PRÜFTECHNIK

Machinery Service

APPLICATION

Online condition monitoring of hydro turbines

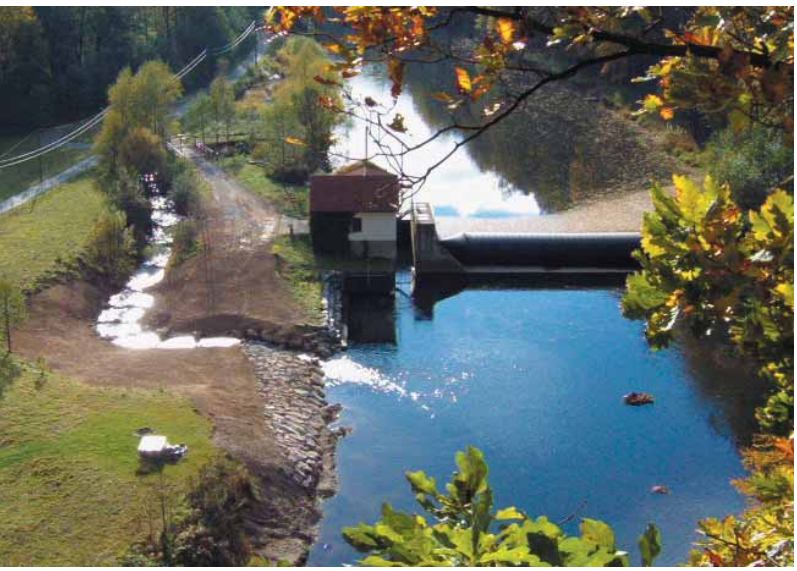
Increased system availability

Predictive maintenance

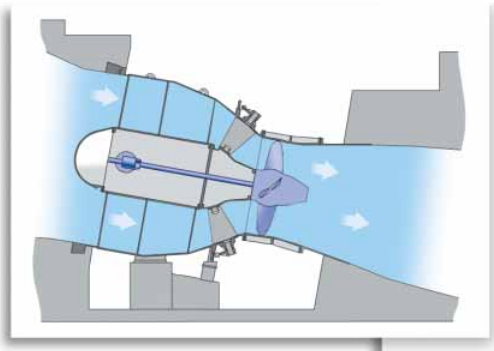
Service concepts with remote monitoring

Innovative solutions for
- Manufacturing
- Quality assurance
- Commissioning
- Process assurance
- Increased availability
- Service concepts

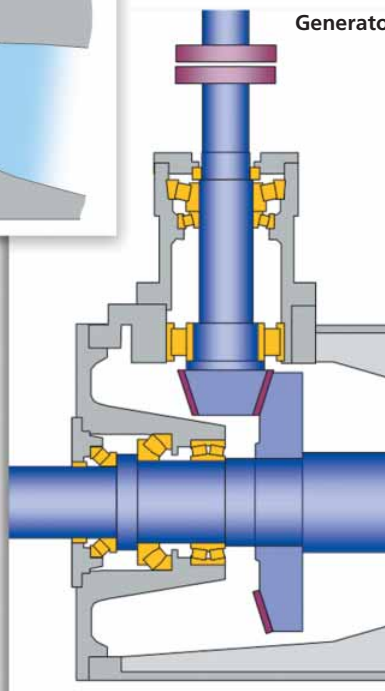
Process assurance and the increase of availab



Hydroturbine at the Zschopau River in the Erzgebirge region



Interior configuration of a double-regulated Kaplan A turbine with a gearbox, adjustable guide vanes, and a turbine wheel with adjustable blades.



Top view

As the prices of fossil fuels rise, hydroelectric power is gaining in importance as an alternative energy source. Therefore, hydropower is being actively promoted in Germany. Since late 2005, operators of hydropower plants that comply with the current environmental regulations for water protection are being rewarded with high prices for current fed into the national power grid. Thus, downtimes in electricity production are now costlier than ever before.

Example in Germany

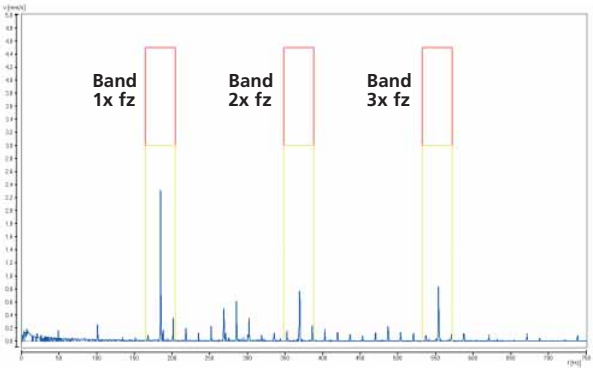
Hydroturbine power	500 kW
Feed-in remuneration	0.0967 ÈUR/kWh
Downtime costs per day	1160.40 EUR

Maintenance costs are of crucial importance for the profitability of hydroturbines. Financing is usually calculated over a time span of 25 years. Turbines and generators are generally designed to operate without significant failures over a similar period. Profitability decreases radically if early failures with consequential damage occur or components must be changed before the end of their service life has been reached.

Condition monitoring helps avoid machinery downtime and allows the use of components to the end of their expected service life. For small hydroturbines with roller bearings - as shown here - VIBNODE® is a practical and cost-effective online monitoring solution.

OMNITREND® PC software

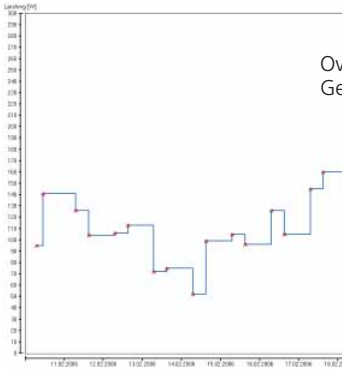
This visualization software stores all machine condition data and provides a clear display of the acquired information.



Monitoring bands of a gear mesh

Level 1 - Monitoring ov

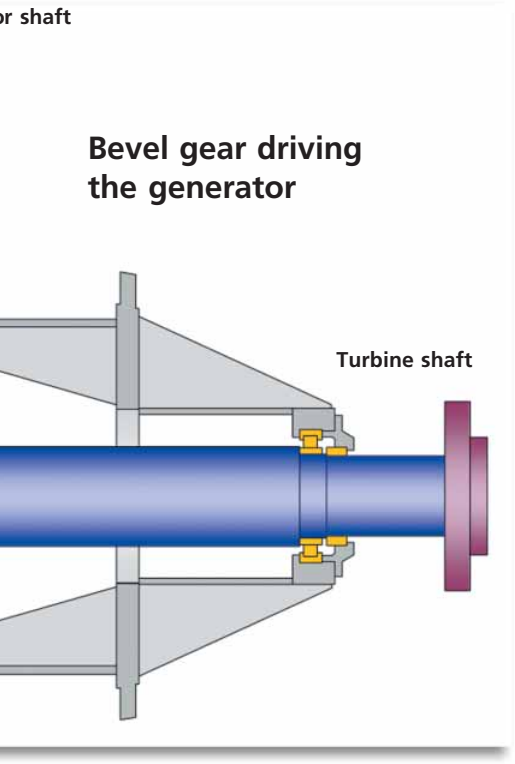
Vibration value trends can be
itored using process paran
When values exceed
thresholds, the system activa

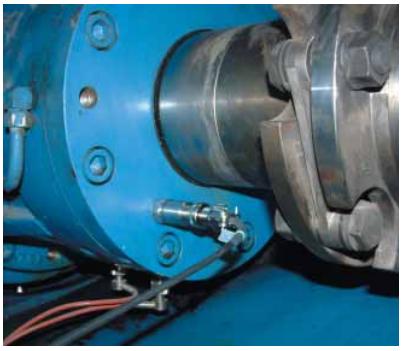


The overall value trend of the gear

bility of hydro turbines

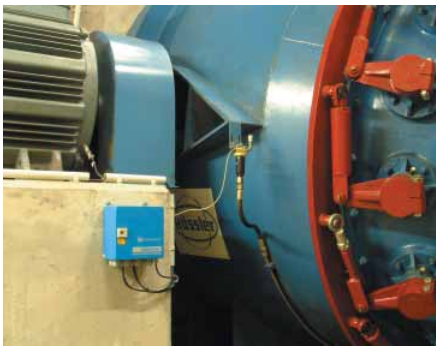
Reliable monitoring with the VIBNODE® online monitoring system





Vibration sensor on drive shaft

Sensors detect the following signals:
- Vibration in turbine shaft
- Vibration in output shaft
- Vibration in generator, DE
- Vibration in generator, NDE
- Guide vane blade position
- Impeller blade position
- Power
- RPM



VIBNODE® online monitoring

The conditions of components such as
- Turbine bearings
- Gear teeth
- Generator bearings

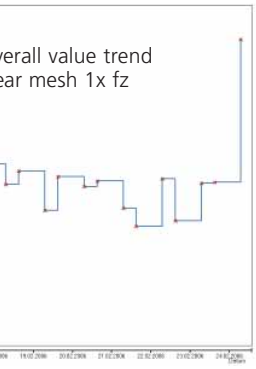
can be monitored by observing the specific fault and pass frequencies in a narrow frequency band. Information about the condition of the turbine is automatically transmitted to an operator or service partner by eMail.

verall values

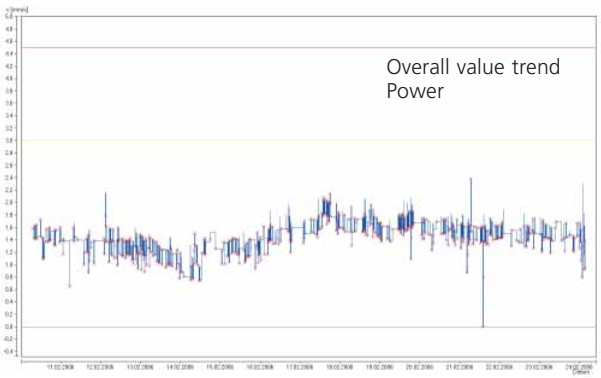
e mon- alarm. Machine condition forecasts
meters. can be made based on the increase
certain in the trend curve.
ates an

Level 2 -
Analysis & diagnostics

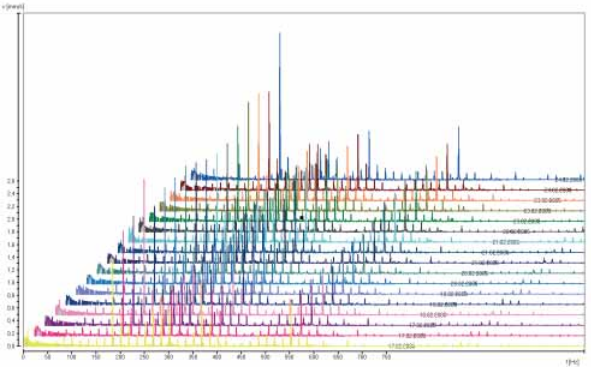
The causes for the deterioration of a machine's condition can be identified with the aid of in-depth diagnosis. This allows condition-based and cost-effective maintenance planning.



r mesh is still stable, ...



... the relationship between the gear mesh amplitudes and turbine power is clearly visible.



Based on fault frequencies and amplitudes, the causes and the severity of a failure can be determined in a 3D waterfall diagram.

PRÜFTECHNIK

Machinery Service

Profit from the **benefits** of our

proven measurement systems –

and from the **extensive experience**

of our **worldwide** PRÜFTECHNIK

Machinery Service!

Online + offline machine monitoring and diagnosis

Troubleshooting – Videoscopy, torque measurement

Measuring roller parallelism

Training, consulting and engineering

Mobile measurements
Diagnosis + troubleshooting service

Temporary and telediagnosis service

Visit us at www.pruftechnik.com

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Productive maintenance technology