

ELECTRICAL ENGINEERING SOLUTIONS FOR HIGH VOLTAGE NETWORKS

CONTRACT: TPPS-15
 SCOPE OF WORK: Dismantle of Generator Transformer
 END CLIENT: E-on
 CONTRACTOR: Alstom Power Ltd
 LOCATION: Isle of Grain Power Station, Kent
 DURATION: 5 weeks
 VALUE: £ 220,400 GBP



SUMMARY:

TPPS was successful in our tender to remove and dispose of a failed 515MVA OFAF Generator Step-Up Transformer at Isle of Grain Power Station, Kent. The transformer suffered a major fault in August 2010, and the fully assembled 418 tonne unit had 90 tonnes of mineral oil and 50 tonnes of ancillary equipment removed, and main tank moved to a storage area on site awaiting fault analysis and warranty discussions. Before the five week programme commenced in March 2012, TPPS Ltd had to identify and implement safe working practices to include health & safety control measures for working with heavy plant and equipment, environmental hazards such as the transport and disposal of oil impregnated materials both on and off site and provide evidence that items would be disposed of responsibly.

Weighing 276 tonne on its own, the main transformer tank held a five limb steel core and clamp assembly which secured the three sets of LV, HV and HV tapping windings. The legal restrictions associated with transporting such a vast mass coupled with our in depth knowledge of transformer design supported our decision to dismantle the main tank into its components parts at site. Cranes were used to lift large sections and load onto heavy haulage vehicles for transport to audited waste contractors; however sections such as the tank housing and base, weighing 45 tonnes, had to be cut into manageable sections before loading. Around 50 tonnes of ancillary equipment, which included 44 cooling radiators, 22 fans, HV and LV turrets, marshalling and control kiosks, were loaded and transported for refurbishment or disposal. Operational equipment such as the OLTC drive mechanism, cooling pumps, and monitoring equipment were tested and refurbished for sale as strategic spares on similar units at other UK power stations.

DISMANTLING PROCESS:

The main transformer tank measured 11 metres long, 4 metres wide and 4.5 metres high; with the first task to remove the lid and outer shell and expose the 228 tonne core, clamp and winding assembly. The assembly consisted of five upright steel core limbs between upper and lower yolks, three sets of windings each consisting of three coils; LV, HV body and HV tapping coil, located on the central three limbs and secured with insulation and large core clamps.

The only item within the core and winding assembly being partially re-used was the core steel; however the core steel is the main chassis of the assembly and weighed 154 tonnes on its own. The core clamps were unbolted and lifted off by the crane, and dismantle of 23 tonne upper yolk begun.

With the upper yolk dismantled the packing insulation between the core clamps and windings could also be removed which would then allow each winding to be lifted over its core limb, and the remainder of the core dismantled in sections. Approximately 325 tonnes of material would be dismantled and removed from the site in 14 different stages with the aid of mobile crane, excavator with grabber, telehandler, specialist winching vehicles, mobile elevated working platform equipment and numerous large recycling skips.





DISMANTLING OF COIL WINDINGS:

Experience dictated that we would not be able to remove all three sets of coils in one winding as they weighed 15 tonnes in total and would have contracted and tightened on each limb, so a bespoke coil lifting frame was designed, fabricated and load tested to remove each of the coils individually.

The first to be removed were the HV tapping coils weighing 4.5 tonnes and slid relatively easily over the insulation wraps covering the HV coil underneath in complete sections using the lifting frame. The HV body coils weighed 6 tonnes each and had been compressed between the HV tapping coil and LV coil and took slighter longer to remove. The LV coils weighed only 5 tonnes each and mounted directly on the limb and they were the easiest to remove. It took engineers a total of 10 days to remove all HV leads, core clamps, packing insulation, 3 sets of 3 coil windings and load these onto heavy haulage vehicles for transport to the recycling contractor.

CORE STEEL DISMANTLING:

With each of the windings removed the five upright limbs and lower yolk could be removed, the safest way being to overturn the base and remaining core over onto its side under controlled conditions. Before this operation could be completed mineral oil that had wept from the core and winding assembly during dismantle and collected in the base had to be pumped into barrels and any residues removed to ensure the land was not contaminated.

The 130 tonne core assembly was lowered onto its side using two 75 tonne specialist winching vehicles and once laying on it's side each of the three winding limbs, weighing 27.3 tonne each, and the two outer limbs weighing 13 tonne each, were removed from the lower yolk and loaded into shipping containers for removal from site along with the upper and lower yolks weighing 23 tonnes each.

All that remained of the 276 tonnes tank now was the 12 tonne base which was cut into smaller sections and transported to the nominated contractor for recycling. With the unit now completely dismantled the site had to be cleared of 8 tonnes of waste such as timber supports, pallets and general waste so that the site could be inspected, handed back to the owner and TPPS demobilise from site.



WASTE MANAGEMENT:

The control of materials was a critical part of the contract to ensure each material was segregated by type and the disposal of materials was minimised. Good housekeeping had to be maintained during site works and the volume of materials being handled needed large material skips which were loaded by excavators with grabbing claws. Over 95% of all materials were recycled or re-used; including 45 tonnes of copper, 100 tonnes of steel and 154 tonnes of core steel. Although controls had been implemented to minimise the amount of general waste TPPS could not avoid the accrual of 14 tonnes of general waste materials, however by segregating materials, these 14 tonnes were split in 6 tonnes of oil contaminated waste, 4 tonnes of general waste and 4 tonnes of wood going to be recycled.



ANCILLARY EQUIPMENT:

Out of the 50 tonnes of ancillary equipment removed from site much of the mechanical such as radiators, headers, turrets, and pipework had either been damaged during the original dismantling operations or was bespoke to this unit and the steel was sent for recycling, and electrical kiosks had components inspected and removed for re-use in our own products. Key items for the operation, protection and control of the transformer were tested and refurbished to be sold as strategic spares for the many similar units currently in services at other UK power stations. These components, such as oil gauges, flow indicators, temperature indicators, CT's, on load tap changer drive mechanism and cooling pumps have long lead times from specialist suppliers and are often required immediately to get a unit back into service.