One Box Solution for Transformer Control:

Since the advent of microprocessor based protection relays in the mid 1980's, IED manufacturers have sought to pack an increasing number of protection elements and functions into a single device. Examples of this integrated approach are evident in many Transmission, Distribution and Generation protection relays. Significant savings for the utility are realised through reducing the overall number of discrete devices in a panel, let alone the reduction in time and materials used during design, installation and commissioning. While similar technology is now available for Transformer Controls , the advanced and extended use of such Tap Changer Controllers (TCC's) / Automatic Voltage Regulators (AVR's) appears to be constrained by a reluctance to change from traditional approaches of using various discrete and often electromechanical devices for temperature control and indication. One observation is that some advances in functionality can bridge departmental boundaries, hampering adoption of new solutions because of demarcation issues. "Who becomes responsible for a one box solution?"

For an IED manufacturer, the opportunity to work closely with a power utility to provide functions in a one box solution, ultimately serves all parties in the organisation. Here's some examples:

Winding Temperature Indication (WTI)
The traditional approach of using a discrete electromechanical device, which connects to the CT on the HV yellow phase bushing and measures top oil temperature has been superseded.

The REG-DA Tap Changer Control Relay is normally connected to LV or HV CT of the transformer. Using an optional input to measure Top Oil temperature, a WTI function is available in A.Eberle's REG-D and REG-DA (TCC) devices .This provides Top Oil temperature indication, and a Hot Spot temperature calculation, which can also be used as the basis for temperature control of the transformer. Ambient temperature can also be measured/displayed. A variety of controls and related information is available on the TCC front Panel LCD and via SCADA.

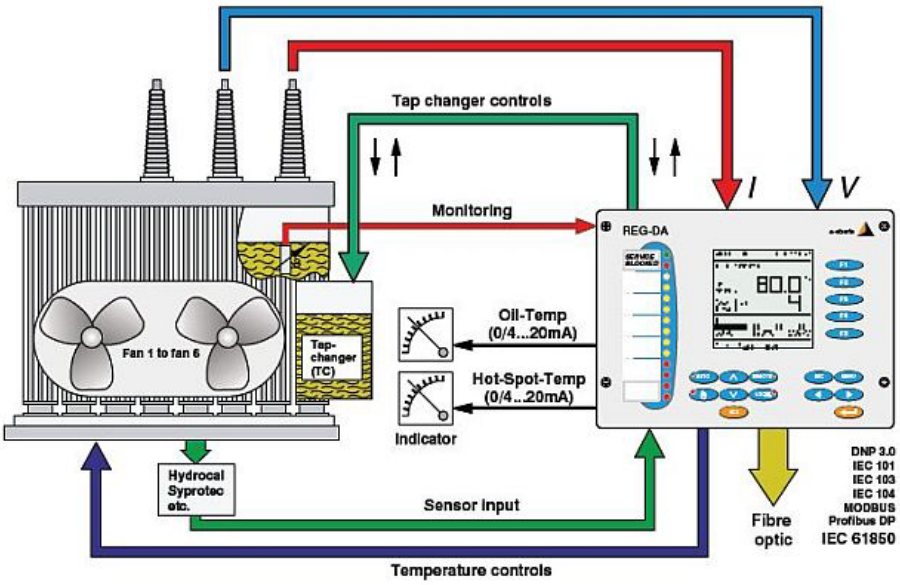

Figure 1 A.Eberle REG-D/DA Voltage Regulator (Tap Changer Control) with Transformer Temperature Control

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Thermal Trip Device
Based on the calculated Hot Spot measurement, the REG-D and REG-DA provide set points for both alarm and tripping output functions. They also support some customers preference to have alarm and tripping functions based on Top Oil temperature.

Automatic Fan Control
With transformer temperature being monitored, the REG-D/DA can also provide automated control of fans and pumps for cooling. A variety of controls and related information is available on the TCC front panel LCD and via SCADA.

Maintenance related functions
The use of a discreet electromechanical counter on the OLTC control panel is no longer necessary, as the TCC keeps a tally of the operation of the OLTC (with an independent count for each tap). Similarly, where the REG-D or REG-DA is controlling fans and pumps, hour run timer functions are provided. A recorder function also provides strip chart recording and event logs of important parameters.

Transformer winding life is also calculated, based on IEC 354. Essentially, for every 6 deg C rise above 80 deg C, a typical transformer's life consumption doubles. The voltage regulator measures the transformer temperature, and determines the "consumption" of the transformers estimated life. Where transformers can be run at higher temperatures, such as in an emergency overload situation, this information is very useful.

If reading this triggers thoughts of "perhaps there is a better way than how we are currently doing……" please contact us at HV Power to discuss your requirements.

For further information on advanced transformer monitoring and control, contact us to find out how to download A.Eberle's white paper "Transformer Monitoring according to IEC 60354".

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