KELVATEK

Accelerating network performance
for a sustainable future

kelvatek
camlin group

CONTENTS

FACING TOMORROW'S CHALLENGES, TODAY.

Energy Network Operators are under unprecedented commercial and regulatory pressures to deliver value to their customers while meeting ambitious decarbonisation goals set by the government. The electricity grid is transitioning to renewable generation, with wind, solar and hydroelectric now the fastest-growing sources of electric power. Rising electric vehicle ownership and low carbon technology (LCT) adoption are making consumers more reliant on the continuity of their electricity supply. There is also growing demand for low carbon gas with an increasingly diverse range of biogas sources.

In a complex and rapidly evolving landscape, energy networks need commercially viable solutions to optimise the performance of their assets, ensure customer satisfaction and generate more sustainable returns from their investments.

For over two decades we've been collaborating with Network Operators across the UK and Ireland to support their strategic goals and help them pivot successfully to a low carbon future with the transition to modern energy systems.

Our intelligent solutions deliver data-driven insights that enable Energy Network Operators to monitor and protect their networks, optimise performance, safeguard their assets and people, enhance customer satisfaction and drive a more sustainable future.

Trusted

We work closely with our customers to understand their unique challenges and drive value through our industry-leading solutions and services.

Expertise

We've been delivering innovative solutions and services which monitor and protect networks across the energy industry for over two decades.

Driven by Data

Harnessing the latest advances in data analytics, artificial intelligence and machine learning, our intelligent solutions drive strategic decision-making.

Ready for Net Zero

We ensure networks have the resilience to meet tomorrow's challenges as customers switch to Low Carbon Technologies and renewable energy.
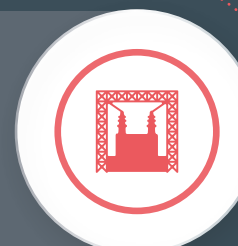
In excess of 2,000 permanent faults prevented on the UK network annually.

More than 20 million hours of LV circuit load profile data captured and analysed.

Over £7,000,000 saved in damages to transformer bushings

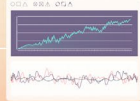Over 25,000 devices deployed in the field

FAULT AND LOAD MANAGEMENT

UNDERGROUND CABLE FAULT DETECTED...

FAULT MANAGEMENT

Every fault matters.

The adoption of low carbon technologies is growing fast, making customers increasingly reliant on the continuity and quality of the distribution network. That's made finding and repairing LV faults an even more pressing priority.

At Kelvatek we're leading the way with cutting-edge solutions for LV fault location and management. You'll find our smart devices, services and software deployed by every DNO across UK & Ireland, helping them anticipate, prevent, repair and manage faults more effectively.

We've amassed decades worth of experience from real-world networks, providing unparalleled insight into every stage of the fault management lifecycle. We're harnessing the power of that data to enable better-informed network management strategies for our clients.

As the challenges of managing networks safely and sustainably become tougher, we're here to help Network Operators drive operational efficiencies today – and embrace the opportunities of a low carbon future.

UNDERGROUND CABLE FAULT DETECTED...

FAULT MANAGEMENT

Weezap
LV Vacuum Circuit Breaker

Bidoyng
Single-Shot Auto-recloser

Equipment Manager
Network Equipment Tracking and Optimisation

Rezap Modular
Multi-shot Auto-recloser

Rezap Faultmaster
Multi-shot Auto-recloser

Restore
Safe, Temporary Restoration Device

PRESense
LV Network Monitor

Transflekt
TDR Fault Location

LineSIGHT
High Voltage Fault Location

Wattsguard
Monitoring & Protection for Rising & Lateral Mains

Blastguard
UDP Protection

Multi-restore
Safe, Temporary Restoration Device

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Fusemate
Safety Re-energisation Device

Reflekt
TDR Fault Location

Snoopi
LV Cable Fault Gas Detector

INNOVATION IN ACTION: GUIDING BEST PRACTICE

Kelvatek's in-depth analysis of fault data captured on a UK DNO's LV network triggered a change in the customer's operational practices, **generating additional savings of more than £1m per annum** from their current fleet.

Analysis of fuse rupture patterns and intervals revealed that subsequent fuse ruptures were most likely to happen in the few days following the initial rupture. This indicated that the greatest value from Bidoyng reclosing devices would be obtained by fitting equipment within the first few days of the initial activity, and that successful execution of fault location was key to unlocking benefits around unplanned LV outages.

These findings have led to the customer modifying its previous equipment policy of installing a Bidoyng after two ruptures within 30 days. Adoption of a proactive 'first fuse' policy has **avoided an estimated 42% of repeat supply interruptions**, contributing directly to significant operational savings and reduced disruption to customers.

ADOPTION OF A PROACTIVE 'FIRST FUSE' POLICY HAS AVOIDED AN ESTIMATED 42% OF REPEAT SUPPLY INTERRUPTIONS

LOAD MANAGEMENT

LV visibility and control to enable net zero

Load patterns on our electricity network are becoming more complex as penetration of low carbon technologies increases across the distribution grid. With customer behaviours evolving fast, operators are under pressure to accommodate increasingly dynamic, unpredictable power flows.

We're here to help DNOs transition to DSOs and see the complete picture in a changing world. Our smart devices have gathered tens of millions of hours of highly granular monitoring data on LV circuits across the UK and Ireland. That information gives us an unmatched picture of load patterns and their impact on network performance.

Our data-driven insights enable DSOs to implement proactive load management strategies, optimise the health of their network assets to realise bigger returns and pre-empt future problems.

PRESense

LV Network Monitor

Weezap

LV Vacuum Circuit Breaker

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INNOVATION IN ACTION: OPTIMISATION OF VOLTAGE LEVELS THROUGH CONTROLLABLE SWITCHING DEVICES

Kelvatek has supported Electricity North West (ENW), a UK Distribution Network Operator, as a key partner in a pioneering innovation project that is reducing consumers' energy bills and enabling the journey towards net-zero carbon emissions.

ENW's Smart Street initiative has demonstrated the benefits of actively optimising network voltage to reduce customer consumption and losses. Announced in 2013 with funding by Ofgem, Smart Street saw Kelvatek partnering with ENW to implement innovative voltage control techniques that allow customers' appliances to perform more efficiently.

Smart Street uses advanced real-time optimisation techniques to manage HV and LV network assets, enabling ENW to respond efficiently to consumers' varying demands. Kelvatek supplied several hundred Weezap intelligent substation circuit breakers together with over 125 underground distribution box network switches. This has allowed ENW to reduce customers' supply voltage to optimum levels, so the network and customers' appliances work more efficiently. Kelvatek also provided hands-on support during the trials, with field teams providing assistance and training to ENW's engineers.

Smart Street has met its targets of reducing the consumption of customers' electrical appliances by up to 3.5% per annum while lowering annual network losses across HV and LV networks by up to 2%. This translates into annual savings of up to £70 per household plus a reduction in carbon emissions – and without compromising the quality of consumers' supplies.

Delivered on time and to budget, the success of Smart Street has been recognised by Ofgem with the award of further funding through the Innovation Roll-out Mechanism (IRM). This roll-out will involve a combination of optimisation software using real-time measurement data to manage voltage on the LV network, together with meshing distribution transformers with on-load tap changers and LV circuit breakers and switches to allow real-time network reconfiguration.

SUBSTATION AT 90% CAPACITY

POTENTIAL ARCING FAULT DETECTED

CABLE HEALTH

Optimising cable replacement strategies

Changing customer behaviour – including increased usage of electric vehicles and low carbon technologies – is putting greater pressure on our ageing distribution infrastructure.

The condition of cables, cable joints, link boxes, fuses and other LV network elements can progressively degrade over time. Without an effective monitoring strategy, undetected issues can escalate into faults that may take customers off supply and lead to costly penalties for DNOs.

Our smart devices – and the data they collect – enable a more proactive approach to managing cable health by giving clients a clear picture of developing problems. We also provide guidance on where and when to install equipment on the network, allowing DNOs to plan timely interventions, maximise network availability and realise greater value from their equipment fleet.

PRESense

LV Network Monitor

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ADVANCED ANALYTICS

Data's in our DNA

At Kelvatek, we're experts in distilling terabytes of network data into actionable intelligence. Our advanced capabilities in analytics, artificial intelligence and machine learning allow our team of data scientists, software/ electrical engineers and physicists to analyse millions of data points collected from the smart devices on LV cables and other network assets.

The powerful insights we deliver from our clients' fault and load data allows them to maximise returns from existing network investments, make informed strategic decisions, deliver improved customer outcomes – and embrace the opportunities of Net-Zero.

The data we collect is transparent and open, giving Network Operators powerful tools to optimise network performance and guide operational strategies.
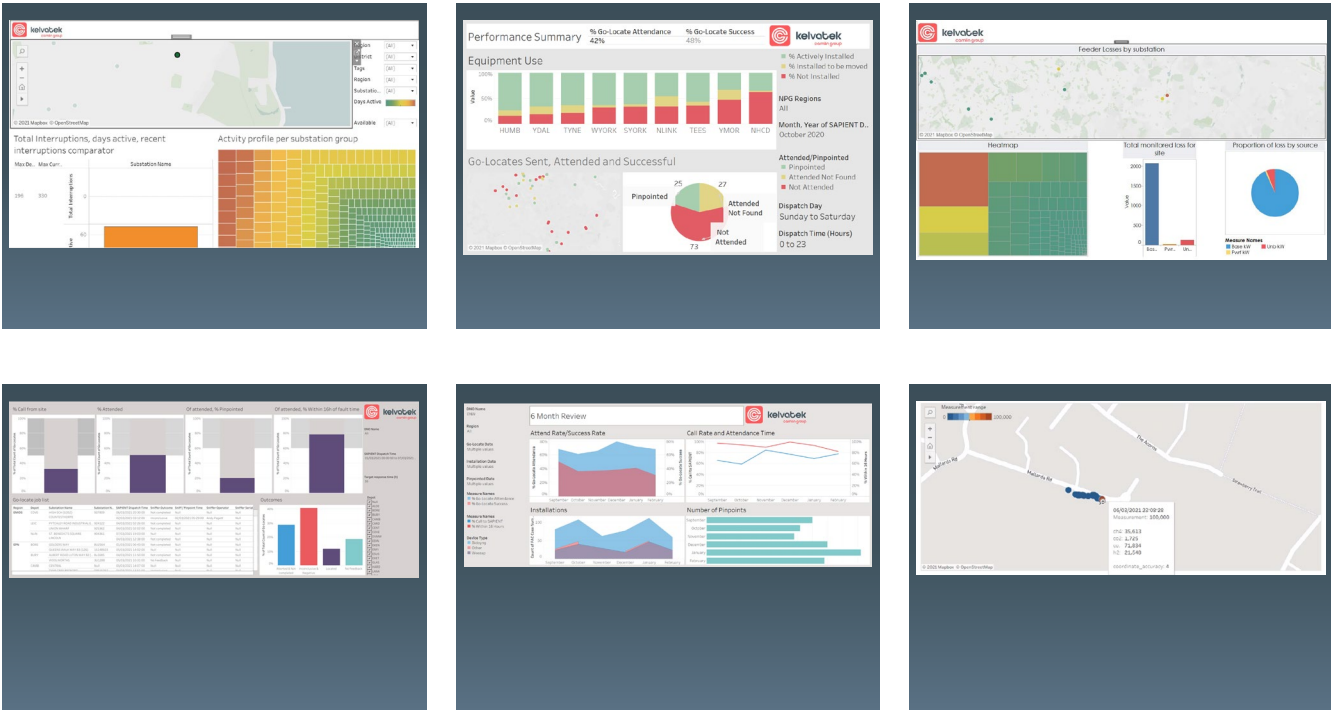
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SAPIENT: OPTIMISING LV NETWORK PERFORMANCE AND VISIBILITY

Unique to Kelvatek, Sapient is our cloud-based service that provides real-time, actionable insights that enable pre-fault diagnostics, fault location and asset health monitoring. It provides Network Operators with round-the-clock support and unparalleled visibility of their LV networks. Drawing on our 20-year leadership in fault management combined with our experience in load management, cable health and advanced data analytics,

Sapient encompasses:

24/7/365 technical support

Our engineering support team analyse data from devices in the field to deliver equipment installation support, reporting, cable route entry and tailored 'go-locate' fault notifications to customers.

Advanced analytics capability

Harnessing Artificial Intelligence (AI) and Machine Learning (ML) algorithms, we pinpoint fault behaviours in large datasets of power flow information captured from smart devices on the network.

Unrivalled historical datasets

Representing over 20 million hours of LV circuit load profiling information and 10 million instances of fault activity on LV networks captured by 25,000+ smart devices deployed in the field.

Smart devices

Collecting 24/7 fault and load information on thousands of LV circuits around the UK and transmitting this data back to our operations centre for analysis.

Data science team

With over 50 years of collective experience, our team of engineers, physicists and software specialists unlock deep insights from network data.

Best-in-class hosted platform

With enterprise-grade servers, storage and security to safeguard customers' data.

Reporting and visibility for operators

Dashboards providing key metrics and information on device activity, fault/load information, network health and trends over time.

Multi-channel training and support capability

Delivered in-person and remotely to maximise device utilisation and support best practice for successful results.

Compatibility with Network Management Systems

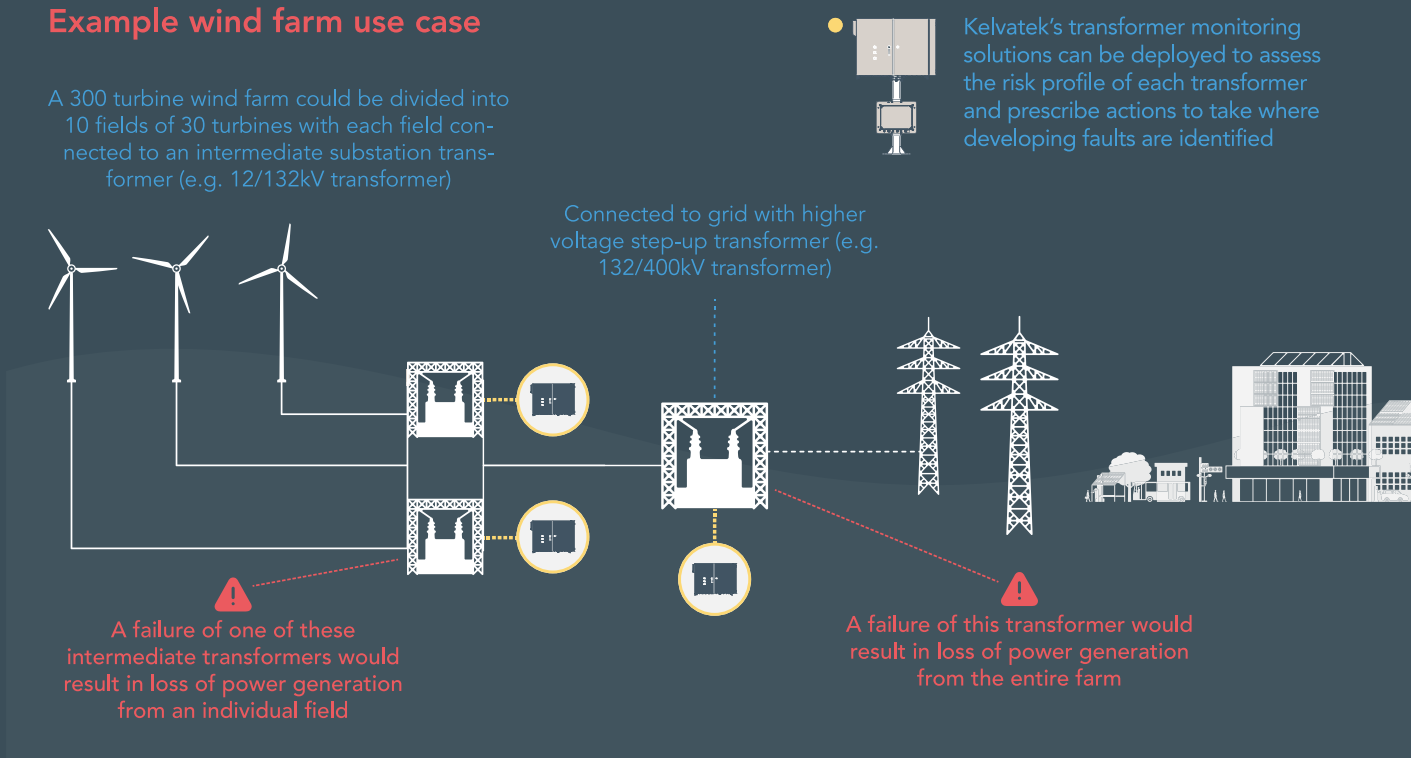Allowing notifications from Sapient to be seamlessly integrated into dispatch and mapping systems.

ASSET MONITORING

ASSET MONITORING

Example wind farm use case

A 300 turbine wind farm could be divided into 10 fields of 30 turbines with each field connected to an intermediate substation transformer (e.g. 12/132kV transformer)

Kelvatek's transformer monitoring solutions can be deployed to assess the risk profile of each transformer and prescribe actions to take where developing faults are identified

Connected to grid with higher voltage step-up transformer (e.g. 132/400kV transformer)

A failure of one of these intermediate transformers would result in loss of power generation from an individual field

A failure of this transformer would result in loss of power generation from the entire farm

TOTUS G9

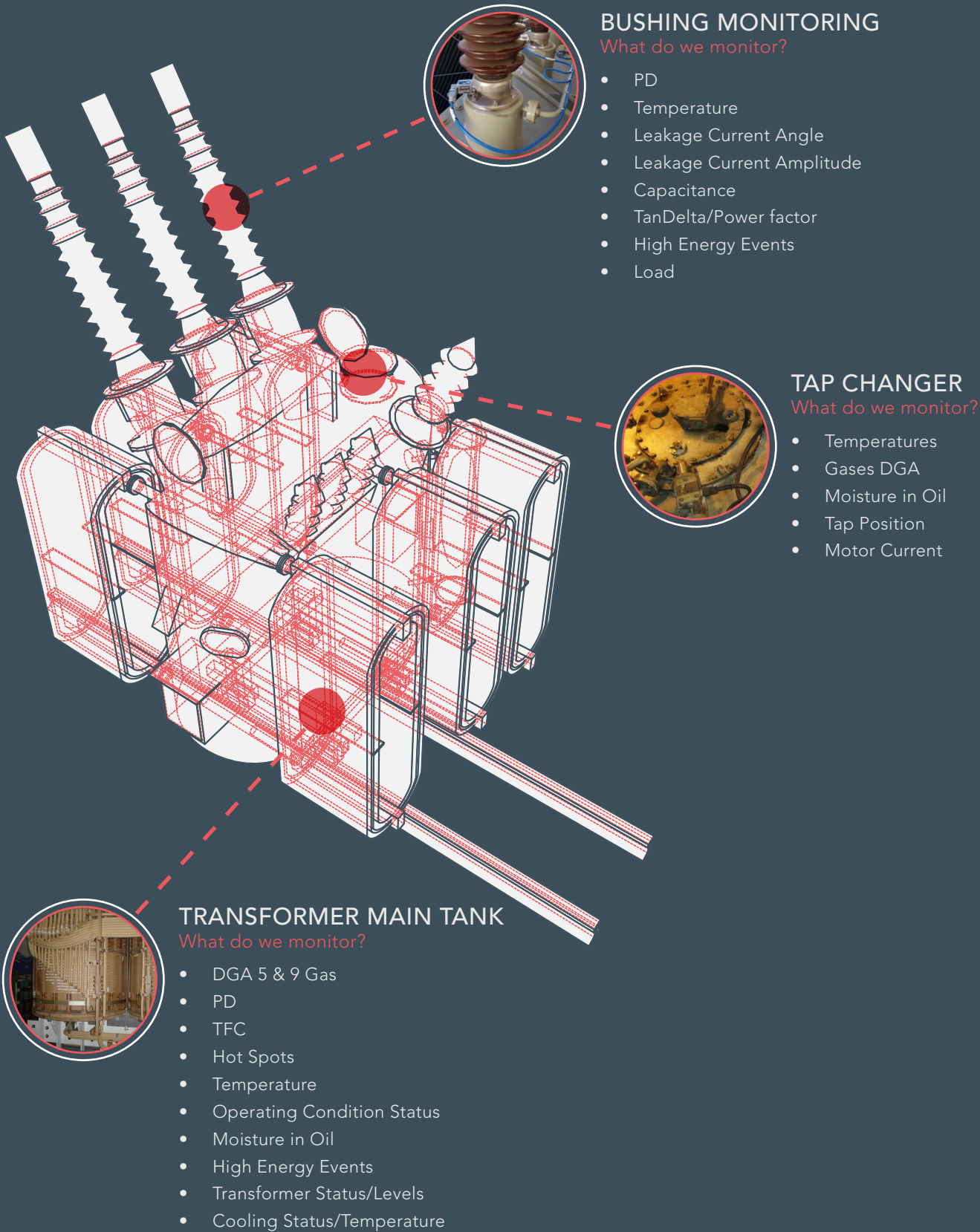Click on any product image to view online

We understand the increasing challenges facing the UK power industry. Ageing assets are being driven to work harder as the network evolves, while asset managers are constrained by limited resources and reduced maintenance budgets. Transformers are critical assets in Transmission and Distribution networks. When transformers fail prematurely, damages can far exceed the cost of a replacement and additional expenses may include the loss of production time and regulatory fines.

In the drive towards renewable power generation, transformers will play a critical role in connecting wind, solar and hydroelectric generation to the electricity network. These transformers are often under increased pressure due to intermittent renewable power generation and an undiagnosed fault can lead to a catastrophic failure, taking the transformer offline and resulting in loss of electricity production from the entire facility.

Understanding the health of assets in the presence of increasingly complex network operations, and load patterns presented by renewable power is necessary to deliver a low-carbon future. Our real-time transformer and generator monitoring solutions help green energy providers and renewable plant operators to consider the risk profile of these assets, mitigate against unexpected failures and safeguard the delivery of renewable power to electricity grids.

Data and insights are key to driving business-critical decisions about assets. At Kelvatek, we deliver those insights through our TOTUS monitoring solution. Partnering with customers to interpret their data and deliver outputs that drive action. We work to 'connect the dots', linking complex data sets with actionable information. This provides a complete picture enabling informed decision-making and optimised long-term transformer health. TOTUS TTM is the only unit to integrate

DGA, Partial Discharge (PD), Bushing Monitoring (BM), Through Fault Currents (TFC) and Transformer Analytics into a single system. The result - a comprehensive, granular picture of power transformer health that allows asset managers to optimise maintenance strategies.

BUSHING MONITORING
What do we monitor?

- PD
- Temperature
- Leakage Current Angle
- Leakage Current Amplitude
- Capacitance
- TanDelta/Power factor
- High Energy Events
- Load

TAP CHANGER
What do we monitor?

- Temperatures
- Gases DGA
- Moisture in Oil
- Tap Position
- Motor Current

TRANSFORMER MAIN TANK
What do we monitor?

- DGA 5 & 9 Gas
- PD
- TFC
- Hot Spots
- Temperature
- Operating Condition Status
- Moisture in Oil
- High Energy Events
- Transformer Status/Levels
- Cooling Status/Temperature

INNOVATION IN ACTION: TRANSFORMER MONITORING FOR WIND POWER GENERATION

Renomar develops and operates wind energy power plants in Valencia. In 2019, we installed the TOTUS Total Transformer Monitoring (TTM) system for nine-gas dissolved gas analysis (DGA), partial discharge (PD) and bushing monitoring (BM) on the 132/400kV transformer connecting their wind fields in Morella, Valencia to the electricity grid. These fields have a combined production capacity of 394MW.

TOTUS provides asset managers at Renomar with a deeper understanding of the health of the transformer and how to manage the transformer most effectively.

- Key benefits for Renomar include:
- Significantly reduced risk of unanticipated transformer failure and associated costs.
- Enhanced predictive maintenance, extending transformer life.
- Avoids interruption to renewable power generation and consequent revenue loss.

By measuring all key aspects of the transformer, we provide Renomar with a complete picture of the health of their transformers in real-time. Continuous monitoring has enabled the Asset Management team to identify and classify faults, monitor how those faults are developing, understand the risk that such faults represent to the asset and their business and prescribe the actions that should be taken to manage that risk.

'We selected this provider because of their experience in monitoring these critical transformers for the wind sector and their Total Transformer Monitoring system provides diagnostics for all the major transformer failure modes in a single solution'. José Carretero, O&M Manager, Renomar.

ROTATING MACHINES

Understanding trends in Partial Discharge activity over time gives asset managers a powerful tool to assess generator condition, plan effective maintenance strategies and reduce the risk of costly outages.

INTEGO is a unique online monitoring solution for rotating machines that provides a comprehensive picture of PD events under different operating conditions, including variable loads plus changes in temperature, humidity and other parameters. INTEGO uses powerful algorithms that can detect subtle anomalies in PD data, giving a clear picture of actual generator condition with a lower risk of false alarms.
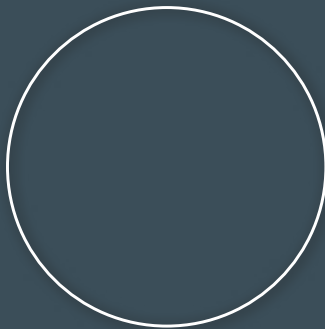
INTEGO

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CIRCUIT BREAKERS

An ageing or poorly maintained circuit breaker can be slow to trip, causing significant problems for network operators. As well as taking customers off supply, slow tripping breakers can cause high current faults to 'cascade' across the network, leading to;

• Plant damage
• Safety risks to operational staff
• Costly financial penalties

Conventional timing tests, which require the circuit breaker to be removed from service, don't provide an accurate assessment of breaker condition. Defects that may lead to slow trip operations are often temporarily cleared during the first operation, making it difficult to assess how the breaker would perform in real-world fault conditions.

PROFILE P3 provides a unique online insight into the true condition of circuit breakers at all voltages, capturing the vital 'first trip' to show how the breaker would perform in a real-life fault situation. Capturing the first trip gives asset managers insight into the true condition of the circuit breaker, this leads to major benefits;

• Improves circuit breaker performance (no more slow trips)
• Avoids damage to plant and personnel
• Enables a condition-based maintenance strategy
• Reduces operational costs

BIOGAS & GAS MONITORING

BIOGAS MONITORING

Growing demand for renewable energy sources combined with incentives to generate biogas from waste has put suppliers and operators of biogas upgrading plants under pressure to accept a diverse range of feedstocks. This leads to unpredictable levels of volatile organic compounds (VOCs) in the gas that can significantly impact plant efficiency and uptime.

Without monitoring VOCs and other contaminants, it is difficult to determine the optimal time to replace activated carbon filters. Replacing the filters too early when they have not yet reached the saturation point results in unnecessary costs. However, replacing them too late can result in the filters becoming oversaturated which can have a detrimental effect on the biomethane plant. Harmful VOCs can leak through the saturated filters and damage the expensive upgrading equipment. This can also result in the gas being rejected by gas networks for not meeting the required specification for grid injection.

Kelvatek's BioSpec VOC helps biomethane plants overcome these problems through real-time analysis across multiple points in the biogas upgrading plant, enabling the user to replace the activated carbon filters at the optimal time. This maximises plant efficiency, improves operational performance, reduces expenditure, and mitigates potential plant downtime.

BioSpec VOC

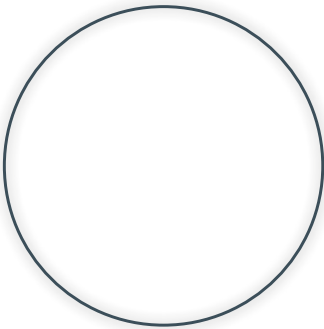Click on any product image
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GAS MONITORING

Natural gas and biomethane are odourless, requiring odorant to be added to gas networks to give a warning of potential gas leaks or issues with appliances. Odorant is also required for future hydrogen networks. It is vital that the correct amount of odorant is added to the network, and that it is present at the required concentration over the whole gas grid. Too little odorant means gas leaks may not be detected, putting lives in danger. Too much odorant can create a false sense of alarm as well as an additional cost for gas networks.

BioSpec Rhino is an automated online system that performs 24/7 monitoring of gas odorant levels. Harnessing our expertise in optical spectroscopy measurement technology, BioSpec Rhino provides continuous assurance that safety regulations are complied with and offers a more cost-effective and timely monitoring approach compared with periodic manual and laboratory measurement.

BioSpec Rhino

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ENGINEERING BETTER FUTURES

Being a trusted partner within the energy industry means taking responsibility for the many challenges that lie ahead in the road to net zero. That is why we have developed policies that reinforce a commitment to sustainability, both internally and in helping drive forward our customer's net-zero plans.

We are committed to net zero emissions by 2050 or sooner and are currently engaged in a Climate Action initiative with UK-based sustainability consultancy 3keel.

WORLD CLASS RESEARCH AND TEST FACILITIES

Research is central to our success at Kelvatek. We have invested and developed world-class facilities across our different sites globally.

LV test distribution network – 11Kv connected >1 km of underground LV cable

Physics and chemistry laboratory - FEA analysis, gas chromatography and mass spectrometer

- Artificial Intelligence & Machine Learning research centre
- Computer Numerical Control machining prototyping shop
- Applied engineering environmental testing and certification laboratory

Our unique LV test distribution network comprises of dedicated cable health labs and a live electricity network. These facilities enable us to monitor the fault development lifecycle from their infancy, right through to a permanent fault condition.

The network is constructed of multiple cable types that can be arranged in a wide variety of configurations. Faults can be added to the network in a specially constructed fault trough which allows us to investigate faults mid-cable, at joints and at cable ends. This also allows us to evaluate the behaviours of faults in different ground conditions.

To date, this has allowed us to capture more than **20 million bursts of fault activity** and countless hours of early life fault development data.

KELVATEK

Kelvatek is part of the Camlin Group. With facilities in 21 cities, across 17 countries, Camlin's goal is to optimise the critical infrastructures that people, cities and communities around the world depend on, all day and every day. As these networks get bigger and more complex, they're becoming exponentially harder to manage. That's why we're here - to make the world's energy and transport infrastructures run smarter and more efficiently, ultimately helping our customers keep the lights on and keep passengers moving.

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