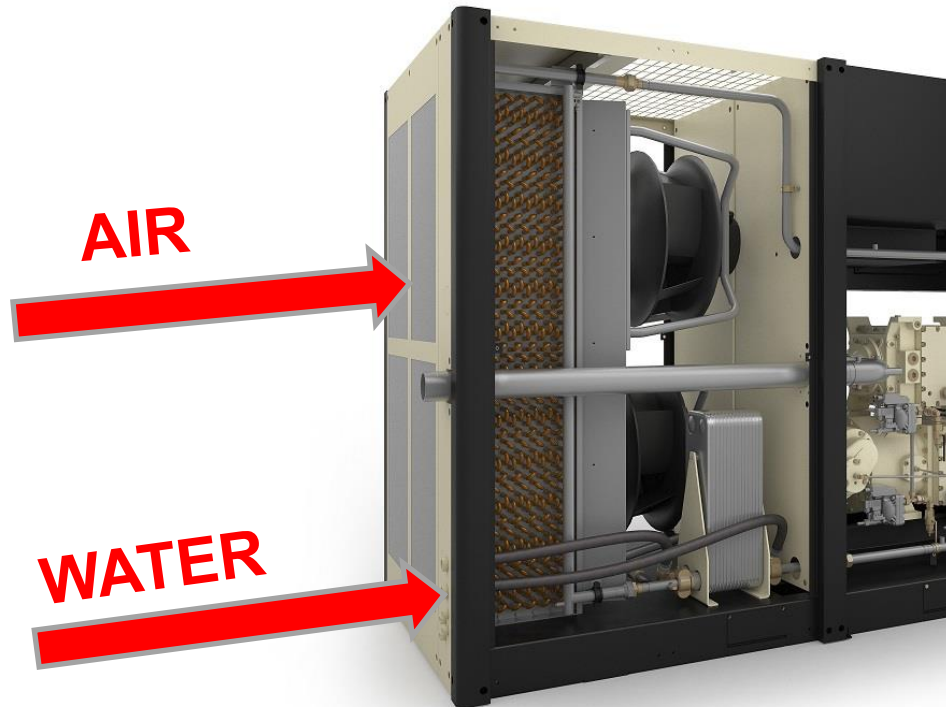
*Based on 6 year lease

6. Hybrid Cooling



Hybrid Cooling

Hybrid Cooling



Features

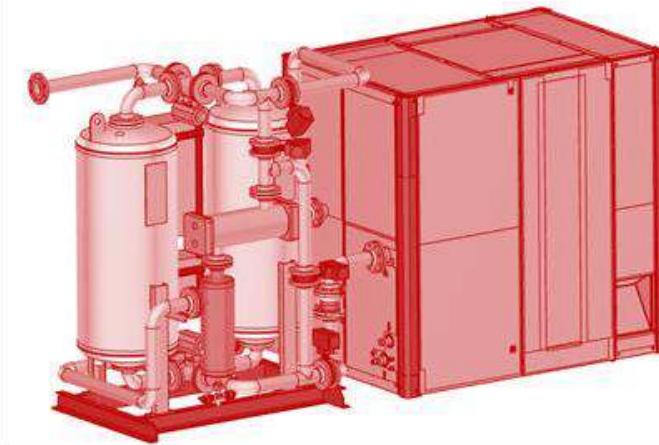
- **Air Cooling and/or Water Cooling** is possible
- **Potential applications:**
 - Apply hot cooling air for **space heating in winter**, produce hot **process water in summer**
 - **Redundant** Cooling System, e.g. if the water cooling system is under **maintenance**
 - Get rid of backup cooler in case of heat recovery

Benefits

- **Optimize running hours** in areas with seasonally changing availability of cooling water
- **Reduce operating cost** by using water-cooling whenever possible and avoid fan power consumption



7. Heat-of-Compression Lowest pressure dew points without energy consumption



Heat-of-Compression Lowest pressure dew points without energy consumption

Option: E Series EHOC Dryer



Features

- Permanent pressure dew points up to -40°C or better
- Operating pressure: 6,5 – 11 bar
- 3 model sizes available:
 - E75ne: EHOC 0750-B
 - E90ne/E110e: EHOC 1100-B
 - E132e/E160ne: EHOC 1700-B

Benefits

- Reliable and stable pressure dew point of up to -40°C
- Turn key solution with all connections adapted for E Series
- Almost zero energy consumption

Heat-of-Compression Lowest pressure dew points without energy consumption

EHOC economics vs other dryer technologies

Boundary conditions

Operating pressure [bar]	7
Volume flow [m ³ /min]	24
Operating hours [h/a]	6000
Electricity price [ct/kWh]	10
Pressure dew point [°C]	-25
Spec. power of compressor [kW/(m ³ /min)]	6.41

	Vacuum Purge Desiccant Air Dryer	Heatless desiccant adsorption dryer	Hybrid Dryer	Heat of Compression Dryer
Electricity consumption [kWh/h]	11.3	0.15	3.9	0.15
Electricity consumption [kWh/a]	67,533	900	23,400	900
Purge air consumption [m ³ /min]	0.0	4.0	0.8	0.0
Operating costs [€/a]	6,753	15,474	5,417	90



8. Care Service Programs



CARE Service Programs

A Trusted Partnership

- Goal: Long term partnership...earn the right to provide reliability for life
- Expanded Offering: We now have more flexibility to match the right maintenance program to each customer's specific need
- Consistent with ITS Strategy: Compressed air systems, not just compressors



Select CARE Service Program

Comprehensive and Preventive Maintenance Coverage

- Extend standard 12 month
- Early detection of impending
- Ensure all equipment maint
- Covers all regular maintena
- Comprehensive expertise v
- Reduces maintenance and



tion & schedule

ints

surprises



Predictive Diagnostics



OEM Genuine Parts



Trained Technicians

Select CARE Service Program

The **local** distributor A Trusted Partnership

Our extensive network of authorised Ingersoll Rand distribution partners ensures superior service with:

- Professional air audits to identify cost savings in our customers facilities
- Providing expert routine maintenance through certified technicians
- Guidance on selecting the right compressed air solution for end user specific applications

Local distributors are ...

- Highly-responsive & customer- focused
- Involved in the community
- Flexible to customer requirements
- Well-trained and well-staffed
- Experts in their territory
- Service-oriented and stocked



CARE Service Programs

Common Features and Benefits

- Genuine parts
- Rapid service response
- Optimize compressed air system efficiency
- Preventive approach – detect problems before they happen (**IOT ready**)
- Reliable, long term operation

It All Adds Up to Peace of Mind



CARE Service Programs

CARE Programs vs Warranties

Competitor Warranties	Ingersoll Rand CARE
Typically NOT a “program”	SelectCARE
Reactively solves a problem after it occurred	Proactively manages equipment to avoid problems
Focus is on assigning blame	Focus is on reliability and proactive maintenance
Customers are left to manage equipment on their own, and prove compliance	Uses our expertise and SWPs to help customers manage equipment
Intent is to disqualify	Intent is to improve
REACTIVE WARRANTY	PROACTIVE SERVICE



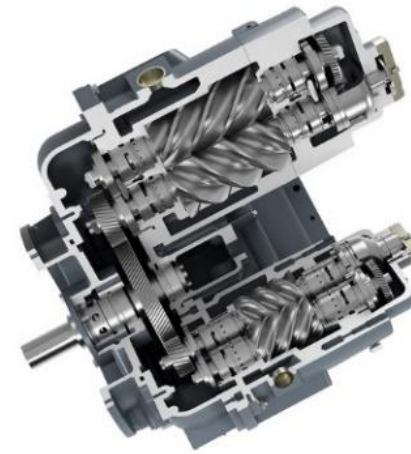
CARE Service Programs

Ingersoll Rand offers a wide array of service programs that can be customized to satisfy all of your maintenance needs for the life of your equipment. Choose the service provider that CARES for over 1 million horsepower of compressed air globally.



RELIABILITY
FOR LIFE

9. Reliable and stable air end performance over time



ISO CLASS:0
zero 
PLUS SILICONE FREE
PLUS SILICONE FREE

GERMAN 
ENGINEERING
& DESIGN

Reliable and stable air end performance over time

	Feature	Evaluation
Coating	PTFE and Nickel-PTFE 2 layer chemically bonded coating	Ingersoll Rand has a proven stable performance even after many years of operation
Cooling Jacket	Water cooled	Water cooled means better heat transfer and cooling efficiency, (due to higher spec. heat capacity); less stress, risk of degradation and oil deterioration, resulting in less service cost; generally less oil in the system
Load balancing	Balancing pistons on both stages	Balancing pistons on both first and second air end stage reduces bearing load and increases air end life

Ingersoll Rand



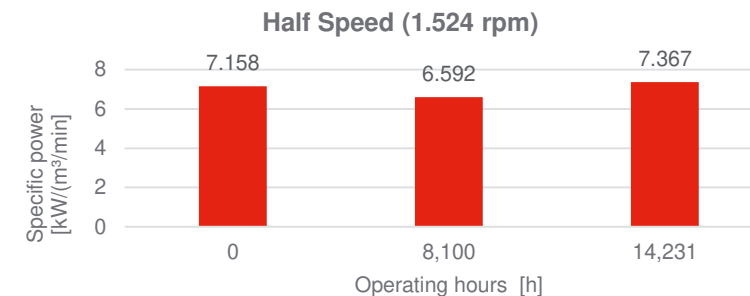
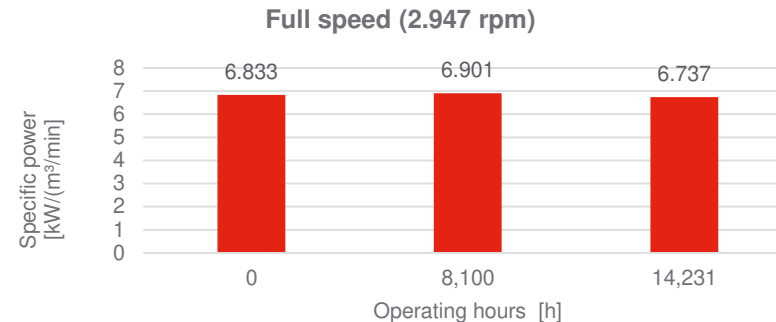
Reliable and stable air end performance over time

Case Study: Ingersoll Rand Air end Performance over time

Performance comparison of 3 LP air ends used in 75kW water cooled compressors after different operating hours

Full speed performance (2.947 rpm)		Operating hours [h]		
		0	8.100	14.231
P shaft	kW	143,7	140,8	141,1
FAD	m ³ /min	21,468	20,956	21,436
Wsp	kW/(m ³ /min)	6,833	6,901	6,737
	% deviation from initial conditions	0,0%	1,0%	-1,4%
ΔT	K	135	143	142

Half speed performance (1.524 rpm)		Operating hours [h]		
		0	8.100	14.231
P shaft	kW	71,9	71,3	71,5
FAD	m ³ /min	10,230	11,06	9,902
Wsp	kW/(m ³ /min)	7,158	6,592	7,367
	% deviation from initial conditions	0,0%	-7,9%	2,9%
ΔT	K	140	144	143



Key Findings

- No significant performance decrease over a period of 14.231 hours measurable!!
- In some points the measured specific power was even better compared to a brand new air end!!

10. Air Insite – Auditing Tool

Air Insite – Auditing Tool

airINSITE is an advanced data logging (equipment) & web application (software) solution that enables compressed air equipment & complete systems to be easily audited

- ✓ **Get the best out of your compressed air system**
- ✓ **Identify energy efficiencies**
- ✓ **Lower capital spending & improve ROI**
- ✓ **Lower your carbon footprint**
- ✓ **Lowest operating cost your compressed air system**
- ✓ **Improve your manufacturing productivity**
- ✓ **SAVE MONEY AND ENERGY**

Air Insite – Auditing Tool

Measure, manage, improve

Efficiency monitoring

Combine input power with output flow (and discharge flow) to monitor the compressor's efficiency over time

Air audits/ Leakage management

Monitor the overall consumption of your plant, to know where you are at, and to quantify results

Cost allocation

Monitor the actual demand per area, and allocate costs.



Measure, manage, improve

Point of use measurement

Check consumption at point of use. Allocate costs, track leakages, Influence behavior, avoid misapplication.

Auditing

Check the consumption of machines. Optimize the air consumption of components



Pressure loss

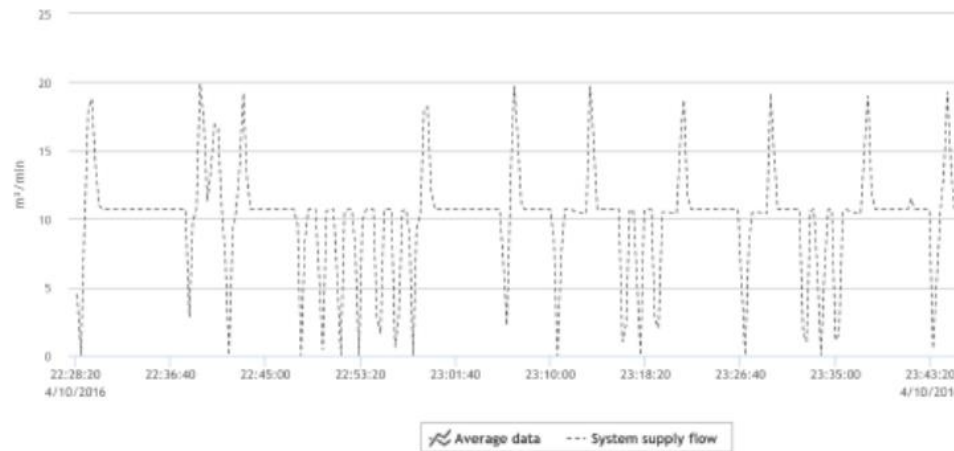
Monitor downstream pressure loss due to large consumers

Air Insite – Auditing Tool

- airINSITE's high quality sensors collect & store information relating to:



- Allowing us to:
- Analyse
- Chart
- Graph
- Simulate



- Expertise plus proven hardware & software platforms - delivering a complete professional audit report & value-adding analytics service

And the list of features and benefits continues...



Further features and benefits of E Series

- To be continued...
- Ambient temperatures up to 45°C for both air- and water-cooled models
- No intake regulator required
- Sinus filters / EMV filters for motor/grid protection
- Canopy stand still heater
- Outdoor option
- Closed internal water circuit
- Optional external cooling module
- Speed regulated radial fans of air-cooled models
- Modbus, Profibus, Profinet connectivity
- Controller with 8" colored touch screen
- Designed and engineered in Germany
- References all over the world in all main industries
- Short lead time – 15-20 working days





Thank You

www.irco.com