REACTANCE
Power Engineering

Revision of Single-Phase 420kV Autotransformer OLTC Assembly

CASE STUDY 01

Mitigation of Local Overheating and Oil Decomposition
in a Single-Phase Autotransformer OLTC Assembly

OVERVIEW

During internal inspection, clear signs of oil decomposition and localized overheating were identified in the mechanical console area of the OLTC structure. The issue appeared to be long-term and design-related rather than caused by a transient fault.

OBJECTIVE

- Identify the root cause of gas formation.
- Eliminate the source of localized overheating.
- Implement a reliable and permanent corrective solution.

THE CHALLENGE 02

Observations:

- Carbonization traces and oil discoloration in the OLTC mechanical console area
- Evidence of thermal stress (overheating marks on metallic parts)
- No direct current-carrying components in immediate contact with the affected area

Root Cause Hypothesis:

The OLTC console consists of two metallic parts:

- One part connected to a defined electrical potential
- Another part floating (not grounded) and located in close proximity

This configuration created:

- Capacitive coupling between conductive parts
- Potential difference leading to circulating currents or partial discharges
- Resulting localized heating and oil degradation

Design Limitation:

In older OLTC designs, equipotential bonding and grounding of auxiliary mechanical structures were not always fully considered. This can lead to unintended electrical stress in non-current-carrying components.

TECHNICAL SOLUTION

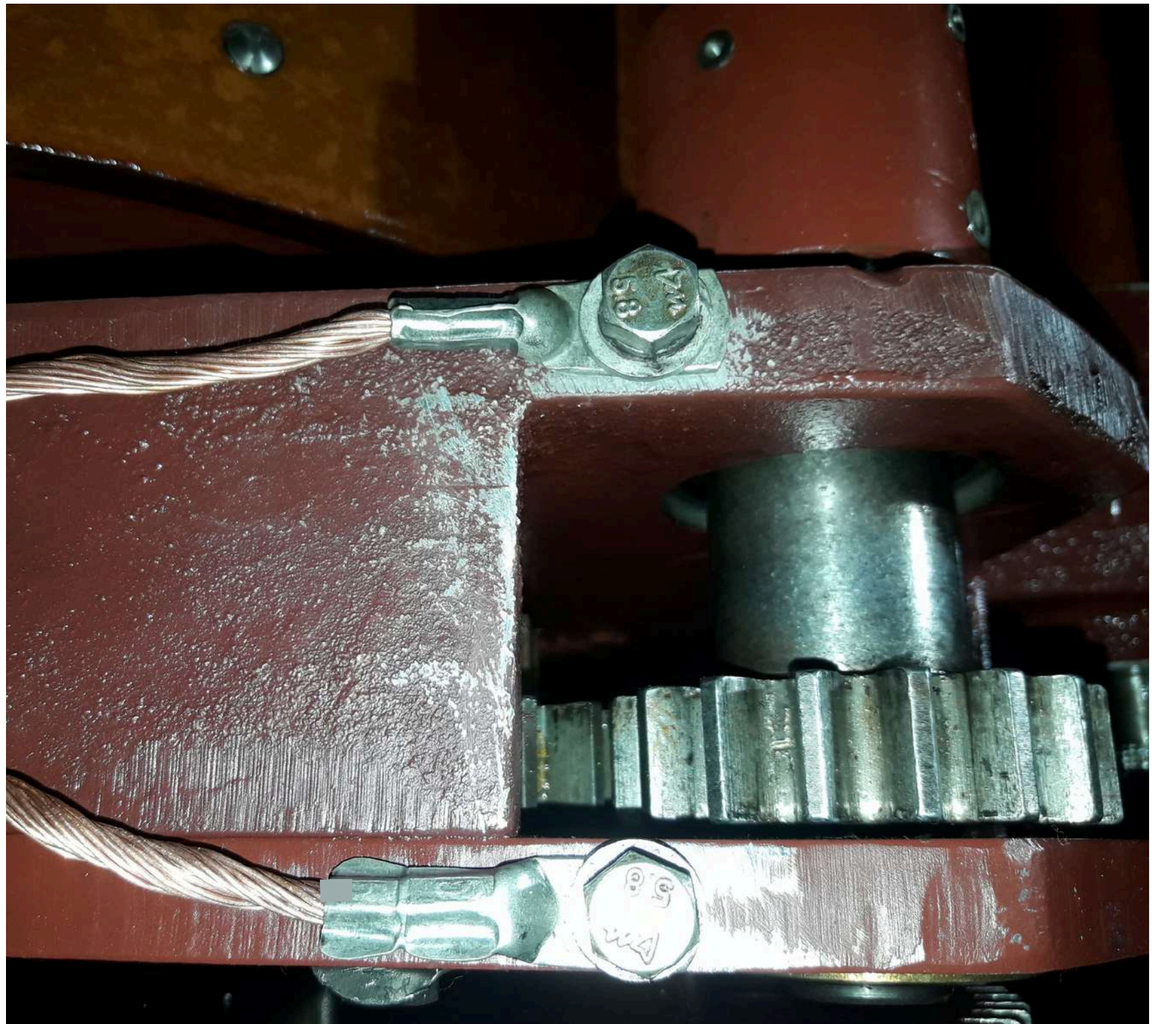
03

A dedicated grounding conductor was installed to electrically connect the two parts of the console, ensuring.

IMPLEMENTED MEASURE

This solution aligns with best practices in transformer design and maintenance:

- Equipotential bonding of conductive parts
- Avoidance of floating metallic structures in high electric field zones
- Compliance with modern insulation coordination philosophy



RESULTS

After implementation:

- No further signs of overheating observed
- Oil sampling showed stabilization of dissolved gas levels
- No recurrence of carbonization or thermal damage
- Improved dielectric reliability of the OLTC compartment

CONTACT US

123 Anywhere St., Any City, ST 12345

hello@reactance.be

123-456-7890

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