

New locomotives for Tata Steel

Description of the new shunting locomotives being supplied by Clayton to the South Wales steelworks.

In business for over 88 years, Clayton Equipment is now the only independent locomotive manufacturer in the UK capable of designing and manufacturing locomotives from 1.75 tonnes to 135 tonnes, for track gauges from 457mm to 1,676mm.

The company designs and builds a wide range of products including battery, diesel, overhead (trolley), rubber-tyred, battery-diesel and battery-diesel third-rail hybrid locomotives as well as bespoke rail construction equipment such as tunnel drilling rigs. It has supplied equipment to over 60 countries, supporting the industrial depot, metro, main line, tunnelling and mining industries.

Clayton has witnessed a particular market shift over the last few years with customers looking for alternatives to operating traditional diesel-powered shunting locomotives. There are a number of reasons why this is the case:

- Reliability. Old locomotives, particularly '08' shunters, are now over 50 years old with spare parts being near impossible to source.

- Cost. Operational maintenance costs are going up while the customers' locomotive fleet availability is going down (not good if your locomotive is key to your 24-7 operations!).

- Environment. Old locomotives do not emit clean exhaust emissions, often remain on idle, burning fuel and chucking out smoke when stationary, just to ensure that they are ready when needed, and constantly drip oil everywhere they go.

- Noise. Old diesel locomotives, operating in depots near domestic housing throughout the night, are not popular with the neighbours!

Tata Steel order

Some of these issues were acknowledged by Tata Steel, based in Port Talbot. It operates a mixed aged and fleet type of diesel locomotives, which are critical to its operation. They move molten iron in refractory-lined 'torpedoes' from the blast furnaces to the Basic Oxygen Steelmaking (BOS) plant through to moving finished rolled steel using main line rail wagons. With its locomotive fleet, Tata



Above: The CBD90 locomotive inside the despatch end of the Tata Steel works at Port Talbot.

Below: The line of sight looking forwards along the locomotive's bonnet.



Below: The CBD90 at Port Talbot.



New Equipment

One of the bogies (below) and the battery box (right) from the CBD90 locomotive.



Steel loads up to 2,500 tonnes and works on gradients up to 1:60 (1.7%).

Through a tender process, starting in late 2018 into 2019, Clayton successfully won the contract by proposing the optimum locomotive design for Tata Steel's operations and site conditions. Together with a competitive price and delivering a solution that would reduce operational costs, the locomotive allows Tata Steel to increase its locomotive availability yet deliver environmental benefits with significantly lower emissions.

The CBD90

The Clayton CBD90 locomotive is a 90 tonne, hybrid Bo-Bo locomotive. In fact, this is the largest locomotive designed and built in the UK for over 16 years with a similar tractive effort to a main line Class 68, albeit limited to the slower speeds found in depots and industrial sites.

Power is delivered by the low-maintenance traction battery and four maintenance-free, high-torque electric motors. The locomotive is self-contained, with an on-board battery charging from a low emission, EU Stage V compliant diesel engine. The engine is only 55kW and used only for battery recharging. It operates at the optimum speed for maximum fuel and emission efficiencies, automatically stop/starting when the battery charge drops below a preset level.

Lead acid batteries are still used in Clayton shunting locomotives, despite the 'trend' for lithium-based batteries. There are a number of reasons for this use:

- They are proven to last beyond their expected life.
- They are a stable technology, so have no obsolescence concerns. Lithium batteries are rapidly changing as the technology develops, and are mainly led by the automotive industry.
- They are durable in heavy-duty demand applications. Clayton battery locomotives have been used for over five decades including underground hard rock mining.
- They have a significantly lower cost - at least a fifth of the price of lithium batteries.
- Unlike lithium, they are very low fire risk.
- They are heavy, which is ideal for shunting locomotives requiring tractive effort!

Delivering benefits

This CBD90 locomotive configuration enables Tata Steel to realise significant financial savings from reduced fuel costs and near maintenance-free operation. It also allows a higher service availability to support its 24-7, 365 days-a-year operation and for the company

Right: One of the hybrid locomotives supplied by Clayton to London Underground.



to maintain and grow its planned productivity.

Clive Hannaford, Managing Director, Clayton Equipment, said: 'We are pleased to work with Tata Steel, designing this locomotive to meet their specific needs. As with all of our locomotives, the design of this bespoke locomotive (with manufacture, test and commissioning taking just over 24 weeks) allows Tata Steel to quickly realise the benefits needed.'

'This locomotive is the largest designed and built in the UK for over 16 years, with Clayton Equipment being the only UK independent OEM that retains this ability. Clayton Equipment and Tata Steel are also proud to be using high-quality steel for the 30 tonne frame, supplied by Tata Steel's Plate Profiling Centre in Wednesfield.'

Other locomotives

However, traditional diesel locomotives still have their place. This is shown by the recent locomotives delivered by Clayton - including



Above: The main frame of the locomotive under construction in Clayton's workshops.

seven CD40 locomotives for use on Crossrail (the world's first Stage IV diesel locomotives) - and a CD45 locomotive for use at Ford's Dagenham site.

Another option Clayton offers is to overhaul the customer's existing shunting locomotives rather than purchasing new ones. By replacing the old mechanical transmissions and diesel engine with a clean, maintenance-free electric solution, the capital costs are lower as the locomotive structure and wheel sets can be retained. An added benefit, of course, is low emissions, reduced noise, lower operator and maintainer training, all with lower operational costs. A prime example of this was the fleet of 10 locomotives converted by Clayton on behalf of London Underground. These are powered by a lead acid traction battery and also third/fourth rail traction current.