

# Sustainability and Decarbonisation

## What are transformer losses?



NEVILLE  
HAIDE

**I**t is a good question, and one that needs to be answered and better understood by a wider audience within the rail industry. The perpetual transformation of electrical energy into thermal energy is seen within a transformer's two main loss components. The off-load standby losses derive from reversing magnetisation and eddy-currents within the core. These losses can be reduced heavily with the quality of core material and designed levels of flux density.

The on-load losses are, in the main, generated from the ohmic resistance of the transformer's nonferrous windings under load and can similarly be reduced with good design practices. A transformer's core loss can be compared to an electric heater, guzzling electrical power continuously and so transforming electrical energy into wasted thermal energy. With a transformer, this also happens in a standby state, with no inductive or resistive loading present. A 60 per cent reduction in standby power losses is easily achievable and has been demonstrated as being commercially viable.

It should be noted this is not a great discovery, nor some revolutionary new technology. Rather, it is the adoption of efficiency-conscious design methodology. In the case of a points drive transformer rectifier, energy is being thrown to the wind even when the points are not moving, so why are we still deploying low-efficiency magnetics into these systems and other power distribution networks?

The UK must hit a CO<sub>2</sub>e (carbon dioxide equivalent) reduction target of 38 per cent by 2030. This, in part, can be achieved with the enhancement of standards and legislative requirements to the supply chain and system designers.

Traction power demand annually is around 3,400GWh alone, taking into consideration a highly saturated legacy network of mainly low-efficiency magnetics.

Studies show that at least three per cent of the power generated in the UK is wasted energy from the losses in transformers.

To put this into context, around 102GW of traction power could be attributed to the wasted energy of its associated magnetics. This is the equivalent of unplugging the domestic supply to around 30,000 homes in the UK for a whole year.

Decarbonisation schemes focus heavily on the development of new technology to support a reduction in future carbon emissions. High-efficiency solutions already exist, but they are not being considered by a large majority of regional projects. Why is this? Is there a lack of understanding of the technology, a culture of 'copy and paste' engineering or the age-old commercial driver to satisfy a project at the lowest possible cost?



London Bridge REB.

Either way, selection of the cheapest or oldest products available for an electrical system do so to the detriment of that system's whole life efficiency. Whole life cost assessments favouring high-efficiency equipment demonstrate unarguable carbon reduction and energy savings.

Despite this data, competitive tendering governed by awarding bodies and the flexibility of standards continue to drive the use of high carbon output solutions. Industry leaders who rethink the selection of products for the power networks with an Archimedean point view of a systems efficiency, environmental impact, and whole life cost can make significant changes for the future.

Top-level commitment in CP6 by route asset managers, principal designers and those organisations that demonstrate best practice in the development and/or deployment of low-carbon solutions can align together to deliver a strong, traction-carbon reduction framework for CP6 and beyond. Significant carbon reduction and energy savings over the life of a power distribution system, while safeguarding the environment for future generations, are attainable if we consider the 'low hanging fruit' solutions and technology already available to us.

The world we leave for our future generations must not be one heavily harvested of its depleting earth reserves when widely available alternatives exist. Alternative sustainable solutions for electrical conductors need also be deployed and not just seen to be discussed.

Bauxite, the ore used to produce aluminium, is the most abundant ore on our planet, yet we continue to harvest depleting copper reserves that some environmental analysts predict, with a growth in demand of just two per cent, will be commercially exhausted within the next 25 years.

A coherent policy is needed that considers, where practical, high-efficiency products, and those with advancements in the application of alternative sustainable materials. These should be adopted by all responsible manufacturers, system designers, and project delivery institutions if we collectively are to meet our environmental obligations and targets. ●

Neville D Haide is managing director of ATL Transformers.

# Advanced magnetics supporting industry



GARY  
TAYLOR

» Siemens adopted the ATL Transformer 'aluminium' range for its new Westlock WESTRACE Trackside System (WTS) as that move aligned with the copper-reduction strategy championed by Network Rail. The aluminium range also provided CDM benefits with significant weight savings and an increase in reliability.

The team at ATL Transformers worked closely with the Siemens WTS team in developing the new range of products, which was first adopted as part of the Thameslink London Bridge Area Partnership Scheme, completed in 2018.

Following the Thameslink scheme, ATL transformers and transformer rectifiers have been adopted on all WTS schemes that Siemens have commissioned, including on Weaver to Wavertree, Liverpool Lime Street, Derby remodelling, Victoria 2B and Huddersfield to Bradford Resignalling.

Following these numerous commissionings, there have been no

in-service failures of the ATL transformers, demonstrating how reliable this new product has been. •

*Gary Taylor CEng MIET, engineering manager - power engineering, Siemens Mobility.*



ISTVAN  
BAZSINKA

» ATL Transformers, as a product and as a company is indeed fantastic. I first came across their low-inrush transformer range during the development phase of 4LM (4 Lines Modernisation - the resignalling of London Underground's sub-surface lines) Wayside LVAC power supply design.

We were in need of finding a working solution to our individual radio power supply inrush-current problem and the inrush limiters on the market just did not do the job - either they were not in range or their RAMS (reliability, availability, maintainability and safety) figures were too low. As hundreds of these are powered



from the same network, their x16 inrush has created a rather big problem for protection settings and discrimination.

ATL proposed its unique range of transformers which have helped to eliminate the problem with the excellent 1.96x FLC figure. The company's knowledge and support throughout the project were spot on, its factory testing facility and scheduling flexibility helped save the day and, with our combined effort, we were able to provide a leaner design without the need of any individual inrush limiters.

If a similar situation would occur on any other projects of mine, I would not hesitate to contact them immediately as the very first company in mind. •

*Istvan Bazsinka CEng MIET, project design authority, Thales.*

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**atl**

# A KNOWLEDGEABLE AND SUPPORTIVE SUPPLIER



ABDUL REHMAN  
SAVANT

**T**hroughout the large portfolio of rail engineering projects that we have worked on or are presently working on at Amey Consulting, we have built very good relationships with suppliers and manufacturers that support us in the specification and selection of innovative products and technology.

In the world of electrical power on the UK railway, Amey Consulting has successfully designed and commissioned several signalling power upgrades for reliability, resilience and enhancements. As part of this success, and the present work bank we have, we work very closely with ATL Transformer's rail segment.

ATL has been very supportive in providing Amey Consulting with product solutions to support its energy management targets and global sustainability goals, in particular 'Goal 9' and 'Goal 13', which are 'Industry, Innovation and Infrastructure' and 'Climate Action' respectively. The design work Amey Consulting E&P has produced for signalling power projects include the use of ATL's Rail Signal Transformers and PSP/ASP Transformers.

The new generation of eco-rail® transformers, that have been made available to us from ATL, have characteristics that contribute to the safeguarding of the environment as they are ultra-high efficiency, reducing the carbon emissions and environmental impact. These transformers also present low standby losses which support the reduction in wasted energy.

The latest aluminium range not only supports copper elimination, a major sustainability target, but it also offers a 30 per cent reduction in cost and weight, making the transformers easier to transport and install on projects being designed by Amey Consulting.

As part of our product research and specification of electrical power products, Amey Consulting has attended several CPD (Continuous Professional Development) sessions and exhibitions to support the personal development of staff and the business. ATL's Neville Haide has been a great supporter of this, delivering sessions at our offices and practical sessions on hassle-free installation solutions at exhibitions.



West Hampstead Principal Supply Point.

Amey Consulting has been one of the first E&P design consultants in the UK to design and implement a signalling power distribution system using the new ATL slim, aluminium, lightweight supply transformers located inside principal supply points, resulting in a reduced footprint.

ATL has worked with Amey Consulting, manufacturing bespoke solutions to provide a 'plug and play' system, as required by the client. It has been a pleasure to work with such a knowledgeable supplier that gives the time and effort to ensure they meet their customer's requirements.

As the rail industry has a history of lengthy processes when seeking product approvals for newly innovated solutions, this did not deter the collaboration between Amey Consulting and ATL as both organisations have built a reputation and trust within the industry and approvals was the least of our concerns.

Amey Consulting has several objectives, one of which is a sustainable growth of the business. This objective is related to employee development. In addition to all of the CPD and technical support we have had from ATL, we are also looking at the ATL Training Academy for our apprentices, trainees, graduates and experienced engineers. ●

Abdul Rehman Savant CEng MIET is a senior electrical engineer (E&P Design CRE) with Amey Consulting.

