

An aerial photograph of a white wind turbine situated in a lush green forest. The turbine's three blades are visible, and the surrounding landscape is covered in dense trees. In the background, several high-voltage power lines and towers are visible against the forest. A road or path winds through the forest near the turbine. The overall scene is misty or foggy, with white clouds or fog partially obscuring the lower parts of the forest and the turbine's base.

ZF Wind Power

Wind farm O&M with digitalization



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10 Years in digitalization

26 Countries worked with customer & partners

5 Sectors with digitalization experience, focus on O&M

- Wind 
- Off-highway
- Machinery
- Postal
- Geospatial

ZF Group, 2021 overview



EUR 38.3 billion
sales



157,549
employees



EUR 3.1 billion
Research &
Development



EUR 1.9 billion
adjusted EBIT



5.0%
adjusted
EBIT margin



EUR 1.6 billion
investments in
property, plant,
and equipment

Powering 25% of installed geared wind power capacity

> 180 GW

Shipped



> 80,000 

Turbines with ZF gearboxes



> 1,000,000

Households per month that we convert to green energy

Full Coverage of Onshore and Offshore

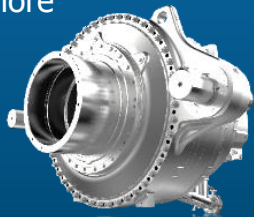
Grow through innovation

Customized designs

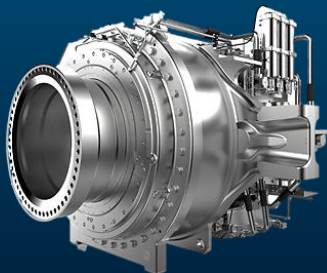
Modular platform concept

Modular powertrains 7 – 15+ MW

Onshore

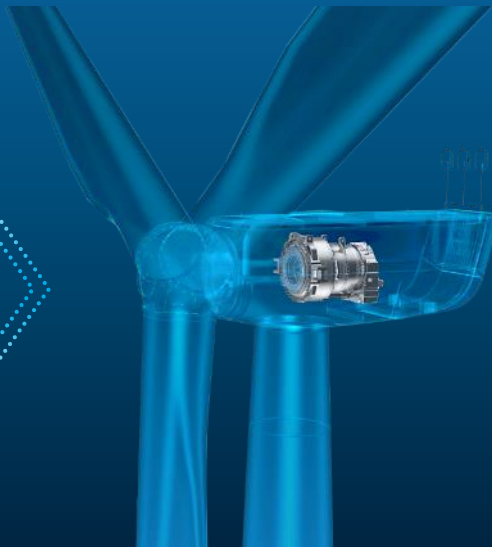


Offshore

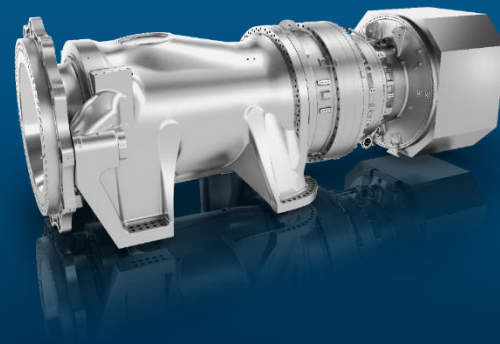


SH/FT

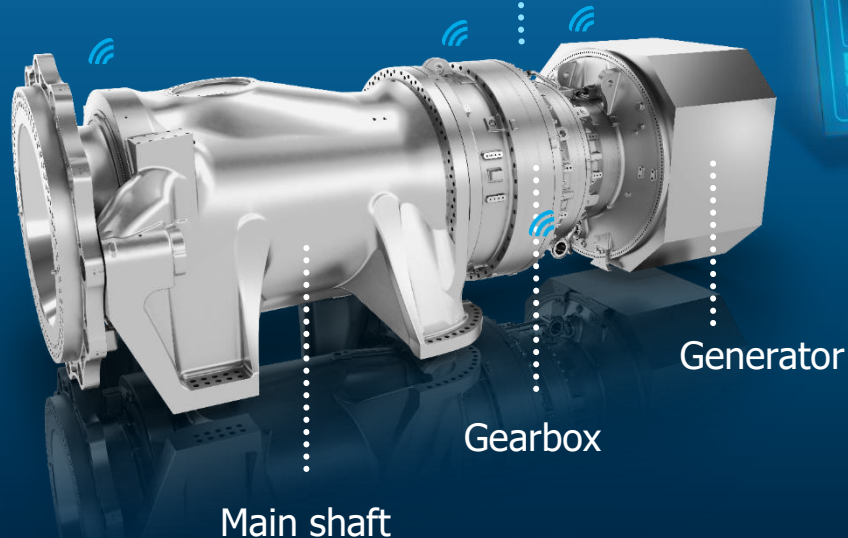
Onshore & Offshore



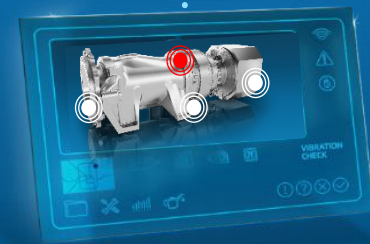
Onshore & Offshore



From gearbox to intelligent powertrains ...

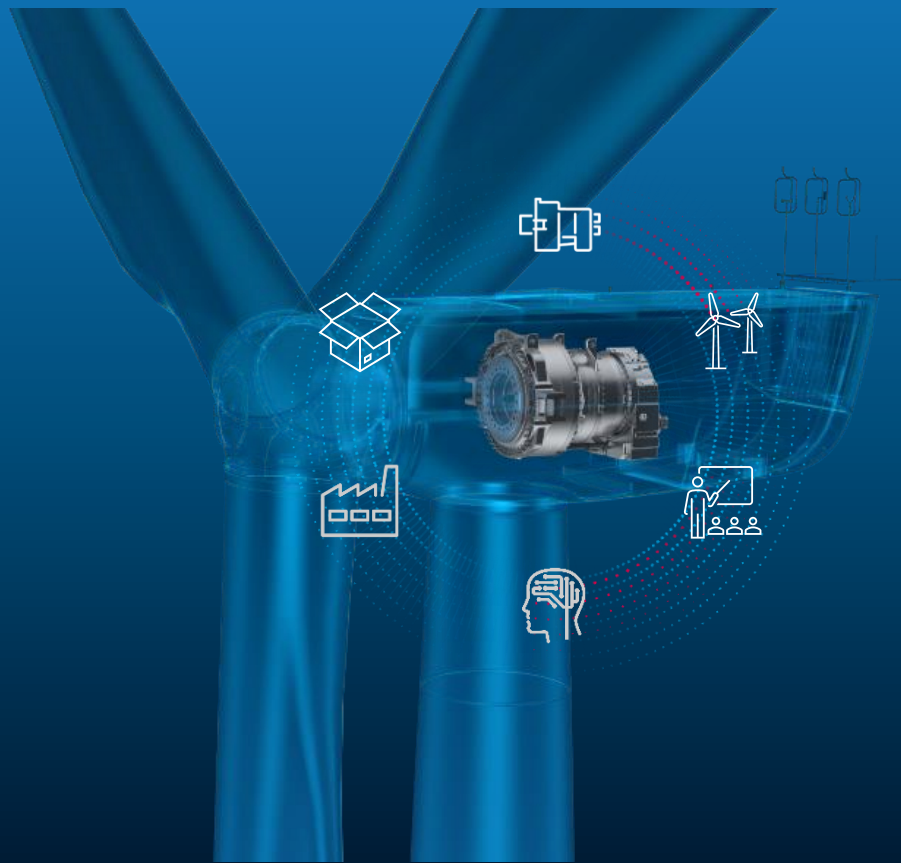


ZF Cloud



...to intelligent
powertrains

Thrive - Wind Power Service



Up-tower and On-site repairs

Replacement of kits & parts at site by field technicians



Workshop Repairs

Refurbishment of gearboxes



Replacement Units

Pool gearboxes (New + Reman.) at regional locations



Spare Parts Management

Kits & Spares for market



Partner training

Train customers tech. for up-tower repairs



Digital Offer

Services powered by Analytics

Reducing the cost of energy, using data

- Reduce CAPEX by reducing uncertainty in design factors
- Increase Power Output and Turbine Availability
- Enable Lifetime Extensions
- Reduce Operational Expenditures



Wind sector challenge

The gearbox is a critical wind turbine component.
Existing value chain is fragmented and reactive.
Failures of components lead to:

- Lost revenue
- High emergency repair costs
- Ultimately, an increase in **Levelized Cost of Energy**



A wind turbine is shown with a target graphic consisting of concentric circles in blue and red, centered on the nacelle. Dotted lines connect this target to the first two steps of the process flow.

Fault notification processing:

2 days

Fault inspection time:

1 week

Order the right components:

6 weeks

Plan & execute repairs:

2 weeks

Typical service intervention: 9 weeks

113.000€

Lost revenue for 3.5 MW turbine

Reducing the cost of energy, using data



Life Cycle Monitor
Performance Data
and SCADA Data



Gearbox Expertise
Failure modes
and solutions

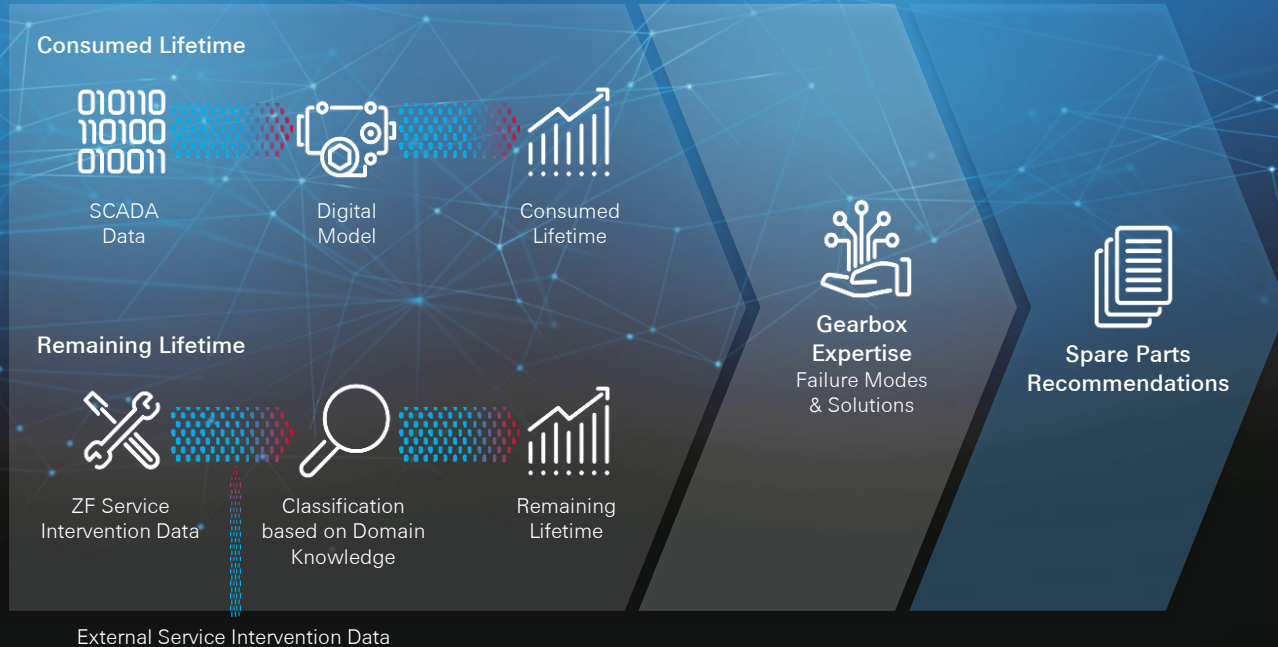


Life Cycle Analytics
Consumed and remaining
lifetime analytics



Digital Birth
Certificate
Design Models,
As-built Gearbox
Information

SPARE PARTS OPTIMIZATION



Demo SPOS Report: Overview

ZF Wind Power

Spare Parts Optimization Service report

2022-07-04

Report generation date

Wind Park Company Ltd.

Organization

Overview

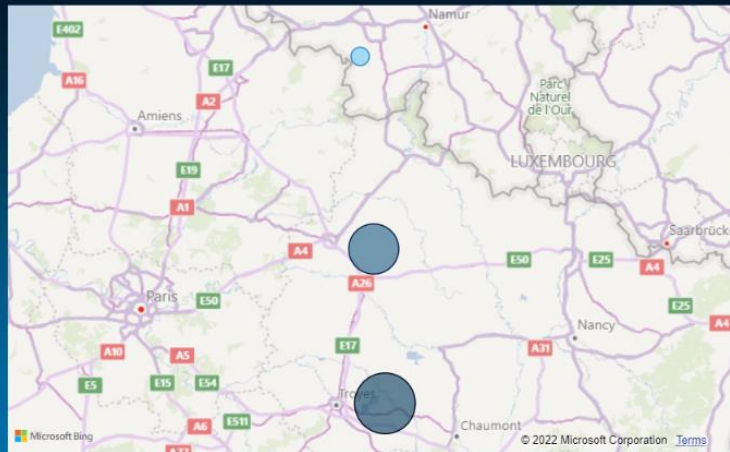
Spare parts recommendations

Consumed lifetime report

Turbine models overview

Type	Gearbox type	Power [MW]	Count
X V105	EF901	3.00	2
Y V90	EH751	2.30	8
Z V110	EF901	3.00	10

Wind park locations



Number of ZF gearbox types

EF901
12
EH751
8

3

Number of wind parks

20

Number of wind turbines

54.40

Total power output capacity [MW]



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Demo SPOS Report: Spare Parts Recommendation

ZF Wind Power

Spare Parts Optimization Service report

2022-07-04

Report generation date

Wind Park Company Ltd.

Organization

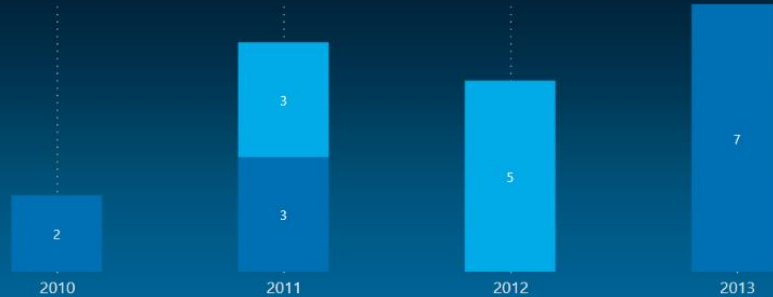
Overview

Spare parts recommendations

Consumed lifetime report

Gearboxes commissioned by year

● EF901 ● EH751



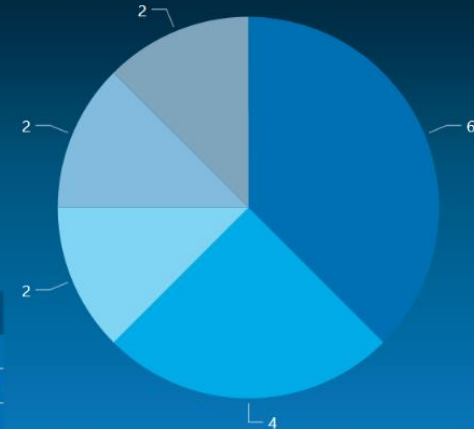
Gearbox type	Total count
EF901	12
EH751	8
Total	20

Solution	Required stock *
Motor 157-6008079	6
HI-IS preassembly kit K92-1A0KBE020	4
Gearbox EF901	2
Gearbox EH751	2
HSS preassembly kit K92-1A0KME008	2

* Required stock can be changed based on the service and maintenance

Spare parts demand in units per solution up to:

2029 (Year) + Q1/Q2 (Quarter) ▾



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Demo SPOS Report: Consumed Lifetime

ZF Wind Power

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Spare parts recommendations

Consumed lifetime report

Select gearbox types

Alle

Select forecasting period

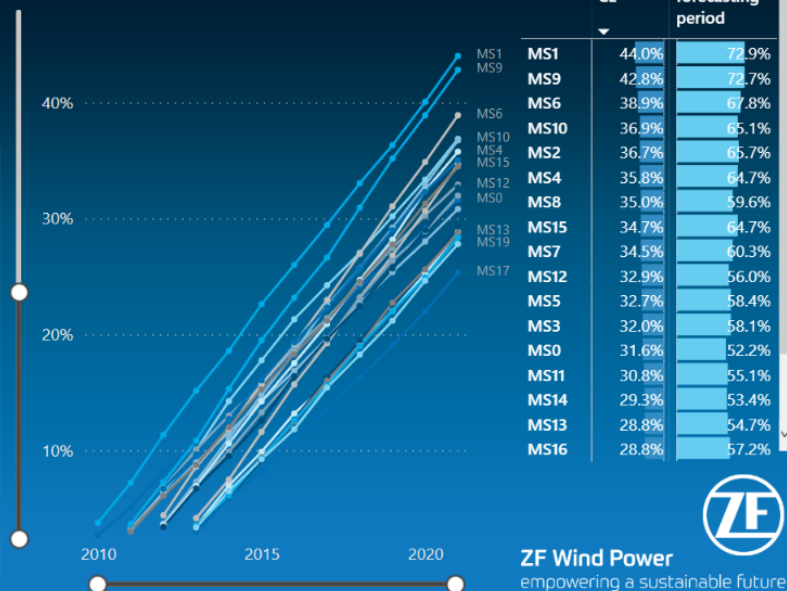
2022

2029

Consumed lifetime (CL) modes in population

Gearbox type	Component + mode	Max. current CL	Max. CL within forecasting period
EF901	EF901 BEARING HSS_RS Pitting	44.0%	72.9%
EH751	EH751 BEARING HSS_GS_out Pitting	42.8%	72.7%
EH751	EH751 GEAR LSS_planet Pitting	38.9%	67.8%
EF901	EF901 BEARING LSS_Car_RS Pitting	37.1%	63.6%
EF901	EF901 GEAR HSS_pinion Pitting	37.0%	61.6%
EF901	EF901 BEARING LSIS_RS Pitting	36.9%	65.1%
EH751	EH751 BEARING LSS_Car_RS Pitting	36.7%	65.7%
EF901	EF901 GEAR ISS_pinion Pitting	36.3%	61.9%
EF901	EF901 BEARING LSIS_GS_out Pitting	35.1%	57.7%
EF901	EF901 BEARING HSS_GS_out Pitting	34.7%	64.7%
EH751	EH751 BEARING LSIS_RS Pitting	34.2%	61.9%

Consumed lifetime (CL) per turbine



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SPARE PARTS OPTIMIZATION

A ZF Service powered by Analytics

- ✓ **Reduced downtime**
by having the right parts at the right time
- ✓ **Reduced costs**
by optimizing the stock levels
- ✓ **Improved convenience**
by having ZF service support
- ✓ **Improved transparency**
by having access to ZF domain knowledge



ZF Wind Power

empowering a sustainable future together

