

CMS in Wind From Big to Smart Data's



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Agenda

1. SKF / CMS / Remote Monit.

2. Turbine adjustment / Fleet Analysis

3. Fleet Comparison

5. Conclusion

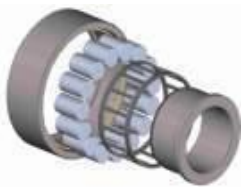
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SKF / CMS / Remote Monit.

SKF – Key figures

Established:	1907
Sales 2011:	SEK 66,575 million
Employees:	46,775
Production sites:	around 130 in 32 countries
SKF presence:	in over 130 countries
Distributors/dealers:	15,000 locations
Global certificates:	ISO 14001 OHSAS 18001 certification

SKF market launches towards Wind Energy



New CRB-design with extra-high carrying capacity (2006) + new (2010) separable version



Remote monitoring & failure analysis of wind farms (2007)

New high endurance slewing bearing design for active windturbine pitch applications (2012)



CMS - WindCon 3.0 for early detection of mechanical failures (2008)



Nautilus range extension with a range of additional customized features (2012)



Wind-gearbox refurbishment kits (2011)



Black-oxidized gearbox bearings for improved run-in performance (2010)



Automatic centralized lubrication for reduced maintenance costs (2007)



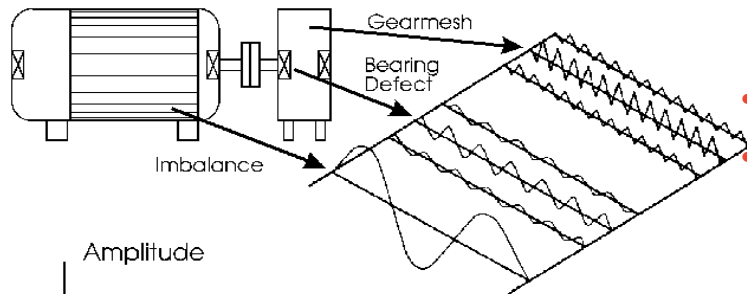
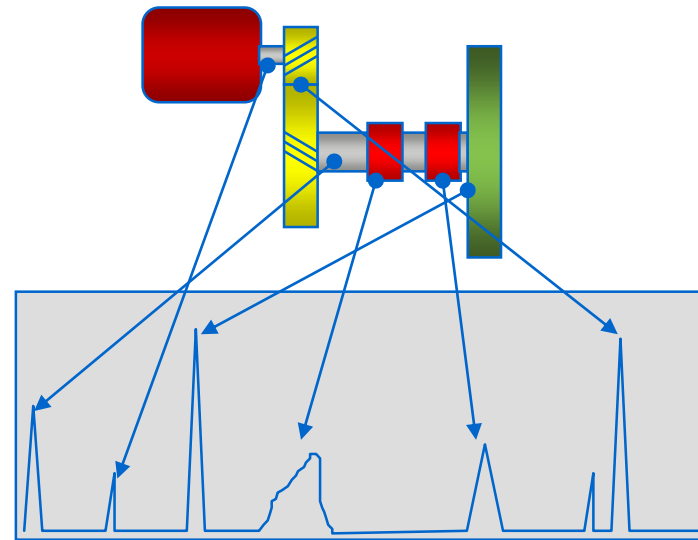
Reinforced rubber sealing solutions for windturbines (2011)

XL Hybrid bearings with ceramic balls for superior insulation of wind-generators (2007)

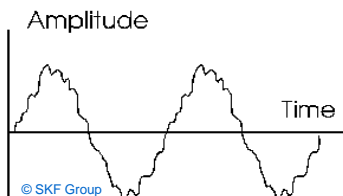


Preliminary: Condition Monitoring using Vibration measurements

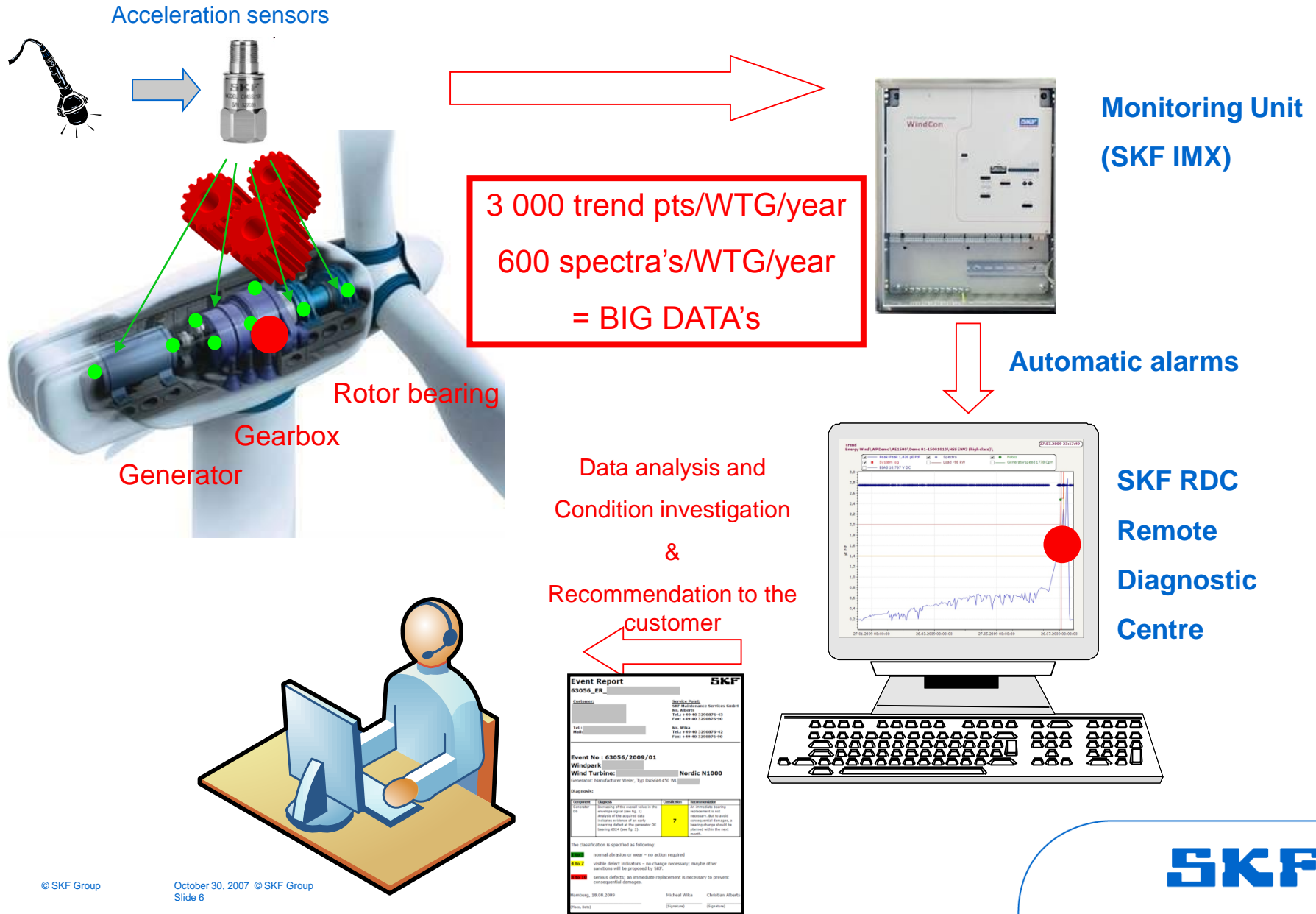
- Bearing is the heart of any rotating machinery.
- Bearing failure – “Root cause of unplanned breakdown”
- Machine vibration is the parameter that gives the best overall measure of the condition to rotating machines



- Vibration Amplitude indicates the Severity of the problem.
- Vibration Frequency indicates the Source of the problem.



Vibration Monitoring on wind turbines








CMS / RDC contracts / Turbines Refs. / Global Presence

Approx 4 000 CMS sold since 2005

Approx 2 000 of them are monitored by SKF

> 40 WTG types from 15 OEM's

Manufacturer	Model	Number	Manufacturer	Model	Number
	G47	12		MD77	63
	G58	9		MM70	4
	G90	15		MM82	129
	1.5sl & 1.5s	232		MM92	120
				5M/6M	52/36
	V42, V52	1	Frisia	68/750	1
	V44	5	NEG-Micon	64c/1500	10
	V47	5		52/900	1
	V66	66	Nordtank	500/37	1
	V80	75	Tacke	1.5s	1
	V90 2M 3M	>500	Clipperwind	2.5	1
SIEMENS	1.3MW	75		N60	19
Ingetur	1.5MW	1		N100	29
				N117	100
IMPSA	2MW	1	Mitsubishi	MHI 1.0	49



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Turbine adjustment / Fleet Analysis

Work process – SL = Service Level

1. Adjusting phase

SLO (3 month)

Data collecting 2MB/day/WTG

Individual alarm setting /early warning
„as low as possible and as high as necessary“

Evaluation of status
„check spectra’s“

comparison of machines

Adjusted system

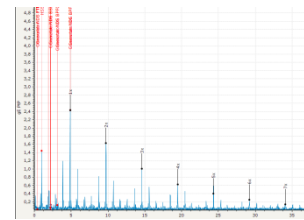
2. Condition monitoring

SL1

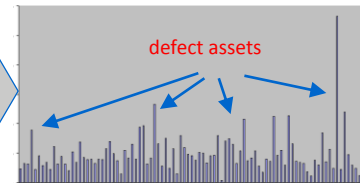
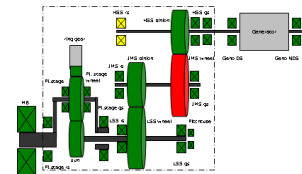
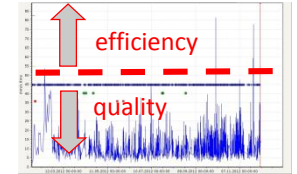
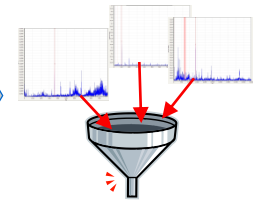
1. Alarming as a trigger event



2. Analysis



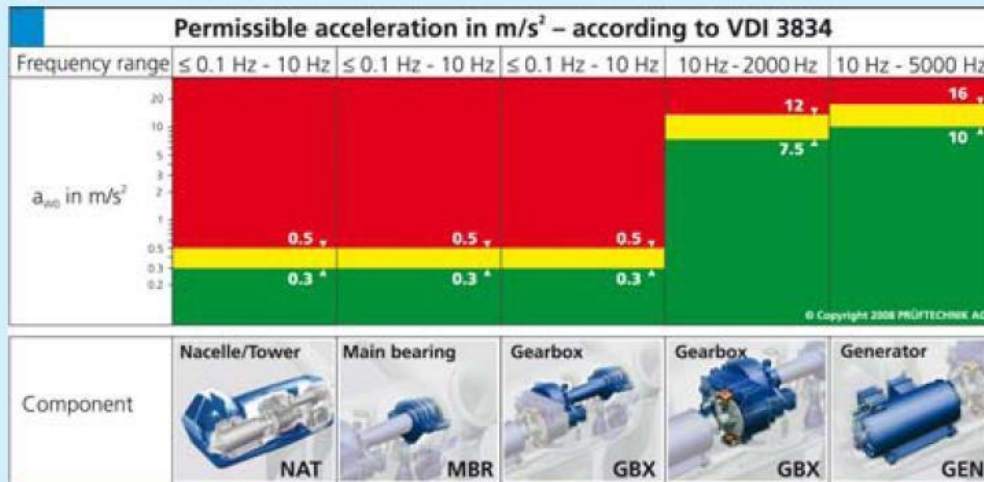
3. Reporting



WT 1

WT 92

Basic of fleet comparison

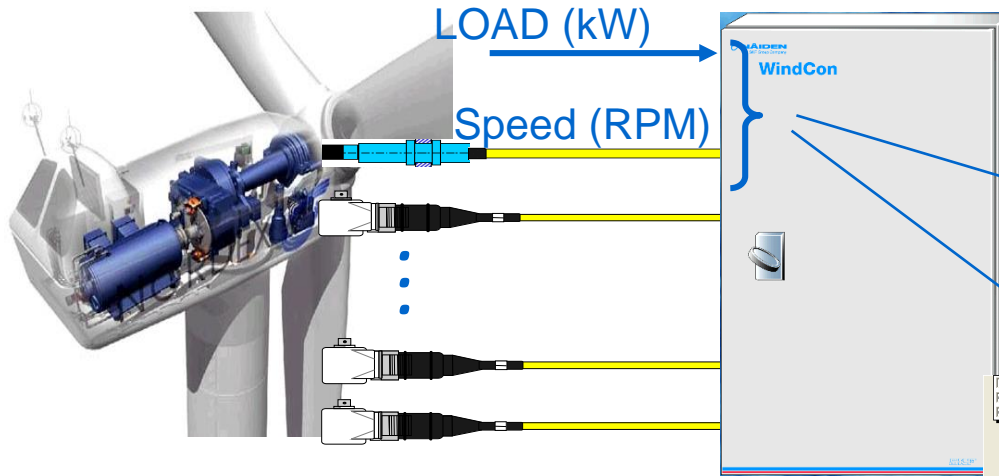


Permissible evaluation accelerations

VDI 3834 acceleration
alarm for wind turbine application

1. Identical machines
2. Identical components
3. Sensor positions
4. Same Parameter
5. Age
6. Location

Technology: Active Range - Always measure in same conditions for efficient trend Data comparison



Measurement Range(s) :
1 or 2 load classes

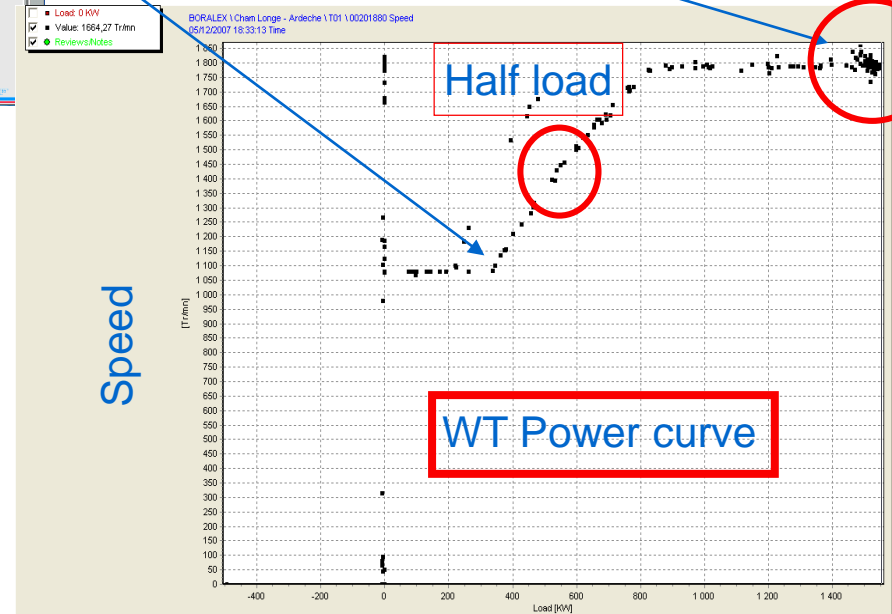
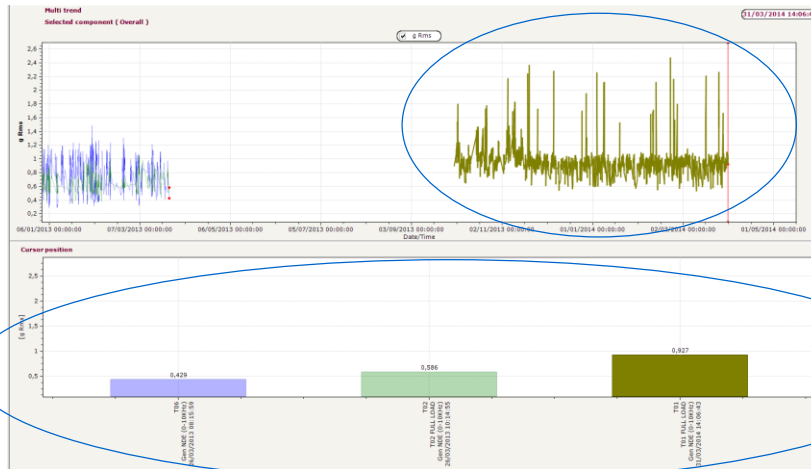
Full load

Half load

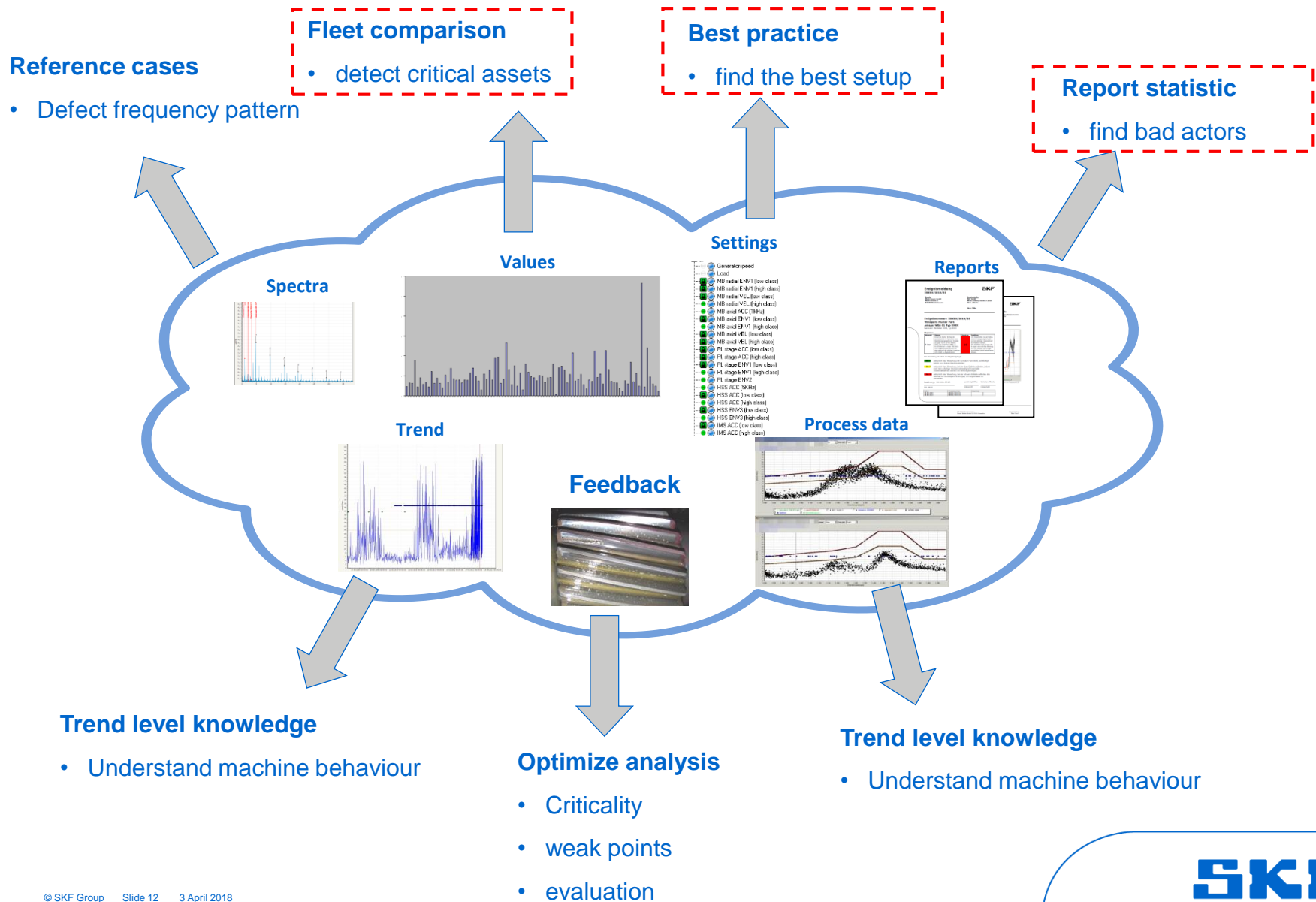
Speed

WT Power curve

Load



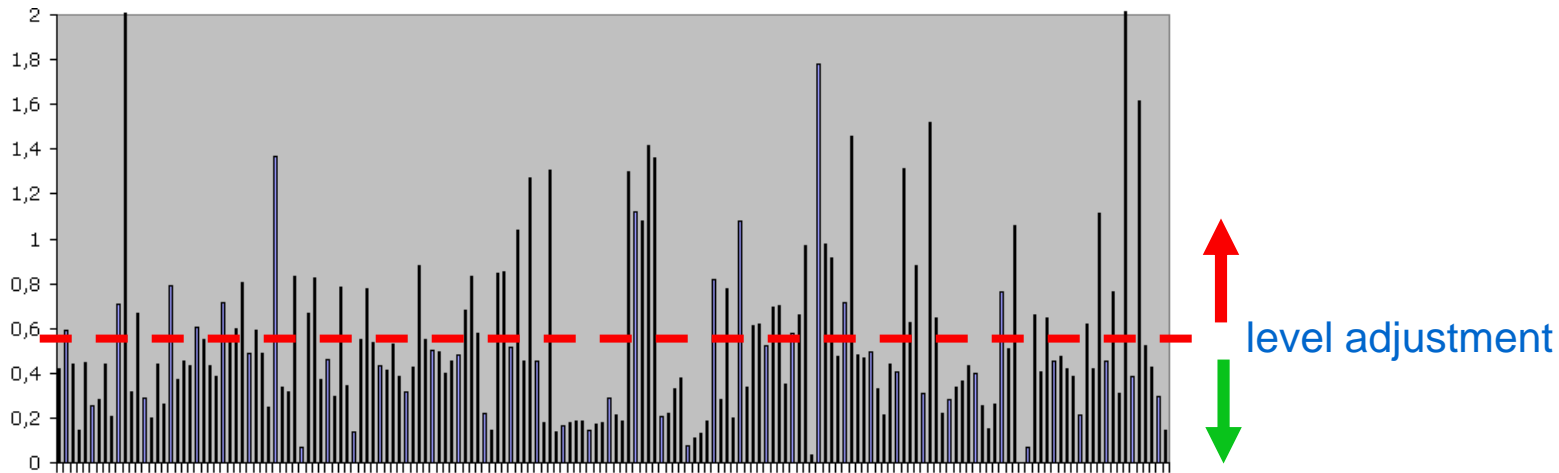
What does „fleet analysis“ mean ?



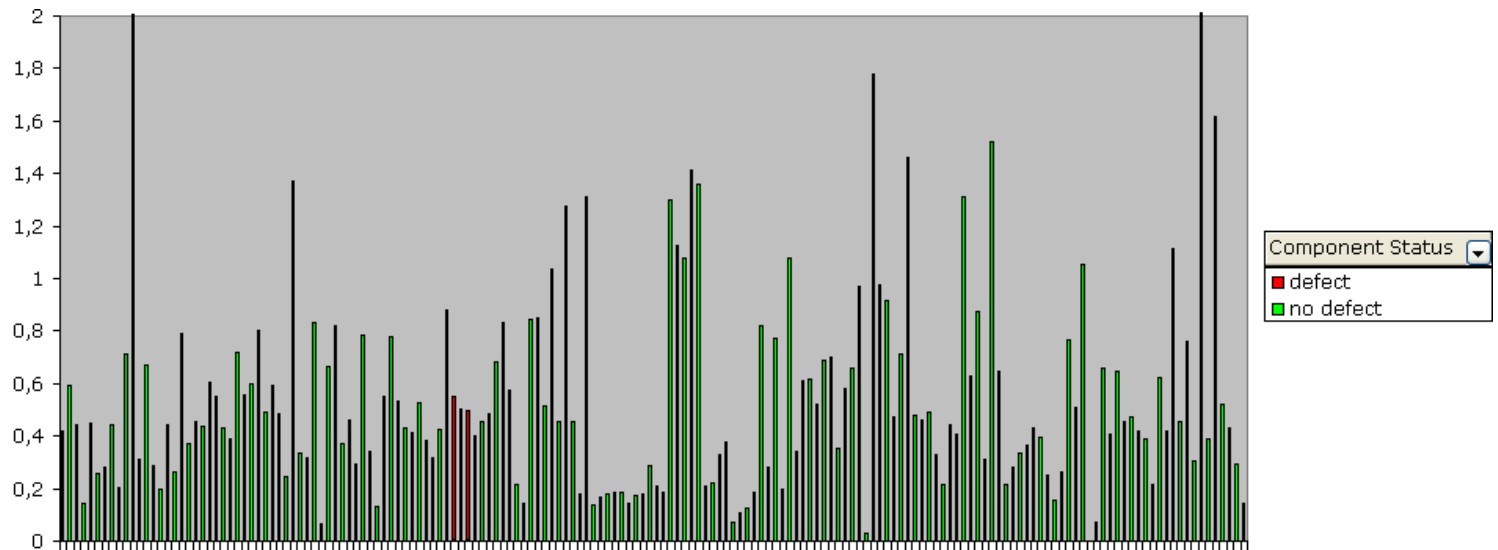
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Fleet comparison

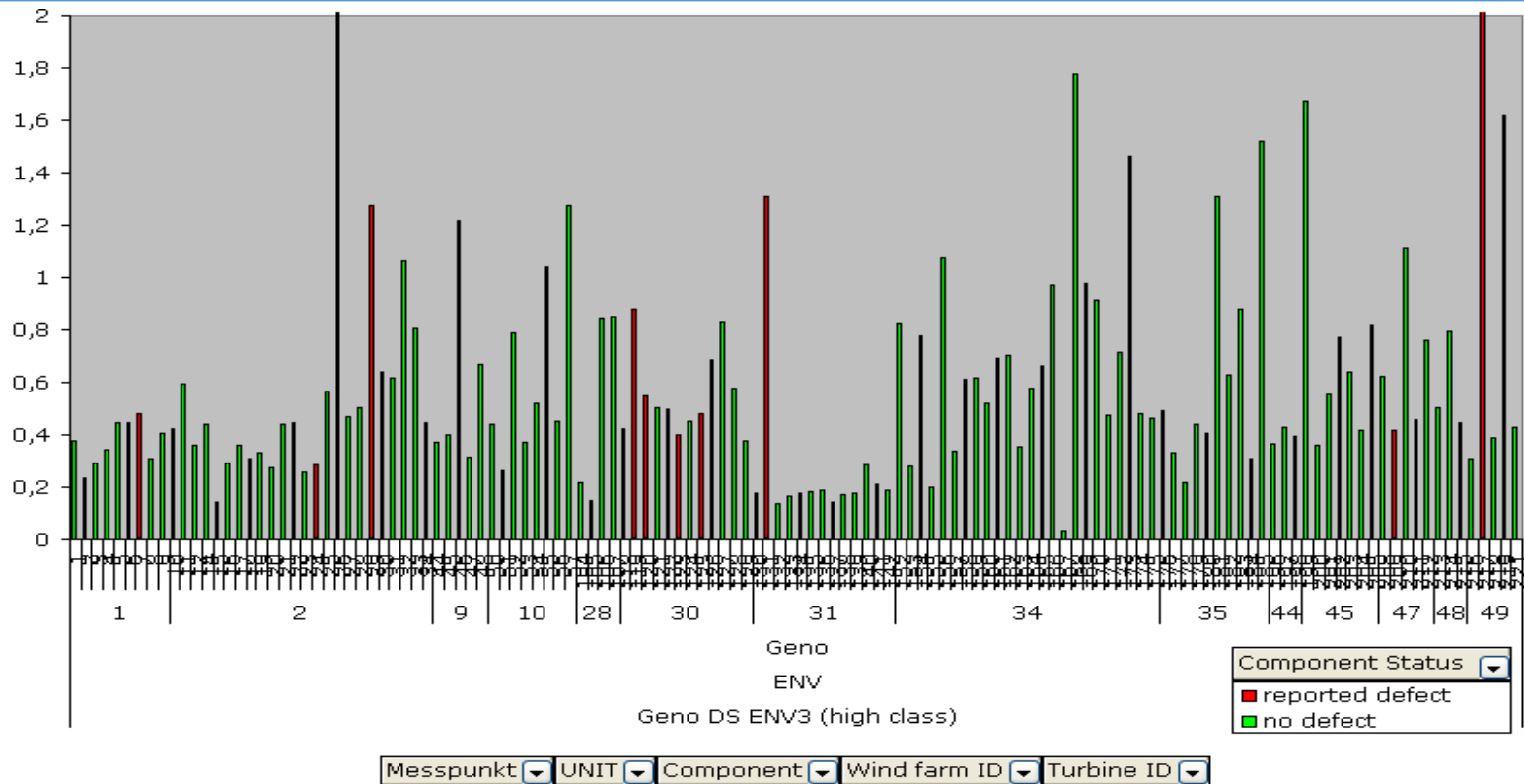
Comparison of Measurement Data



absolute values of the total pool of wind turbines



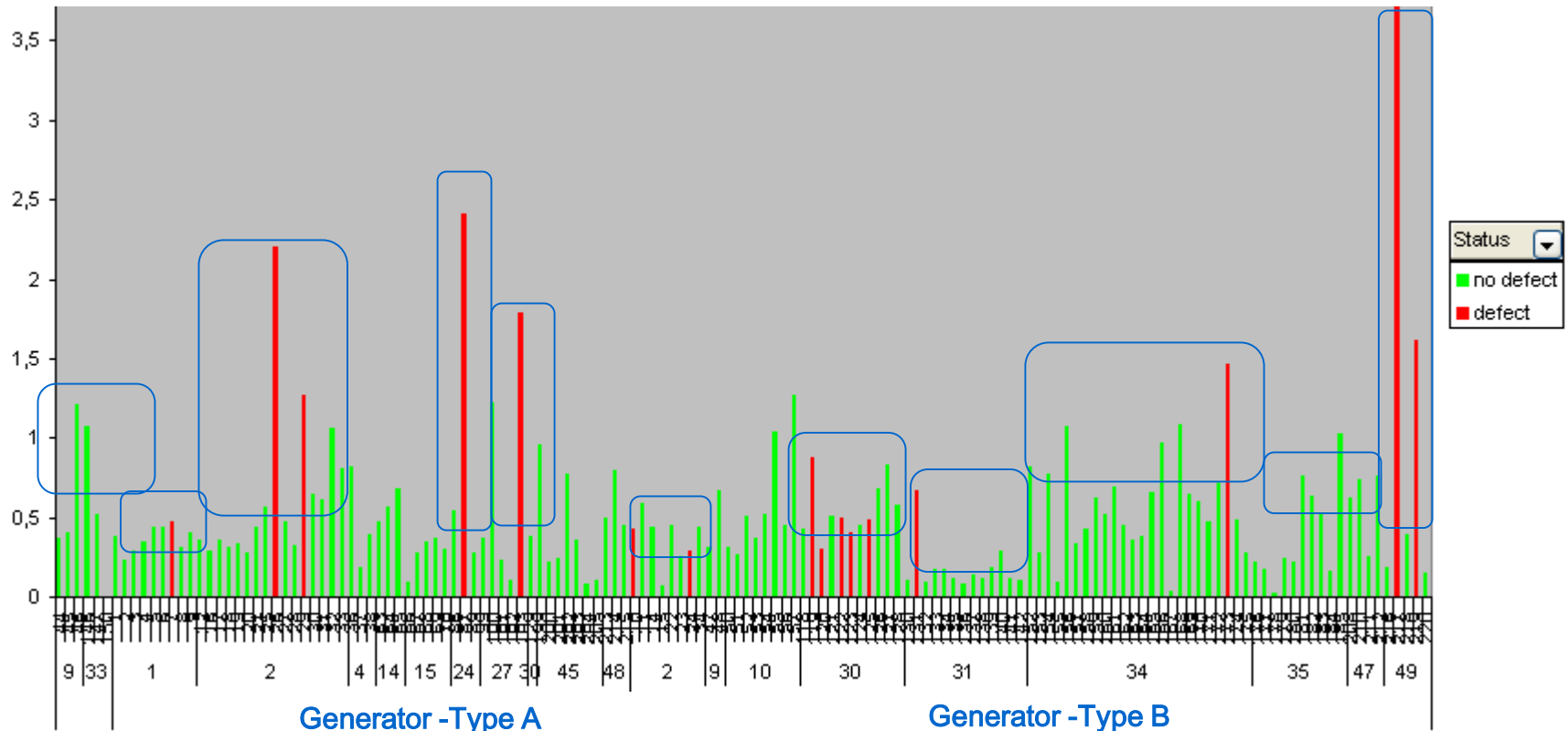
Selection of trend data



Filter parameter

- Machine
- Sensor position
- Measurement parameter

Filtering and Correction of the Pool



Influence factors:

- local influences (different wind farms)
- statistical selection
 - elimination of known defects
 - Correctness factors

Result = Decision guidance

5

Conclusion

From Big to Smart Data's

- Ensure to take measurements in comparable conditons
- Classify following criteria's of comparison
- Fleet comparison
- In depth analysis on suspicious cases
- Allows a better Detection rate + work efficiency

Questions ?

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