Overview

Transformers are one of the key and most valuable components in a power system. Equipping them with an on-line monitoring system is essential for information gathering, condition assessment, better management and decision making.

Decades of experience in transformer design, production and on-site diagnostics as well as a field-proven hardware platform are built into Končar TMS – a state-of-the-art monitoring and diagnostic system.

Features

» Comprehensive on-line monitoring system for all types of power transformers and shunt reactors

» Modular and expandable system for a new or an existing transformer (retrofitting), open to any transformer manufacturer

» Provides monitoring and diagnostic for all vital transformer parts by integrating the available sensors and supporting various IED communication protocols

» Built-in models for transformer condition assessment (bushings, thermal model, insulation ageing, cooling efficiency, OLTC)

» Advanced trending analysis tools

» Interpretation methods of fault gas analysis according to the relevant IEC and IEEE standards

» User defined alarm limit and gradient setting

» Long term archival of data and event logging

» Periodic automatic report generation

» Various remote access options
Benefits

» Detects incipient faults and assists in preventing failures and unplanned outages
» Enables the condition based maintenance
» Improves staff safety and environmental protection
» Provides valuable data for a root cause analysis and an investigation in case of a failure event
» Helps in optimizing transformer performance and enables better asset management (overloading, lifetime expectancy estimations)
» Makes your transformer ready for the ‘Smart Grid’

Monitoring functions

Due to modularity any of the following functions may be included in the system:

Bushings
» Operating voltages
» Overvoltages
» Change of bushing capacitance
» Tan delta /power factor
» Loading current (single or three phase)

Active part
» Power (apparent, active, reactive)
» Losses
» Oil temperature (top, bottom)
» Ambient temperature
» Hot-spot temperature (calculation or fiber optic measurement)
» Gas in oil (single or multi gas sensors)
» Moisture in oil and paper
» Paper insulation ageing and lifetime

Partial discharges
» Electrical, acoustic and UHF methods available
On-Load Tap Changer
» Tap position
» Number of switching operations
» Switching time
» Power consumption of the OLTC motor drive
» OLTC oil temperature and differential
» Sum of switched current
» Contact wear

Cooling system
» Oil temperatures at the cooler inlets and outlets
» Cooling efficiency
» Running hours of pumps and fans
» Content of gas in the Buchholz relay
» Oil level in the conservator
» Intelligent cooling control
» Auxiliary equipment statuses and alarms (pressure relief device, OTI, WTI, Buchholz relay, etc.)

Tools
» Trend analysis
» Alarms and events logging
» Loading forecast
» Data export to text and Microsoft Excel
» Automatic report generation

Services
» Consulting services on how to select the optimal condition monitoring system for a new or an old transformer
» Installation and commissioning
» Staff training
» Recommendation of limit values (alarms) settings
» Expertise in interpretation of the acquired monitoring results
# Monitoring System Specification

<table>
<thead>
<tr>
<th><strong>Architecture</strong></th>
<th>Data acquisition unit with the real-time controller installed on the transformer and Industrial PC installed in the control/telecom room</th>
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</table>
| **Inputs and outputs** | - DC analog inputs: 4-20 mA; 0-10 V DC  
- AC analog inputs (CT): 0-1/5 A  
- RTD inputs: Pt-100  
- Digital inputs: dry contacts with 24V wetting  
- Analog outputs: 4-20 mA  
- Digital outputs: potential free contacts (SPDT relays)  
- Quantity: as per requirement  
- All channels protected from overvoltages and overcurrents |
| **Data logging** | SQL database used for long-term data, alarms and events archival  
Event driven data acquisition results in a reduced database size |
| **Data visualization** | Web browser or client application for local and remote access |
| **Communication** | Physical layer: RS-232, Ethernet 10/100, Fiber optic |
| **Supported protocols** | IEC 61850; IEC 60870-5-101 and 104; Modbus; OPC |
| **Power supply** | Universal switching power supply  
Voltage: 85 V AC - 264 V AC, single phase  
Frequency: 45 – 65 Hz |
| **Cabinet** | Material: Painted stainless steel (color selection per RAL scale)  
Rating: IP66 (standard) IP68 (on request).  
Mounting: on a tank wall or a stand |
| **Operating temperature** | -40 to +60°C |
| **Standards compliance** | EMC Directive 2004/108/EC and standards:  
EN 61000-6-2:2005; EN 61000-6-4:2007; EN 61000-3-2:2006; EN 61000-3-3:2008  
LVD Directive 2006/95/EC and standards:  
EN 60950-1:2006+A11:2009 |
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