

Hunslet Austerity Tanks

This numerous 0-6-0ST loco owes much to its makers industrial loco ancestry. The direct lineage can be traced back to 1937 with the 48150 class of loco. These were the first of the 18" loco's that bear a close resemblance to the later Austerities. Subtle differences includes a different shaped coal bunker and the water tank that finished before the smoke box. 48150's had been developed from an earlier design with 16"x22" cylinders rather than the 18"x26" ones. Wheel diameter was increased by 3½" from 3'9". Development for the 50550 class of locos was an increase in the length of the tank to reach the smoke box front thus increasing the water capacity. For details about the 50550 that is under restoration at Embsay see <http://respite3696.tripod.com/Hunslet2414/>

During the war the Ministry of Supplies had a conference to suggest possible locomotive for heavy shunting duties. Initially they had looked at the possibility of building some more of the LMSR "Jinty" tanks however Edgar Alcock convinced the Ministry that a loco based on the Hunslet 18" saddle tank would be a more straight forward design and feature a shorter wheelbase enabling it to operate on a greater number of routes. The specification stipulated that the loco would be able to operate on rough track, capable of starting a 1000 ton train on the level, 550 tons on a 1 in 100 and 300 tons on a 1 in 50 grade.

The first of these Austerity tank locos was steamed on the first of January 1943 (HEC 2849). To speed the production of these loco's during the hostilities many were built by many of the other industrial loco builders in the UK under contract from HEC. These include Andrew Barclay, W.G. Bagnall, Hudswell Clarke, Robert Stephenson & Hawthorns, Vulcan Foundry and Yorkshire Engine Company. Production of this versatile loco continued after the cessation of hostilities in 1945.

With 391 locos built there were many modifications made from the standard loco to make each one different from the next. The coal bunkers were extended on some to increase the capacity, the ones operating at Lambton colliery had cut down curved cabs. Some were converted to oil firing. There are subtle detail differences between ones built by the various sub contractors.

After the war the loco's were used by many of the then nationalised collieries for the transportation of the coal from their site to the local sidings. Seventy five of these were sold to the LNER who classed them as J94

Developments on improving the loco's performance and economy have been carried out. Initially the Giesl ejector multiple blast pipe was fitted to a number of loco's this helped to overcome the emission of black smoke that had been outlawed by the clean air act. An example of one of the loco's that was latterly fitted with one is under restoration (WG Bag 2777/1945) by the Scottish Railway Preservation Society. In the late 1940's, Dr. Adolph Giesl-Gieslingen developed a new exhaust design called the Giesl Ejector. He patented this device and it was applied to thousands of steam locomotives all over the world. The Giesl Ejector featured a series of small in-line nozzles exhausting up a thin, oblong chimney.

Some loco's later had the blast pipe was changed to a Lempor (Lemaître -Porta) exhaust developed by Livio Dante Porta. The Lempor was a development of the Kylchap exhaust. Andre Chapelon used the exhaust splitter developed by Finish engineer

Kylälä, which divides the exhaust stream into four parts. The Kylchap draws in gases from more than one level of the smoke box, which Chapelon believed to be an important feature in providing an even gas flow through the many tubes of the boiler..

Other major modifications that took place on quite a few loco's that extended their working life until the 1980's was the fitting of underfeed stokers and the Gas Producer Combustion System (GPCS)

The thought behind having the underfeed stoker enables the loco to be operated by a single person during the working day.

GPCS

The French chemist Fontana observed in 1780 that passing steam through incandescent carbon gave off two combustible gasses carbon monoxide and hydrogen. The benefit of this had been forgotten until the Argentinean engineer Livio Dante Porta had been experimenting with the metre gauge 4-8-0 La Argentina. Steam mixed with the primary air in the ashpan both reduces the firebed temperature below the ash fusions level and enhanced the combustible gasses given off. This reduces the draught through the firebed along with the loss of coal particles in the draught. To ensure a good mixing of the combustible gasses and turbulence an improved chimney/exhaust is fitted to create enough draught. Improved chimney/ejectors used with the GPCS include the Lemâtre nozzles (Lempor), Kylälä splitter (Kylpor) the Kylchap or the Giesl to create enough draught to compensate for the additional resistance of the spark arresting screening in the smokebox.

Porta gave advice to Hunslet in 1960 about how modifications could be made to incorporate the GPCS into the locomotives. He rode on the prototype at Waterloo Main Colliery.

Locomotives with different arrangements were tested by Swindon to assess the benefits of the different parts. A standard loco could not produce 6000lbs/hour; with a Kylpor ejector fitted this rose to a steam rate of 12000lbs/hour. When fitted with the GPCS mixed results resulted in the need to balance the ashpan steam supply with the fire conditions.

When new coal burns in the hydrogen rich flame secondary air needs to be adjusted so as to maintain an exhaust that is just coloured to optimise the steaming rate. If the steam is shut off during traction to avoid excessive smoke while the firebed is gasifying the firebox needs the blower on and the fire door to be opened.

For further information about the different exhausts, the theory and practical use and other key modern steam locomotive technologies such as the GPCS see *La Locomotive a Vapeur* by Andre Chapelon. The fairly recent English translation has greater information in than the original French edition including write ups about various modern current steam engineers.

A very good website that has information about modern steam loco technology and the engineers is Martyn Bane's <http://www.martynbane.co.uk/>