

Heavy Haulers at Port Talbot



The huge Tata Steel plant at Port Talbot in South Wales has an extensive internal rail network with a varied – and seldom reported – locomotive fleet, including some new Clayton battery-diesel hybrid locomotives. Robert Pritchard was lucky to be given a rare guided tour of the loco depot and some other parts of the site. All photos taken by the Author on 21 August.

Visits to the locomotive depot at Port Talbot steelworks are rare – and when you visit you can see why – it lies in the shadow of the two huge blast furnaces which between them are typically responsible for the production of as much as 3.5 million tonnes of iron per year. These days there are just two major steel plants in the country that produce steel from raw iron ore, coal and limestone, and Port Talbot is very much the largest (British Steel Scunthorpe is the other with four smaller blast furnaces). Port Talbot, in West Glamorgan between Bridgend and Swansea has around 4000 staff currently directly employed at the plant.

Background

There have been steelworks in this area since the 1900s, but the current site opened in 1953 as Abbey Steelworks, at the time in private ownership as The Steel Company of Wales. At peak production in the 1960s the steelworks employed around 18000 staff. The plant was nationalised as British Steel in 1967 and then privatised in 1988 before becoming Corus with British Steel's merger with Dutch steelmaker Koninklijke

Above: In a classic industrial setting at Tata Steel, Port Talbot, Clayton-built battery-diesel CBD90 locomotive 931 (built in 2019) shunts torpedo wagons in front of blast furnace No. 5.

Hoogovens in 1999. The current owners, Tata Steel UK (part of Tata Steel which is a huge global company headquartered in India) took over from Corus in 2007.

As it is now officially called, Port Talbot integrated iron and steel works covers a vast area of land around four miles long and one mile wide to the east of the town, situated

next to Margam Moors, with Port Talbot Docks bordering the site to the north with the town of Port Talbot, motorway, the Great Western Main Line main line railway and the Port Talbot Peripheral Distributor Road (PDR) forming its eastern boundary. To the south-west of the site is Swansea Bay and Margam Sands.



Above: A general view of the small four-road locomotive shed at Tata Steel, Port Talbot which maintains the varied fleet, some of which is seen in front of the depot. To the left is stored 0-4-0 DE 501, and then 09 (ex-909), new Clayton loco 930, 903 (inside the depot) and 07 (ex-907).

Raw materials such as lump iron ore and pellet ore as well as limestone and coal used in the steel making process are imported by sea in large bulk carriers that arrive in a dedicated deep water harbour. Iron ore is imported from all over the world, including from South America and Australia, and these days bids for this are often made while the ships are at sea.

The traditional and time-honoured steel making process sees iron ore reduced in the two huge blast furnaces. Limestone is used to absorb impurities in the ore, and coal – having been turned into coke on site in a separate oxygen-free atmosphere coking plant – chemically reduces the ore to iron. The carbon from the coke reacts with the oxygen in the iron ore to facilitate the chemical reaction that turns 60% pure iron into 95% pure iron. With air and high-purity oxygen being pumped in the temperature in the blast furnace can reach well above 2000°C and excess slag has to be separated out. In its molten state the pig iron produced is then poured from the blast furnace into torpedo wagons and hauled by rail to the Basic Oxygen Steelmaking (BOS) plant where the torpedoes are rotated to empty the pig iron which is then refined into pure molten steel through desulphurisation and then injecting oxygen. Slabs of steel are then able to be cast continuously. The slabs are cut into 10 m lengths for hot rolling at the rolling mill and the steel can then be coiled for further processing or shipment to customers.

Some of the steel produced at Port Talbot is sent to other steelworks (such as Llanwern and Trostre) to produce products such as tinplate. Coils are also a common sight being moved by train to steelworks such as Corby or Shotton. Some is also moved to sites in the Midlands, such as Round Oak, for use in the motor industry. Rail output is from the adjacent Margam Knuckle Yard to the east of the site, with DB Cargo the principal operator of steel trains to and from the site.



Above: One of only two of the four B-B DH Trojan locos currently on site, 920 “Branwen” with 904 top-and-tail two torpedo wagons from blast furnace No. 4 to the Basic Oxygen Steelmaking (BOS) plant.

The percentage of product produced for the home market can vary year-to-year, but generally stands at around 60–70%. Headline customers include Jaguar Land Rover and BMW. Some steel for export is moved by train via Newport Docks.

From the late 1980s to the late 2000s steel production at Port Talbot gradually increased, through investment and as a result of the closure of competing plants such as Ravenscraig and Redcar, and also the end of steelmaking at Llanwern in 2001.

Port Talbot has two huge blast furnaces, No. 4 and No. 5 – which both originally date from the late 1950s. No. 4 was completely rebuilt in 2012 in a £185 million project which at the time the UK’s largest industrial engineering project which took around six months. It boosted capacity by an additional

400 000 tonnes per year. Furnace No. 5 was refurbished in 2018 in a £56 million project. Furnaces Nos. 1 and 2 were shut down in the 1970s and 1980s and No. 3 was retained as standby for some time but then demolished, having last been used in 2001. Some of the foundations were used for a new power plant.

The internal railway and loco fleet

There are 25 miles worth of internal railway lines within the site, and the fleet of Tata Steel locomotives play a vital role in many aspects of the process – from hauling liquid iron in torpedoes from the blast furnaces to the Basic Oxygen Steelmaking (BOS) plant to hauling finished products into Margam Knuckle Yard for onward movement on the national network.

The loco fleet comprises four different types of loco and currently stands at 15 operational locos on site (see Table), of which eight are usually required for daily service, 24 hours a day, seven days a week – so it is a hard-working fleet.

Two locos each are required to transfer the torpedo wagons of molten iron from each of the two blast furnaces to the Basic Oxygen Steelmaking (BOS) plant. Another three are normally based at the opposite end of the site to move rolled steel to the main line exchange sidings in the Margam Knuckle yard.

The buzzword all about the place these days is decarbonisation: there is always pressure on the business to decarbonise and whilst emissions from the older diesel locos are a small fraction of the total emissions of the site, there is still a commitment to reduce emissions from the locomotive fleet, some of which still dates from the 1950s. It was in September 2018 that Tata placed an order with Clayton Equipment Ltd of Burton-on-Trent for a framework order of up to seven state-of-the-art CBD90 90-tonne Bo-Bo hybrid locos (initially there was a firm order for one prototype loco, numbered 930) as part of the start of modernising its fleet to



Above: A torpedo wagon is loaded with molten iron at blast furnace No. 5 before being taken to BOS plant.

bring reduced operating costs, increased availability and reduced emissions. Quotes were taken for heavy rebuilds of some of the existing locos, but these didn't offer good value compared to completely new locos, each coming out at around 80% of the cost of a new loco.

As reported in our article on Claytons in **TRUK219** the CBD90 is a bespoke battery-diesel hybrid loco, with the engine acting as a slave used solely to charge the onboard traction batteries. Tata explained that the slave engine was vital, otherwise a charging station would have to been installed – for which space was tight – and the locos would also have had to be taken out of service for several hours at a time to charge – so a larger overall loco fleet would therefore have been needed. The locos have EU Stage V compliant Deutz diesel engines rated at 55 kW to charge the traction batteries, automatically stopping and starting when the charge in the battery reaches pre-determined levels. Lead-acid batteries are used as they add more weight than the alternative lithium-ion types, which makes them ideal for heavy shunting locos, giving improved tractive effort and a higher axle load. They are also cheaper, more durable, pose little by way

Port Talbot internal locomotive fleet list

No.	Type	Works Number	Name	Notes
501	Brush Bagnall 0-4-0 DE	3066/54		Locomotive stored at the depot
503	Brush Bagnall 0-4-0 DE	3068/54		Used solely on the separate coke oven railway, heavily rebuilt
504	Brush Bagnall 0-4-0 DE	3069/54		Locomotive stored and up for sale
509	Brush Bagnall 0-4-0 DE	3099/56		Locomotive stored and up for sale
901	Brush Bagnall Bo-Bo DE	3063/55		
902	Brush Bagnall Bo-Bo DE	3064/55		Locomotive stored and up for sale
903	Brush Bagnall Bo-Bo DE	3065/55		
904	Brush Bagnall Bo-Bo DE	3137/57		
905	Brush Bagnall Bo-Bo DE	3138/57		
906	Brush Bagnall Bo-Bo DE	3139/57		
07	Brush Bagnall Bo-Bo DE	3140/57		Rebuilt by Hunslet Barclay (ex-907)
08	Brush Bagnall Bo-Bo DE	3141/57		Rebuilt by Hunslet Barclay (ex-908)
09	Brush Bagnall Bo-Bo DE	3142/57		Rebuilt by Hunslet Barclay (ex-909)
920	SES "Trojan" B-B DH	0001/2009	Branwen	Rebuilt by Hunslet Engine Company
921	SES "Trojan" B-B DH	0002/2010	Rhiannon	Rebuilt by Hunslet Engine Company
922	SES "Trojan" B-B DH	0003/2010	Guinevere	Rebuilt by Hunslet Engine Company. Currently at Loram, Derby
923	SES "Trojan" B-B DH	0004/2011	Aurora	Rebuilt by Hunslet Engine Company. Currently at Hunslet, Barton
930	Clayton CBD90 Bo-Bo BE	B4646/2019	Fiona	
931	Clayton CBD90 Bo-Bo BE	B4649/1/2019		
932	Clayton CBD90 Bo-Bo BE	B4649/2/2019		
933	Clayton CBD90 Bo-Bo BE	B4662/1/2021		
934	Clayton CBD90 Bo-Bo BE	B4662/2/2021	Abigail	
935	Clayton CBD90 Bo-Bo BE	tbc		Delivered to Port Talbot on 25 October, being tested
936	Clayton CBD90 Bo-Bo BE	tbc		Currently under commissioning at Clayton's

The second part of the Works Number is the date built (for example Works No. 3066/54 was built in 1954).
SES = Scunthorpe Engineering Services.



of fire risk and are longer lasting than the lithium alternatives.

The battery supplies power to the four high-torque electric motors which provide 416 kW and a tractive effort similar to a Class 68 – needed to shift the heavy torpedo wagons up some steep gradients. The locos were the largest to be built in the UK since the Eurotunnel 9/7 locos built by Brush until 2002.

Left: 901 and 921 are seen undergoing maintenance in the depot.

Below left: Awaiting their next duties outside the depot on 21 August are one of the three Brush Bagnall 1950s-built locomotives that was heavily rebuilt by Hunslet Barclay (09) and Clayton loco 930. Normally one loco is available as a "hot spare" to be deployed at short notice should there be any issues with any of the locos in service.

Below right: Another view of 901, the oldest of these Brush Bagnall locos, dating from 1955.



930 was constructed swiftly and was delivered to Port Talbot in March 2019 – the manufacture, testing and commissioning having taken a mere 24 weeks! Two further Clayton locos were ordered in June 2019 (931/932) and another two followed in 2021 (933/934). Completing the framework order for seven locos, two more locos were ordered in July 2021, and 935 was delivered from Clayton's on 25 October, with 936 due to follow shortly.

Despite some initial teething problems with the first loco (mainly related to the brakes and charging – to be expected with a new design) the new Clayton machines have now bedded in well, the first having been used for more than four years now. A maintenance arrangement is in place with Claytons, with support staff from the Burton-on-Trent company on site at Port Talbot one week out of every month.

The rest of the loco fleet

In terms of the remainder of the fleet, aside from the five (soon to be seven) Clayton-built locos, the most modern are four heavy shunting 100-tonne locos that were built by Scunthorpe Engineering Services (both works were part of the Tata group at the time) between 2009 and 2011 as 920–923. These are nicknamed “Trojan’s” and have all been given girl’s names. The first loco was supplied in October 2009 but there were numerous design flaws which made them unsuitable for their planned duties and they were also not popular with drivers. As a result they were soon rebuilt by Hunslet at Barton-under-Needwood during 2011–12. Modifications in particular were made to the cabs, heating and insulation and the control system was replaced. They are fitted with Caterpillar C27 engines rated at 1000hp.

Currently the four Trojans are undergoing a further series of overhauls as they reach 25000 hours life. 920 and 921 are presently



Above: Just one of the smaller Brush Bagnall 0-4-0DE locos is still in use, on the coke oven railway, but 501 of 1954 is stored outside the depot and 504 and 509 are stored close by and up for sale.



active at Port Talbot, while 922 left for Loram, Derby in January for overhaul and should return within a few months. 923 is away at Hunslet at Barton for attention.

For many years the backbone of the fleet, and still forming an important part of it, are Brush Bagnall Bo-Bo DE locos, built jointly by Brush Traction at Loughborough and William Bagnall at Stafford (Brush sub-contracted the assembly of the locos to William Bagnall and they were some of the last locos this company built before going out of business in the early 1960s). As-built they had Mirrlees engines but were re-engined with Rolls-Royce DV8Vs. Five in their original form are still active, along with three others that were heavily rebuilt in the 1980s

from the frame up by Hunslet Barclay with Caterpillar engines (and at the same time were renumbered from 907–909 to 07–09). For the older locomotives the spares pool is becoming a real challenge to maintain, however, and with the oldest loco now almost 70 years old the aspiration is that these will be replaced in the coming years – the arrival of 935/936 should see two stood down imminently. Different hire locomotives from Ed Murray have also been used on an as required basis in the past.

One smaller Brush Bagnall 0-4-0 DE loco, 503, remains in service as “No.1”, but on the separate short coke oven railway some way from the main depot. This loco has been heavily rebuilt to meet the harsh operational requirements of this railway. None of the other smaller Brush Bagnall 0-4-0 DEs remain in service and 501 is stored at the depot along with 504 and 509 which are long-stored and up for sale (along with Bo-Bo DE loco 902). Some of the 5xx series locos were rebuilt as brake tenders in the 1970s, with just the chassis left, 514, 505, 510 and 512 respectively becoming BT-1 to BT-4.

The locomotive fleet livery today is a smart light blue and white, the older locos were previously in Corus yellow and grey livery. Some locos can be seen in action from one public vantage point – at the east end of the site where a public footpath crosses both the GWML and the connecting line from the steelworks to Margam Knuckle Yard at Margam Moors Crossing.

Our visit to Port Talbot

The number one priority at Port Talbot is of course safety. For our visit we are required to change into full protective gear – this is the same that members of staff working in the same areas are wearing, known as full



Above: One of the oldest locomotives in its original condition that is still in use, 1957-built 905 top-and-tails a train of torpedoes for blast furnace No. 5 with new Clayton CBD90 931.



Above: Full laden torpedo wagons are deposited outside the Basic Oxygen Steelmaking (BOS) plant where they are shunted ready for emptying by a dedicated loco, on this day 08 (just visible to the left). Empties are then hauled back down the hill to be loaded again. The BOS plant alone employs around 600 staff.

Below: Two loaded torpedo wagons are prepared for transfer to the BOS plant.



Above: The two newest Clayton locos at the time of our visit, 934 and 933, were both at the east end of the site of shunting trains into and out of Margam Knuckle Yard.

Right: The works plate on Clayton loco 933.

molten metal gear, consisting of under- and over-garments as well as the usual hard hats, gloves and goggles. A higher level of PPE is required for those working in the blast furnaces, BOS plant and certain other areas.

We are first taken into the small control room that controls all rail movements – cameras provide the operator with a view of all operations and they are in direct contact with the loco crews through radios and via phone to the blast furnaces and steel plant. Most staff across the site, apart from some that are office based, generally work in 12-hour shifts. The majority live locally and for many generations of their family have worked at the site – there is a real camaraderie between staff. We were also told that 200 new apprentices, graduates and interns were about to start work on site.

We were then taken on a short ride with the torpedo wagons, two locos are needed for each furnace but locos also swap ends and for safety one loco propels the torpedoes up the 1 in 60 gradient to the Basic Oxygen Steelmaking plant. First, we sample 905 shunting torpedoes for blast furnace No. 5 and then new Clayton loco 931 to the BOS. The top speed on these trains is just 5 mph and the drivers are supported by a shunter who swaps from being on the ground to in the cab as required. It took most drivers time to get used to the new locos and they are noticeably quieter than the old ones – some prefer them but some prefer the older locos – being used to working with big noisy engines all their working life! The cab of 931 is very spacious and offers excellent visibility and there are separate desks for driving in each direction.

At the BOS there is a fan of six sidings at the top for holding torpedoes and we see loco No. 08 which is here to shunt the torpedoes in and out of the plant for unloading.

The brick-lined torpedoes normally run in pairs, but can also be taken singly. They operate unbraked. It is a continuous operation, and to meet the current demand around 70000 tonnes of liquid iron is taken from the two furnaces per week to the BOS. This can equate to around 20 trips per day (with two torpedoes each) from each furnace. Never fully loaded, the torpedoes can take either 250 or 300 tonnes each depending on the wagon type, loading up to a maximum of 420 tonnes each gross. It takes around 30 minutes to load each torpedo, when they are at 80% the control room is alerted and preparations are made to undertake the next trip. It is a very slick operation!





Left: The driver of Brush Bagnall locomotive 905 shunts his train of torpedoes at Blast furnace No.5.

We are given a tour of the loco depot, a four road shed, all roads having with pit access and with a wheel lathe. Almost all maintenance is carried out in-house, with support from Claytons for the new locos. This is not the original site of the locomotive depot, which used to be much closer to the GWML (the current site dates from the 1970s). There is a separate shed for maintaining the fleet of torpedo wagons, which require a very high level of maintenance. A separate department manages the maintenance of the track and infrastructure.

The plan is always to have at least nine locos available for service, and the maintenance board in the depot on the day of our visit does indeed show nine locos as available. If the number of operational locos drops below nine priority is given to routine maintenance. A separate sheet gives the current loco hours and estimated date of the next service for each loco.

Finally, we are taken to the rolling mill end, where three locos are stabled for moving trains into and out of the Margam Knuckle Yard (today 906, 933 and 934).

Seeing behind the scenes of just a small part of the vast Port Talbot site was a fascinating experience, and there certainly aren't many places where almost 70 year old locos are in daily service, running alongside state-of-the-art new almost emission free locos. The future of the plant has been called into question a number of times, with Tata citing the ongoing costs of its energy and the cheaper imports from countries such as China. As time passes and the decarbonisation agenda gets ever stronger thoughts turn to the future. The future may lie with electric arc furnaces, as used on a smaller scale by several steelworks already. These use recycled steel, of which the UK has an abundance, with around 11 million tonnes available each year – around 8 million tonnes of which are currently exported.

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Above left: Fresh off the mill: Some of the finished steel coil being moved into position for loading onto a train by the overhead crane.

Left: A train awaits loading for Corby in bay 28, where the finished product is packed and loaded for the customer. The majority of steel leaves by rail.