



TCM[®] Turbine Condition Monitoring



Relax.
With our TCM[®] technology,
you'll save more than ever

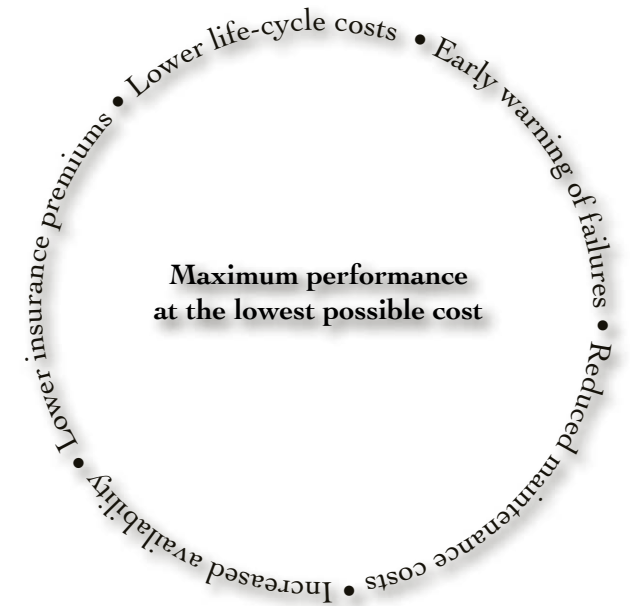
No matter what the installation – retrofit, built-in, land-based or offshore – our TCM[®] solutions will enhance the performance of your assets. Discover how TCM[®] can maximize the reliability and profitability of your wind turbine assets by keeping downtime to a minimum.

In an industry that requires maximum uptime to generate profitability, it's easy to see how downtime can mean the difference between success and failure.

Turbulent wind conditions subject turbines to damaging structural vibration levels and peak load stresses on drive trains, gearboxes and generators. If left unchecked for extended periods of time, it can lead to severe equipment failures that could have been prevented.

Typical cost of unplanned downtime

According to a study of more than 1000 wind turbines conducted by the German University ISET, unplanned downtime events – such as a gearbox and generator failures – cause an average of nearly 12



days of downtime every year. TCM® can reduce this downtime significantly. And that's just the tip of the iceberg. TCM® also cuts the cost of repairs and lost production associated with equipment failures. It is easy to see how this unique turbine condition monitoring system is cutting costs and increasing revenues for customers.

The TCM® Solution: Return on Investment (ROI)
The Gram & Juhl TCM® (Turbine Condition Monitoring) Solution has helped customers increase productivity and profitability by monitoring wind turbines for early signs of impending failure.

TCM® solutions increase your overall knowledge of asset condition and allow you to pro-actively schedule

downtime, labor and materials based on your equipment's health. Experience shows that a predictive maintenance program can positively impact overall equipment effectiveness:

- Improve uptime and availability
- Reduce unplanned downtime and planned downtime duration
- Maximize reliability
- Improve design

The Gram & Juhl TCM® family of solutions gives you the information needed to make intelligent decisions to optimize uptime, cut maintenance and warranty costs and quickly realize return on your investment.



Our TCM® Data Center solution can be used for 24/7 monitoring.

We know wind turbines And what it takes to protect them

A successful wind turbine monitoring solution is a well-integrated solution



Siemens chief designer
Henrik Stiesdal:
"The TCM® system has
long ago paid itself back"

Gram & Juhl's TCM® Machine Condition Monitoring and Structural Vibration Monitoring SVM solutions maximize turbine asset performance and help keep total cost of ownership as low as possible.

Gram & Juhl is an industry leader in wind turbine condition monitoring solutions. By integrating your wind turbine assets, we can help you implement and configure a system that allows you to control the health of your wind turbines and reduce your total cost of ownership.

Whether built-in or retrofit, stall or variable speed, big or small, land-based or offshore solutions work because we understand the unique stresses and failures that can affect wind turbines.

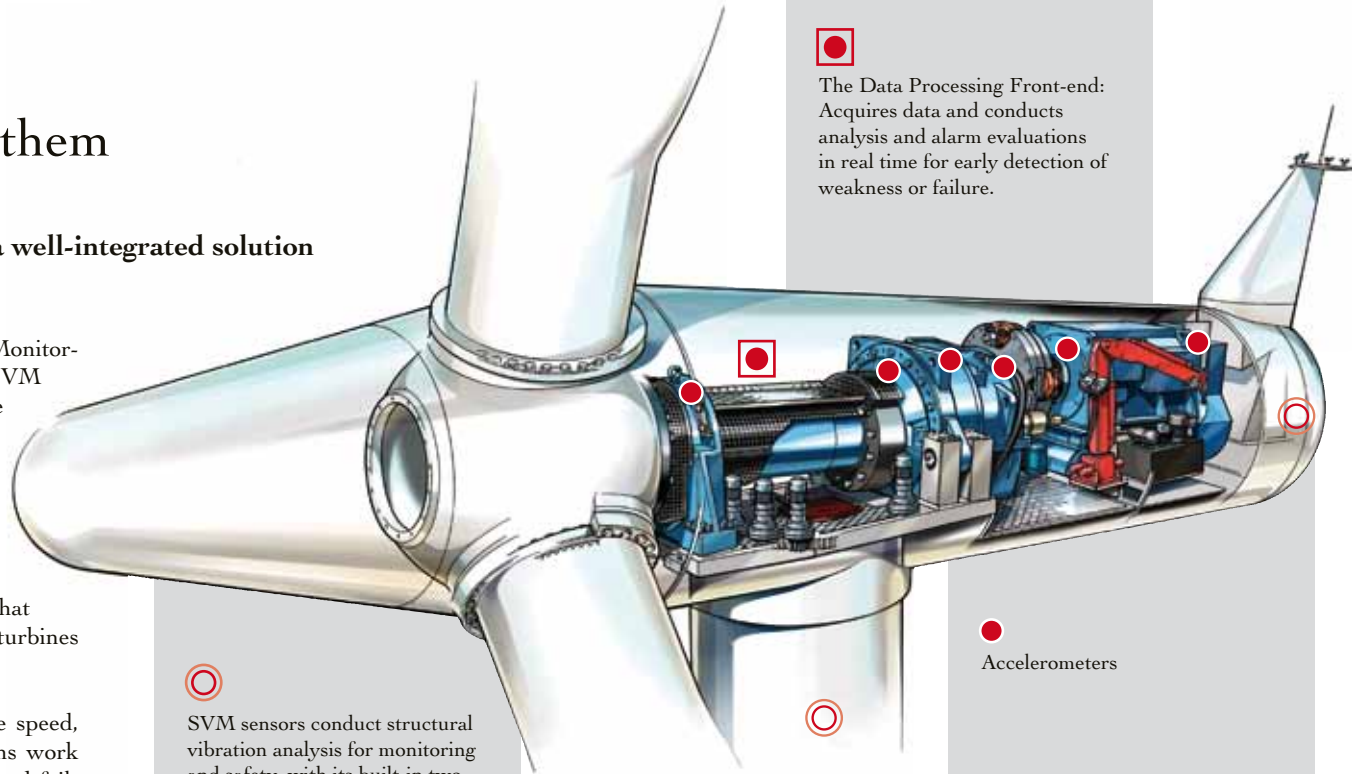
Continuous TCM® monitoring and protection

The M-System, which is mounted in the nacelle of the wind turbine, acquires data from the sensors for on-line analysis and alarm evaluation, while the TCM® Server stores the data and handles alarm monitoring and notification, post data-processing, report generation and backup.

With our GL certification, in many cases we can even help lower your insurance premiums.



Germanischer Lloyd
WindEnergie



The Data Processing Front-end:
Acquires data and conducts
analysis and alarm evaluations
in real time for early detection of
weakness or failure.



Accelerometers



SVM sensors conduct structural vibration analysis for monitoring and safety with its built-in two-axial accelerometer. It includes 4 non-stop vibration guards to assure the fastest response time possible.





Reduce downtime significantly !

Implementing TCM[®] means predictive maintenance – and predictable costs!

Lets face it. When a small bearing failure can lead to a gearbox failure that costs over a US \$100,000 to repair, it makes good sense to protect your wind turbine investment. Clearly, failures like these are going to have a dramatic impact on your company's profit margin.

Experience shows that customers can reduce downtime for monitored components of the turbine very significantly by implementing TCM[®]. But perhaps the biggest advantage is the way it allows customers to benefit from a maintenance program that identifies early signs of impending weaknesses or failures.

How much can your company save by adopting a Gram & Juhl TCM[®] system?

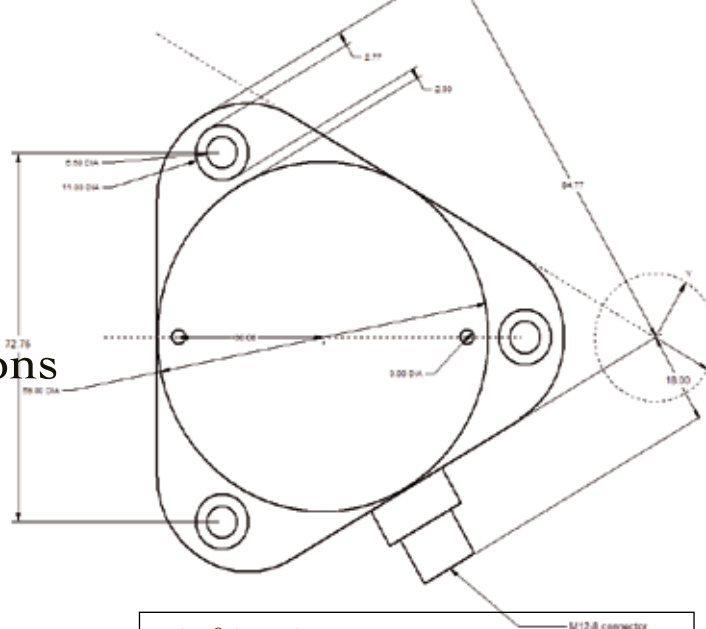
That, of course, depends on the specifications of your wind park. But even when using the most conservative estimates, most customers can expect an ROI rate better than 50%!



Calculate your Return on Investment Online. Now!

Go to www.gramjuhl.dk/roi
Take 5 minutes to calculate your TCM[®] ROI!

Gram & Juhl solutions



The ease and convenience of it all

TCM[®] is a permanent condition monitoring system for wind turbines. It can be configured to monitor stand-alone turbines or thousands of turbines located continents apart using an online monitoring operator interface. You can configure and monitor hundreds of turbines on a template basis, and alarm settings can be automated along with many other easy-to-use features.

Open communications

We make it easy to integrate TCM[®] into your existing operations, with customized installation, hands-on training and certification.

All M-Systems in the turbines are linked to a TCM[®] Server in a control room or to the TCM[®] Data Center, depending on the solution you choose. TCM[®] will integrate easily into your existing network. All communications are based on TCP/IP using the http protocol to pull data to the TCM[®]-Server. Data are available from a SQL database so you can easily access your data with third party programs.

Industry leading performance

The TCM[®] solution offers unrivalled performance in the industry. Its unique advanced performance and durability has been proven and utilized by major wind turbine manufacturers for years.

TCM[®] SVM Sensor

The DAM-XY sensor: A two axial DC-coupled accelerometer, signal conditioning unit, computational unit (DSP) and a communication interface, all integrated into a stainless steel housing.

The DAM-LMU sensor: As the DAM-XY but with inbuilt features to act as a overspeed safety device.

TCM[®] Accelerometer

The GJ1200M8 accelerometer: A single axis accelerometer with constant current interface in a stainless steel housing with a service friendly industry standard M12 connector and M8 stud for easy mounting.

TCM[®] Data Processing Front-end

The M-System: Continuous Data Acquisition, analysis and alarm evaluation capabilities. Up to 12/24 synchronous channels, interface for SVM and RPM sensors, extern process parameters and analog outputs.

TCM[®] Site and Enterprise Server

Collects data from the TCM[®] Data Processing Front-ends. A Web-based operator interface facilitates remote monitoring, configuration, data mining and decision-making. TCM[®] Enterprise adds global site management, post data-analysis, automatic report generation, backup and much more.



With the TCM® Data Center you can do 24/7 remote surveillance, monitoring, data mining and configuration, alarm notification, report generation and much more.



You're in control with the TCM® Data Center

Enterprise TCM® - Server is the backbone in the TCM® Data Center.

The 24/7-solution that maximizes your profits

TCM® Data Center ensure the timely prediction of problems on wind turbines.

Our engineering staff is continuously developing and applying highly specialized algorithms and analysis for the M-System and the TCM®-Server to identify specific faults – long before a breakdown occurs.

Enterprise TCM® advantages include short response times, guaranteed data security and complete data and configuration integrity.

Features included are:

- Data collection
- Centralized monitoring and configuration
- Alarm notification and handling
- Condition report generation
- Instant online data mining
- Expert analysis
- Customized data interface for your control room

Sleep tight at night.

With around-the-clock monitoring

Ask for Gram & Juhl's complimentary site appraisal. Let us demonstrate our TCM® Center Solutions to survey your equipment, suggest a solution and provide a quotation.



It's simple to operate.
It's cost effective. It increases management confidence, performance reliability, and profitability. You'll sleep better at night.



Protect and optimize your investment

When it comes to wind turbines, we empower customers with the knowledge, information and resources they need to optimize productivity and enhance performance levels, so that their wind turbine sites are more effective, assets are maximized and return on investment improved. Gram & Juhl A/S has equipped more than 4000 turbines with TCM® hardware and software since 1997.

Count on us

Behind our success there is a simple philosophy: We put customers first. It's a simple statement. And yet, it defines everything we do, from design and engineering to the way we treat each and every customer.

Our engineers have given serious consideration how to achieve the best protection of wind turbines for a lifetime of cost-effective and trouble-free performance. So you can benefit from a more profitable and environmental friendly business.

If you wonder what motivates us every day, here's the answer:
It's you.

Welcome to Gram & Juhl A/S.



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