



Reducing Costs with ESA and MCA™ Technology



Managing Rotating Equipment

More than 300 million electric motors are used in infrastructure, large buildings, and industry globally. These motors account for about 2/3rds of the industrial power consumption. Electricity is required in almost all areas of the plant to provide the driving force that either operates the equipment that produces the products or provides the services that the plant's equipment was built to perform. Knowing the condition of the incoming power, along with the motor and drive is important at all facilities to maintain uptime & save money. Many testing instruments only provide measurements or alerts rather than answers to the condition of your motors. MCA™ & ESA technology help answer questions on the health of your motors and drives by providing fast, reliable answers that ease the burden of interpretation and expertise required when analyzing and interpreting other testing methods.



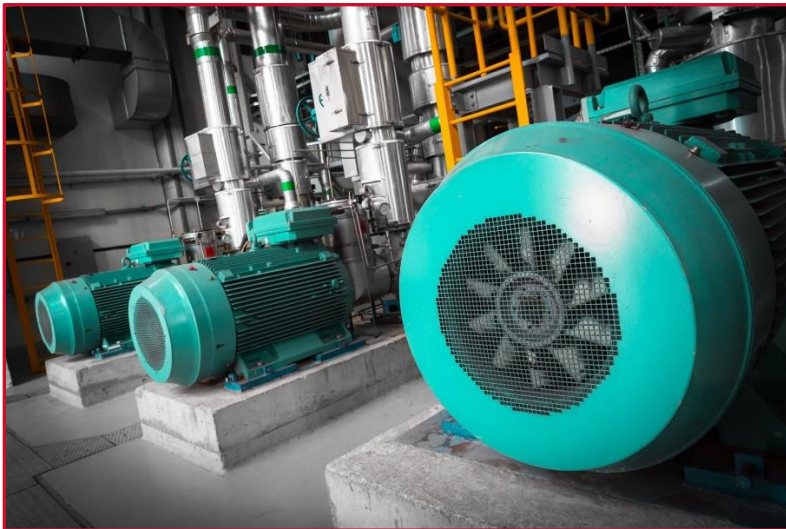
What is MCA™ and ESA technology?

MCA™ (Motor Circuit Analysis) is a deenergized low voltage test method to assess the health of the motor and associated cabling. This method can be initiated from the Motor Control Center (MCC) or directly at the motor. The advantage to testing from the MCC is that the entire electrical portion of the motor system, including the connections and cables between the test point and the motor, will be evaluated. MCA™ is a field proven motor testing method that quickly and accurately identifies faults previously difficult or impossible to detect using the older cumbersome (go-no go) techniques. The condition of the ground wall insulation system fails to identify the condition of the winding insulation system or any of the various rotor faults. MCA™ assess the health of the motor while the motor is deenergized. MCA can be used to determine the condition of the ground wall insulation, winding insulation as well as identify squirrel cage rotor faults in induction motors as well as cabling to the control.

ESA (Electrical Signature Analysis) uses both voltage & current to evaluate the entire motor system while the motor is energized. Incoming power quality detects faults in the grid, control, or distribution center, operation, and environment. ESA quickly identifies faults before most other technologies. ESA captures time waveform of the motor's voltage and current and performs a Fast Fourier Transform (FFT) on these waveforms to identify mechanical faults which apply periodic loads on the motor, such as unbalance, misalignment, looseness, bearing defects, gear faults and vane or blade forces or process faults such as cavitation, or hydraulic forces in fluid or air systems and easily identifies the issue. ESA also finds faults in the motor such as static and dynamic eccentricity, or any fault in the squirrel cage rotor. ESA assess the health of the motor system while operating. ESA recommended monitoring schedule varies between monthly up to annually depending on how critical the motor is and the environment your motors are operating.

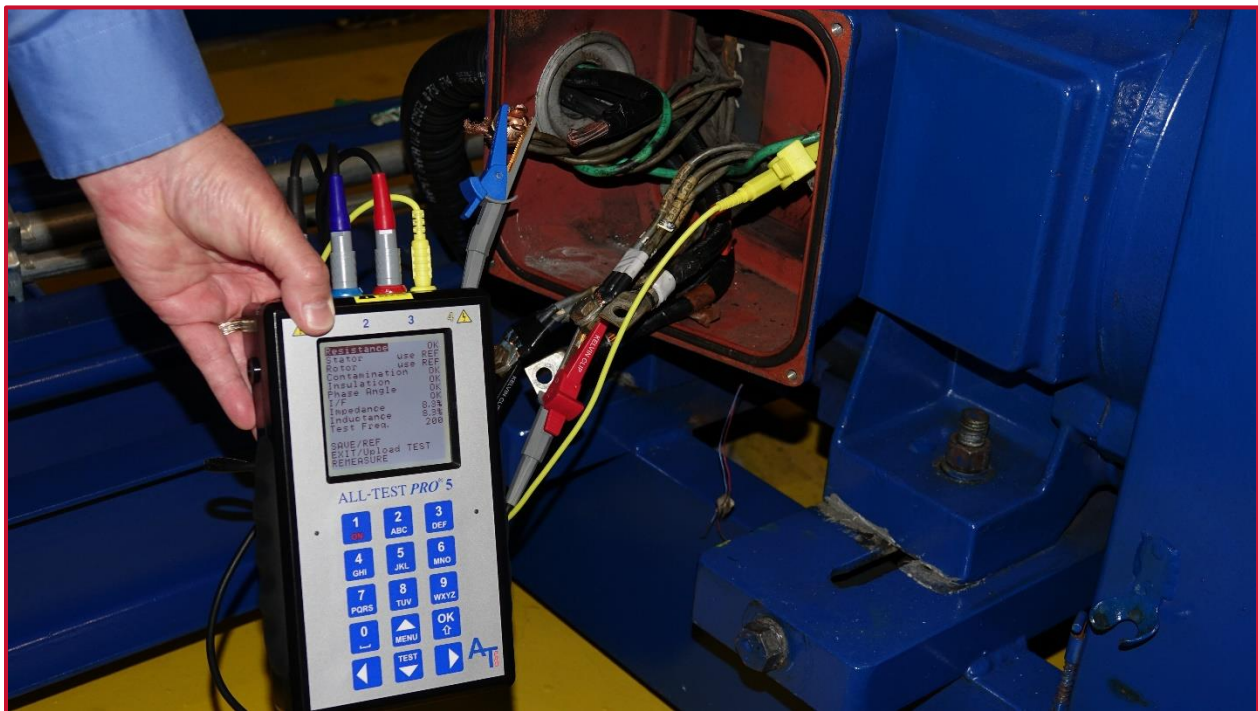
MCA™ & ESA technology complements other testing technologies. Vibration, infrared, and ultrasound all alert you to a potential problem. Use of MCA™ technology will help you identify the source of the problem.

- AC/DC motors regardless of size, power, or voltage
- AC/DC Traction Motors
- Generators/Alternators
- Machine Tool Motors
- Servo Motors
- Control Transformers
- Transmission & Distribution Transformers
- Machine Tool Motors
- Gearboxes
- Pumps and Fans & Belted systems





Benefits of MCA™ - Motor Circuit Analysis technology is used for incoming and outgoing inspection of new, repaired motors (motor tags), condition monitoring, preventative maintenance, predictive maintenance (trending asset life) in a safe and quick manner and troubleshooting. MCA quickly detects cable degradation, pitted/eroded contacts, loose connections, developing winding faults, ground faults, winding contamination, and rotor faults. Another benefit of MCA™ is TVS™ (Test Value Static) that tracks the motor asset from the cradle to the grave. TVS™ monitors changes in the motor baseline that alert you to potential motor failure and associated developing problems.



In under 15 minutes the ice skate rink at local university tests cabling and motor with MCA™ technology. University saved over \$15K in expenses before the scheduled removal and rewind of the motor due to operational issues. Motor was in perfect condition, whereas the cabling between the motor and MCC needed replacement.

Benefits of ESA – Electrical Signature Analysis technology quickly detects mechanical issues such as stator & rotor issues (eccentric, casting voids, cracked or broken bars), balance (bent or cracked shafts and bearings) and alignment (belts, fan & pump). ESA includes power quality and can be used for energy data logging, harmonic analysis, voltage, and current charting, viewing waveforms, waveform capture of sags and swells, transient capture, and event capture while the motor is operating. Additional features include motor efficiency, commissioning, troubleshooting & predictive trending, and analysis



ESA Technology being used. End ring damage on rotor. Diagnosis was determined after several bearing changes, strange motor behavior and motor trips. Vibration equipment indicated amplitudes that increased and decreased over time between repeated bearing replacement and service intervals. Subsequently the motor was retested with ESA equipment. The problem was not with the bearings but rather the condition of the rotor.



Cost increase when motors have a catastrophic failure, which results in more replacement parts, production losses & wasted time troubleshooting. Although the cost is low to maintain a motor in a run to fail scenario, the cost increases significantly when the motor fails as compared to a moderate approach to maintenance and routine testing. Both ESA & MCA™ technology identify not only bad motors but also good motors. Both technologies are nondestructive test methods that do not additionally stress the motor with additional voltage that could deteriorate insulation which could cause an end of life situation on an operating asset.

ALL-TEST Pro provides instruments for both MCA™ & ESA technologies that have long life battery, are handheld and portable so the instruments can be easily utilized in facility maintenance and management. Both methods can test motors in hard to reach areas such as submerged motors (submersible pumps) & overhead such as cranes and fans. Other benefits include route-based testing, software and reporting and safe connection points and remote Bluetooth® accessibility for energized testing that eliminate protective gear requirements.