The real oil on longer lasting transformers

For many years the service life of power transformers has been typically set at 50 to 70 years. Some die a catastrophic death while others are phased out before this can happen. But if an autopsy was performed on these failing assets, the electricity industry would discover that they are dying not from old age, but by being progressively damaged.

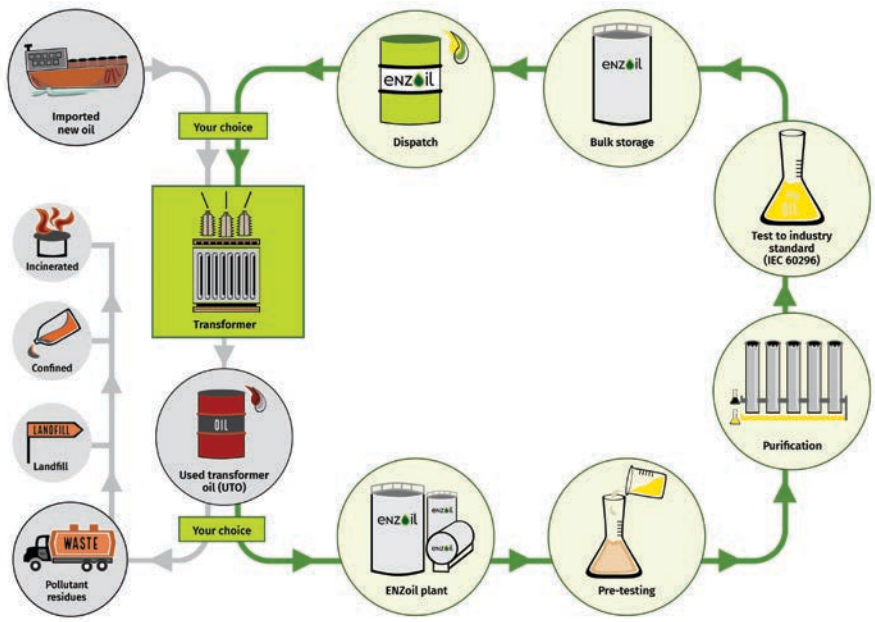
The good news, says Brett Hodgson, is that the terminal harm being caused to the transformer windings and other internal components can be arrested immediately with an oil transfusion. If the oil is kept clean using the latest techniques, it could double the service life of a transformer.

As a director of eNZoil, Hodgson, says their processes to regenerate transformer oil remove harmful contaminants and provide greater asset longevity, while reducing the cost of asset maintenance and replacement.

He says oil is the lifeblood of a transformer and eNZoil supplies all the means necessary for transformer owners to get far more performance from their assets than they ever thought possible.

Proof of this is in the quality of the regenerated oil supplied by eNZoil and the higher standard the company applies to its regeneration processes in restoring transformer oil to as good as or better than new oil. This cleansing process is completed by the pre-flushing of existing transformers to remove the last of the harmful contaminants like corrosive sulphur before the regenerated oil is added.

Brett Hodgson



The circular economy delivered by the eNZoil re-refining process measurably lowers the carbon footprint of transformer owners while extending the life of transformers

Higher standard

In 2020, the IEC raised the status of regenerated oil to that of new oil when it released Edition 5 of IEC 60296 as a complete technical revision. This new standard recognises that the offsite re-refining of used transformer oils can now restore those oils to the original specification. There is so much life left in used mineral insulating oils that IEC 60296:2020 does not differentiate between the specifications and test methods for new oils and recycled oils.

Industrial chemist, Andrew Henderson, runs eNZoil's laboratory and the production of the company's regenerated and pre-flush oils. Henderson says eNZoil's re-refining processes today are carried out in full compliance with this new standard.

He says eNZoil's GC Regen is a high-performance oil regenerated from lightly coloured used transformer oil.

"It is indistinguishable from today's new oils and under rigorous independent testing overseas for accelerated oxidation and stability comparison, our oils have outperformed premium-priced, high-grade new oils.

"Key to this advanced performance is the fact that used transformer oil becomes

contaminated, but it does not break down. By re-refining it and purifying it to a higher standard than many new oils are made to in the first place, we are able to offer New Zealand transformer owners a better, less costly and longer lasting solution."

Consumable or asset?

With transformer oil now recognised as a primary determinant of transformer life once it is in operation, along with the fact that if managed well it can outlast the transformer it is installed in, Brett Hodgson says it is time for asset owners to take a fresh look at their oil and see it as the asset it is.

"Because used oil can be purified and verified as good or better than new oil, it is no longer a consumable commodity to be disposed of. It is an asset just as much as the transformer it is installed in and, as an asset, it is highly maintainable using the eNZoil process," says Hodgson.

He says the maintenance process is infrequent, inexpensive and easy.

"Oil regeneration in a well-maintained transformer need occur only every 20 to 25 years to ensure the heat removal and insulation functions continue to perform optimally and the efficiency of the transformer does not degrade."

For most installations, he says the biggest risk to the life of a transformer is not the outside elements causing damage to the metal construction, it's the internal damage being done to the windings.

Industrial chemist, Andrew Henderson, checks the results of the industry standard 500 hour test

Independent testing of eNZoil regenerated oils has verified their purity as good as and often better than new oils on the market

"The copper wires are in close proximity and are usually wrapped in paper bound around an iron core. The greater the load, the hotter the wires get and the dielectric fluid acts as a coolant. The oil also acts as an insulator.

"But as the oil ages and oxidizes it loses the ability to do both of those things. It becomes acidic and starts to eat the paper. The paper deteriorates and loses its ability to insulate and eventually the transformer will fail, sometimes in a spectacular way.

"This does not need to happen. By maintaining the oil asset, you can prevent that damage from occurring and extend the life of the transformer."

Lower price and carbon cost

Hodgson says the benefits of this new approach extend to network planning and lower the cost of transformer upgrades.

"By potentially doubling each transformer's service life, instead of spending money replacing the asset prematurely, owners can redirect their resources to buying new assets that add to their capacity to supply and increase the national fleet of transformers.

"We know we require more transformers in place to supply the energy demands for 2030 and beyond. With high quality oil regeneration and good maintenance practices, we no longer have to take transformers out of service, or dump their oil after only 35 years of life."

Hodgson says by utilising the eNZoil service, the entire stock of transformer oil in New Zealand can be treated as a national asset and become part of a renewable oil bank that we keep, maintain and circulate throughout the industry.

"Today, it is all about periodically maintaining the oil as new, not periodically replacing it with new."

He says eNZoil's GC and SY Regen oils are half the cost of new oils and often measurably better as can be seen in time lapse videos on the eNZoil website, and they are not the only company globally to have observed this.

The GC and SY Regen oils also dramatically reduce the carbon footprint for transformer owners.

"Getting new oil out of the ground, producing it and then transporting it to New Zealand creates around 10-15 times the carbon footprint compared with what we offer by regenerating that same product.

"Using internationally available data, we measured the carbon footprint of an 80,000 litre transformer. Just to empty it out and refill it with new oil would create an imported carbon footprint of approximately 250,600 kilos of CO2. If we were to regenerate the waste transformer oil our process would generate about 22,000 kilos of carbon dioxide, a reduction of over 91 percent and delivered in two weeks.

Hodgson says eNZoil has commissioned an independent life cycle assessment of its products. Initial findings put eNZoil's Material Circularity Index (MCI) for regenerated oil at 0.969 on a scale of 0 to 1.

"This means the use of eNZoil Regen oils is about as good for the environment as you

can get. These MCI values are crucial in helping transformer owners quantify their CO2 footprint and minimising their waste."

The company also offers an oil testing service carried out in its own laboratory under the direction of industrial chemist, Andrew Henderson. Tests are certified to either IEC, ASTM or AS standards and include moisture analysis, dielectric breakdown, acidity, dissipation factor and resistivity, DBPC analysis, PCB, density, viscosity, oxidation, sediment and sludge, flash point, pour point and sulphur contamination.

Henderson says the service eNZoil provides to the power industry is designed to ensure every transformer maintains high dielectric strength, thermal conductivity and chemical stability and will continue to perform at high temperatures for long periods throughout an extended service life.

Oils can be shipped from eNZoil's refining facility in 209 litre drums, 24,500 litre ISO containers or by tanker truck

Exchange Partner programme

A wholly owned New Zealand company, eNZoil has been regenerating naphthenic transformer oil since 2004 in the last plant of its type built by Castrol.

Now certifying its oils to the latest international standard, eNZoil offers Exchange Partner programmes to asset owners.

Brett Hodgson says becoming an Exchange Partner ensures transformer owners get the best price, the best possible carbon and environmental footprint and the best way to monitor and protect the life of transformers.

"All you need to do is deposit your used transformer oil with us or have us collect it from anywhere in New Zealand in exchange for one of our high performing regenerated oils."

All eNZoils (and also new oils) are available in volume from local stock, avoiding international logistics and price fluctuation uncertainties. The oils can be shipped in volumes from 209 litre drums, through to 24,500 litre ISO containers or via tanker trucks.

"We are keen to help the industry progress to a fully circular economy model for transformer oil, with lower costs, longer service lives and reduced carbon emissions to help New Zealand meet its commitments to CO2 reductions." ■

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