

Introduction to Resin Cast Transformers

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Background

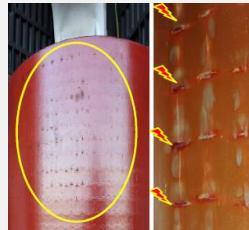
Researching the advantages of cast resin transformers, you may find the information available to be somewhat lacking. Many resin cast transformer companies mention that these transformers only need air to cool, due to its smooth coil surface eliminates heavy dirt buildup.

Even in the most extreme circumstances (mining activities), the only recommended maintenance is a routine visual inspection by technical personnel and a wipe down of the transformer as required. If this is the case the client will soon find out that his store will soon run out of resin cast transformers due to premature failures.

Martec conducted assessments of +/-200 resin cast transformers and can prove that condition-based maintenance will enhance their reliability. To ensure the maximum useful life expectancy is reached, the IEC specifications must be adhered to concerning manufacturing, commissioning quality assurance, maintenance and monitoring.

Key challenges

Manufacturing process: The most critical component of the resin cast transformer is the HT coils. The main purpose of vacuum impregnating HT transformer coils is to remove any air from the coil structure and replace it with resin which has significantly dielectric and sealing properties. Not getting all the air removed from the coils during this process will create partial discharges within the insulation system that can lead to premature failure of the coils.



Millions can be saved by conducting partial discharge assessments and diagnostics as a standard factory acceptance test and adhering to IEC specification.

Implement PD assessments as part of the maintenance plan that is suited for the environmental conditions of the plant to avoid premature failures will add to the extended operating life of the transformers.

Intime condition assessments

- Intime condition assessments (intime - meaning that the resin cast transformers were assessed during operations) were conducted on +/- 200 resin cast transformers in different environments. It is important to conduct the assessments intime so that the plant is subject to the full combination of thermal, electrical and mechanical stresses that it is subject to while in service.
- These assessments were conducted with the main focus to detect electrical discharges (PD, i.e. voids or tracking and PA, i.e. loose or high resistant connections).
- Visual inspection is valuable, but insufficient for a comprehensive condition assessment of most items of electrical plant and equipment. In conducting a visual inspection, visible defects are evident, but many defects remain unseen because they are hidden below the surface or out of sight. Additionally, in many instances it is not possible to take the asset out of service and assessments must be conducted on-line (intime). Therefore, it is best to combine visual investigation with objective, systematic engineering processes including intime condition assessments. It must also be noted that an untrained eye can miss small critical defects that could turn into failure.

Premature failure causes

Partial discharges in the resin cast transformer coils due to voids, contamination and poor manufacturing processes are the main reasons that can lead to premature failure.

Loose coil clamping system can lead to high mechanical stress that can lead to insulation cracks and premature failure



Loose connections will lead to high resistant defects that will create heat and lead to failure.



Loose core clamping (bolts) system can lead to high temperatures that can lead to premature failure.



Value add

- Condition monitoring business process.
- Improved reporting time of premature defects to be repaired.
- Signs of critical failure picked up before they occur, thus improving planning and response time.
- Equipment in critical failure state identified on site.