



# LT118 Traction Motors

## Overview

Few companies have as long an association with London Underground as Brush Traction, which built a number of carriages for what would eventually become the Central and Northern Lines in the 1900s, when it was still known as Brush Electrical Engineering.

More than 100 years later, Brush Traction, now part of the Wabtec Corporation, was asked to put its expertise to good use once again, having been given contract 04/53010 to overhaul and repair approximately 1,400 LT118 types C and E traction engines used to power the fleet of trains on Piccadilly Line in 2006.

The LT118 Traction Motor is one of Brush's well-known products, having first been manufactured in the 1970s and subsequently redesigned by the company in the early 1990's to become the LT118 types C and E.

The contract commenced in August 2012 and the motors were to be overhauled to Specification TL/EO.11.01.01 in order to extend the service life of the fleet to at least 2026. This was in conjunction with a policy that required individual motors should be capable of remaining in continuous service for up to 8 calendar years before overhaul.

## The Deliverables

The need to withdraw the fleet from service, in or around 2014, for the duration of the overhaul work meant there was a requirement to ensure that repairs were kept to a bare minimum, alongside a requirement to achieve cost-savings through the whole process.

The motors were to be given a light overhaul with specific electrical testing in line with the parameters as set out under Specification TL/EO.11.01.01m, while it was agreed that in order to return the motors back to an as-new state, the test and inspection had to be severe.

Brush was also required to use its own historical data records in order to provide overhaul failure projections. It was also agreed that it would be most cost effective to both the customer and Brush if it manufactured the coils for the re-fields.



## Challenges

Some of the motors had suffered catastrophic service failures which meant they had to be set aside, while the need to cut costs meant worn or non-functioning coils were replaced using donor coils. These were stripped-out from failed motors, tested and added to others in order to create a serviceable set.

Concerns over the need to increase service life, reduce in-service failures and improve fleet performance were addressed by using fleet analysis and statistical data when focusing on new coils.

It was noted that the existing clamp plates were worn, and this required a mandatory change of plates across all units.

Another cause of reduced service in motors concerns the longevity of the pinion and gear wheel. Instead of replacing like with like, Brush implemented a new-design pinion to lengthen service life.

Concerns surrounding the likelihood of commutator covers becoming detached on aged motors were addressed by the provision of a new design for the covers and the introduction of a new catch mechanism.

The company generated a new design for the locating of brush gear and also assisted in setting up an armature seasoning plant.



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## Solution

The mobilisation for the contract had to take into account the scheduled vehicle lift programme and the 70 heavy repairs that were currently awaiting work at Brush. The beat rate was proposed at 8 motors a week comprising of a minimum 4 heavy repairs and 4 light overhauls.

Any motors that had suffered catastrophic service failures were set aside which, in normal conditions, would have been unsustainable. However, the fleet life was coming to an end, so the net result was that approximately 70 motors were removed from service awaiting major repairs.

Brush drew on historical data and also from its rotating machines engineers during discussions with the customer in order to generate a robust specification and a sustainable repairs policy in line with the customer's exhaustive requirements.

## Outcome

Throughout the contract, Brush continuously demonstrated cost savings with no loss in quality to the product. The feedback from the customer, once the motors were back in use, was the fleet had never been so good.

The contract was completed successfully in December 2016 with the delivery of 942 traction motors ahead of schedule on a contract value of £5m. Re-field rates ran at 44% and warranty rates were recorded at just 0.6%.

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