

Tyseley Light Maintenance Depot

Underframe Washer

Due to Network Rail's installation of an innovative, high-pressure, under-frame washer system at Tyseley Light Maintenance Depot, the time it takes to manually clean the underframe of a typical three car train has been reduced from three hours to an astonishing seven minutes. Not only does this time saving element make it a popular choice, but this new machinery has introduced significant energy saving improvements through the reduction in water, chemical and detergent usage.



Confined layout of works

Courtesy of Hyder Consulting

Typically, before any maintenance is performed on a train it is required that the underframe is thoroughly cleaned due to the vast amount of grime that it collects on its journeys. Without this cleaning it would make it very difficult to perform any mechanical improvements. Previously the underframes were washed in a pit with the use of a mechanical trolley that ran the length of the train spray-washing it with a mixture of water, chemicals and detergents. This proved ineffective at the Tyseley Depot which meant that hand lacing had to be carried out by the operatives which was not only an unpleasant and tedious task, but it was also a health concern due to the various chemicals that they may have come into contact with during the cleaning process. It was also not uncommon for the effluent water to obstruct the drains causing frequent flooding of the pit.

Further to the identification of these issues by the Depot Facility

Operator London Midland, Network Rail agreed that an underwasher was the best solution to combat the problems identified.

In early 2005, a design-and-build contract was awarded to GallifordTry Construction who then went on to appoint Hyder Consulting as their Designer. Due to the nature of the machinery the works had to be designed to suit the equipment which was provided by a specialist supplier, Ceccato SpA. The equipment and plant consisted of the following:

- wash apron and drainage sump
- services building
- under-track and gantry crossings of existing railway lines
- effluent treatment works
- pumped disposal system for final effluent
- sludge storage tank



Wash apron for new underframe washer at Tyseley Depot

Courtesy of Hyder Consulting

Due to the layout of the depot, the works had to be designed to ensure that all the elements of the projects could be accommodated. This meant that the building structures had to be strategically placed into confined spaces between the existing tracks. Other constraints included the careful consideration of the operational requirements of the busy rail depot which meant that work being carried out had to be programmed around the frequent movements of the trains. This was overcome by daily consultation with the Depot Facility Operator to ensure disruption was kept to a minimum.

Due to the radical new concept of the underframe washer, which has never previously been used by the UK Rail Industry, a custom-built washing facility was no longer needed and instead a bespoke wash apron, measuring 8m x 7.2m, was installed onto the line of an existing track. The nature of the works also meant that instead of the ineffective trolley which had previously been used, jet washing nozzles which were both static and rotating, were fixed onto the apron to provide time saving and effective cleaning of the underframes of the trains.

In order for the existing track to accommodate the wash apron it was re-laid on special supports and an underground transition slab was constructed at the approach to the apron in order to accommodate the change from ballasted track to slab-track. By using the existing track it ensured that cost saving benefits were utilised.

A new services building was designed and constructed with factory manufacturer GRP panels which ensured speedy line-side assembly of an inexpensive but functional structure. The buildings were designed to be well lit with sufficient ventilation and were located some distance away from the wash apron. Gas, electricity and water services are conveyed to this building via a custom-built gantry over an existing track. The steel gantry was hot-dip galvanized, to avoid the need for further painting. The elimination of the painting means that track possession would not be required in the future, ensuring minimal disruption to the depot and the passengers themselves. The



New over-track gantry at Tyseley Depot

Courtesy of Hyder Consulting



New line-side settlement tanks at Tyseley Depot *Courtesy of Hyder Consulting*

building also houses a boiler room with an industrial gas-fired boiler and an equipment room which was required to hold a compressor, various pumps and switchgear.

In order for successful cleaning of the underframes to take place, the underframe washer was designed to use hot water, wash chemicals and detergents which are then pumped under high pressure from the services building to the wash apron. The automated wash operation requires the train to make four slow passes over the wash apron (up, down, up, down) and as it passes, the high pressure jets spray its underframe, ensuring that it is washed thoroughly.

Throughout the cleaning process effluent from the underframe washer gravitates to a deep sump under the wash apron. From here, a submersible pump delivers it, via underground pipework, to line-side settlement tanks in series. These reinforced concrete tanks are square in cross-section and are at ground level. The reason being because it

proved difficult to construct the circular tanks and by having them at ground level instead of underground it ensured that expensive ground supports which would have had to be positioned between the tracks, were not required. The design also ensured that all of the pipes used in the tank were made of stainless steel. This ensured that these inaccessible components would not corrode in the future.

Treatment in the line-side treatment works consists of settlement, oil-skimming, chemical dosing and filtration through activated carbon. This ensures that the treated effluent is of a quality that could be discharged to a watercourse, although in this case, it is disposed of by being pumped into the foul water sewer system.

Sludge from the treatment works is stored in a 12m³ capacity tank and decanted liquid from this tank is periodically returned to the treatment works. Sludge is then tankered off-site every 3 months. However, the sludge does not consolidate in the interim because is kept in suspension by means of compressed air that is bubbled through a sparge laid on the floor of the sludge storage tank. This aeration of the sludge minimizes odour nuisance.

Previously, in order to wash a three car train the amount of water required was 30,000 litres. Since the introduction of the underframe washer it has meant that this typical water usage has reduced substantially to using only 600 litres of water. This 98% decrease illustrates not only the cost saving benefits, but also how energy efficient the underframe washer has proved to be. The project is estimated to achieve a total carbon emissions reduction of 550T CO₂ per year. The considerable savings made in consumables are sufficient to repay the initial capital outlay within five years.

Maintenance of trains at Tyseley Depot has been greatly facilitated by the fact that the train underframes are now so thoroughly washed and due to reduction in time more trains that ever before are being cleaned using the process. This has ensured financial gain for the facility because nearby Depots are also using the underframe washer due to its excellent performance.

The £0.8M project was successfully completed on time and to budget and was successful awarded the ICE West Midlands Innovation Award 2006 'for an outstanding example of a Civil Engineering project completed in 2006'. It was a finalist for both the Environment Agency Water Efficiency Awards 2007, in the Envirowise industry & business category, where it was adjudged to 'make a massive impact on reducing water use and deserving of recognition' and also the Edie environment excellence award in the carbon-reduction project category.

Note: The Editor & Publishers thank Hyder Consulting for providing the above article.■



New underframe washer in operation (left) and cleaned train leaving Tyseley Depot (right)



Courtesy of Hyder Consulting