mondo®

Non-Invasive Testing Services

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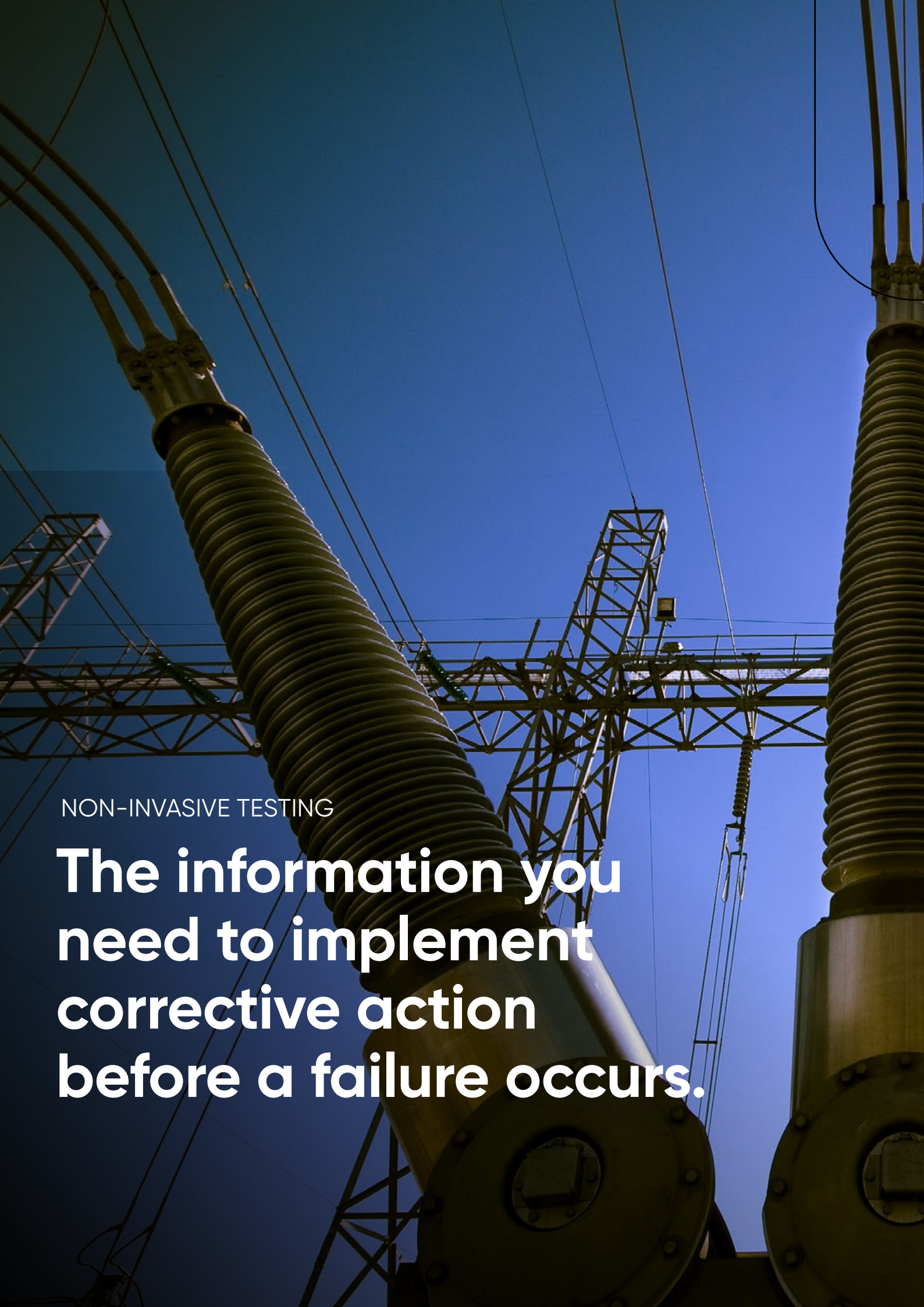


NON-INVASIVE TESTING

The information you need to implement corrective action before a failure occurs.

Non-Invasive Testing

Electrical assets that are failing have a range of different characteristics that can be captured using a variety of hand-held and vehicle mounted sensors.

Our non-invasive testing services include:

- Corona discharge
- Thermographic survey (infrared)
- PD airborne acoustic
- Ultrasonic scanning
- SF6 leak detection

We help you to manage risk, control costs, or meet compliance regulations. Our solutions solve problems that large electricity businesses face.

Mondo offer a wide range of electrical asset inspection and non-invasive (non-outage) assessment of in-service electrical plant to support asset management and on-going maintenance programs.

We have decades of experience looking after both transmission and distribution networks. Whether you are building new infrastructure, or maintaining your network, Mondo's solutions help you manage your assets, remain compliant and find new value for your customers.

Whether you need a rapid response or a long-term program, Mondo can inspect, assess, monitor and protect your assets from the ground up. We offer a range of tailored assessment programs are designed for specific type of electrical plant to best manage the asset life based on age, loading and operational history.

Working together for a bright future.

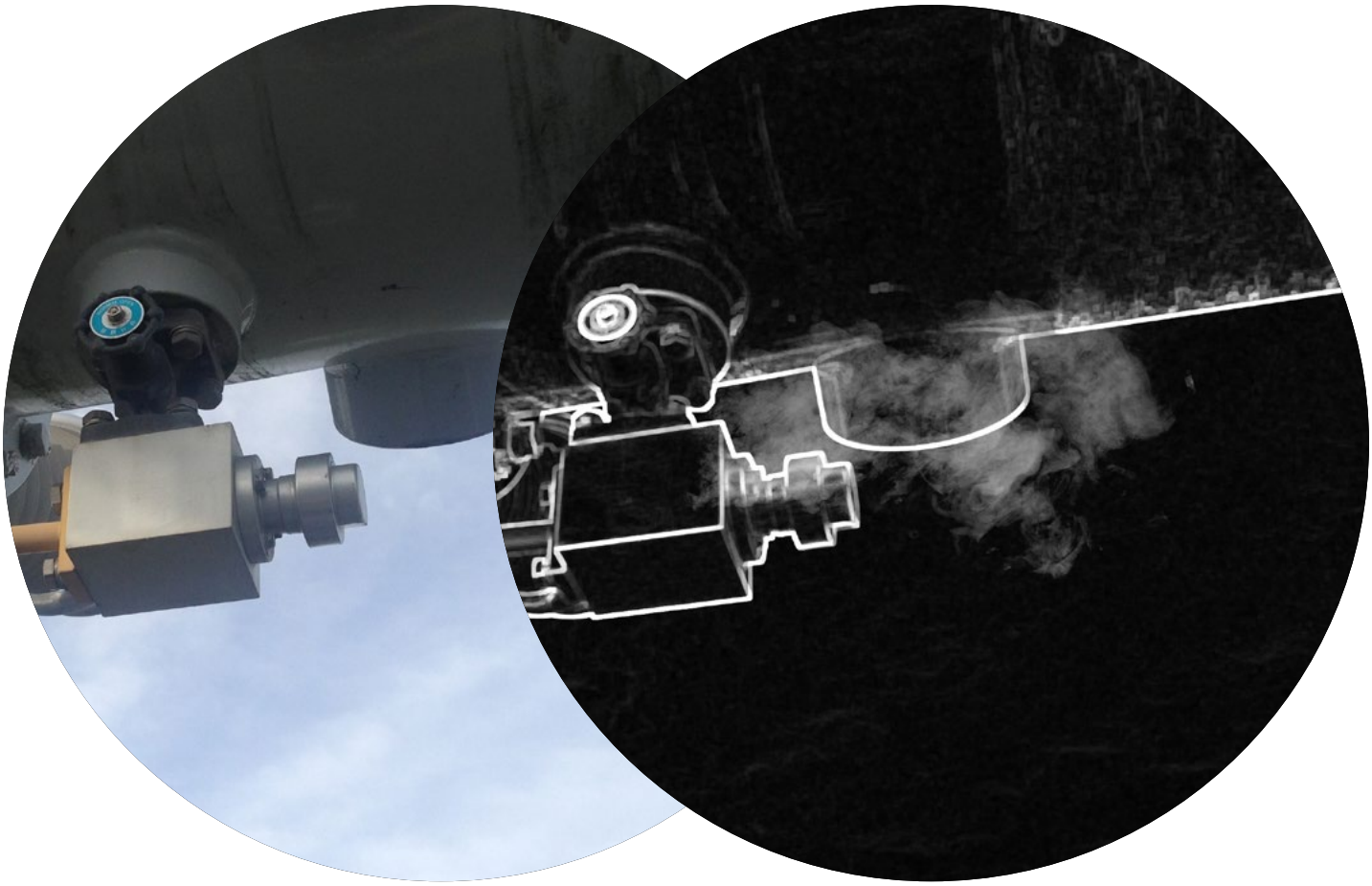
CORONA SCANNING

Find the source of corona emissions

Mondo, through the use of a daytime corona imaging camera, are able to accurately pinpoint the source of a corona emission and measure its intensity even during daylight hours.

The corona camera is designed to detect ultraviolet radiation in the UV solar blind band of the spectrum (240 to 280 nm range), capturing vision of the small amount of corona UV discharges normally invisible to the human eye.

If the electrical field is compromised by foreign materials, poor design, or other factors, corona discharge will occur. Corona discharge results from the ionisation of air around an electrode; this is an ever-present occurrence where intense electrical fields exist at the hardware surfaces of high voltage equipment. A certain level of corona discharge activity around hardware is tolerable, but excessive levels can create unacceptable radio and television interference, or even damage equipment leading to expensive replacements or failures if gone unchecked.



(SF6)

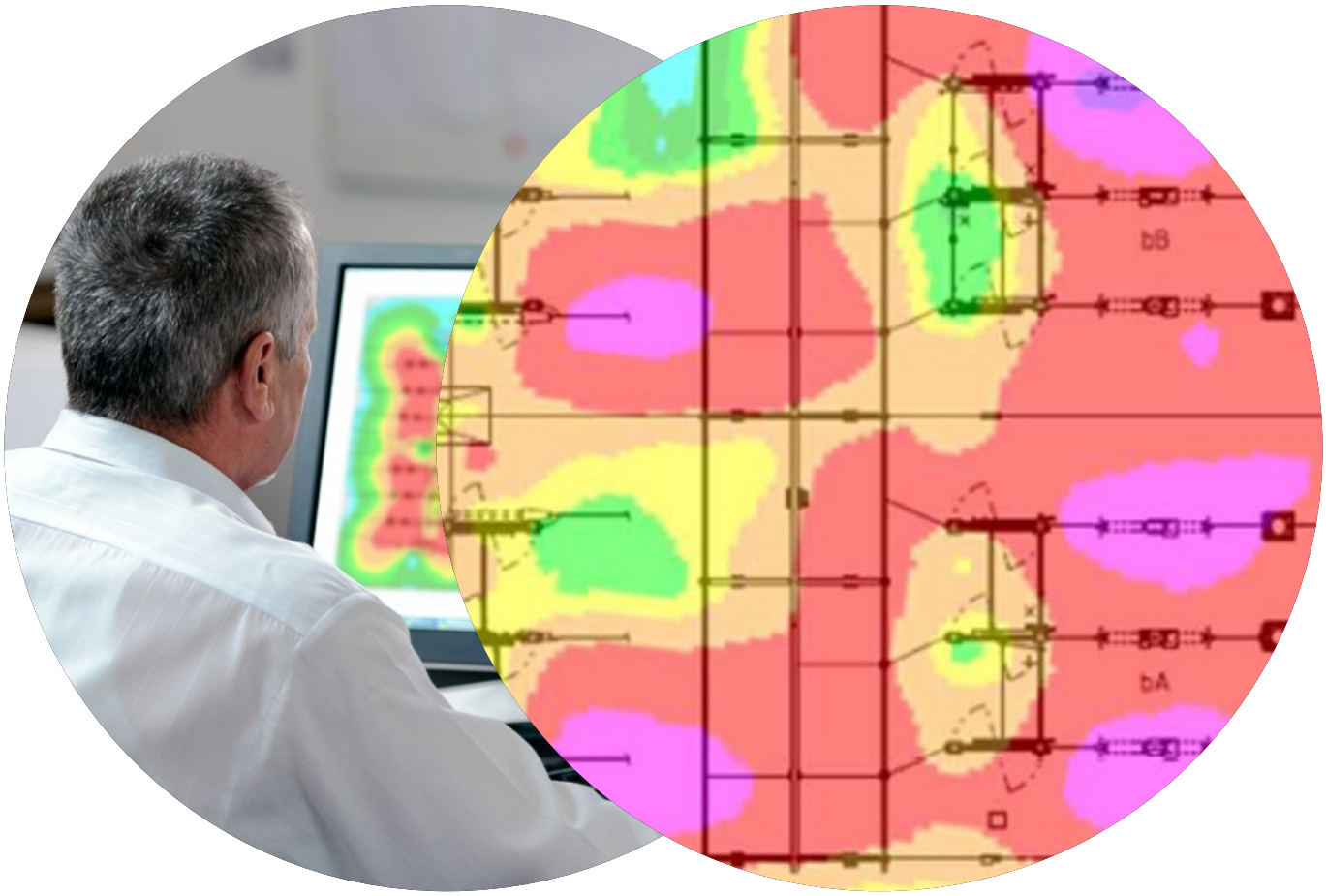
Pinpoint the exit point of a SF6 gas leak

SF6 is a particularly inert gas that cannot be seen at room temperature and pressure. Unlike other gases, no chemical can be used to interact with it to make it visible.

SF6 is a very potent greenhouse gas – one that is emitted in far smaller quantities than CO2, but with a significantly more damaging effect.

Mondo utilise SF6 leak detection cameras to accurately pinpoint the exit point of the gas in leaks emitting as little as one kilogram of SF6 a year. The SF6 cameras display the leaking SF6 gas as a wispy black plume and the equipment is so sensitive, that even a small quantity, evenly distributed across the field of vision, will render the entire screen 'black'. Data capture software ensures a permanent video record of the inspection is maintained.

Utilising this technology, SF6 leak investigation can be safely carried on live electrical plant in switch rooms and switch yards from up to 30 metres away from the individual components. Circuits remain in service while the inspection is being carried out, and the leak will appear clearly on the monitor regardless of the background.



ELECTROMAGNETIC FIELD (EMF)

Ensuring that the electrical network complies with the limits

One of the main sources of low frequency electromagnetic fields (EMF) is from the electricity network (generator, transmission and distribution). Electrical equipment such as generators and motors, power transformers, capacitor banks, power lines as well as other plants within terminal stations/substations emit EMF.

Exposure to high levels of EMF can affect the functioning of the nervous system. Although the electricity network emits extremely low levels of EMF, limits of exposure have been recommended by international and Australian standards to avoid exposure to high EMF causing harmful effects on the human body.

EMF measurements can be performed to determine the levels so as to ensure that the electrical network complies with the limits. Mondo uses an EMF measurement system to measure the EMF in its individual component – Electric Field (V/m) and Magnetic Flux Density (μT). During the measurement, extra precautions are taken to eliminate the interference of the EMF between the operator and the measurement system. For measurements of terminal stations or substations, the electric and magnetic fields can be presented in a contour map.

INFRARED (IR)

Thermographic imaging

There is no real end to the list of failure modes that can be detected by thermal imaging. The key benefit of thermographic imaging is that condition assessments can be performed while the plants are in-service, allowing any problem diagnosis, outage planning and resource allocation to occur without interruption.

Infrared thermal cameras are widely used to assess the condition and integrity of in-service electrical plant by measuring operating plant temperatures and temperature variations.

Examples of potential failure modes include but are not limited to:

- Joints overheating due to a high resistance
- Conductors carrying similar loads but running at different temperatures
- Insulators with hot spots along their length
- Transformer bushings with unexpected temperature profiles along the length
- CT's with high connection resistance
- CVT's with failed capacitor packets in their HV sections

PARTIAL DISCHARGE (PD)

Detect transient earth voltages, airborne acoustic and ultrasonic discharge

Partial Discharge activity is a localised electrical discharge in insulating system that does not completely bridge the electrodes; it is a major cause of insulation degradation, a factor in the disruptive failure of critical electrical plant. The combination of moisture and nitrogen gasses produce nitric acid which corrodes surrounding metalwork and further degrades the electrical plant.

There are two types of Partial Discharge in high voltage insulation -Surface and internal discharges. Surface Partial Discharge is when tracking occurs across the surface of the insulation creating erosion of the insulation material, whereas internal Partial Discharge occurs within the insulation material and is caused by age, poor materials, design or build quality.

Mondo's effective non-invasive methods of detecting Partial Discharge activity include:

Airborne Acoustic

Provides a means of early detection and location of audible noise caused by strong corona discharge in air, tracking across insulation surfaces, leakage from high-pressure air systems, damaged bearings on motors, mechanical problems in tap-changers or poor clamping of transformer cores are a few of the applications for this technique.

Airborne Ultrasonic

Ultrasonic scanning is an effective method for early detection and measurement of Partial Discharge activity. Measuring airborne ultrasonic emissions is used to assess surface Partial Discharge activity, where there is direct line of site, i.e. an air passage through vents or door in the casing of a plant.

RFI/Transient Earth Voltages (TEV)

High frequency voltage pulses in earthed surfaces creating discharges of radio energy that are directly associated with PD. Measuring TEVs is a most effective way to detect internal Partial Discharge activity in enclosed metalclad MV switchgear, cables, dry-type transformers and other devices.

Non-Invasive test matrix

Mondo has the capability to perform all the non-invasive tests shown in the matrix below. The results from these tests allow asset managers to ascertain potential problems and implement correct action before failure occurs.

Electrical Plant Type	**Effective On-Line Test Methods**							
	Visual	IR	TEV	Acoustic	Ultrasonic	Corona	SF6	EMF
Switchgear	●	●	●	●	●	●		
Power Transformers	●	●	●	●	●	●		
Reactors	●	●	●	●	●	●		
Cables		●	●	●	●	●		
Circuit Breakers	●	●	●	●	●			
Instrument Transformers (CT/ VT/CVT)	●	●	●	●	●	●		
Rotating Machines	●	●	●	●	●	●		
Surge Arrestors	●	●	●	●	●	●		
Capacitors and Reactors	●	●	●			●		
Overhead Transmission/ Distribution Lines	●	●	●	●	●	●		●
Terminal Stations/ Substations	●	●	●	●	●	●	●	●

Want to learn more?

Call: 1300 735 328

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Empowering a bright future.

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