MCP-01: Construction to Decommissioning

Construction

MCP-01 sat in 94m of water 173km, or roughly 108 miles, off the coast of Aberdeen, in Block 14/9 of the North Sea. Although ‘MCP’ is usually regarded as an acronym of its function - ‘manifold compression platform’ - , earlier documents occasionally described it as a ‘midline compression platform’, from its position halfway along the pipeline system, or ‘manifold concrete platform’ before the compressors were added. The numeral was to distinguish it from up to five other compression platforms that were planned, but never built.

MCP-01 was installed on the seabed in June 1976, at latitude 58° 49' 39" north and longitude 00° 17' 12" west. It had been registered on 13th February that year with the number 0119. The topsides were constructed by Sir Robert McAlpine at Ardyne Point, Argyll, Scotland, using 13,000 tonnes of steel. The jacket was built in Sweden by Doris Engineering before being floated and towed by tug boats into position, an operation that lasted 11 days. The advantage of this method is that, apart from installing some deck equipment, almost no construction was necessary once the platform was installed in the North Sea. The base of the substructure, up to 18 metres (59 feet) above the waterline, was constructed at a dry dock in Kalvik, Sweden. As construction work on the platform advanced, it had to be ballasted to maintain a practical working height, and was towed to a deep fjord that would allow it to be ballasted up to 68metres (223 feet) below the water level.

Water was initially used as ballast, but once positioned in the North Sea, sand – 170,000 tons of it - was used for greater stability. In total, the platform required 150,000 tons of concrete, is 62m (203 feet) diameter and 188m (617 feet) high. At 102m (335 feet), its circular base is almost twice the diameter of the platform, with a centre shaft of 9 metres (30 feet) internal diameter. Ladders inside the atmospheric central core lead all the way down to the seabed.

Pre-stressed concrete was used because of its ability to withstand the severe weather conditions in the North Sea. It was a concrete gravity structure, meaning that it remained on the seabed due to its own weight of 386,000 tonnes, negating the need for foundations and making the installation process more straightforward.
The upper 37m (121.3 feet) of external wall of the concrete substructure was perforated with 1282 holes of 1.5 metres diameter, and this Jarlan wall was designed to protect the central core and dampen impact from waves. The 3600m$^2$ (2.2 mile$^2$) deck carried the manifolding equipment, turbines to generate power, pigging facilities and the compressors. The deck was built above the 30 metre (98.4 feet) ‘once in a century’ wave height predicted.

### Function

MCP-01 was part of the Frigg Transportation System that carried gas between the Frigg Field and St Fergus Gas Terminal in Scotland. Gas entered the platform through one of the two entry pipes at the base, rose up through the central core, through the manifold (and possibly compression) systems, back down the central core to the seabed, out one of the two exit pipelines and on to the St Fergus Terminal. The exception was gas from Piper/Tartan fields, Platform layout, taken from ‘Manifold Compression Platform’ which was connected by an 18 inch diameter riser on the outside of the platform. MCP-01 was designed to manage 80 million standard cubic metres of gas a day. The pressure in the system varied with flow demand, with a maximum permitted pressure of 149 barg.

MCP-01 had four main functions:

**Manifolding:** this is the switching of gas from one pipeline to another, for example if one pipeline requires repair or maintenance, gas can be transferred to the other so that the supply is not interrupted. In an emergency, it would have been possible to bypass the upper part of MCP-01 completely.

**Pigging station:** Pigs are neoprene-rimmed plugs that remove liquid that accumulates in the pipelines and were also used to check for any internal damage or corrosion to the pipeline. They are pushed through the pipe by the pressure of the gas behind them. They are built to fit exactly the diameter of the pipe, but otherwise differ depending on their function. The less common ones are cleaning pigs which have thick, abrasive brushes to remove accumulated water and condensates from the inside of the pipeline. Intelligent pigs are those used to inspect the inner surface for corrosion or damage, and contain sensitive electronic equipment to accurately record the condition of the pipeline. In the 1970s, it was not possible to pig a pipeline as long as the Frigg Transportation System in one go.
At MCP-01, the worn pigs received from the Frigg field were replaced with undamaged ones or refurbished and sent on down the line to St Fergus. Pigging facilities, and the living quarters, were on the southern side of MCP-01.

Interconnecting point: Initially, only gas from the Frigg Field passed through the platform, but over the years a number of fields utilised it, including Tartan, Ivanhoe and Alwyn. In 1978, a spur line for Piper Alpha gas was added. Before being connected to MCP-01 up to 1.5 million m3 of gas a day used to be flared from Piper/Tartan. MCP-01 provided a convenient point-of-entry for the gas to enter the Frigg Transportation System on its way to St Fergus.

Compression: Compression facilities were installed in 1981 on MCP-01 for the Frigg Norwegian pipeline (pipeline 2, now Vesterled), at a cost of £14 million. They came into operation on 1 October 1983. As gas travelled hundreds of kilometres through the pipeline, its pressure fell, meaning a smaller quantity of gas could be transported in a given time. Compression facilities at the half-way point would give the supply a 'boost'. Installing compressors required major modification works to be carried out. In May 1981 a pre-constructed unit was lifted onto the deck to serve as temporary living quarters for up to 110 people. The deck and Load Repartition System needed strengthening to take the extra weight of the compressors and redistribute it evenly throughout the structure. In 1982, deck equipment was refitted underneath the deck, in steel baskets. The two 38,000hp compressors, built by Italian company Nuovo Pignone were each 26m long, 11m wide, 36m tall, and weighed 1800 tons.
The compressors were installed into the modules before being transported offshore. At the time, they were the largest in the North Sea and became something of a landmark. Both compressor modules and a separator to remove condensate before recompression of gas were installed on the northern side of MCP-01, over the course of 1982 and 1983. The condensate had to be removed from the pipeline because the compressors could not handle fluids, but it was injected back into the system after compression. During their period of operation, the compressors increased flow capacity by 30%, from 31 million standard cubic metres per day to 42 million standard cubic metres per day, for each compressor. They were taken out of service in 1987 and partially removed during the demanning works.

As well as these primary functions, MCP-01 had ancillary roles such as continuously monitoring the dew point of the gas (at which vapour begins to separate out as droplets of liquid - condensate), as well as its temperature, pressure and quality. Piper/Tartan gas had its own pig trap facilities and separate metering system, recording the calorific value and volume of gas. The platform was never used to store hydrocarbons, as some other concrete gravity structures have been. Before satellite communication, MCP-01 provided a telecommunications link for tropospheric scatter and line-of-sight communications, and British Telecom had men permanently onboard to ensure both systems were operational. Line-of-sight is exactly that – the radio waves travel in a straight line and any obstructions (sometimes even very bad weather) could interrupt the signal. It was used for communicating with the neighbouring platforms, such as Claymore. Tropospheric scatter bounces radio waves off the troposphere, so they travel further than the line-of-sight. Although hardly used elsewhere, this was the method by which the platform kept in contact with St Fergus and the platforms on the Frigg Field, until satellite communication took over.
**Platform Conversion Project**

On 21 December 1992, MCP-01 changed from having a usual crew of 80, to being an officially 'not-normally-manned' (NNM) installation - the first in the area to be operated remotely from onshore, by staff at the St Fergus gas terminal, although the nearby Tartan platform could shut MCP-01 down in an emergency. Tartan was not its nearest neighbour; that was Claymore, just 45km (27 miles) south. Initially, returning the platform to its original state (i.e. without compression facilities) was considered, but this was eventually abandoned in favour of NNM. This was partly due to the Piper Alpha tragedy, after which companies sought to reduce the number of people offshore. Security cameras onboard monitored the platform 24 hours a day. Operational equipment used on the platform was kept to a minimum, to reduce maintenance and minimise the hazards posed to visiting personnel. The systems retained included import and export risers/pipelines, pressure control systems, blowdown/flare systems, communication systems and support utilities.

**Decommissioning**

Decommissioning was not originally planned until 2024. Once it became not-normally manned, the policy was that routine visiting maintenance crews would only do the maintenance necessary to maintain the integrity of the structure. However, environmental and safety studies indicated that it would be less risky and costly to carry out decommissioning work sooner. Even with an appropriate level of maintenance work, it was not possible to guarantee that an acceptable standard of safety could be kept up until the platform was fifty years old. A major obstacle was that the concrete substructure was never designed with removal in mind. After consultation with stakeholders and the public, the decision was made to remove the topsides and leave the concrete sub-structure in place. The pipelines that fed into the base of MCP-01 are still in use and had to be re-routed before any decommissioning work started. Removal work began in 2006 and has been coordinated with the decommissioning of the six Frigg Field platforms.
1.1 OVERALL PROCESS FLOW

SYSTEM DESCRIPTION

Until compressors are installed on the platform the only operation carried out affecting gas flow will be the receipt and despatch of pipeline spheres (pigs) and the collection and reinjection of condensate into the line to St Fergus.

PROCESS DESCRIPTION

Sphere Receiving and Launching

At low flowrates along the pipeline, the condensate dropout tends to collect as puddles in the bottom of the pipe. This condensate can be artificially removed sending spheres along the line ('pigging'). The condensate is pushed by spheres from the Frigg Field to the platform. The spheres are removed and the bulk of the condensate passes on to the St Fergus Terminal as a 'slug' of liquid. Spheres may also be dispatched from the platform to the St Fergus Terminal to remove any condensate puddles which may have formed.

At high flowrates the condensate is carried by the gas as a mist and pigging should not be necessary.

Condensate Recovery

The system collects hydrocarbon condensates which are carried along by, or drop out of, the gas stream. After collection the condensate is reinjected into the stream and passed on to St Fergus.

Venting

A vent system is installed throughout the plant to enable the streams, slug catchers and launchers etc to be depressurised safely to atmosphere.

Fuel Gas

Fuel for the turbines, gas vent pilot and slop oil burner is provided from the condensate recovery system and supplemented by sales gas.