

DLW: The Change Management

About DLW

Diesel Locomotive Works (DLW) was established in 1961 in collaboration with M/s ALCO, USA in the ancient holy city of Varanasi to undertake indigenous manufacture of diesel electric locomotives for meeting increasing transportation needs of Indian Railways. DLW is one of the few facilities in the world, where the complete locomotive is manufactured under one roof starting from component level.



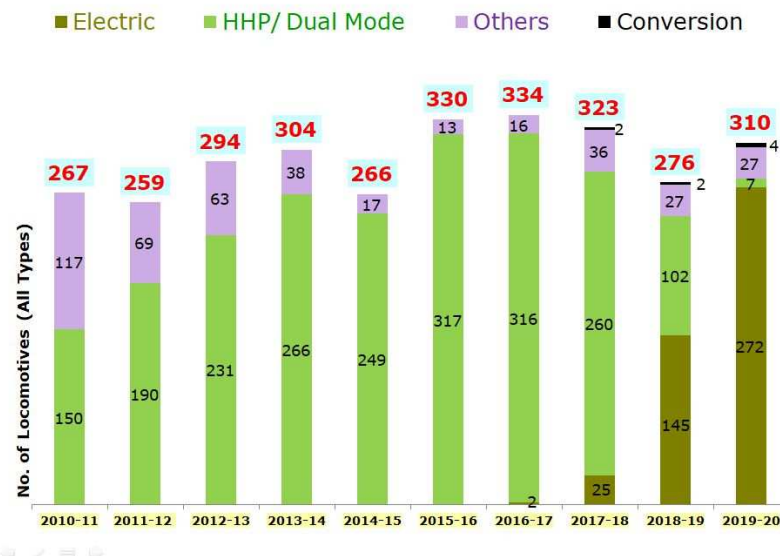
Y.P. Singh
General Manager

First diesel electric locomotive WDM2 manufactured at DLW was flagged-off by **Shri Lal Bahadur Shastri** on 3rd Jan 1964, since then DLW is continuously acquiring expertise in the latest Designs of Diesel locomotives & lately of Electric locomotives meeting the transport needs of Indian Railways and Non Railway Customers (NRC) in India as well as abroad. Since inception, DLW has manufactured more than **8737** locomotives of various types and horse power viz. Diesel loco (ALCO & HHP) and Electric locos.



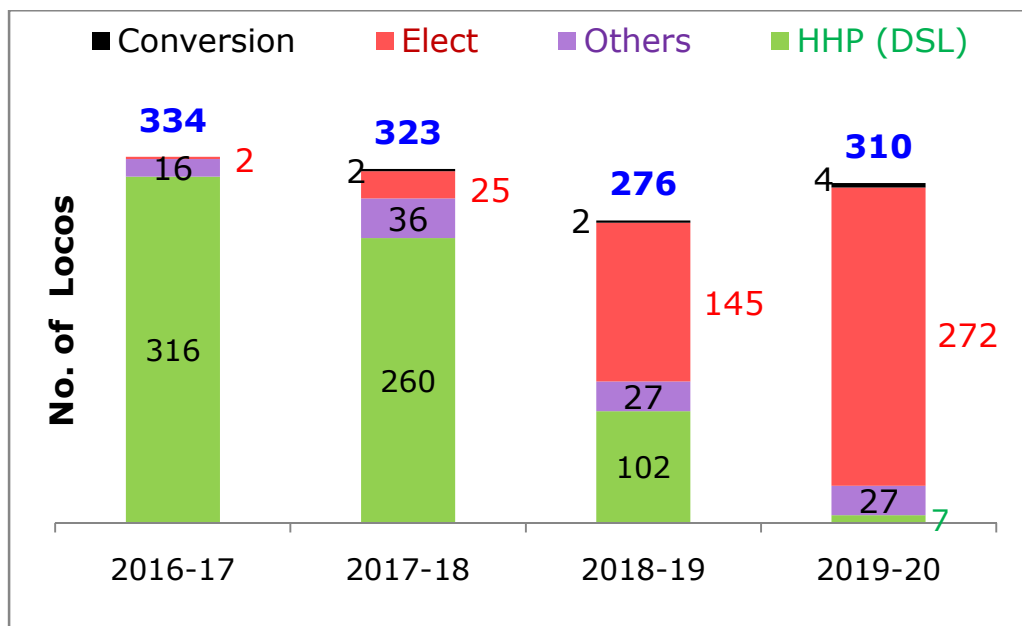
With the dedication of its team of officers, supervisors and staff, DLW rolled out 334 locomotives (highest ever) during the year 2016-17, which accounts to “*more than one locomotive a day*”.

Past 10 Years' Production Performance



Beginning of New Era: Transition From Diesel locomotive to Electric locomotive

With rapid electrification in IR during FY 2015-16, requirement of electric locomotive was on rise and requirement of diesel locomotive was on decline. It was decided by Indian Railways to switch over from Diesel to Electric Locomotive usage in order to reduce carbon foot print and other environmental issues. Railway Board entrusted DLW to manufacture 2 Electric locomotives as a test project in Financial Year 2016-17. Before this transition, DLW was only a Diesel locomotive manufacturing unit & a hub of Excellency for Diesel loco manufacturing. DLW successfully rolled out first 2 locomotives within the time limit set by Railway Board. Thereafter production of Electric locomotive manufactured at DLW kept on increasing and DLW manufactured 25 & 145 locos in FY 17-18 & 18-19 respectively. Now DLW has completely switched over from Diesel locomotive manufacturing to Electric locomotive manufacturing except few Diesel locos required for NRC/Export. Following chart clearly indicates transition of DLW from a Diesel locomotive manufacturing unit to an Electric locomotive manufacturing unit.



During the financial year 2019-20 DLW manufactured 272 electric locomotives.

Switching from a Diesel Locomotive manufacturing unit to an Electric locomotive manufacturing unit in such a short span of time required meticulous planning, dedication and hard work. Team of officers and supervisors working at DLW achieved this milestone with hard efforts and commitment. Major steps taken during the transition phase are as under:

- Training imparted to the staff, supervisors & officers involved in Electric loco manufacturing.
- Development of product structure - Complete parent-child relationship to permit procurement.

- Arrangement of various special facilities like Horse/Ladder /Tackles for shell & Roof, Synchronized Jacks for lifting of loco, Hydraulic synchronized system for transformer mounting, Dummy bogies for shells etc.
- Commissioning of various Testing & Commissioning facilities like Loop & Logic Box testing arrangement, Transformer oil centrifuging arrangement, Battery charging arrangement, Traction Motor Run Test arrangement etc.
- Removal & Shifting of structures like long hood fixture, RW2 structure, deck milling machine etc. in order to make space for electric loco manufacturing.



Before



After

- Conversion of HHP Diesel loco manufacturing structures like trunion and paint booth to facilitate manufacturing of Electric loco shell.



Old Paint booth



Modified Paint booth

- Streamlining of process flow in Loco Assembly Shop in line with the requirements of Electric loco manufacturing.
- Establishment of a feedback close loop system for taking care of feedback of internal as well as external customers.
- Online Warranty Handling System for DLW rolled out electric locos introduced, for lodging and disposal of complains made by user loco sheds.

With each passing day, DLW is improving efficiency of Electric loco manufacturing, which can be inferred from the fact that our efforts has reduced Loco Assembly time from 21 to 15 working days, Loco testing time from 12 to 5 days, Rain test time from

average 10 passes to 4 passes. Overall, loco outturn time has been reduced from 38 to 26 working Days for unpainted shell and with Painted shell from 33 to 20 days. Today DLW has evolved into a unit which can easily roll out 400 Electric locomotives in a year.

Further, various innovative features have also been added to the Electric locos rolled out of DLW like foot rest for loco pilots, modified loco pilot seats with improved ergonomics etc.

In order to further improve quality of our Electric locomotives regular feed-back from various sheds are taken and necessary corrective actions are being implemented. In this regard customers meet was also organized at DLW in August'19. Officers from Railway Board, RDSO and various Zonal Railways participated and shared their experiences which has also enriched DLW's knowledge bank for Electric loco manufacturing.

DLW has also undertaken some of the innovative projects like conversion of Diesel loco to Electric loco and manufacturing of Dual mode loco. Till now, DLW has already converted 8 Diesel locomotives to Electric locomotives. It was an honour for DLW that a Converted locomotive WAG10 was flagged off by the Hon'ble Prime Minister of India in February 2019.

The manufacturing of Dual Mode Locomotive, which will run on both diesel & electric mode, has also been successfully completed by DLW. The Dual Mode locomotive will produce 4500 bhp in Diesel mode and 4500 HP in electric mode. This was again a flagship project for DLW and first such Dual Mode loco WDAP5 is under testing.



Dual Mode Locomotive



Conversion Loco flag off by Hon'ble PM

Ensuring Quality in Changing Times

In line with the mandated requirement, DLW made necessary changes in the apex organization to meet the challenges of increased and sustained production of electric locomotives along with consistent quality. Officers having exposure in the field of electric locomotive design, production and maintenance were deputed to DLW to lead the change.

To align the knowledge of inspection wing inspectors with the changed product, identified supervisors and artisans were trained in Technical Training Center, DLW. They are now the frontline personnel in ascertaining the manufacturing quality of the

product. They were imparted in-depth knowledge of three-phase drive-based electric locomotives with emphasis on items to be checked during inspection.

For large and complex systems like Locomotive, production passes through multiple stages of manufacturing, and for each stage, there are several quality checkpoints that need to be ascertained. All the checkpoints are required to be standardized in the form of check sheets. The check sheets were collected from CLW and other production units were adopted initially. However, on gaining more experience all these check sheets were thoroughly revised for correction, inclusion, deletion of checkpoints and also to suit and align with the stages of Production at DLW. A further system of digitalization of all check sheets was developed to give a copy of the locomotive booklet to the customer via digital means (E-mail).

Inspection Wing at DLW is also working as a bridge between the customers and DLW production shop. To strengthen, a Service Improvement Group (SIG) was also set up for Electric Locomotives. The main role of SIG is to monitor the customer complaint (warranty, failure), take a lead in resolving these issues, and also to actively monitor commissioning of Locomotive in the user loco Shed.

To deal with the warranty claims in a transparent and fair manner, an Online Warranty Portal was launched for Electric Locomotives also, and all the user sheds were given direct access for lodging the warranty claims of failed Equipment/Component of newly turned out Locomotive. Two training sessions have also been conducted for the users of warranty portal from the sheds for imparting know-how of working of Warranty Portal. Each and every warranty claim on this portal is monitored with the respective firms for corrective and remedial actions. This is helping DLW in fulfilling the warranty obligations towards its customer sheds in the timeline of 90 days.

A centralized system of monitoring the commissioning defects and failure reported by sheds through various means of communication was set up. All such reporting is being acted upon for improving the process/checkpoints and vendor side corrections.

Customer satisfaction can truly be achieved only if his suggestions are acted upon in true spirit & for this the Feedback System for reliability improvement was adopted. The issues raised by sheds and non-conformity during production are being consolidated on monthly basis and being advised to the Production shop and Design division of DLW. Exhaustive meetings are also being conducted regularly with the active participation of all Officers / Supervisors from Production, Design and Inspection. Frontline officers and staff have very enthusiastically taken on themselves to contribute better practices and innovations on this forum. This has become a forum of a healthy discussion with an overall objective of improvement in the quality and reliability of Electric Locomotive being turned out from DLW.

Since the importance of direct communication cannot be denied, a system of roster of Inspectors has been made and implemented with the mandate to visit the

nominated sheds on a bi-monthly basis. It will enable DLW to understand the customer's problems in the right perspective and implement the suggestions effectively.

DLW has also complied with the requirements and obtained following certifications from reputed certifying agencies: -

- Integrated Management System (IMS) of ISO 9001:2015 (QMS), ISO 14001:2015 (EMS) and OHSAS 18001:2007 (OHSMS). 5-S certificate for Workplace Management System (WMS).
- The NABL (ISO/IES 17025:2005) Certificate.
- ISO 3834 (2):2005 Certificate for Welding Standard.
- ISO 22163 International Railway Industry Standard (IRIS).

In addition to this, following small but far-reaching steps were also taken to improve the quality & reliability of Electric locomotive-

- Daily meeting of inspection supervisors started to discuss the issues arising on the shop floor during quality checks.
- Quality booth: a one-stop place for inspection know-how started in Loco Frame shop.
- Work Instructions for UST of Bogie & Underframe.
- Radiography of critical joints in Cattle Guard of Electric Loco.
- Load Test of Crimping of Cables used in Electric Locomotives.
- Use of Laser-based measurement tools.

Diesel Locomotive Works is thus committed to scale new heights by breaking old records, introducing cutting edge technology and continuously improving the quality of locomotives along with care for its environment.

Jai Hind