SKF Online Motor Analysis System – NetEP

Continuously monitor critical motor systems
24 hours a day, 365 days a year, from a central
office – or from anywhere in the world

Introduction

The SKF Online Motor Analysis System – NetEP is a permanently-installed machine system monitoring solution. It continuously acquires health and performance data on electric motors and the rotating machine systems they operate. With the NetEP, maintenance professionals can safely gather performance data on critical motors around the clock, 365 days a year. They can monitor the condition of motors and the rotating equipment they drive from the convenience and safety of a central office. The system helps reduce costly unplanned downtime by providing information that improves maintenance decision making and planning.

The NetEP system represents a new paradigm in predictive maintenance for rotating equipment. It enables an organization's critical motor assets to communicate if and when they are malfunctioning or experiencing a problem that could lead to failures or downtime. Motor maintenance programs are too often characterized by reactive approaches to motor failures, and rely upon periodic tests to troubleshoot a given motor's condition. These snapshots often help to determine if a motor requires replacement or repair, but the data acquired often doesn't reveal certain motor system issues that impact motor performance or and lead to failure.

The NetEP goes beyond what portable testing does to provide a timeline of trend information that maximizes visibility into motor system health and performance. Maintenance professionals can use NetEP to monitor motor system performance from virtually anywhere

The NetEP helps avert unplanned downtime and reduce motor maintenance costs with continuous monitoring of motor performance and health

in the world with a PC using the system's Web-accessible interface.

Because the NetEP is a stationary system with permanent connections to motors, it makes it safer and faster for PdM personnel to monitor motor conditions. Maintenance route testing can be reduced or eliminated, allowing personnel to focus on motors the NetEP identifies as having potential problems. The system can also be used to continuously supply motor system data to an OPC standard server for use with an organization's unique maintenance management and asset analysis systems.

How NetEP works

Motor systems include three fundamental elements: the power source, the motor, and the mechanism that places a load on the motor (e.g., a pump, or fan). The NetEP monitors motor systems for any degradation of performance, poor power quality and adverse load conditions. It generates alerts for environmental factors such as excessive heat on a given motor's operation.

The NetEP tracks motor on/off cycles, determines load mismatches and identifies any adverse load oscillations or overloads. Performance data and problem notifications are promptly delivered to the Web-accessible operator console to reveal any operating inefficiencies, which in turn allows maintenance professionals to make informed decisions about motor maintenance, repairs or replacement.

The NetEP is built upon the proven motor system monitoring capabilities of SKF's EXP dynamic motor analysis technology. The NetEP features proprietary data collection mechanisms that are coupled with standardized computer server and network technologies. A single NetEP cabinet can collect data from up to 32 motors using any combination of up to seven different voltage busses. Multiple NetEPs can be connected to a single computer server, enabling users to monitor hundreds of motors from a central location, anywhere in the world.

The NetEP operates with a single voltage measurement per voltage bus, using current sensors installed for each motor being monitored. Two data acquisition methods are provided: power quality (acquired every ten seconds) and time waveforms (acquired once per hour). The unit analyzes more than 100 electrical parameters, and compares results to user-defined thresholds and generates alerts if these threshold limits are crossed.

The system delivers this motor health and performance data over an Enternet computer network to a Web-enabled NetEP program interface. This securely and conveniently puts critical performance information and alerts at the fingertips of maintenance and operations professionals, and minimizes the need to collect data in the field where critical motors or motor control centers (MCCs) are located.
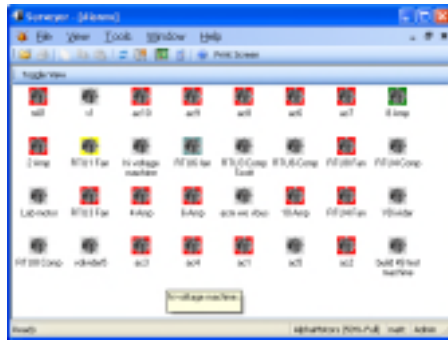
The NetEP alerts maintenance professionals of problems with an easy-to-scan alarm screen

Surveyor NetEP software

Surveyor NetEP software automatically compares the collected data to user-defined parameters, and indicates to the operator the condition of the motor system via five status levels.

The software displays the condition of each motor in an alarm view using a color-coded scheme. This color code is consistently displayed throughout the software, including the motor tree, for easy identification of motor status.

The motor tree view also displays maps of voltage buses and machine hierarchy within the facility or plant. The Surveyor NetEP multi-motor view allows a user to monitor the status of motors connected to NetEP from a single desktop or laptop screen.

The software's markers, cursors, box zooms, slide scales and other tools make it easy to navigate through large amounts of data quickly, confirm alarms, and make informed decisions about machine maintenance and operational processes.

Because the NetEP works continuously, a series of watch, caution and warning flags are employed to alert maintenance professionals that a machine condition needs attention. The software also allows an operator to mark and automatically analyze a given motor's rotor bar condition. The NetEP uses an integrated database of 30,000 bearings to help identify potential bearing faults.
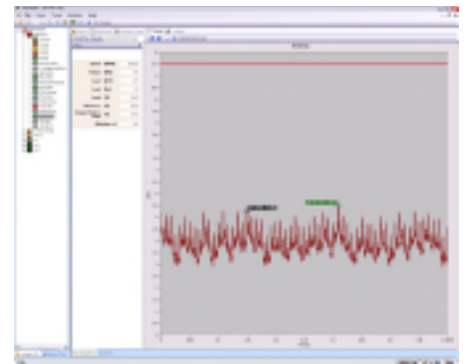
NetEP torque v. time waveform with motor tree view at left
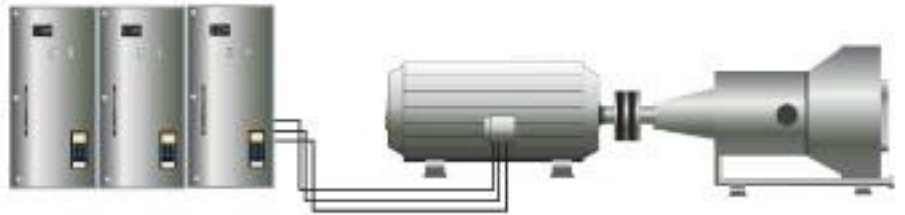
The NetEP monitors power quality/condition, motor condition, and load to help assess machine system problems that are either mechanical or electrical in nature

Data acquisition, management and trend analysis

Surveyor NetEP software delivers data at regular intervals on more than 100 motor condition parameters, and can be set with alarms on up to 38 of them. Some parameters can be set to acquire trend data every ten seconds, while others can be set to gather data once per hour.

The software displays the time and date of all collected data as well as start-stop times of every machine monitored. The system gathers parameter data from each motor connected to the NetEP in serial, and automatically starts over again for a new round of data collection. When each round of tests is completed, results are saved and stored for each motor for later recall and trend analysis. Monitoring data is managed with Microsoft© SQL Server.

Sequenced acquisition

This is the default mode for each motor. The NetEP automatically sequences to each motor to acquire data on power quality, distortion peak levels, unbalances, crest factor and symmetrical components data.

Time-waveform acquisition

NetEP gathers spectral data for current, torque and voltage, in addition to motor speed, rotor bar, eccentricity, power out, percent load, percent efficiency, effective service factor, input power, power factor, torque time waveform and KVAr data. System Fmax is 6000 Hz.

NetEP architecture overview

The NetEP device (cabinet) is the measurement engine. The NetEP server manages data storage and communication to networked computing resources (e.g., the customer's computer network, data storage resources, Internet). This server can be anywhere on a network, and is also available as a Web-accessible service from SKF. The user interface is SKF Surveyor NetEP.

Monitoring capabilities

Power quality monitoring identifies:

- Improper tap settings on supply transformers
- Poorly distributed single-phase loads
- Overloaded (saturating) supply transformers
- Missing or open power factor correction capacitors
- Voltage surges/sags

Motor performance monitoring identifies:

- Thermal overloads of the motor
- Machine deterioration from heat-related issues
- Motor efficiency
- Motor speed
- Percent load

Current monitoring identifies:

- Over-loading
- High resistance connections
- Misconnections
- Iron saturation
- Improperly wound motors

Current/voltage spectrum monitoring identifies:

- Saturation problems
- Broken rotor bars
- Eccentricity

Torque monitoring identifies:

- Mechanical issues
- Transient overloading
- Mechanical imbalances
- Bearing problems
- Cavitation
- Worn impellers
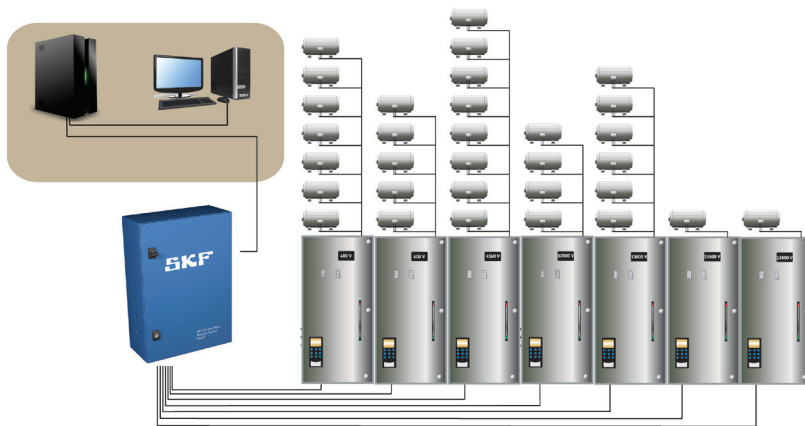
Schematic of connections from NetEP to motors via motor control cabinets, and to the user interface via the computer network

A NetEPcabinet in a permanent installation at a customer site

NetEP specifications

Technical capabilities
- Continuously monitor more than 100 parameters on up to 32 motors
- Connect to motors using up to seven voltage busses
- Measurements include: Peak, RMS, THD, TD, CF, unbalance, power factor, input power and symmetrical components for each V, I phase (and in total)
- Spectrum acquisition (three phases, voltage and current)
- Time waveform acquisition
- Torque time waveform, torque spectrum
- Speed
- Eccentricity
- Power out
- Percent load
- Percent efficiency
- Effective service factor

Identify preventive maintenance opportunities
- Set alarm limits for parameters
- Display trends for parameters

Surveyor NetEP capabilities
- At-a-glance condition status for all machines
- View multiple NetEPs on single display
- Dashboard view of more than 100 measurements
- Time waveform displays
- Spectrums with markers
- Trend information
- Machine, alarm, voltage bus editing
- Torque time waveform and spectrum
- Alarm acknowledgement
- Data retention/storage

Additional specifications
- Local-area network: Ethernet 802.4 standard 100/1000 Base T
- AC input power: 110V–240V required
- Current transformers (CTs): 5A–2000A, up to 1000 ft CT signal runs on CAT V cable, 25 kHz signal acquisition
- Voltage busses: connects with any combination of up to seven unique voltage busses (up to 32 motors maximum per NetEP)
- Computers, data storage and computer network connectivity is provided by customer

Server requirements
- Server processing capability: greater than (or at least equivalent to) a 2 GHz Intel Pentium Core2 Duo processor
- Memory: requires at least 2 GB
- Disk space: requires at least 10 GB of free disk space per NetEP
- Operating system: Microsoft Windows XP/XP Pro, Windows Vista, Windows 7 or Windows Server 2003
- Local-area network connection: 10/100 LAN
- Database: Microsoft SQL or SQL Express
- IP address: static
- Power source: UPS (uninterruptible power supply)

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