

**CONSULTING
RISK ENGINEERING
RISK MANAGEMENT
TRAINING**

Inspired Solutions LLC is the preferred network partner for Risk Engineering Associates and the reference for outsourced Risk Engineering Services for the international insurance market.

Inspired Solutions is your trusted network partner delivering highly flexible, effective and efficient Risk Engineering services.

Inspired Solutions offers a wide range of services geared towards the insurance market. The associates provide a broad spectrum of network management support, field services and training.

The team comprises a network of self-employed Risk Engineering Associates with a minimum of 20 years of working experience in the insurance industry, with proven competences and skills.



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**Transformer Oil Testing
Risk Engineering**

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Risk Management
Training

Transformer Oil Testing

WHAT TO CONSIDER WHEN DISCUSSING TRANSFORMER OIL TESTING

Fires as a result of electrical failures, and especially transformer failures, remain an important loss driver for both property damage and consequential loss or business interruption for the industry. Even though larger transformers are equipped with safety devices like Bucholtz relays, the insulating oil of a transformer could deteriorate over time and result in a breakdown of the winding insulation.

Transformers are often installed and utilized for many years without problems. With ageing equipment, the need for in-depth testing and analysis becomes more important.

There are several test methods that can be applied that include:

- Standard oil testing
- Chromatographic oil testing
- Furan analysis

STANDARD OIL CHECKS

Standard oil checks on transformer oils include parameters like dielectric strength, water content, color, viscosity and acidity. These physical characteristics reveal the condition of the oil, its ability to function as an insulator, conductor of heat and its potential to cause damage to the transformer windings.

Standard oil checks are relatively cheap, but the information it provides is limited.

‘The perception of risk is driven by experience’

CHROMATOGRAPHIC OIL TESTING

The chromatographic oil test looks at what the oil has picked up during its operation and in particular what gases have become dissolved in it. This methodology is also known as Dissolved Gas Analysis (DGA).

DGA requires special equipment and skills to interpret the test results. The test method is therefore more expensive than standard oil checks and mostly outsourced to an external third-party.

Considerations for DGA oil testing are:

- What is the criticality of the transformer for the operation?
- Is there potential for collateral damage as a result of a catastrophic failure?
- What is the replacement time?
- What are the cost to replace?
- What are the operating conditions including location, temperature and duty determining the ageing?

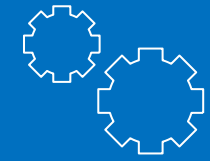
For equipment with tap changers, oil sampling and testing should be included in the DGA package.

PAPER DEGRADATION

The insulation system of a transformer ages with time resulting in deteriorating dielectric properties. Besides oil degradation, also the paper insulation deteriorates, making the unit susceptible to winding failure. Paper ageing is non-reversible. Therefore the remaining lifetime of a transformer is determined by the quality of the paper insulation. Paper quality testing is done through Furan analysis.

FURAN ANALYSIS

The paper degradation results in the release of glucose that converts in Furan, which is soluble in oil. The test results of a furan test indicates the Degree of Polymerization (DP) of the insulating paper. Two DP values taken at different times provide insight in the paper degradation and therefore the remaining lifetime of the transformer. Furan analysis can be combined with DGA.



RISK ENGINEERING

Inspired Solutions offers hands-on risk engineering services comprising field-oriented services, distant interactive assessment (DIA), plan and project review, risk improvement follow-up and account engineering.



RISK MANAGEMENT

The risk management services of Inspired Solutions include Business Continuity related services like defining the Strategic Risk Management approach, Business Impact Analysis, Hazard Analysis and Total Risk Profiling.



TRAINING

The training package of Inspired Solutions can be tailored to the needs of an organization and ranges from basic risk engineering activities to detailed risk management support for top management.