Clean oil drives clean energy. Longer turbine life and lower O&M costs is a function of contamination control.

# Influence of Oil Cleanliness and Condition **Monitoring on Wind Turbine Reliability**

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## **Real-World Data & Results**



3 MW Wind Turbine Hydraulic Pitch System: Particle count results after adding a 3µm offline filter. An *improvement of 9 ISO Codes (ISO 4406) was observed* with real-time condition monitoring. Life Extension of 10x.



**1.5 MW Wind Turbine Gearbox:** Improving filtration by

#### Intro

Researchers at London's Imperial College showed that rolling element bearing life can be **increased up to** seven times using a 3µm filter. Gearbox and hydraulic component manufacturers recommend stringent oil cleanliness for longer life. However, most wind turbines do not meet these standards.

#### Methods

Using oil quality sensors and digital data transfer we can **trend** the level of oil contamination and **predict** the early onset of failure.

### Results



### Conclusions

Condition monitoring combined with finer filtration reduces wear and increases visibility into oil quality. Improving filtration in gearboxes and hydraulic systems advances reliability, extends service life, and slashes O&M costs.

adding a  $3\mu m$  offline filter removed >99% of the particles, reduced water content from 349 ppm to 40 ppm, and dropped the Iron content from 69 ppm to 1 ppm in 11 days.

Internationally recognized cleanliness targets for accepted life of equipment									
ISO 4406 Cleanliness Level Code									
	15/12/9	16/14/11	17/15/11	18/16/13	19/17/14	20/18/15	21/19/16	22/20/17	
Engine Lube Oils	Life Extensi		on 1%		wt	vt Caution Dirty –		Reduced Life	
	121								
Hydraulic Fluids	Life Extension		Normal		Caution	Dirty – Reduced Life			
Gear Reductions	Life Extensi		on N		mal Caution		Dirty – Reduced Life		
	- 1/20								
Rolling Element	Life Extension		Normal Caution		Dirty – Reduced Life				
Bearings									
Section in	- 150								
Turbine Oil	Life Extension		No	rmal	Caution	Dirty – Reduced Life			
Journal Bearings									
	100 ( S. )					31.134			
Diesel	Life Extension		Normal		Caution	Dirty – Reduced Life			

Acknowledgements: KEW Engineering Ltd. References: "The Influence of Filtration on Rolling Element Bearing Life" R. Bhachu, R. Sayles, and P.B. Macpherson

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#### Download the *Clean Oil Guide* here:





