PACIFIC CREST
TRANSFORMERS

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Transformer Rebuild Option

Distribution and power transformers are extremely reliable and highly efficient. They typically operate 24 hours a day with minimal maintenance. Since there are no moving parts, properly designed and applied transformers do not have an specific age limit.

If a transformer does fail, the cause is usually tied to a breakdown in the internal insulation system ultimately resulting in a short circuit. The winding insulation system is made up of a high dielectric paper immersed in insulating fluid. Long term overloading may lead to a process called “polymerization”, where excessive heat results in a gradual degradation of the insulation system. Over time the insulation becomes brittle resulting in a decrease in the breakdown voltage level. Additionally, a voltage surge, caused by a lightning strike or line fault, can also be sufficient to cause an insulation breakdown resulting in an internal arc.

A major advantage provided by liquid filled transformers is the ability to monitor the condition of its insulation system through dissolved gas analysis (DGA). The insulation fluid can be considered the “lifeblood” of the transformer. Just as a blood sample can provide a doctor with insight as to the health of his patient, dissolved gas analysis of a transformer’s insulating fluid provides an indication as to the general health of the transformer. An oil sample can be taken at anytime in most cases without having to take the equipment out of service. The ability to access the general condition of the liquid filled transformer through DGA represents a significant advantage over dry type transformers. Monitoring the dissolved gas contents over time provides the opportunity to enact preventative measures to minimize the potential of failure and/or schedule a shutdown for rebuilding or replacement.

For larger transformers (above 2500 kVA), a rebuild may prove to have substantial economical advantages over replacement with a new unit.

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Consider the Advantages...

- The transformer maintains its original footprint assuring that it will fit into its original space.
- HV and LV connection points remain unchanged.
- Besides the tank, the original core, core frame, as well as bushings and accessories may be reused.
- Transformers are rebuilt and upgraded using the latest design technologies and materials which often results in increased clearances, lower losses, improved dielectric and short circuit strength, and lower temperature rises.
- Lead times are typically half that of new which translates to a reduction in down time and associated costs.
- Rebuilt transformers carry a new product warranty.
- Alleviates the time and expense associated with having to go through new installation permitting process.

Secondary Unit Substation Transformer Installation

As an example, consider the transformer pictured above. It has a base rating of 10 MVA with a high voltage at 16500 delta and low voltage at 12470Y/7200, and was installed in 1978. The owner had determined that the insulation system had deteriorated to the point that they had to take action to alleviate the financial impact of an eventual failure. To address the situation at this time, would also provide the opportunity to have the transformer redesigned with a high voltage at 16500Y/9526 and low voltage at 12470 delta. This had to be done however while maintaining overall dimensions and phase bushing locations.

To maintain the HV and LV phase voltages while changing from a $\Delta-Y$ to a $Y-\Delta$ configuration required designing and manufacturing new windings. In addition, the original windings were constructed with aluminum conductor while the rebuilt were to be wound with copper.

Upon receipt of the original transformer at the factory, the tank cover was removed, photos were taken of the core/coil assemble while still within the tank, and critical dimensions were recorded.

Original Core/Coil Assembly - in & out of tank

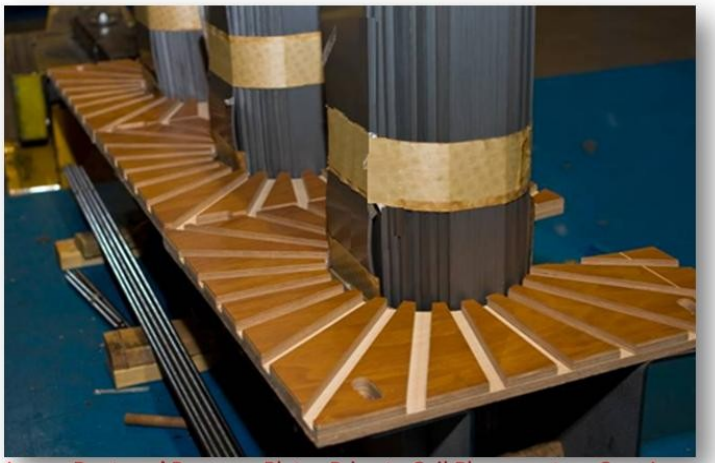
The rebuilt core/coil assembly was designed, built, and configured to accommodate the existing tank dimensions. Since the original tap changer was 36 years old, it was replaced with a new, heavy duty switch.

Rebuilt Core/Coil Assembly

Rebuilt Core/Coil in Original Tank

To allow for constant monitoring of the transformer load, the owner had requested that under oil phase and neutral high side current transformers be added as can be seen in the above photo.

The redesigned windings incorporate the latest technology so as to allow for 360 degree cooling. The top and bottom of each winding is secured via pressure plates with routered ducts which provide an unimpeded path for the cooling fluid as it flows from the bottom to top of each coil. The top and bottom plates are locked in place via through bolts in order to secure against axial movement.



Lower Routered Pressure Plates Prior to Coil Placement on Core Legs

Once the rebuilt transformer has been tanked and vacuum filled with its insulating fluid, it was subjected to the same battery of tests that transformers of new construction are subjected to. The tank cover was then replaced after which the completed unit was pressure tested to check the integrity of all tank seals.

As Received at Factory

Completed Rebuild/Upgrade

Pictured above is the subject transformer as received at Pacific Crest followed by that of the completed rebuild. The original tube type radiators have been replaced with panel type, which for their physical size, offer improved performance.

Pacific Crest Transformers: Providing innovative solutions for today's complex challenges.