Of importance to the electrical engineering staff and the energy manager

A Guide to Preventing Electric Motor Failure and to Reducing Energy Costs

Whitelegg

Detect Motor Faults, Cut Energy Wastage

Increasing reliability and optimising output and efficiency are the core responsibilities of process plant management. The use of modern condition monitoring techniques is vital in avoiding down time and as an aid to cutting a plant's energy costs.

Motor and generator test instrumentation specialists, Whitelegg Machines, offer a proven range of single and multi-function testers, featuring advanced digital output capture for interfacing with your computer system.

These instruments will enable you to run preventative maintenance routines which will show motor health and likely failure pattern, so allowing for planned refurbishment or replacement.

Additionally the company offers on-site assessment services and free management briefings as well as formal subsidised training programmes.

The Baker Explorer electric motor tester offers a comprehensive view of motor health whilst on line with no need to isolate power, helping to identify overrated or inefficient motors

The AWA Winding Analyser offers an automatic testing programme enabling less skilled staff to complete tests successfully, combining surge, polarization index, DC Hipot, megohm and winding resistance test in one field-portable unit.

Baker Instrument Company and Whitelegg Machines

Whitelegg Machines are the UK technical sales and service representatives for Baker Instruments Inc. Baker was established in 1961 and are world leaders in the development and production of motor reliability testers together with associated software.

The instruments offer a broad spectrum of capabilities, including dynamic ('on-line') live motor condition monitoring as well as static testing of 'off-line' motors. Designed to detect and verify problems Baker testers are the most powerful predictive maintenance tool available today.

Whitelegg is a well established motor repair and coil winding machinery company established before the last war with a world wide customer base. The company has represented Baker Inc in the UK since 19??. There is a large, UK installed customer base for references.

Major process plant operators world-wide take advantage of the ease and speed of testing with their Baker equipment. Here a test is being undertaken in the motor control centre of an overhead gantry crane in a steel smelter

Here a demonstration is taking place at The Environment Agency flood defence pumping station near York. The Baker Explorer is conducting a test whilst the motor is running.

A Motor Testing Programme

When a motor is new the dielectric strength of the insulation is high. Overtime this slowly deteriorates with potential for problems. Operating environment and process variables can also adversely affect the motor's life.

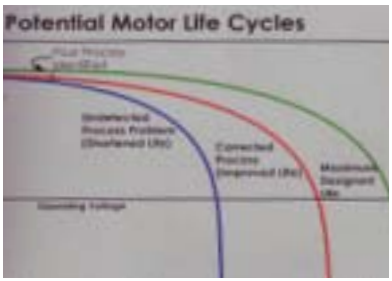
Periodic motor monitoring enables management to detect problems prior to motor failure. These may be caused by inconsistent power, mismatched motors, overheating, or dirt or moisture ingress and they all could lead to a failure.
The Baker Explorer, on-line motor monitor will identify areas of concern which when corrected will improve motor working conditions and maximise working life.

Periodic testing through the life of a motor can indicate the health of the insulation. As insulation deteriorates, off-line testing offers pertinent information on the motor's likely endurance.

Over time insulation will develop turn-to-turn weakness. These weaknesses, which start above operating voltage, can be seen by the Baker AWA - Advanced Winding Analyser, an off-line tester.

In-Service and Out of Service Motor Testing

The two main testing technologies discussed in this guide are in service testing where the motor is running live and therefore under load. The other is off-line or out of service testing.



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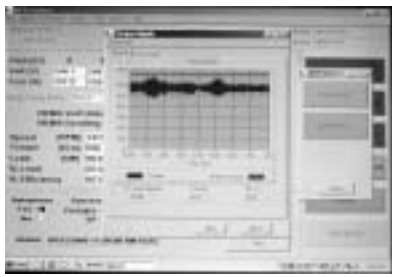

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On-line Equipment

A typical motor control cabinet with the external plug shown, enabling safe on-line motor testing with the Explorer.

The EXPLORER unit monitors motors direct from their motor control cabinet (MCC), through their power cables. A low voltage external plug mounted on the panel door, allows the unit to be connected to the motor in question quickly and safely, without interfering with the motor's operation/process.

The unit measures voltage and current, and then computes the speed and torque to a very high degree of accuracy. Because the instantaneous torque is considered, even mechanical problems with the load can be found.

Voltage level and unbalance, harmonic distortion, over current, rotor bar problems, and load and efficiency problems can all be quickly diagnosed.

The unit clearly indicates input and output power of the motor, percentage load, and percentage efficiency, also making the unit a valuable tool in the ongoing challenge to reduce your energy costs.

Off-line Equipment

Shown here is the Baker AWA, Automatic Winding Tester, in use with Microgen Energy Ltd, a subsidiary of BG Group.

The offline equipment is used to test the insulation system of the motor, the area where 90% of faults occur.

The test units provide a winding resistance test, a meg-ohm test, a DC step voltage test, and finally a surge test. The surge test is the most important test offered as it is able to detect weak insulation between turns, coils and phases prior to the motor displaying any symptoms of a fault.

By surge testing once or twice a year, particularly on your process critical motors, weak insulation can be detected and then remedial work scheduled in as soon as possible.

The traditional ‘Megger’ is often widely used for testing motors, but a Megger and other low-voltage testers cannot detect weak insulation, turn to turn.
Only surge testing can detect intermittent shorting, made possible by weak insulation!

Energy Saving Through Condition Monitoring

"Within the worldwide manufacturing community, the concerns regarding soaring energy costs have become a prominent and substantial issue. Rising energy costs mandate that companies take appropriate measures to lower operating expenses.

It has been well documented that the largest expense most facilities face is the energy cost to operate their electric motors which are a vital component of every operation.

Fortunately, modern test equipment that can accurately measure operation efficiencies of electric motors has become economically available.

It is possible to easily and quickly collect date that will not only measure efficiency and calculate operational costs, but will also detect numerous other potential problem areas.

One can, within a few minutes, safely and non-intrusively collect dynamic test data that defines electrical conditions and many mechanical issues that negatively effect the operation of their motors.

Once defined, measures can be taken to correct causes of poor operating conditions. Inefficient motors can be replaced and issues effecting operating efficiencies can be addressed. "

Tim Thomas
Senior technical advisor Baker Motor Test

Before and after pictures of a sewage water pump. Here the Baker Explorer was used to trend the likely time taken for the pump to become clogged with rubbish. Clogging had previously caused many pumps on the site to run overload and fail. Energy consumption was also reduced through condition monitoring and a planned cleaning programme.

On-Site Technical Presentations for Industry

Whitelegg is ideally placed to offer plant engineering personnel a variety of technical lectures/ presentations on aspects of motor condition monitoring and potential failure analysis.

Surge Testing: - Given by Whitelegg personnel. This very practical, compact, product demonstration builds on the research findings that more than 80% of electric motor electrical failures can be attributed to initial shorting across windings.

This is an off line test demonstration which should be part of a standard condition monitoring regime in any plant relying on electric prime movers

The following compact presentations are given by Baker USA personnel on a thrice annual series of visits to the UK, and need to be booked well in advance. They are aimed at the larger organisation.

The Benefits of Electrical Testing:- Why carry out electrical testing of motors and circuits? This lecture will concentrate on the main causes of failure and the cost versus benefits of corrective/ preventative and predictive maintenance.

The Difference Between Basic Electrical Testing and On-Line Monitoring and their Relative Value:- Baker's equipment can cover both aspects. Here the talk explains the different techniques. The on-line method gives a very broad picture of the motor's condition and is applicable to large plant operation where the knock on effect of down time could be catastrophic.

Why Undertake On-Line monitoring: - A shorter option on the above concentrating more on this aspect.

Other Options are available and can be tailored to suit a company's particular requirements. Presentation last up to 2/3 hours.

These lectures are designed as non-partisan presentations, though the instruments used and referred to are supplied and sold by Whitelegg Machines and Baker USA.

These educational and training modules are free of charge.

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