Type VRLTC™ tap changer

Analysis of pilot unit TLMS data

<table>
<thead>
<tr>
<th>Product</th>
<th>Type VRLTC, on-tank, vacuum reactance load tap changer</th>
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<tbody>
<tr>
<td>Style No</td>
<td>Pilot unit number one</td>
</tr>
<tr>
<td>Rating</td>
<td>25 kV, 1500 A</td>
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<tr>
<td>Install Date</td>
<td>January 2012</td>
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<tr>
<td>Inspection Date</td>
<td>October 2012</td>
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<tr>
<td>Principal Investigators</td>
<td>Bill Teising and Jon Brasher</td>
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1 Introduction

The first pilot unit of the type VRLTC tap changer was retrofitted into an existing transformer on the system of a major electric utility in the USA. The transformer was energized on 27 January 2012. In late October 2012, the transformer was de-energized so that the tap changer could be inspected by both the utility's engineers and ABB's engineers. This inspection was part of the pilot tap changer plan.

The results of the inspection are detailed in a separate report. Basically the tap changer was in “like-new” condition.

2 The tap logic monitoring system™ (TLMS)

The type VRLTC load tap changer is controlled by the TLMS system. The TLMS is a solid state controller. It monitors and controls all of the tap changer activities. In addition to its monitoring and controlling functions, it also generates and maintains a data log of tap changer significant events. In this report we will show some of the reporting that is possible by analyzing the TLMS data log.
2.1 The data log of the TLMS
The data log of the TLMS captures specific tap events and environmental conditions with a time stamp. This data can be downloaded at any time via the USB port on the inner panel of the motor drive.

2.2 Data captured
With time stamp:
- Tap position
- New tap position
- Time of the tap change
- Temperature and humidity in motor drive compartment
- Alarms
- Alerts

2.3 Example number 1, tap range over time
Note that in this application, the load tap changer is operating in the lower tap range most of the time and that it rarely uses the reversing switch to pass through neutral and move into the upper tap range.
2.4 Example number 2, tap changes per day
Note that initially, the voltage band width was set artificially narrow in order to generate many tap changes per day. In March, the voltage band width was reset to a more normal condition.

2.5 Example number 3, motor drive compartment temperature vs ambient temperature
Note that the ambient temperature inside the motor drive is well within the bounds of the motor drive components including the digital components. The safe operating band width for all motor drive components is -40°F to 176°F.
2.6 Example number 3, motor drive compartment relative humidity vs ambient

Note that the TLMS is actively controlling the humidity within the motor drive by operating the heater as needed. Controlling humidity maximizes the corrosion protection of the drive components without having to keep the heaters on continuously.