



TRANSFORMER-LIFE-MANAGEMENT
CONFERENCE

Transformer Monitoring - Opportunities and Trends

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Weidmann





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AN IEEE LOOK AT TRANSFORMER MONITORING
IEEE C57.143.2012

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WEIDMANN Diagnostic Solutions
A Member of the WICOR Group

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MAKING YOUR TRANSFORMERS BETTER

WHY PERFORM ONLINE MONITORING OF TRANSFORMERS?

To Prevent this? →

**Other reasons to monitor transformers:
(according to IEEE C57.143.2012)**

- Prevention of unplanned outages
- Planning purposes (spend of future capital budgets etc)
- Failure analysis
- Condition assessment
- Maintenance
- Alarms & Warnings



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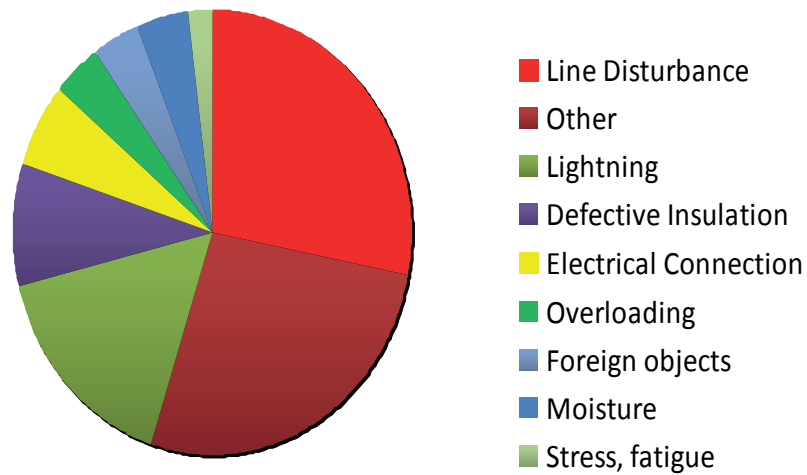
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REASONS TRANSFORMERS FAIL?

Typical Causes of Transformer Failure

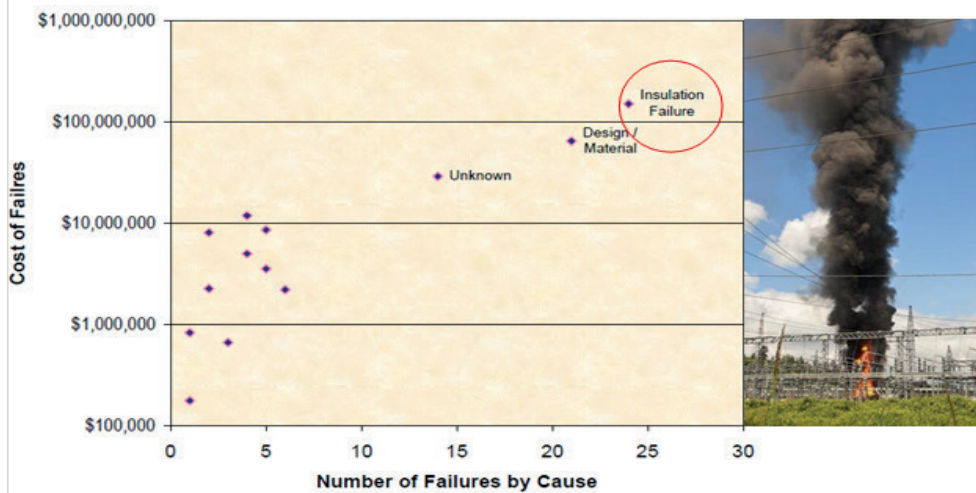


William H. Bartley, P.E. The Hartford Steam Boiler
Inspection and Insurance Co.; 2011

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COST OF FAILURE



Source: W.H. Bartley, Hartford Steam Boiler Insurance Co

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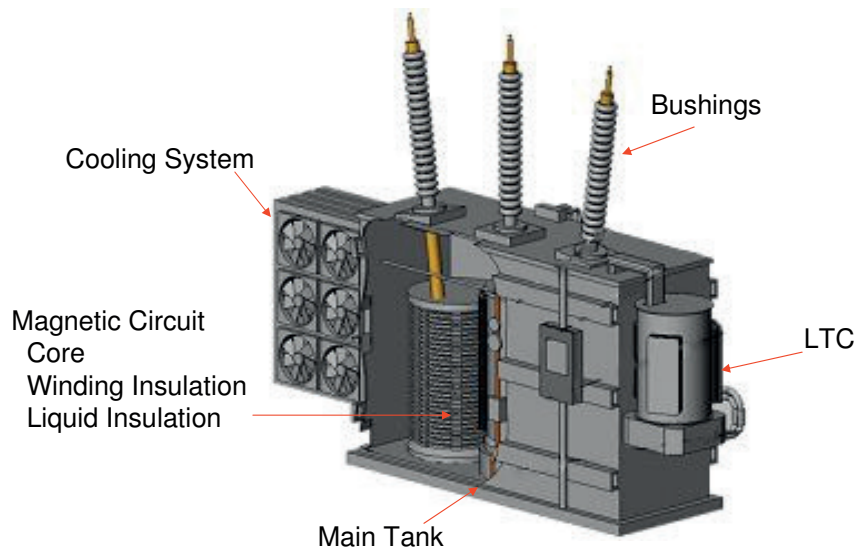


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MAIN TRANSFORMER COMPONENTS ACCORDING IEEE C57.143.2012 TABLES 1 - 3



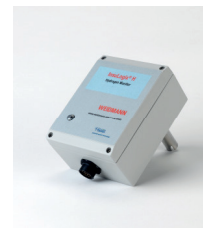
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IEEE TABLE 6 SENSORS



- THERMAL PROPERTIES – top & bottom oil temperature plus hot spot.
- COOLING SYSTEMS – motor current, temperature, flow and power
- LOAD – current or voltage
- LTC – tap change position, temperature, motor, pressure and timing
- MAIN TANK – level, pressure and timing
- CONSERVATOR – level or leak
- DGA – single or multigas system
- MOISTURE IN OIL – dissolved water content
- BUSHING – power factor or current sum methods



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IEEE TABLE 6 SENSORS Cont....

WHAT COMMUNICATION PROTOCOLS SHOULD WE USE?

- MODBUS (Fading out)
- DNP3 (Americas)
- IEC61850 (Europe)

WHAT DOES THE HARDWARE CONSIST OF?

- Serial Connections
- Ethernet
- Relay Contact



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COST BENEFIT

Chapter 7 IEEE C57.143.2012

- Inspection & maintenance costs reduced
 - Lower failure rate
 - Nameplate loading advantages
 - Deferred capital costs
 - Revenue due to failure
 - Extending transformer life
- * *The IEEE guide includes sample calculations*



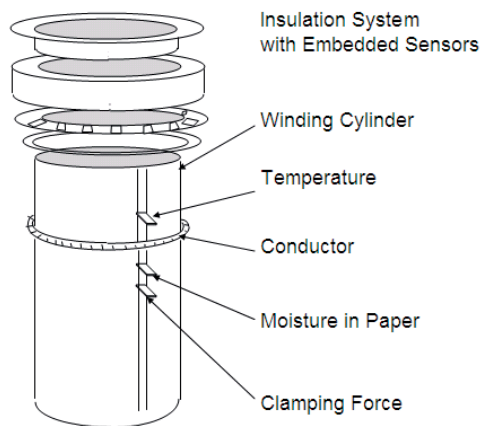


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The Future of Transformer Monitoring: Embedded Sensors



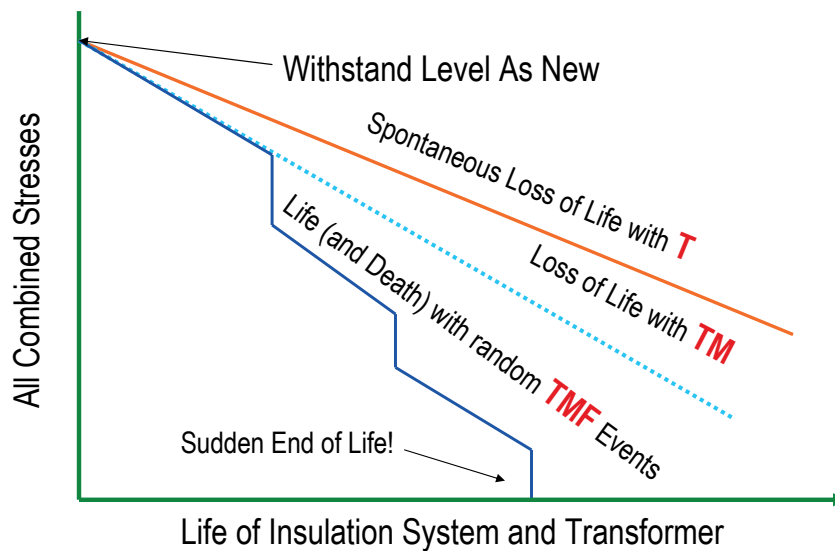
**TEMPERATURE
MOISTURE
FORCE**

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MONITORING

TEMPERATURE – MOISTURE – FORCE THE TMF Transformer “KILLERS”



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**Thank You
QUESTIONS?**

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