Kempton WTW – steam plant project

triple expansion pumping engines restored for public viewing

by

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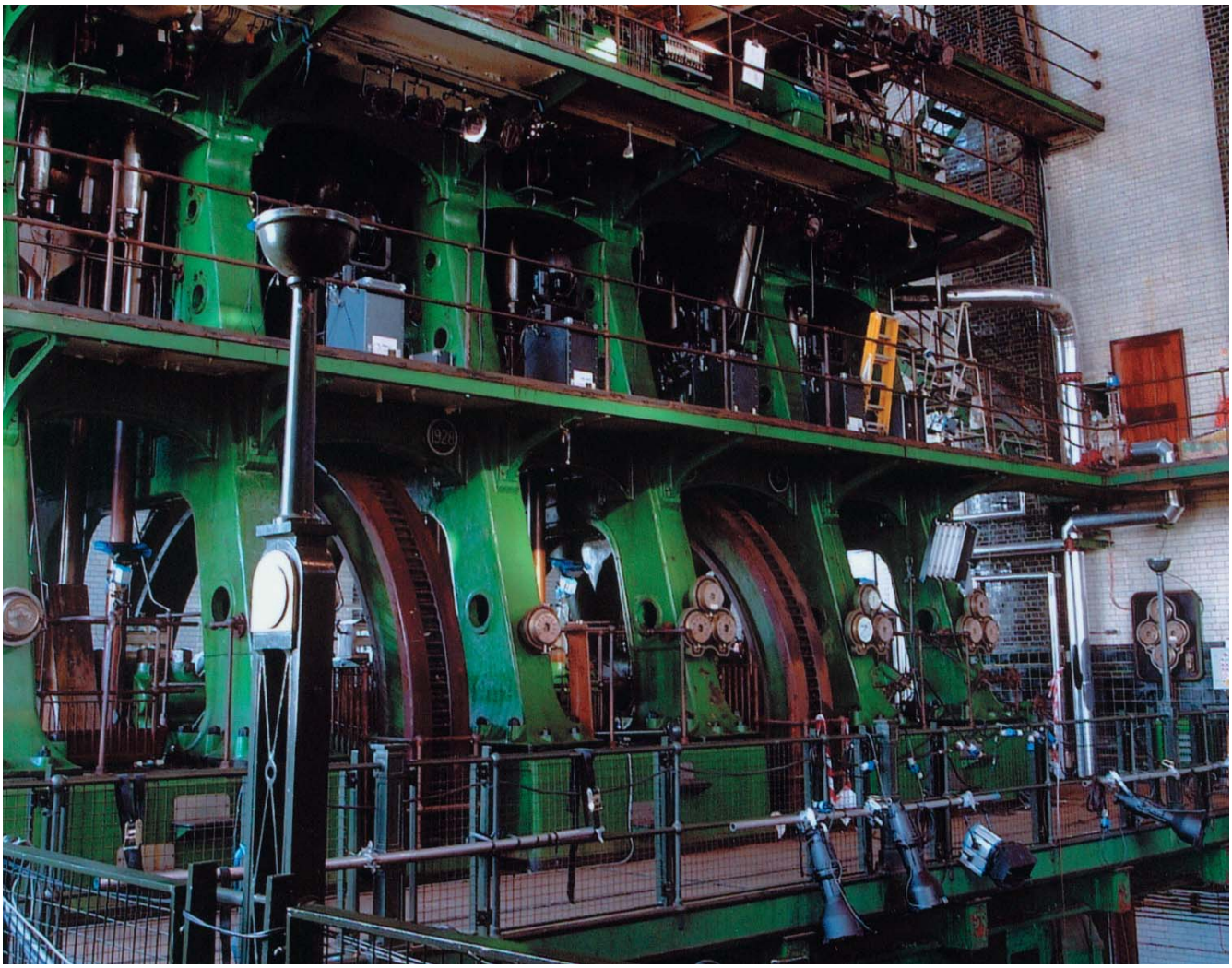
London's impressive industrial heritage has always been an area of great pride for Thames Water, nothing demonstrates this more than its commitment to maintaining age old plants that, under the guise of the Metropolitan Water Board, supplied the capital. Refurbished steam plants can be found at Kew, Coppermills and Crossness and are open to the public. Latest steam engines to be returned to their former glory are the Triple Expansion Engines at Kempton WTW in London. Key to this renovation was the provision of a new steam generation unit and associated plant.



Engine number six - one of the two triple expansion engines at Kempton - nearing complete restoration *(photo supplied by Great Engine Trust)*

Kempton WTW, in Middlesex, supplies 160 million litres of fresh water every day to north London. The principal processes involved today include single media primary filters, main Ozone, dual media secondary filters and gas disinfection. The works was originally built in 1905, having undergone several substantial refurbishments, the last being in 1998.

Up until 1980, coal fired steam engines pumped fresh water into supply. The engines named Sir William Prescott and Lady Bessie Prescott (Sir William was Chairman of the Metropolitan Water Board from 1928 to 1940), are thought to be amongst the largest of their type in the world. They were originally built in 1927 by Worthington Simpson from designs by the then chief engineer of the Water Board, Henry Stilgoe at a cost of £94,000. They pumped an estimated 100 million litres of water per day for nearly 50 years. The engines (see photo), are over 60 feet tall and rated as 1008 bhp. Today, this can be achieved by a pump no larger than your average family car.

As in similar refurbishment projects, Thames Water supported the setting up of a Charitable Trust, to run and maintain the engines as a commercial enterprise. To facilitate this, a 99 year lease was agreed with the Kempton Great Engine Trust. Within this lease, Thames Water agreed to provide various structures to enable the engines to be opened to the public, and a steam generation plant that would enable the engines to run.

There are two triple expansion engines at Kempton held within a substantial engine hall, one of which (Engine No.6 see photo), is nearing full restoration, a process that has taken six years. The impressiveness of the engines matched with the size and grandeur of the engine hall has given rise to a number of commercial opportunities. Indeed, to date the engines have been used as a backdrop for the film "SOS Titanic", (pre Leonardo DiCaprio), and more recently within the last six month as a set for music videos as well as the BBC series "Great Inventions".

Contract for the provision of the steam generation plant was let as an IChemE 'Green Book' design and build contract. This was based upon a detailed performance and technical specification produced by the design function within Thames Water's engineering department. The main contract has a value of £600k.

Protection against corrosion

Due to the nature of the plant and in particular the infrequency of its use and the potential prolonged periods of down time special consideration was required for plant preservation and in particular corrosion avoidance. Alongside the main steam boiler, a pair of smaller 90kw gas fired boilers were installed with automatic temperature demand to enable a background heating system to be installed. The background heating runs eight mobile heaters designed specifically for this purpose. The objective of this is to raise the ambient temperature within the large engine hall above the dew point, thereby preventing any potential damage caused by a damp atmosphere.

Protected status

Outside of the technical challenges that were being overcome, the engine house carries a protected status in the form of being registered as a Scheduled Ancient Monument. An environmental engineer was a key team member and was involved in all discussions that were held throughout the design process with a representative from English Heritage. This ensured that any proposal was sympathetic to the original design and structure of the building along with the engines themselves. Factors that ensured this included siting new plant to minimise visual impact and considered material selection including any final finish. Scheduled Ancient Monument consent for the proposal was granted by the Department of Media Culture and Sport in April 2001.

The new building to house the steam generation plant was constructed and once approval had been granted, work could start in earnest within the engine house itself. First phase of the work was the safe removal of a volume of asbestos that had been used for insulation of the engine cylinder jackets, reheaters and steam pipework.

The main item of plant required within the steam generation plant was of course the boiler, a Cochrane gas fired unit capable of 0.63kg/sec, 1.379 Mpa at 198˚C. The steam is fed within a new duct under an access road through to the engine hall and the engine itself. A condensate return system is utilised to aid boiler efficiency, along with all the normal boiler ancillaries; water treatment, chemical dosing. blowdown and a boiler feed heating system.

The design had to address issues that were particular with the provision of a steam plant. These included high temperature and the associated expansion and contraction, a 30 l/s cooling water system and distribution.

At the time of writing (April 2002), final commissioning tests were undertaken and steam was fed to, first the two small baring engines and then the main engine itself. As planned, the engines turned, slowly and for only a short duration but powered by steam for the first time in over 20 years. Final arrangements are currently being made in preparation for formally handing over the plant to the Great Engine Trust, who are in turn scheduling a grand opening for the Autumn of 2002. ■

Note: *The author of this article, Malcolm Orford, is Project Manager with Thames Water.*