

Heritage report

Harland and Wolff Diesels

Introduction

by Trevor Owen

Interest in the Harland and Wolff diesel range developed following a detailed submission by IDGTE Member James Bradley, owner and MD at Robina Generators on the Gold Coast, Queensland, Australia concerning his father's activities with the company and subsequently his own employment as reproduced below. James provided photographs from his father's collection and a selection has been included as these show considerable detail concerning the design and construction of the H&W engines.

Harland and Wolff were early pioneers in the production of engines following their decision to acquire a licence to build large Burmeister and Wain engines. This decision was influenced by the higher output B&W engines which were being used for ocean going vessels in the period from 1918 onwards. The diesel range would therefore be of interest in supporting the shipbuilding activity at the Belfast shipyard with a higher percentage of local content. H&W secured an exclusive licence for the UK which turned out to be a prudent move as other UK manufacturers were interested in the B&W range. For example in 1921 W H Allen and Co of Bedford acquired a sub-licence from H&W for part of the B&W range and they started to supply large engines for land based applications. H&W continued to supply engines for marine applications for many years both for their own ships and also for other shipyard requirements. They also continued to develop the land based power market as is illustrated in the submission below.

The H&W engine designs were based around two stroke opposed piston designs. The smaller designs were single acting whilst the larger units were double acting with ratings of up to 1,000bhp per cylinder.

A brief and anecdotal overview of Harland & Wolff opposed piston 2 stroke generators supplied to the State Electricity Department, Government of Qatar

by James Bradley (IDGTE Member)

My father, Michael Bradley was employed at Harland & Wolff shipyard, Belfast in the 1950's following his return from many years service in London where he had worked on locomotives and ships.

Sometime after returning to Belfast, he joined H&W and soon became recognised as a competent and able engine builder and tester. He was used on sea trials and appreciated the financial benefits of this work.

One day on the shop floor he looked up and saw two of the supervisors or 'hats' (as their status was denoted by wearing bowler hats) pointing at him from the gallery. He was

summoned to the office to see the manager and assumed there was a problem. (He was a minority Roman Catholic working in a predominately Protestant and sectarian environment.) To his relief they informed him that there were favourable reports about his work and was asked if wanted to be involved in the H&W power station contract in Doha, Qatar in the Persian Gulf. He jumped at the chance of extra pay and was duly sent overseas. He made several excursions and when the installation was completed he applied for a position of maintenance engineer with the State Electricity Department or better known as SED. The conditions of employment were favourable and benefits included tax free pay, family accommodation, long paid leave and return travel. He was also unsure of his prospects back in Belfast and the position gave him better status and prospects as well as some Government employment security. He was the only original builder of the sets employed by the SED and he was extremely knowledgeable and practical. He frequently filled in as acting superintendent and he was eventually recognised and rewarded for his hard work and dedication.

He was promoted to the permanent position of Superintendent sometime in the mid 70s and retired in 1985 at the age of 60, having completed over 30 years of continuous service with the State Electricity Department. He was well respected and popular figure within the expatriate community and well-liked by the Qataris who addressed him as 'Mr Michael' including members of the ruling family, due to his straight talking and overriding sense of fairness and good humour. (He could and did deliver hair drying bollockings, but as far as I recall he never fired anyone.)

The site had an existing power house with 6 National diesel engines that I think were installed late 1940s and made up of 750kVA NA and 850kVA TC 750 RPM sets. The diesel stations were built on the outskirts of town but by the 1980s the site was in the centre of a growing city. At night you could hear the low rumble of the engines and whine of the turbochargers from many kilometres away.

H&W supplied 5 opposed piston 2 stroke diesel generators with an output each set of about 5MW at 375rpm. These sets along with the National diesel station ran as main power for the capital, Doha and suburbs. Both National and H&W stations were located at the end of Kharaba (Electricity) Street. The electrical installation contractors were GEC. When the Ras Abu Abud steam turbine and desalination plant came on stream in the 1960s the work of the diesel stations was reduced. It was usually quiet during the winter months and this was when maintenance was carried out but the stations were called into action occasionally in winter as relief and during the summer as power demand was greater. The H&W station was extremely hot and noisy with all 5 set running, with outside summer temperatures in excess of 45°C and 100% humidity the norm. No ear muffs in those days (partial

P. O. Box 41
Doha,
Qatar,
Persian Gulf
4-7-1959.

Manager, Messrs. Gardner & Theobald,
Engineering Engineers,
1, 43, 57 Lamb House Lane,
West Hamstead E.C. 4, L.

Subject: Maintenance Engineer,
Doha Power Station.

Dear Sir,

I wish to apply for the post of maintenance engineer in the Doha Power Station, that has become vacant due to the resignation of Mr. Wood.

With having served a fully engineering apprenticeship, plus 15 years experience gained in the building, maintenance and repairs of heavy diesel and steam machinery, I feel I am fully qualified to accept the duties and responsibilities of the senior maintenance engineer to the Qatar State Electricity Authority.

The following particulars cover my training and experience in heavy mechanical engineering.

Apprenticeship served as chief apprentice plus 3 years.

The Turbine, Steam Engines Co.,
Warrick,
W. Ireland.

London, North Eastern Railway,
Barnsley,
London.

Length of service: 16 months.

Employed as a fitter and in capacity in the engine room and boiler shop. I left the service of the railway voluntarily.

J. Russell & Co., (The New Shipyard Line),
Docks Road, Liverpool,
London W.C.

I was employed as a fitter and engine room for approximately 3 years.

My work covered the overhaul, assembling and trials of engine and preparation and auxiliary machinery.

During the time in their employment I was identified as being the best of the staff.

The Bradley, Fynn & Hutchinson Co.,
Willesden, Middlesex,
London.

When I successfully carried out the overhaul and trial of the main generator and auxiliary machinery on a 5,000-ton ship, also the conversion of the main flow coal burner to oil burning.

The specialist overhauls and trials of engines were by the Port of London Authority.

The complete overhaul of diesel generators on ships owned by:
The London Group,
Shipping Line.

I was represented by the Bradley, Fynn & Hutchinson Co., to recruit as far as personally in their employment.

I desired to return to P. Russell & Co., after a period with them, I left voluntarily to return to Belfast.

I am at present employed by the Qatar State Electricity Authority as maintenance engineer on the D. S. Staff.

Especially I was employed by Messrs. Harland & Wolff, Belfast, in their main engine works and high speed diesel shop, where I was selected for the execution and completion of the project that was named the Doha Power Station.

This includes the erection of the main Harland & Wolff engine and auxiliary machinery.

On the completion of my contract with Harland & Wolff I joined the Qatar State Electricity Authority as maintenance engineer. Since then I have successfully carried out the first major overhaul and finished the remaining that has concerned the erection of all turbo machinery of the station. Heavy Station completed installation. Also I wish to point out, that during the period when we commenced certain working hours with the engine I carried out the modifications that were required to correct these troubles.

Regarding all other major generating installations that are the responsibility of the State Electricity Authority, I wish to state I am fully conversant with their construction and design.

As can be verified by my training and constant employment in the heavy engineering industry, I am fully conversant in the construction and operation of diesel and steam machinery also workshop Department, procedures and practice.

If I am successful in my application I can assure you of my complete confidence in my ability, to carry out the duties and responsibilities expected of me as senior maintenance engineer.

Yours faithfully,
M. Bradley.

TELEPHONE RELEASE FORM
TELEGRAM: HARLANDIC WELPORT

10th June 1959.

HARLAND & WOLFF
LIMITED
Shipbuilding & Engineering Works
Belfast

Ref: G/ZW/M.

To
Mr. M. Bradley,
15 Pinkerton Street,
BELFAST.

We duly received your letter dated 7th June advising us that in view of your having accepted the position of maintenance engineer with the State Electricity Department of Doha, Qatar, you will not be resuming your employment here as a fitter.

We confirm this will be in order so far as we are concerned and, at your convenience, you should call at Cash Office to collect your Insurance Card and any money due to you.

We take this opportunity to thank you for the competent manner in which you carried out your duties as an erector in Doha, and wish you every success in your new appointment.

M. Bradley

Figures 1 and 2 Letters relating to the change of jobs

deafness is now a bonus with a demanding wife and kids). Relief from the oppressive heat and humidity was taken by sitting under the fin fan radiator coolers with the up drafting air offering some cooling and drying. This was preferred to air conditioning as we were usually soaked through with sweat.

Fuel to the stations was piped from the port several km away through buried cast iron pipes. I am not sure if the pipes were installed for the original National Station. The fuel was transported to the port's pumping station in a barge called "Swift" from the Um Said refinery down the

coast some 30km south of Doha. On one occasion seawater was pumped from the barge to the main storage tanks at the power station. The barge's hull had rusted through and as the fuel was floating on top of the water, no-one noticed. This resulted in a night time catastrophe with all 5 H&W sets cascading and plunging Doha into darkness. My dad later told of how he was at a party and worse for wear when the lights went out, but he worked through the night to bring the sets back on line. Luckily the station was equipped with fuel and lube centrifuges and a fuel shop equipped with Merlin injector and pump testers. A sobering event! I was very young but remember going with him to a couple of barge inspections following this event where he dipped the Swift's holds with a water detecting paste.

Around 1976 or so a problem developed with the diesel supply. Whether this was due to quality or other reasons I don't recall, but the route of the pipe was excavated and fuel was found close to the surface wherever the ground was dug up. The brackish water table was high under Doha so the fuel sat close to the surface. Bearing in mind that each H&W set running on full load could consume over 7 tons or 6,000 litres of light diesel fuel in 24 hours, large quantities were piped over the years and as the diesel cost next to nothing, no serious records were kept on fuel consumption.

Over many years vehicle repair workshops sprung up along the route of the pipe which ran under Musherib Street which ran parallel to Kharaba Street. No-one made any connection with the emergence of the garages along the route of the diesel pipeline. Ever inventive, the garages had sunk wells and used the sand filtered diesel for parts washing and general maintenance. They most likely assumed it was a natural diesel spring and why not, as Qatar is a major oil source. The pipe was eventually decommissioned and the diesel brought in by road tankers.

The diesel station was eventually considered unsafe particularly due to old switchboards and obsolete technology connected to a modern grid system. The New Ras Abu Fontas Power Station with its Mitsubishi gas turbines was by this time commissioned and supplying most of the country's power needs. While the main diesel power station was no longer viable there were plenty of out stations around the country with diesel generators powering rural communities which kept the diesel section fully engaged. In the mid 1980s the Doha Power Stations were officially closed and the site earmarked for development as it had become a prime real estate site. The diesel section moved to new purpose-built facilities in the industrial section outside of Doha which was better equipped at looking after the abundance of rural diesel generating sets.

There were suggestions of mothballing the H&W and National Diesel stations in the desert and a costing exercise was undertaken. The cost of wood to crate the sets and labour to carry out this exercise exceeded the original cost of the stations so this idea was scrapped. Qatar had a steel smelter and I think this is where the sets eventually ended up.

During the middle of the 1970s there was an increase in oil revenue and Qatar embarked on an expansion program. This

was seized upon by the sheiks, tribal and village elders who wanted better generating sets for their properties and communities. To appease the locals, the Minister for Electricity & Water approved most requests. This soon led to something akin to 'generator envy' and there was fierce rivalry between neighbouring villages, palaces and communities to install bigger sets leading to some serious over kill where sites that could function easily on 50kVA were now having 250kVAs installed. Qatar is a geographically small country only about 160km long north to south and about 70 km across the country.

My involvement with the H&W sets came about by the troubles in Northern Ireland. I was brought up in Qatar and lived the expatriate and colonial life, alternating between schooling in Belfast and Doha. The Doha English speaking school which was started by the Shell Oil Company only went up to the age of 9, so we were all sent off to primary schools at home and later to secondary education at day or boarding schools in our respective countries. When I was turning 16 and at school leaving age in the early 1970s dad took me out of Belfast and to Doha to get away from the troubles. I was not academic to say the least so this was a good and practical move.

With not much else to do I started spending time at the power station and working unpaid, but received pocket money from dad. After about a year I applied for employment and was duly employed as a fitter. As there were no formal or structured apprenticeships in place, the only way to gain experience was hands on. While the senior engineers were mainly British, I was the only European fitter in a labour workforce made up of Arab, African, Pakistani and Indian sub continentals. We all got along great and I learned to communicate in Arabic, Somali and Urdu and learnt many choice phrases along the way. My dad never learnt any languages but they soon got his Belfast drift.

I stayed with the diesel station from 1972 to 1979. The heavy fitting background learned in the diesel stations put me in good stead for wherever I worked. I returned to Qatar in 1982 and worked for Qatar National Telephone for about 3 years. I have also worked throughout UK and Europe, Saudi Arabia, Caribbean, Papua New Guinea but nothing has come close to the experience of working on the big H&W sets. I have now settled in the antipidies having taken Australian Citizenship and run a diesel generator and diesel fire pump servicing business.

There is a model of a similar H&W engine in the Ulster Transport Museum in Belfast, as shown below. I have not seen it but the photo is very similar. The only exception being the air/fuel starting wheel is on the top gallery, whereas the sets I know had it mounted below and to the left of the free end crankcase door. The crankcase explosion covers were located opposite side of the set (Figure 3).

Prior to starting, the engines were prepped by racking in the electric turning gear. Electric oil pumps ensured oil was present at all journals. Starting was initiated by turning the wheel to admit 300psi of air to No 1 cylinder until the piston was at the bottom stroke. The wheel was then turned further to admit fuel. This alternating between air and fuel took some skill to start the sets, especially in winter as it could get quite



Figure 3 Model of H&W diesel engine at the Ulster Transport Museum

cold and the sets would knock for several minutes before they warmed up. When it was very cold it could take several attempts to get them going. It was lovely to watch the exposed parts reciprocating and rotating at slow speed of 375rpm, like watching old steam engines but much noisier. The low oil pressure over ride was a mushroom button on the floor plate which had to be stepped on while the set was brought up to speed and oil pressure established.

Maintenance was on a large scale. The crankcase doors were large and heavy which took the efforts of at least 8 people with ropes and hooks to lift them off for inspections. Big end and exhaust piston cap nuts were removed and tightened using large ring spanners with a rope attached and flogging the end with 14lb or 28lb sledge hammers. This took considerable skill, balance and strength as it was always slippery with oil, especially standing on the exhaust piston removing the 4 crosshead nuts. Correct tightness was judged by indicator marks on the numbered nuts and studs. No safety harnesses or Sweeny torque multipliers in those days, just brute force and sure footedness.

Big end and gudgeon pin bearings had to be blued and scraped in and the gudgeon pin bearing pressed out and inserted using a 50 ton hydraulic jack which always went off with a large bang when pressing in the new bushes. You could never anticipate when it would bang. This was real work and enjoyable. Taking crankshaft deflections, peak pressure readings, checking mechanical cylinder lubricators etc were routine tasks. We also stripped and overhauled the Napier turbochargers. Replacing big ends was a task as they were heavy and awkward to remove and replace requiring chain blocks and slings. This was heavy work and extremely satisfying.

The lube oil sump capacities were about 2,000 gallons (45 x 45 gallon barrels) of Shell Talpa which had no detergents and had to be centrifuged frequently to remove ash and gum. In the mid 70s there was a mix up in the lube oil and the Shell Talpa which was only for the H&W sets was mistakenly used in the high speed sets around the country which were usually run on Shell Rotella or Shell Talona. Within a month or so many of the sets ground to a halt due to gumming of piston rings and oil galleries, rocker gear and so on. The high speed sets could not handle this. There was plenty of work stripping down and cleaning the sets.

The H&W flywheels weighed in at over 115 tons.

My dad told me the same H&W engines were also employed in the oil fields of Iran as mechanical oil field transfer pumps.

The sets had a mix of imperial sized nuts and fasteners. During the war years and possibly post war era and in an effort to conserve materials, the nut and bolt across flats size was reduced so on these sets there was a mix of pre and post war sized nuts. It took a bit of practice identifying the correct spanner size as imperial tools were sized to the bolt or studs diameter, unlike AF and metric which sized according to the nut across flat dimension.

Additional anecdotes

During one hot summer in the late 1970s the country was undergoing development and expansion and the electrical supply could not keep up with demand. We were not immune from the power outages and our house was extremely uncomfortable without air conditioning. At the back of the power station amongst the equipment graveyard was an old canopied trailer generator that no one paid any attention to. Dad told me to pull it out and check it over. It was an air cooled horizontal twin cylinder diesel set about 12kVA and it had a crank handle and decompression levers and after a few spins on the handle it fired up. The set had sat idle and forgotten for what must be 10 to 20 years and caked in oily dust and grime.

The interesting fact about this generator is that it was off a pair destined for a 1950s British Polar Expedition, not sure which pole but pretty sure it was Antarctica. The sets were redeployed to Qatar following intervention by British Political Agent in Qatar following request to the Foreign & Commonwealth Office for generators for the use by the Emir of Qatar. As well as battery and hand cranking it had been originally fitted with a cold starting aid in the form of a blank shotgun cartridge, but this had been removed for obvious reasons.

We 'commandeered' it and used it to run lifesaving power to the beer fridge, TV, lights and a couple of air conditioners and as we were the only house with lights showing through frosted windows, we became a beacon for 'bar flies'. In our Government housing section there was a great mix of personalities including engineers of different trades and military personnel including fighter pilots so the conversations were never dull.

In 1978 Qatar was the host of the OAPEC (Org of Arab Oil Exporters) and the venue was the Gulf Hotel, Doha. Due to the power problems, the Electricity Department procurement section tendered for supply of 2 x 1MW mobile generators for standby power at the hotel and another venue.

Several months later 2 trailer mounted generators turned up at the power station. They were USA made Cummins KTA type engines and this make of engine was unfamiliar to us as we usually dealt with British made engines. While the generators themselves were impressive, the overall package was not satisfactory as the sets were installed within basic road transport trailers. The supplier was a then unknown FG Wilson.



Figure 4 Doha Power Station showing fin fan coolers on the right



Figure 5 Mike Bradley tightening nuts on main bearings
Note use of rope to maintain tension on spanner.
The bed plate and crankshaft appear to have been shipped part assembled.



Figure 6 General view of 2, 3, 4 & 5 H&W sets taken from the station crane



Figure 7 View of top of No 5 set which was installed without covers

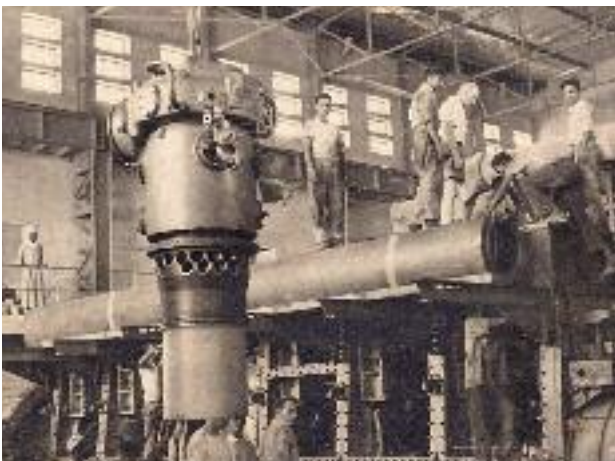


Figure 8 View of cylinder casing and liner assembly



Figure 9 Lowering of cylinder casing and liner into the frame



Figure 10 Alternative view of the fitting of a cylinder casing



Figure 11 View of main piston and rod assembly



Figure 12 Lowering the piston down the liner



Figure 13 View of top of No 5 completed engine with covers omitted for better access

Not only that, my dad was unimpressed as they were labelled as being manufactured in Northern Ireland, he was disappointed that this was not the quality of product that would be expected out of his birthplace. He sent several telexes to the supplier questioning the build quality and a week later we had a visit from non-other than FG Wilson (Fred) himself. Fred advised that the sets were supplied direct from the USA without landing in Ireland. Fred had received the tender documents and following 2 telexes to the USA, he secured the contract to supply the generators. He confided to dad that he made £12K on each set without

setting eyes on them, which was a respectable commission in those days. This was Fred's first venture in the power generation business and on the success of this he went onto greater things, principally being the great innovator and world leader in diesel generator manufacturing.

We had the pleasure of entertaining him in our home which he appreciated, as at that time the hotels were 'dry' and dad would drop him back at the hotel with a couple of 'night caps'. I remember him as being a typical Belfast personality and a good raconteur. ■