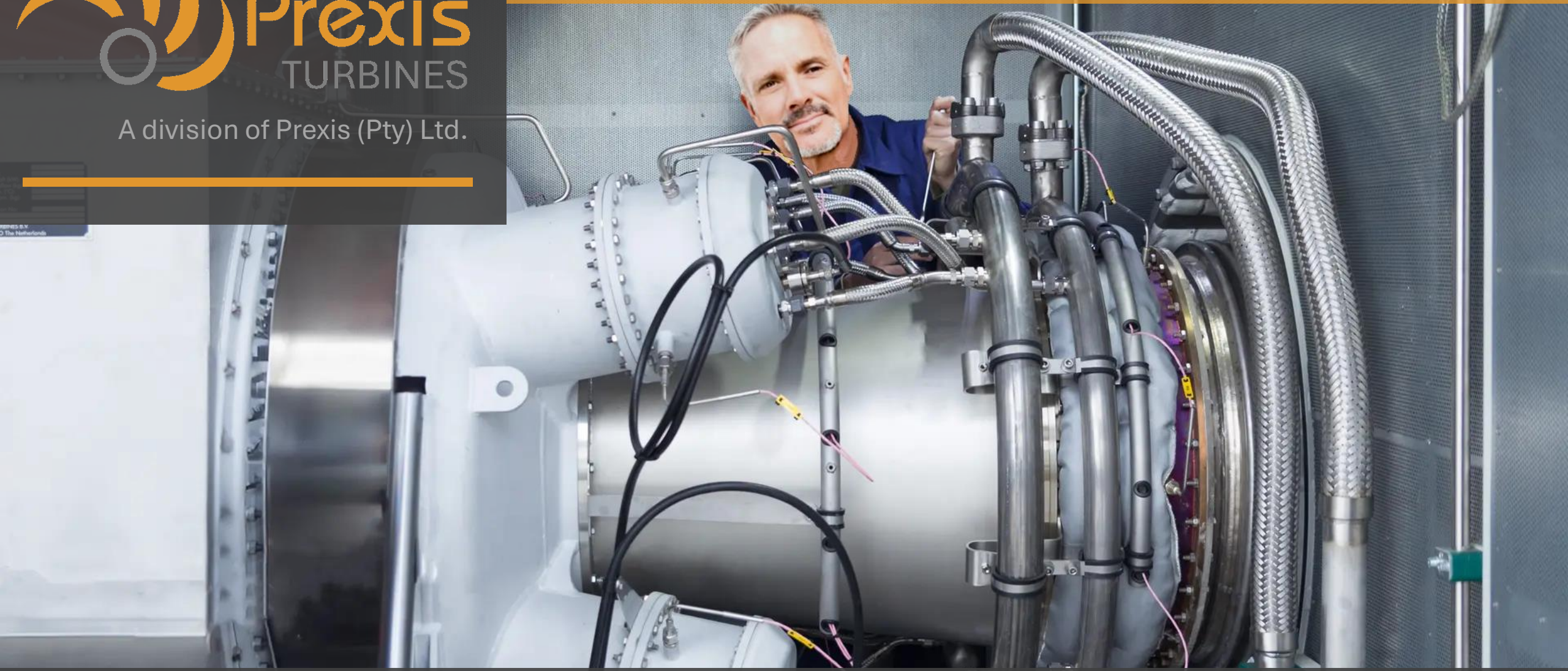
Introduction To Prexis Turbines

Prexis TURBINES

A division of Prexis (Pty) Ltd.



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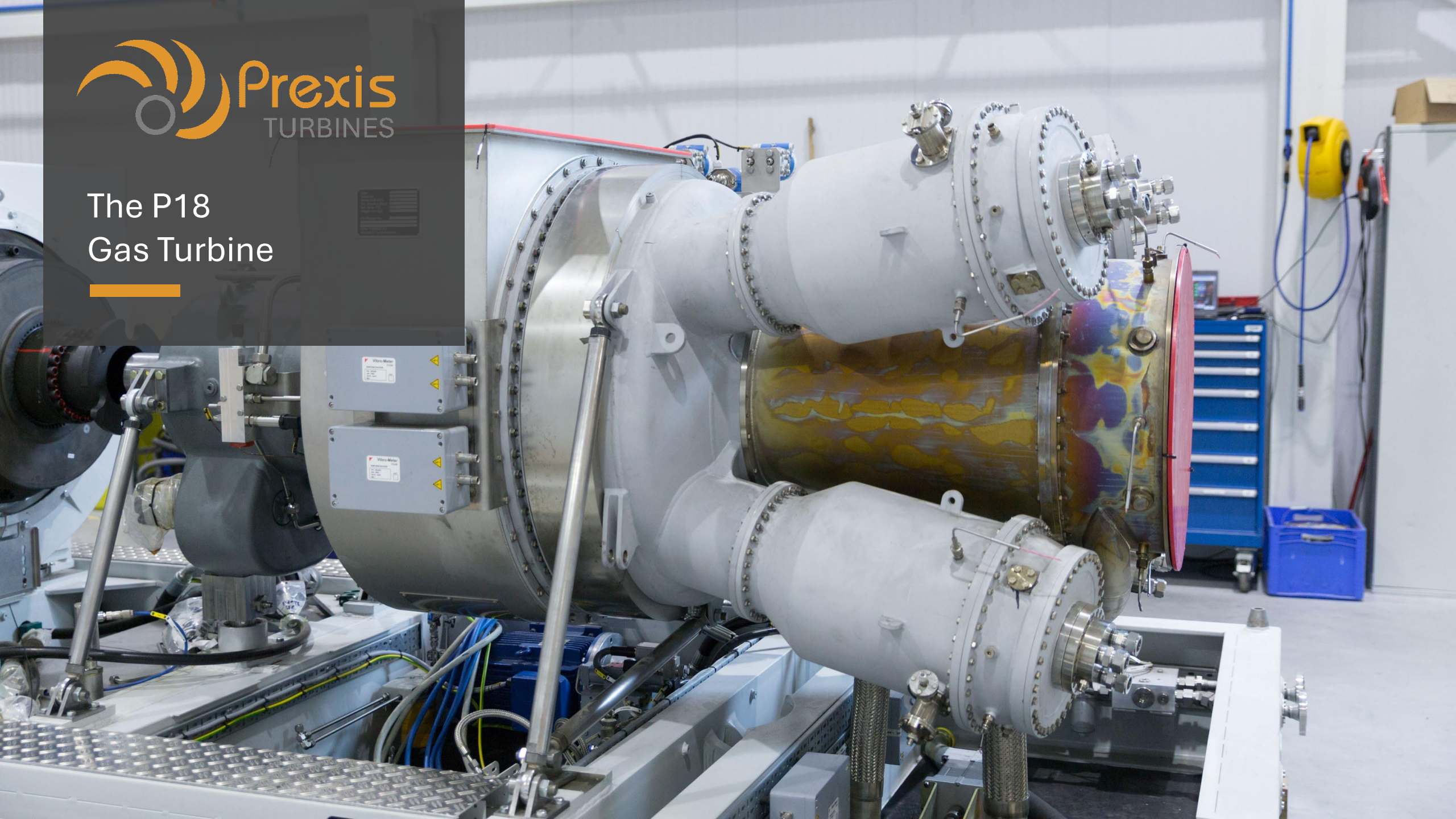
The P18 Gas Turbine



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Fuel Flexibility

- ✓ Low fuel gas pressure necessary (6.7 ratio)
- ✓ Low emission (Premix) combustors available
- ✓ Low BTU fuel gases possible (>5 MJ/kg)

High CHP Capability

- ✓ High exhtemperature (573 °C / 1064 F)
- ✓ High heat to power ratio (1.8 MW el + 5.3 MW th)
- ✓ Oil free exhaust flow guaranteed (direct dryingaust)

Small Footprint

- ✓ Easy installation 2 x 6 m (20 ft) containers)
- ✓ Compact and low weight
- ✓ Few moving parts
- ✓ No cooling water needed

Robust Design

- ✓ All radial
- ✓ Overhaul after 40,000 hours
- ✓ Long bearing life (overhung design)
- ✓ Combustors easy to access

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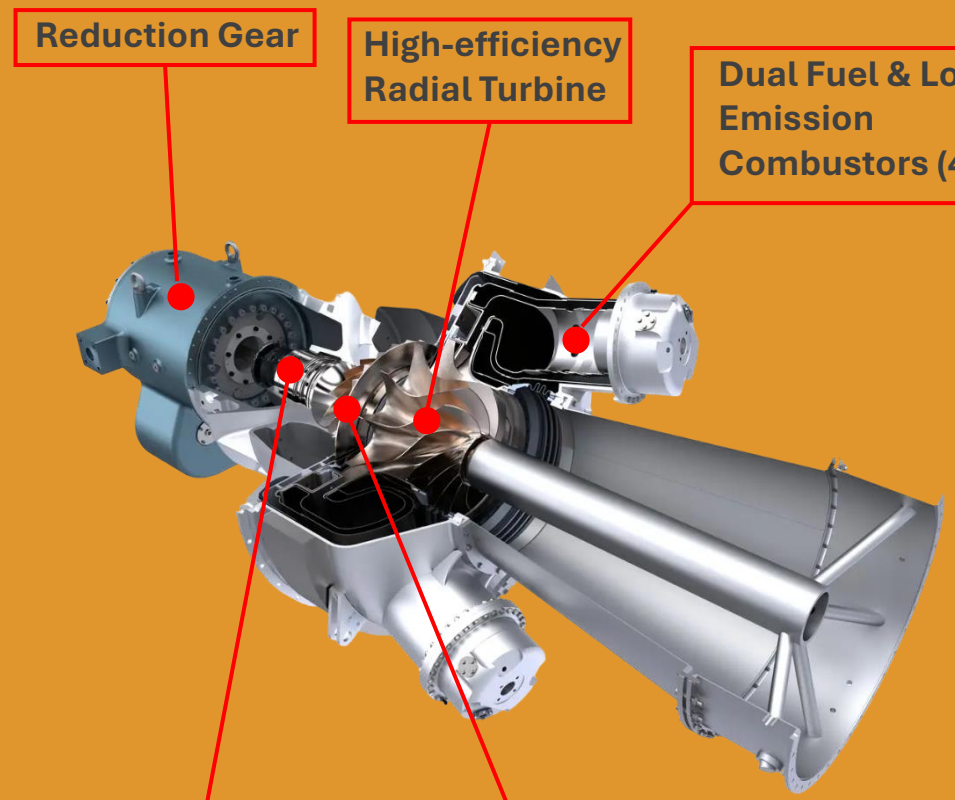
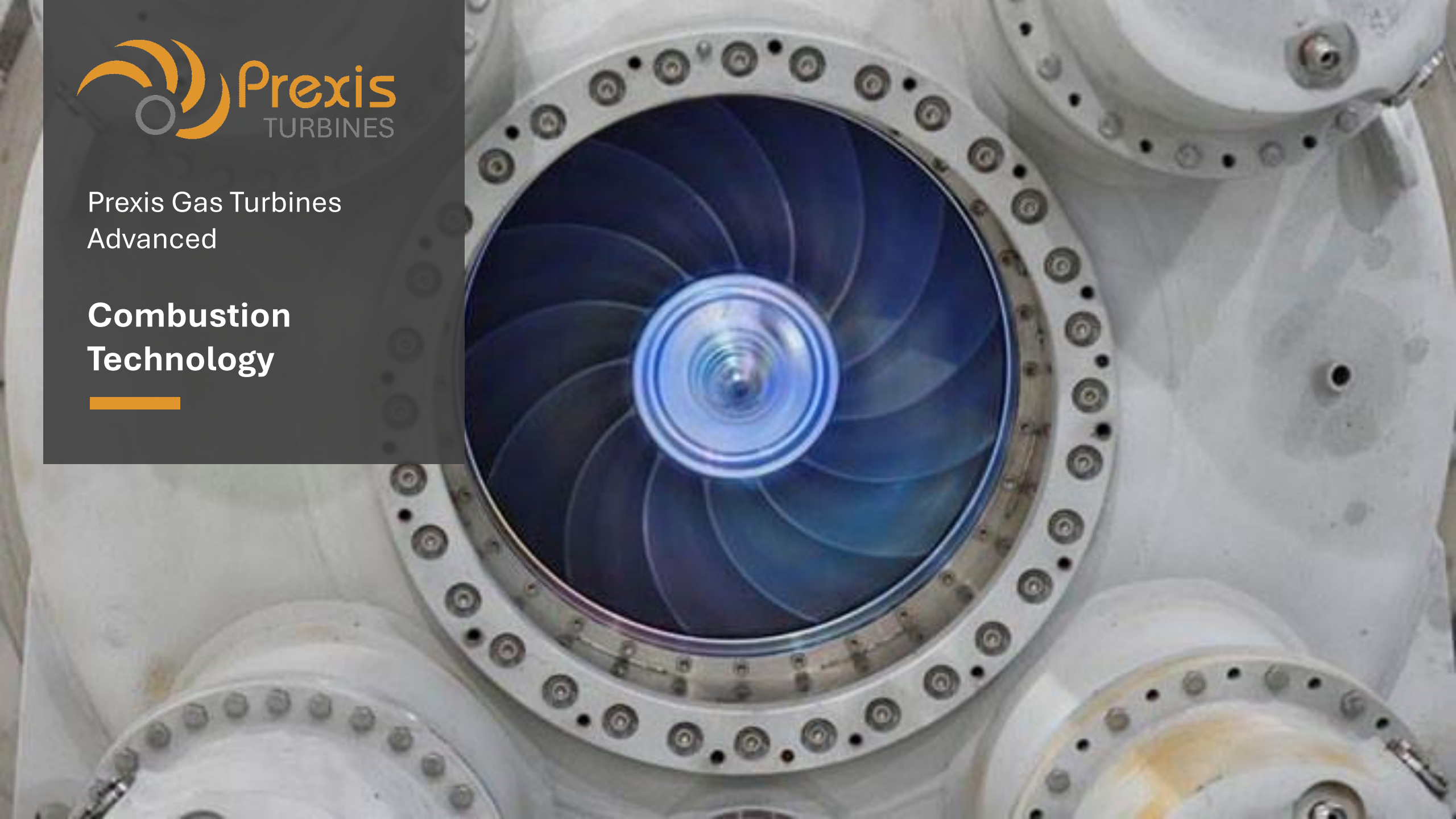


The 1.8 MW Prexis-P18 gas turbine engine combines the best simplicity and high performance

Prexis-P18 Gas Turbine	
Electrical Efficiency	25%
Exhaust Flow	8.7 kg/s
Exhaust Gas Temperature	570 °C
Rotor Speed	26,000 rpm

Prexis Gas Turbines
Advanced

Combustion Technology



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Prexis-P18-3A

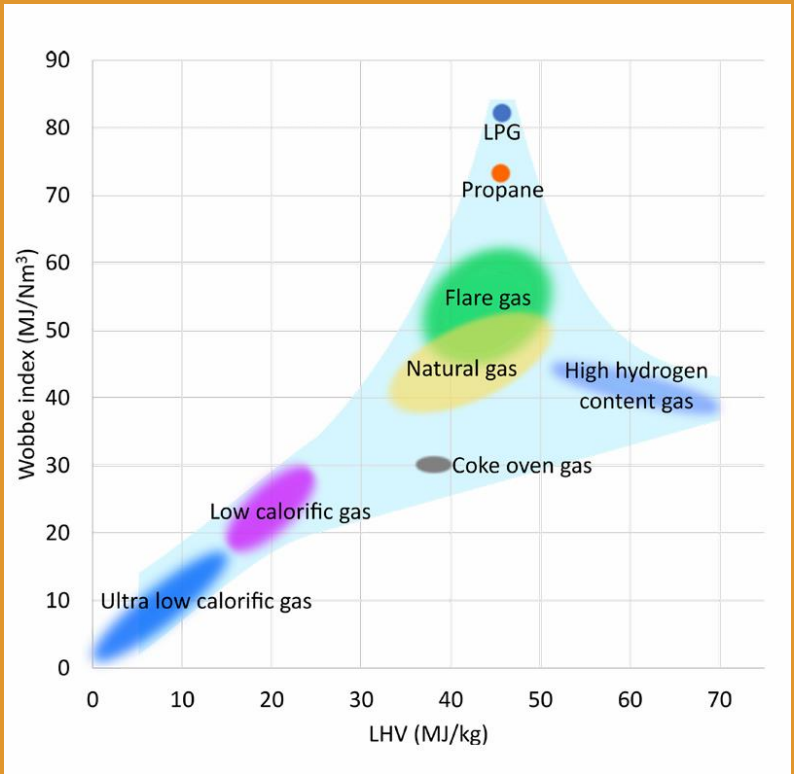
- ✓ **Conventional diffusion type combustor**
- ✓ **Gaseous and liquid fuels between 20-70 MJ/kg**
- ✓ **Dual fuel operation**

Prexis-P18-3B

- ✓ **Dry low emission combustor**
- ✓ **Gaseous fuels between 30-51 MJ/kg**
- ✓ **Diesel or Crude Oil as back-up fuel**
- ✓ **IMO Tier III compliant, NOx, <1g/kWh**

Prexis-P18-3C

- ✓ **Advanced diffusion type combustor**
- ✓ **Gaseous and fuels between 5-25 MJ/kg**
- ✓ **High calorific fuel as back-up**
- ✓ **Waste to energy applications**



P18-3A

- ✓ Low fuel pressure requirement of 10-12 bar (a)
- ✓ Possibility to use Diesel or Crude Oil as back up fuel
- ✓ Ability to burn fuels with changing LHV

P18-3B

- ✓ Low NOx and CO emissions down to 30mg/Nm3 (15 PPMV) on pipeline natural gas
- ✓ Low NOx emissions complying to IMO Tier III w/o scrubbers

P18-3C

- ✓ Ability to burn VOCs and Off-gases from crude oil tanks
- ✓ Acid gases with high CO2 content

Prexis P18 Gas Turbines
VS

Reciprocating Engines

Prexis-P18 Gas Turbine	Reciprocating Engines
Suitable for Saturated steam Generation	Suitable for Hot water generation or low-pressure steam
High Heat to power ratio 3:1	Low heat to power ratio
Fuel Flexibility: Flare gas, Biogas, Pirolysis oil	Required separate gas cleaning system
Lower maintenance periods and costs, regular maintenance once in 8000 hours	Frequent& expensive maintenance required
Negligible lubricating oil cost and consumption	High lubricating oil costs and consumption
Lower Emissions	Higher emissions than Turbines
Most suitable for Absorption chillers (Higher COP)	Lower COP of Absorption Chillers: Hot water fired
Supplementary firing can be used	Not feasible.
Block load acceptance up to 90%	Maximum inrush load 30%

Prexis Gas Turbine
P18 (1.8 MW)

Generator Package

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- ✓ 6 m (20 ft) integrated standard package
- ✓ Mobile –easy transportation
- ✓ Quick installation and commissioning
- ✓ Standard pre-engineered options
- ✓ Integrated oil cooler
- ✓ Ability to handle extreme ambient conditions
- ✓ Low foundation requirements
- ✓ Fully tested string before dispatch

Off-Base Control System

Long Control Room

Short Control Room

Integrated Control Room

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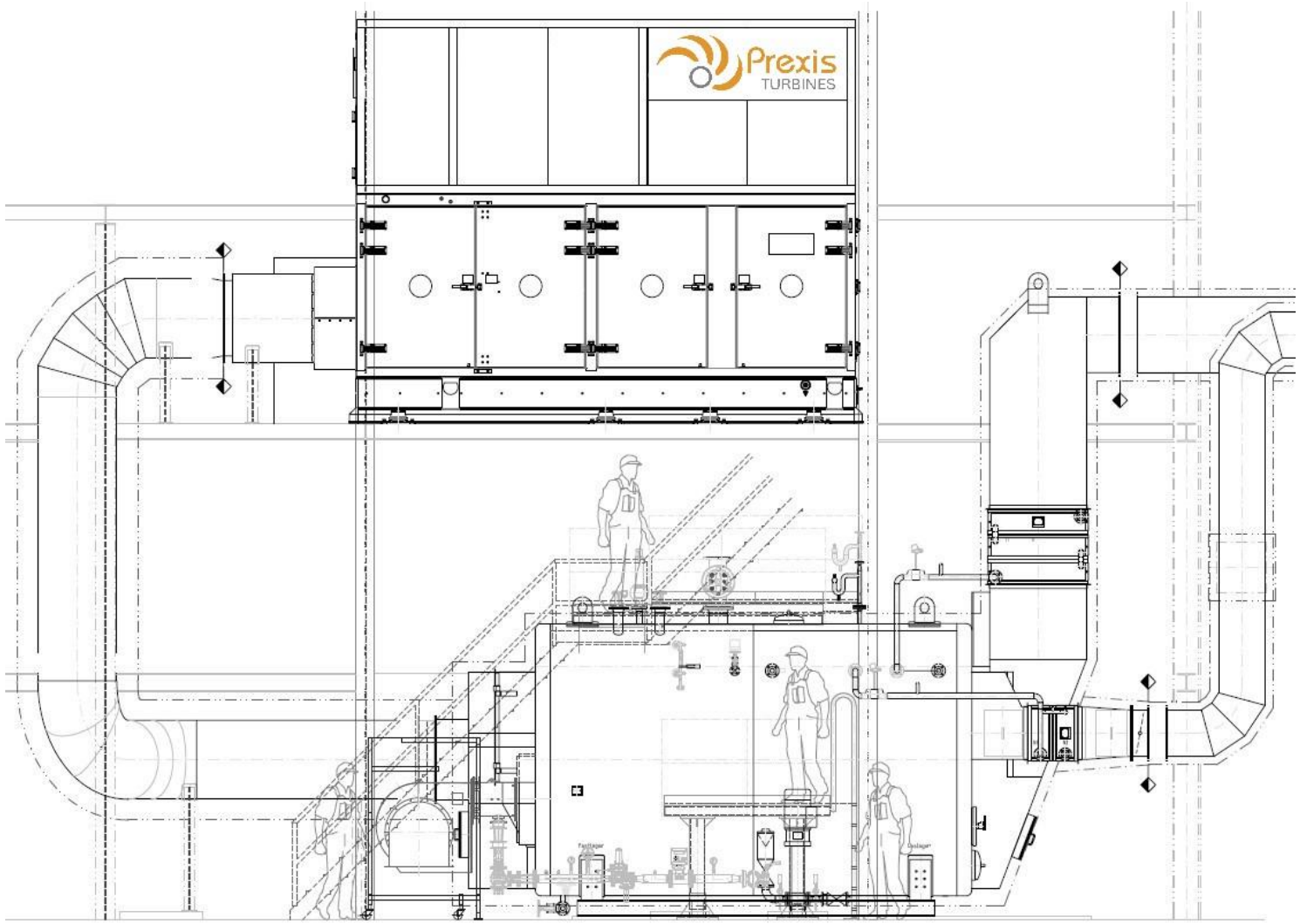
Platform

Supersilent

Prexis P18 Gas Turbine Package is lightweight and

Vibration Free

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Prexis P18 Gas Turbine
Service

Prexis TURBINES

Prexis P18 Gas Turbine
Long Term

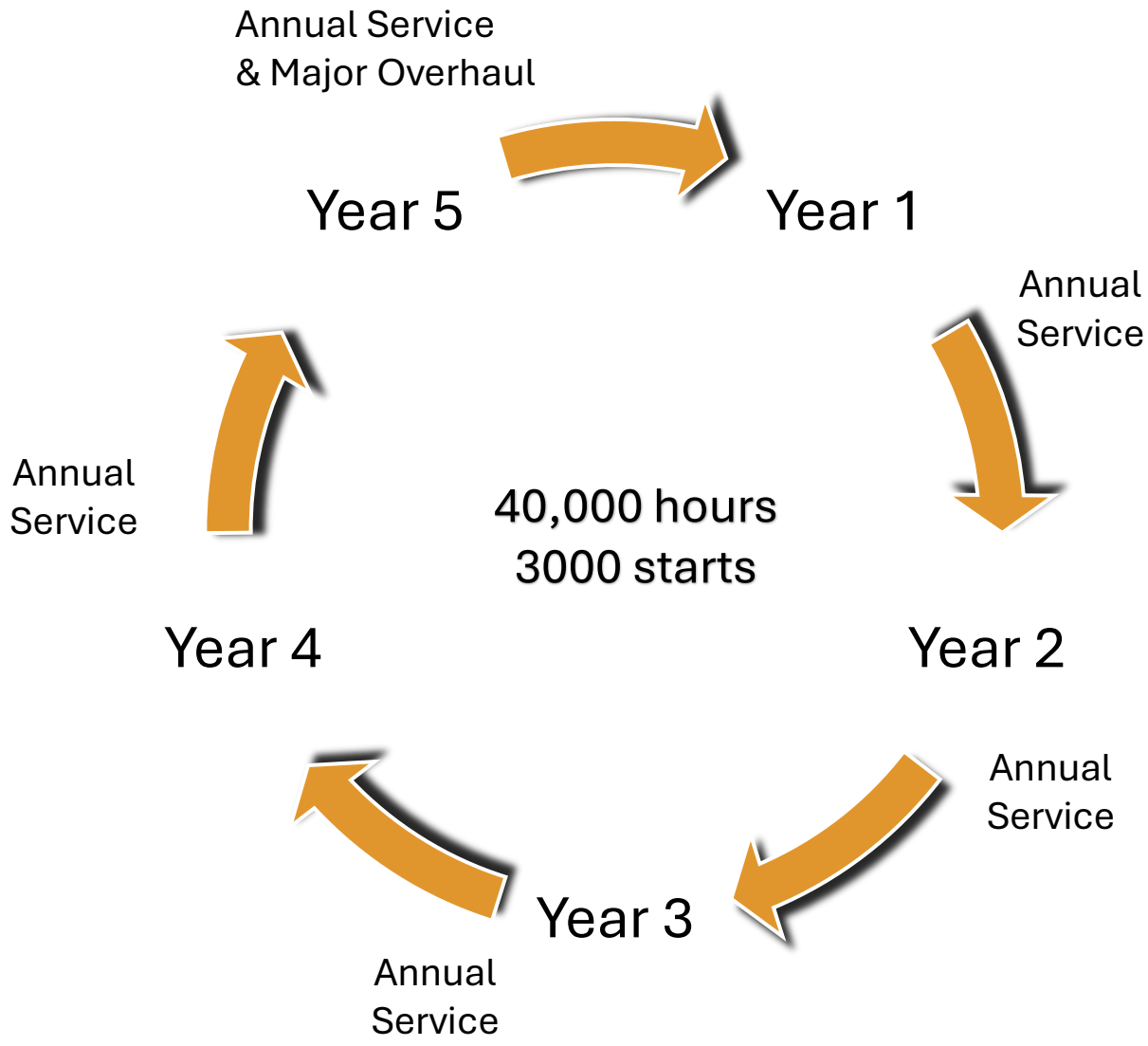
Service Agreement

Major Overhaul:

- ✓ Advanced package services
- ✓ Turbine overhaul by exchange

Annual Service:

- ✓ Health check
- ✓ Borescope inspection
- ✓ Equipment calibration
- ✓ Generator isolation test
- ✓ Replace consumable parts



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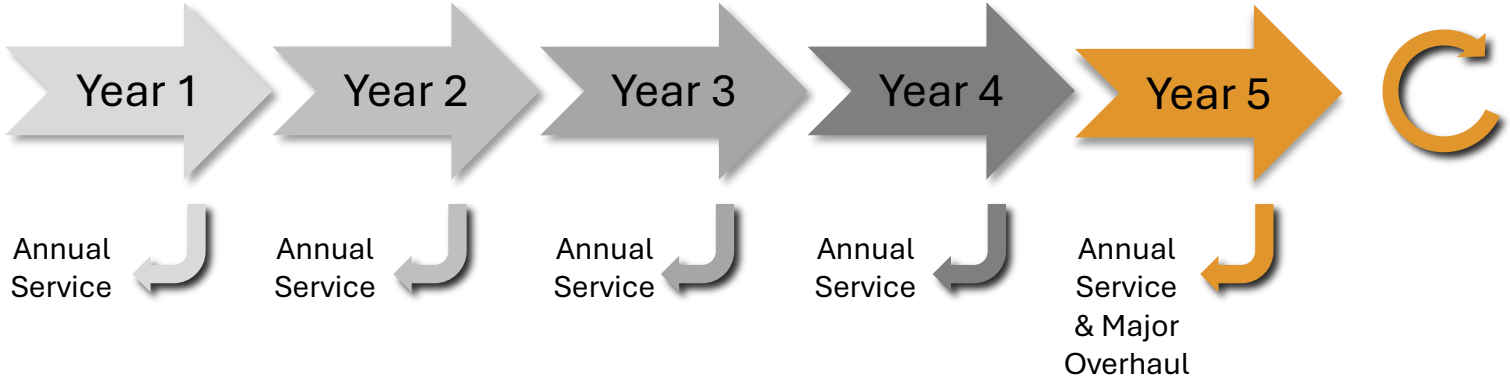
Prexis P18 Gas Turbine

Scheduled Maintenance



Annual Service:

- ✓ Health check
- ✓ Borescope inspection
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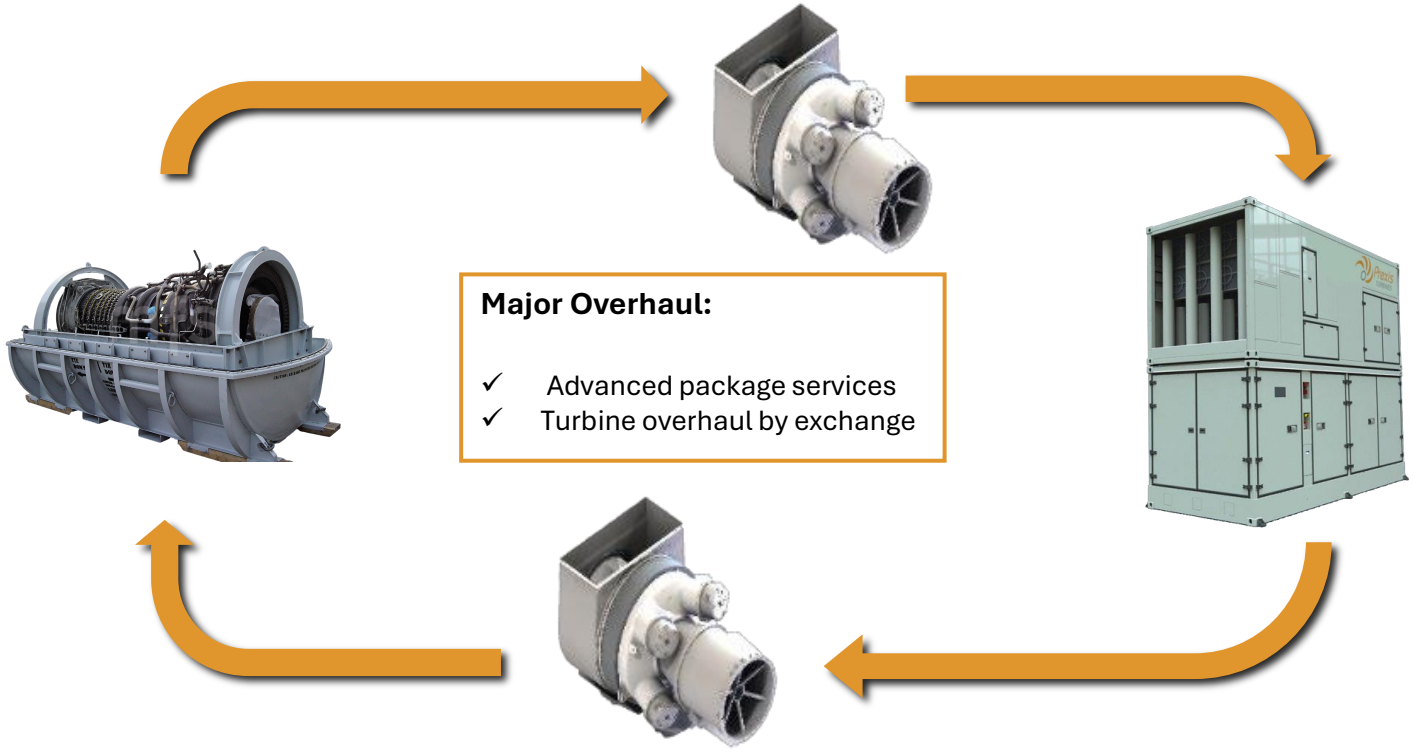

Major Overhaul:

- ✓ Advanced package services
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Prexis P18 Gas Turbine

Maintenance

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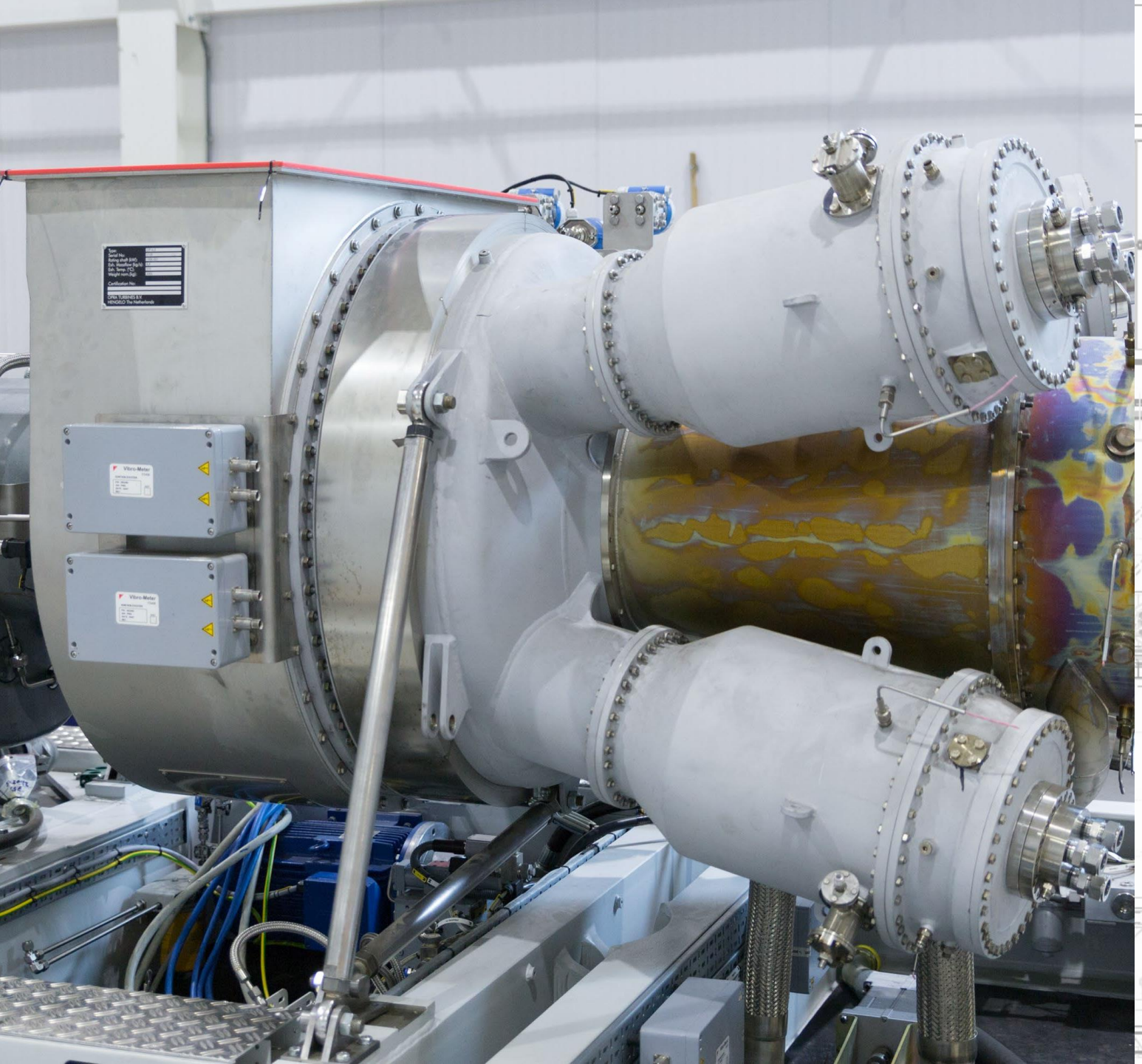
An Prexis-P18 Gas Turbine is being maintained by our qualified Field Service Technicians.

Prexis Turbines can provide the following different maintenance activities:

- ✓ Scheduled maintenance
- ✓ Unscheduled maintenance (Spare core engines)
- ✓ Major overhaul
- ✓ Gas turbine in-house testing
- ✓ Upgrades



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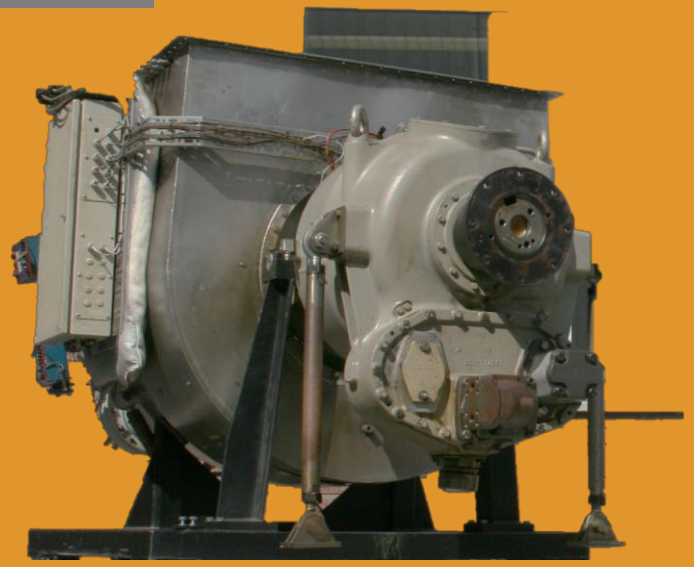
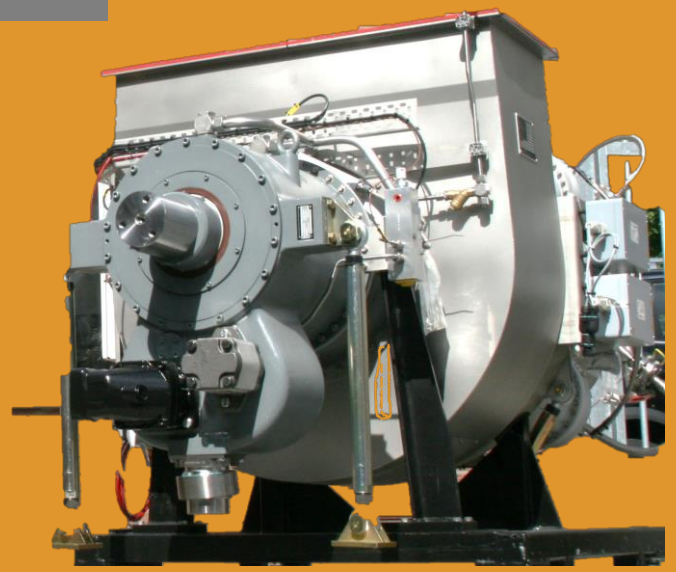
- ✓ The modular design of the Prexis-P18 gas turbine offers the opportunity to build spare core engines.
- ✓ A core engine is standard for each customer, no matter the configuration used.
- ✓ The use of spare core engines enables Prexis to quickly react on field issues and to replace an Prexis-P18 gas turbine quickly.

Before Overhaul



After Overhaul



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After 42,500 hours, the Prexis-P18 gas turbine must be overhauled

An overhaul consists of:

- ✓ In-bound testing
- ✓ Dis-assembly and inspection
- ✓ Cleaning and replacement of parts
- ✓ Rotor balancing
- ✓ Re-assembly of the gas turbine
- ✓ Gas turbine FAT

After an overhaul, the gas turbine can run for another 42,500 hours.

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Prexis Turbines has 2 test cells for testing the Prexis-P18 gas turbine.

All sorts of tests can be performed.

- ✓ Regular FAT (Factory Acceptance Test)
- ✓ In-bound testing in case of an overhaul
- ✓ In-bound testing in case of repair
- ✓ Research and Development testing
- ✓ Gas turbine performance is being measured and corrected to ISO conditions
- ✓ Testing ensures the quality of the gas turbine before it is being shipped to our customers

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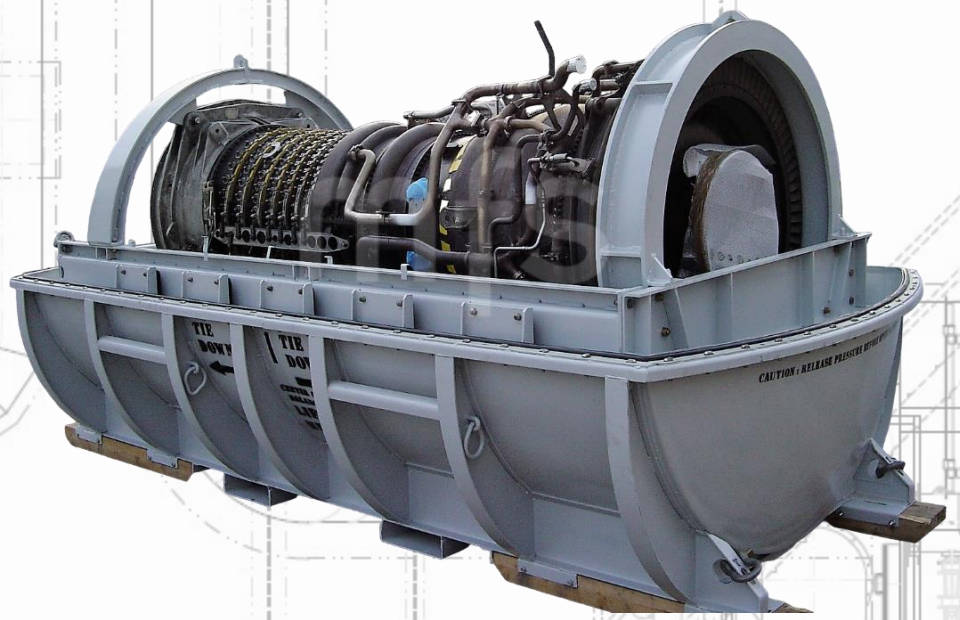

- ✓ Transportation of any gas turbine is a delicate operation.
- ✓ To protect the gas turbine from transportation, Prexis has designed a transportation container.

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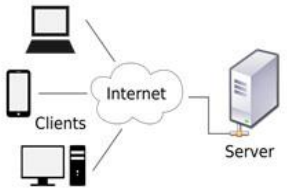
Prexis P18 Gas Turbine

Remote Monitoring Centre

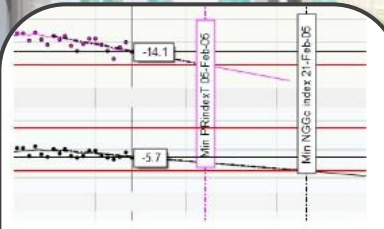
Data acquisition

- PLC data
- Vibrations
- Grid data
- Alarms / Events



Data transfer and storage

- VPN
- Firewalls
- Historical data server



Data analysis, Diagnostics and prognostics

- Surrogate model
- Adaptive monitoring

Predictive maintenance

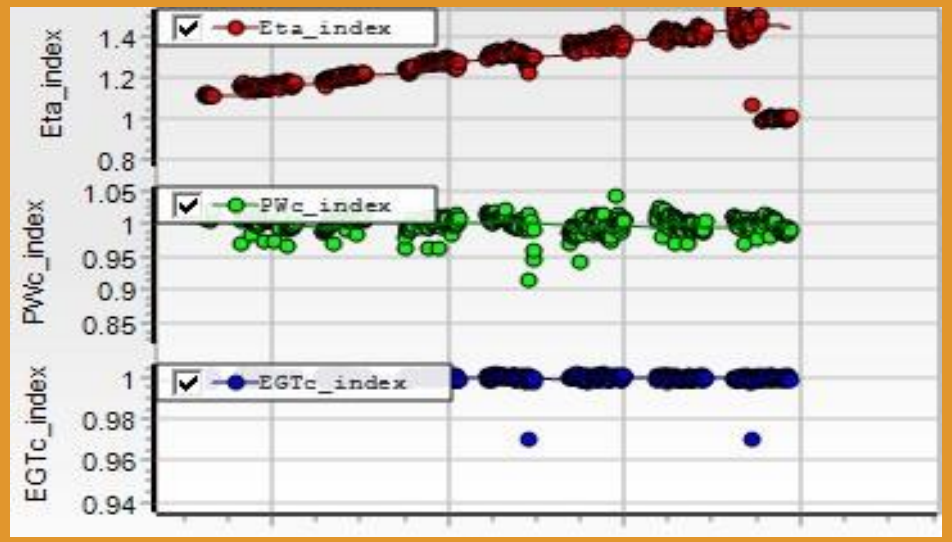
- Machine learning

Configuration of engine type: P18

Constants | Baselines / maps | Rulesets

Name	Description	Component	Maintenance type
Fuel flow sensor	Fuel flow sensor drift		Fuel flow sensor reset

Fieldname	Display label	Unit	Below	Above
PWc_index [-]	PWc_index	[-]	1.050	0.950
EGTc_index [-]	EGTc_index	[-]	1.005	0.995
Eta_index [-]	Eta_index	[-]	0.800	1.200



P181 (selected engine) | Fleet

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Type	Description / reason	Date time
Fuel flow sensor reset	Drifting fuel flow measurement	16-01-2024 18:54:57:000

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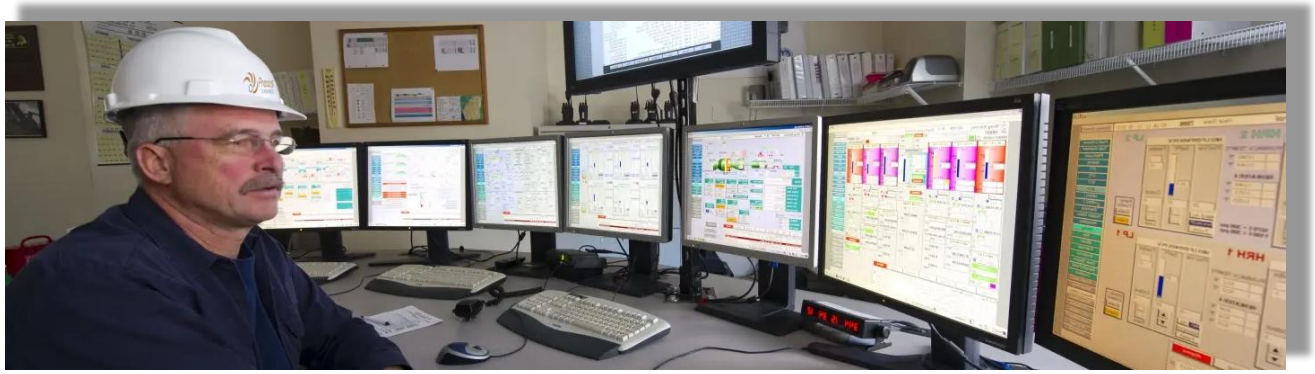
Case study 1:
Detecting faulty fuel flow measurement

- ✓ Constant power and EGT index trends and a deviation in thermal efficiency index characterize a faulty fuel flow measurement.

Trend of performance indices:

- ✓ Thermal efficiency, Power, Exhaust gas temperature.
- ✓ Upon detection, the maintenance calendar is automatically updated, adding the maintenance action of sensor replacement.



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Prexis as A Long-Term Service Partner

- ✓ Scheduled and unscheduled service
- ✓ 24/7 support
- ✓ Continuous equipment health monitoring
- ✓ Spare engines including 9m EUR of spare parts
- ✓ Testing capabilities for core engine overhaul and repair
- ✓ Upgrade potential on controls, combustion, emission technology

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ANY QUESTIONS ?