



Association VAST - winner of the  
Main All-Russia public award  
"Russian National Olympics"  
as an "Outstanding Small or Medium  
Business Enterprise" for the year 2003



Vibration Monitoring  
Condition Diagnostics **DREAM**



# DREAM

**Diagnostic Rolling Element Analysis Module**  
State of the art software for vibration monitoring, analysis, and automatic condition diagnostics.



**DREAM®** is used for mass processing of vibration data for condition based maintenance:

### Vibration monitoring

- Condition monitoring according to ISO 10816
- Analysis and trending of vibration levels, spectra, envelope spectra, etc.
- Trending and extrapolation of trends, prediction of alarms
- Setting up user alarms of any configuration
- Automatic setup of measurements according to ISO 10816 and machine configuration

### Automatic condition diagnostics and prediction

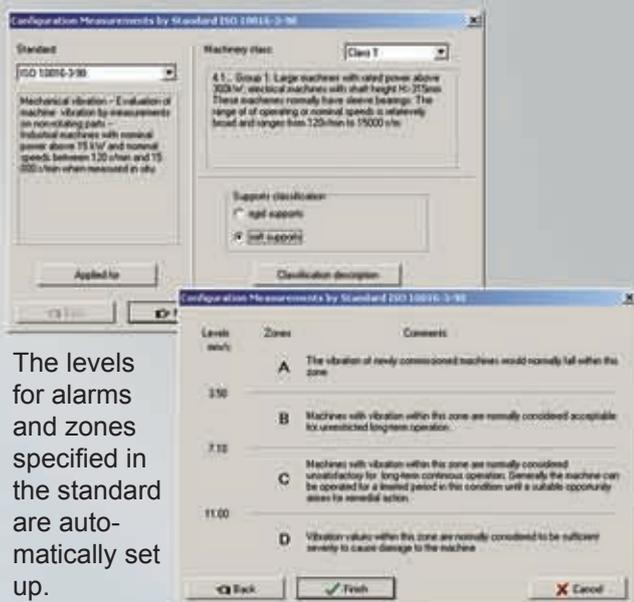
- Since 1991, the world's first automatic diagnostic system
- Automatic setup of measurements according to machine specifications
- Automatic diagnostics and trending of defects
- Automatic condition prediction, recommendations on maintenance and measurements planning based of the actual machine condition

### Automatic reports generation

- Reports are generated automatically in Microsoft Word format including graphs and tables allowing easy edits, sorting, etc.

## CONDITION MONITORING BY ISO 10816

DREAM® includes an ISO 10816 standard database and you can select the correct part of the standard according to the specification of your machine.



The levels for alarms and zones specified in the standard are automatically set up.

Measurements are planned according to the condition of the machine, automatically decreasing

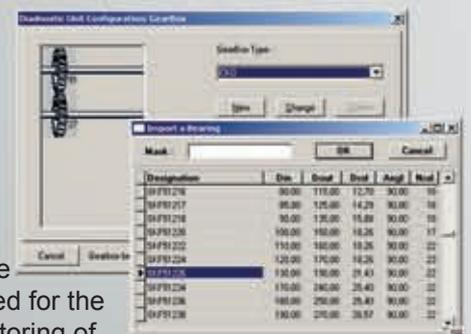


intervals between measurements for machines in bad condition. The results of measurements can be trended and condition prediction is given.

## CUSTOM MEASUREMENTS AND ANALYSIS

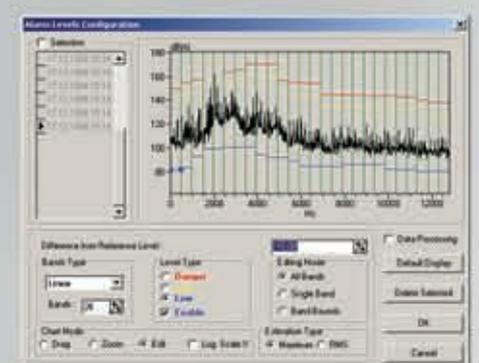
DREAM® allows configuration of a hierarchy of your equipment with unlimited depth. At each measurement point, you can configure measurements in two ways.

First, you can set up any measurement with any type of alarms. Second, you can specify the bearings, gears, impellers, etc, and DREAM® will automatically set up all the measurements needed for the diagnostics and monitoring of your equipment.



Once DREAM® is given physical parameter types of bearings, electric motors, etc. it will calculate all the defect frequencies and display them in the graphic analysis window together with all possible analysis tools like harmonic and side-bands cursors, trends, etc.

With a reference spectrum, DREAM® can automatically setup numerous types of alarm levels. An operator can modify them as desired for trending and alarming.



# DREAM<sup>®</sup> can operate in on-line and off-line modes. It is modular and can be upgraded from a very simple system to a high-end system with no loss of data collected.

## AUTOMATIC DIAGNOSTICS

Automatic diagnostics and condition prediction is the key feature of the DREAM<sup>®</sup> software. It has been proved on several hundred thousand of machines to operate correctly and reliably.

The main task of the automatic diagnostics is to provide an operator all the information regarding condition of the machine, all symptoms for defects and recommendations for maintenance.

The program analyses all measured spectra, compares them to data from history, to standard spectra and to spectra from similar machines, performs comprehensive analysis of random and harmonic components, and reports the unit's condition including listing all defects found, their development stage, and severity. From this data, the program automatically estimates the safe operation period and issues recommendations on maintenance and repair if needed.



## DREAM EFFICIENCY

Automatic diagnostics and long-term condition prediction technology allows one operator to monitor the condition of hundrens machines with a single DREAM<sup>®</sup> based system. Once the safe operation time for all the machines is known, more attention can be paid to the analysis and measurements of the machines in poorer condition, a method of condition-based monitoring and diagnostics.

Another advantage of the DREAM<sup>®</sup> approach is that it can make mass diagnostics and once operator sees across a suspicious case, DREAM<sup>®</sup> presents all the methodology used for diagnostics - all symptoms, all lines are listed and displayed. An operator can use DREAM<sup>®</sup> as an expert to train and lead him through the whole process of diagnostics.

In the diagnostic process, you can use monitoring and trending techniques not only for spectrum components, but also for defect frequencies as well.

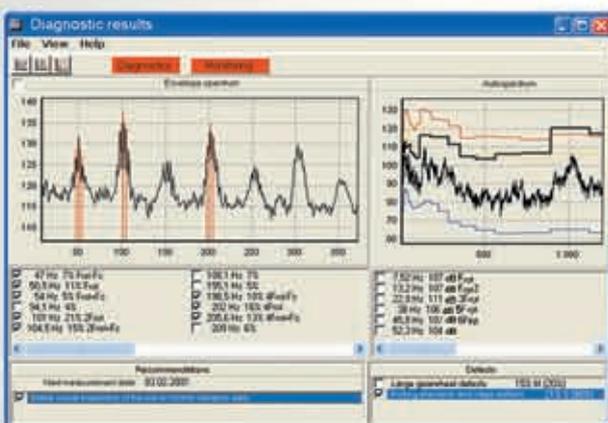
## ONE SYSTEM FOR ON-LINE AND OFF-LINE MODES

DREAM<sup>®</sup> is from a new generation of condition monitoring systems that can operate in several modes.

DREAM<sup>®</sup> can be an off-line system creating route maps for data collectors, loading and unloading data, and planning measurements according to the condition of the machine.

When using measurement systems capable of on-line measurements, DREAM<sup>®</sup> can work as a test stand or as an intergrated mobile system. When several accelerometers are attached to a machine under diagnostics (e.g. a locomotive in the repair shop), use a single button click - *measure machine* and it will make all nessessary actions for the diagnostic measurements at all points.

Finally, DREAM<sup>®</sup> can work as a 24-hour a day on-line system for permanently installed accelerometers and control computer boards or other measurement instrumentation, constantly updating machinery condition on a computer display.



## DIAGNOSTICS RESULTS

On the left, you can see the measured spectra and results of automatic diagnostics for a rolling element bearing of the large gear wheel of a low speed gearbox. All of the defect symptoms are presented in detail to the operator.

The figure on the right shows a photo of the bearing after disassembly.



## DREAM for Windows specifications

### Main functions

Condition monitoring  
Vibration analysis  
Automatic condition diagnostics  
Automatic long-term condition forecast  
Manual vibration analysis and condition diagnostics  
Recommendation on maintenance  
Condition based maintenance and repair of machines  
Automatic report generation

### Configuration

Hierarchy levels - unlimited  
Number of machines - unlimited  
Measurements setup - automatic by ISO standards  
- automatic by machine specifications  
- custom (any measurement parameters)  
Route maps - automatic according to machinery condition by selected date  
- custom (any measurements by operator's choice)

### Condition monitoring

Monitoring types - according to ISO 10816  
- spectra in different frequency bands  
- vibration levels and other parameters  
Alarm levels - Danger, Alert, Normal, Low  
- automatic levels setup by ISO standard  
- automatic levels setup by machine specification

### Automatic diagnostics

Diagnostics type - by each machine unit  
- machine as a whole based on the condition of each machine unit with recommendations "operation not recommended" or "acceptable for operation"  
Modules for automatic diagnostics - journal (plain) bearings  
- rolling element bearings  
- gearboxes  
- chain or belt transmissions  
- rotors and couplings  
- pump impellers  
- fan impellers  
- turbine and compressor wheels  
- electromagnetic part of electric drives and generators (AC and DC)  
Results of diagnostics - safe operation time for each unit  
- type and severity for each defect  
- recommendations for machine repair and maintenance  
- expertise for each unit and machine as a whole.

### Standard reports

Configuration reports - bearings list  
- gearbox list  
- machine units configuration  
- measurement setups  
- routes  
- list of units in a group  
Condition reports - machine units to be measured  
- condition  
- condition by unit types  
- last measurement results  
- condition by overall level measurements  
- history  
Analysis reports - main frequencies

### Operation

Operation modes - on-line  
- test stand  
- off-line  
- mobile, integrated

## List of defects detected by automatic diagnostics

### Journal bearings and shaft line

1. Unbalanced rotor
2. Shaft (coupling) wobbling
3. Defects of support structure
4. Self-sustained shaft vibration
5. Misalignment of the bearing
6. Wear of the bearing
7. Shocks in the bearing
8. Defects of lubrication
9. Coupling defect

### Rolling element bearing and shaft line

1. Shaft (coupling) wobbling
2. Nonuniform radial tension of bearing
3. Misalignment of outer race
4. Wear of outer race
5. Cavities on outer race
6. Wear of inner race
7. Cavities on inner race
8. Wear of balls or rollers
9. Cavities, spalling on rolling elements
10. Unbalanced rotor
11. Defects of support structure
12. Defects of lubrication
13. Coupling defect

### Gearboxes

1. Small gear wheel defects
2. Large gear wheel defects
3. Small gearing defects
4. Large gearing defects
5. Defects on another axis

### Chain (belt) transmissions

1. Drive pulley (gear) wobbling
2. Driven pulley (gear) wobbling
3. Drive pulley (gear) defects
4. Driven pulley (gear) defects
5. Belt (chain) defects
6. Grip (gearing) defects

### Pump, fan impellers, turbine and compressor wheels

1. Unbalanced rotor
2. Impeller wobbling
3. Self-sustained shaft vibration
4. Blades defects
5. Ununiform flaw
6. Cavitation (only for pump impellers)

### Induction motors

1. Unbalanced rotor
2. Coupling shaft wobbling
3. Defects of shaft supports
4. Static eccentricity of the air gap
5. Dynamic eccentricity of the air gap
6. Squirrel cage (rotor winding) defects
7. Stator winding defects
8. Distortions of mains supply voltage
9. Assymetry of mains supply voltage

### DC machines

1. Unbalanced rotor
2. Coupling shaft wobbling
3. Defects of support structure
4. Armature winding defects
5. Excitation system defects
6. Brush-commutator system defects
7. Pulsations in voltage supply

### Synchronous machine

1. Unbalanced rotor
2. Coupling shaft wobbling
3. Defects of shaft supports
4. Static eccentricity of the air gap
5. Excitation winding defects
6. Stator winding defects
7. Distortions of mains supply voltage
8. Assymetry of mains supply voltage



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