

# BP Grangemouth

## Another Successful Fired Heater Revamp

BP's refinery at Grangemouth on the Firth of Forth in Scotland is one of the UK's major refineries and supplier of petroleum products and also provides feedstocks for BP's massive chemicals complex adjoining the refinery.

The crude distillation unit is a vital component of the refinery. Installed over thirty years ago, Heater BA-101 on No 3 Crude Distillation Unit was coming to the end of its lifespan. The cast supports of the 27 metre long tubes in the heater convection section were showing signs of corrosion and required replacement.



Left: Early dawn lift.

Middle: Lifting the new section, carefully missing the fractionator tower...!

Right: The original convection section comes to rest.



next to BP's refinery three days later. From here they were taken to specially prepared temporary foundations at the site, where they were eventually assembled into a single convection module ready for the shutdown.

In parallel, site preparations carried on, with the installation of the temporary steel to support the ductwork, while the convection section was replaced. Scaffolding was erected and preparations made to shut down the heater. The 2,000 tonne crane arrived at site by ship and by truck. Scores of trucks were needed to bring in the crane modules and 900 tonnes of superlift - superlift is the term used to describe the blocks of concrete used on the back of the crane to stop it falling over when it lifts such huge loads. The crane was assembled on the specially piled ground some 53 metres from the heater.

Meanwhile, the existing convection section was completely sealed using an orange fire retardant polyethylene skin to seal off the convection section from the remainder of the heater radiant section and ducting, and then

thoroughly smoke tested for air tightness. Triple airlocks provided for access of specialist personnel in full protective clothing and breathing apparatus. Essential removal of some 40 tonnes of asbestos-laden refractories from inside the existing convection section was carefully undertaken using BP's stringent Asbestos Removal Procedures, to comply with the Control of Asbestos at Work Regulations, and to ensure total safety of personnel and the environment. Next the convection section was totally sealed top and bottom to contain any asbestos particles and tested for 100% air tightness.

Once this had been completed, the steelwork between the arch of the heater and the existing convection section was cut to release the existing convection section from the main radiant section of the heater. The crane's eight point spreader beam took the weight of the convection section through the FWFHD-designed steel lifting cradle, which would ensure the whole convection section, including the tubes, refractories and the damaged cast tube supports, was safely contained

and supported for the lift. Then the big moment.... the old convection section was carefully lifted off, lowered to the ground and taken away by multi-wheeled hydraulic trailers for later dis-investment.

The existing heater steelwork was made ready to receive the new convection section and, in a break in the windy Scottish weather, the new section was gently lifted into place, carefully manoeuvred around the fractionator tower on the adjacent unit.

Once lowered into its final position the flange and columns of the new convection section were welded and bolted into place and the refractory in the area of the joint made good. The ductwork sections were reinstalled using the crane and the temporary steelworks and scaffolding works were dismantled from the heater.

All that remained was to install the new sootblowers and instrumentation and the heater was ready to be recommissioned, to serve the refinery for another thirty years.

BP called in Foster Wheeler's Fired Heater Division (FWFHD), who originally supplied the crude heater in 1968. With a track record of more than sixty previous successful heater revamps, including projects at BP's refineries at Grangemouth, Rotterdam and Kwinana, Australia, FWFHD was well-qualified to help BP find a safe and innovative

engineering solution to return the heater to 'as new' condition in the extremely tight planned shutdown duration of 35 days. Having undertaken a detailed access and lifting study, FWFHD proposed using one of the world's largest truck-mounted cranes, rated at 2,000 tonnes maximum lift, with a 90 metre boom, to lift off the existing convection

section, weighing 320 tonnes, in one piece and replace it with a new convection section, also in one piece. The area for the crane pads needed to be piled to take the huge loads. This proposal would allow maximum design and fabrication progress to be achieved prior to the shutdown and would also minimise the turnaround schedule.

At the South Wales fabricator's shops the work on the replacement modules was given top priority. On completion, the modules were transported under police escort through the town of Pembroke to the docks. The roll-on loading onto the ship went smoothly and, with the ship catching the high tide, the units were delivered to the docks