TOTUS TRANSFORMER MONITOR

Reducing Risk, Maximising Reliability
Protecting your most critical asset
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OPTIMISING CRITICAL INFRASTRUCTURES

With a history stretching back over 30 years, the foundations of the Camlin business are built on a core belief that innovation is key to driving improvements in the energy industry. We have been at the forefront of key innovations that have changed the face of the industry – including digital fault recorders; digital circuit breaker analysers; advanced protection systems and network automation technologies. Camlin continues this track record of innovation, developing innovative and intelligent monitoring products and services that help make electricity and rail networks safer, more efficient, resilient, and sustainable.

Key products and services include:

- **Holistic Asset Monitoring**
  - Transformer, circuit breakers and rotating machines

- **Digital Solutions**
  - Advanced analytics providing prescriptive actions on asset health

- **Asset Condition Assessment**
  - Building a full picture of asset health

- **Expert Services**
  - Focused seminars and training aimed at driving knowledge sharing

We believe in leveraging our partners existing platforms and technology, partnering this with new developments to provide expert analysis into asset condition, translating diagnostic data into prescriptive actions. With headquarters in the UK, the US and China, and facilities in 21 cities across 17 countries, we are set up to deliver globally, ultimately our goal is to ensure our customers see real value from monitoring technology.

WE WANT TO ENSURE OUR CUSTOMERS SEE REAL VALUE FROM MONITORING TECHNOLOGY.
The Challenge for Asset Managers

When it comes to big-ticket items, power transformers are at the top of the list - and when they fail prematurely, it's all the more painful. Damages can far exceed the cost of a replacement.

Key challenges for asset managers include;

- Managing multiple transformer assets
- Gathering relevant health data to make informed decisions
- Cutting through the noise to see critical data
- Trusting the data from transformer monitoring
- Building a transformer monitoring strategy that is sustainable

The Solution

TOTUS monitors all key components on the transformer, giving a full picture of transformer health and 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 resulting in;

- Significantly reduced risk of sudden transformer failure and associated costs
- Enhanced predictive maintenance to extend life of the transformer
- Uninterrupted power supply, reducing unplanned outage

OVER 80% OF TRANSFORMER FAILURES CAN BE ATTRIBUTED TO THREE KEY AREAS; WINDINGS, BUSHINGS AND OLTC.
**TOTUS MONITORING CAPABILITIES**

- **Bushing Monitoring**
  - +17% Failure Rate
  - Dedicated trend for Partial Discharges in bushings
  - Arcing events
  - Currents amplitude and phase
  - Current polar plot
  - Tandelta/PF variations
  - C1 and C2 variations
  - Temperature
  - Load
  - Humidity

- **Tap Changer**
  - +26% Failure Rate
  - Active PD’s
  - Arcing events
  - Event Count
  - Cumulative Effect

- **Main Tank**
  - +40% Failure Rate
  - 9 Gas
  - 5 Gas
  - Moisture in Oil
  - Pump / Fan Absorption
  - Cooling Status
  - Temperatures
  - Hot Spots
  - Aging / Remaining Life
  - Moisture in Paper
  - Geomagnetic Induced Currents (GIC)
  - Direct winding temperatures with fiber optics
  - Analog and Digital Inputs

- **Others**
  - Temperature
  - Load
  - Status / Alarms
  - Integration of any third party monitor/system
TECHNOLOGY SPOTLIGHTS

Dissolved Gas Analysis

Providing a full DGA profile of up to 9 gases, TOTUS delivers cost-efficient condition-based maintenance with best-in-market accuracy without the need for any carrier gas consumable. Featuring embedded advanced alarm management, our dependable solutions enable more efficient maintenance scheduling for asset managers, with alerts only triggered when there is an issue with the transformer.

Partial Discharges

Camlin is the ONLY company that can separate the PD in bushings from the PD in the Main Tank. Early detection of PD can significantly improve risk diagnosis, driving quicker accurate decision making. With no need for expert interpretation, our user-friendly solution uses the innovative Camlin PD Triangle for quick and easy understanding of data. This data can be graphed and correlated to other parameters such as temperature, humidity, load and DGA.

Bushing Monitoring

Online monitoring of bushings, through monitoring of internal insulation (capacitance / Tan Delta or Power Factor) and the internal electrical activity (Partial discharges,) enables asset managers to detect a fault at its very preliminary stage, allowing action to be taken before reaching a critical and irreversible stage. TOTUS monitor the following on bushings: Partial Discharges, High Energy Events, Leakage Current Angles and Magnitude, Temperature, Load, Bushing Properties.

Arcing Events

Acetylene is the primary marker of a high-energy event. Whereas other monitors can provide basic information identifying acetylene in the transformer, TOTUS delves deeper into arcing activities, identifying the phase and winding, as well as visibility on the number of arcing events. The key benefit is the ability to correlate data and generate a deeper understanding of the transformer.

Through Fault Current

One of the largest causes of transformer faults is due to external events such as through faults. Understanding which transformer is impacted in the fleet, plus visibility of the integrity of the paper insulation can help assess the mechanical strength of the transformers and the risk for mechanical damages. TOTUS monitors the stress caused by through faults and cellulose ageing due to the combined action of temperature, moisture and oxygen.

Transformer Analytics

The TOTUS Transformer Analytics module provides reliable diagnostic and prognostic guidance on transformers based on IEEE and IEC loading guides. By combining data from sensors, nameplate details and factory test results, TOTUS is able to run thermal models to estimate transformer remaining life as well as assess overloading capabilities. A specific moisture-package provides bubbling temperature, online breakdown voltage and moisture in paper estimation by using the moisture in oil data.
TOTUS PROVIDES A CLEAR PICTURE OF TRANSFORMER HEALTH, REDUCING THE RISK OF UNPLANNED OUTAGES, ENHANCING MAINTENANCE STRATEGIES AND MAXIMISING OPERATIONAL EFFICIENCY.
BUILD YOUR SYSTEM

The flexible and modular design of TOTUS allows you to configure your system based on your assets. Below is an outline of key configuration options available.

- **T1**: 3 phase transformer
- **T3SP**: single phase bank*
- **INT3**: 3 bushings
- **INT6**: 6 bushings
- **INT9**: 9 bushings
- **G5**: G5 Gas Module
- **G9**: G9 Gas Module
- **TFC**: Through Fault Current Module
- **TAM**: Thermal Models (Hotspots, Overload, Ageing)
- **TAW**: Moisture package (Bubbling, Moisture in Paper, DBV)

**Configuration examples:** Adaptable to your requirements

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1-G5</td>
<td>TOTUS with DGA 5 Gas Module</td>
</tr>
<tr>
<td>T1-G9-INT9</td>
<td>TOTUS with DGA 9 Gas and PD and Bushing Monitoring on 9 bushings</td>
</tr>
<tr>
<td>T1-G5-TFC-TAW</td>
<td>TOTUS with 5 gas, through fault currents and moisture analytics package</td>
</tr>
</tbody>
</table>

*for this configuration contact sales
TOTUSPRO SOFTWARE SUITE

Embedded web server
Each TOTUS device comes embedded with TOTUSPRO Web, and online server which incorporates advanced diagnostics, providing a graphical and easy to read display of information.

Modular approach to software
Customers have the option to expand software options depending on maintenance strategies, the TOTUSPRO Desktop is an optional expert tool with the ability to import offline data for deeper investigation into failure modes, while TOTUSPRO Access provides asset managers with a full fleet view.

Our software suite of products consolidates data from our hardware devices to provide a clear picture of asset health and fleet health, reducing unplanned shutdowns, boosting production and increasing operational efficiency.

Benefit / Value

- **TOTUSPRO Web**
  - Embedded in Device providing key insights into asset condition.

- **TOTUSPRO Desktop**
  - Providing subject matter experts with deeper analysis on failure modes, providing customisable widgets with the ability to import offline data archives.

- **TOTUSPRO Access**
  - Allowing asset managers the ability to manage and make decisions across the entire transformer fleet.
Camlin Services

We understand the increasing challenges facing the global power industry. Ageing assets are being driven to work harder while asset managers are constrained by limited resources and reduced budgets. Our comprehensive range of services enables customers to generate real value from their monitoring technology.

Expert Services

Our team of in-house experts are backed by decades of experience in transformer technology. Our range of expert services enables our customers to tap into this wealth of knowledge via 3 key areas;

- Product training
- Expert support
- Academic seminars

Condition Assessment

While other monitoring systems can provide data trending and alarm notifications, TOTUS is unique in its ability to visually show transformer condition at a glance. Condition assessment service includes;

- Asset Reporting
- Acceptance Tests
- Online Tests

Field Services & Customer Delivery

Camlin plays a vital role from product conception to product installation, and most importantly support and aftercare. We deliver focused services and support programme to our global network of customers including;

- Dedicated Account Manager for installation commissioning & aftercare
- Bespoke Customer Support Portal
- 24/7 support 365 days
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