

Piper may call tune for North Sea safety

Helen Gavaghan

IN THE wake of last week's disaster at the Piper Alpha oil platform, there is growing criticism about design and safety procedures in the North Sea. Explosions wrecked the platform last Wednesday night, killing 166 people and cutting Britain's production of oil and gas from the North Sea by 12 per cent. Occidental of California operates the platform.

Lawrence Slater, the head of a firm of consulting engineers in Tyneside that designs accommodation modules for oil platforms, says: "The whole area of offshore work is unsatisfactory from the view of design and the time available for the job."

Trade unionists are calling for the government to set up an independent safety inspectorate. Currently, the Department of Energy (DoE) is responsible for both safety and production in the North Sea. The unions also want the DoE to publish two reports—one into an accident on Piper Alpha in 1984 and another into the effectiveness of life jackets and the immersion suits that people wear to keep warm if they have to jump into the sea.

The unions will argue their case today at a meeting of the Oil Industry Advisory Committee. They were due to present their case yesterday to the DoE.

The second report, which apparently found the jackets and immersion suits to be ineffective, was completed in April. The DoE will not even show the report to the oil companies, claiming that it would breach commercial confidentiality.

Full details of last week's accident are unlikely to be known until the DoE completes its technical inquiry. Jim Petrie,



The shattered remains of Piper Alpha

the department's director of safety, will head the team of six inspectors. Three of these come from Aberdeen and three from London. One is an expert on pollution. The DoE has also announced a public inquiry to be headed by Lord Cullen, a member of the Scottish Court of Justiciary.

So far, experts believe that gas escaped near a compression module, and that a spark caused the explosion.

As *New Scientist* went to press, survivors said that they had noticed the smell of gas near to the "conservation" module, which separates high- and low-value gases, two days before the explosion.

Piper Alpha was designed to last for 20 years. It was commissioned in December 1976. By May of this year, the platform had 29 wells extracting oil and gas and nine pumping water into the oil reservoir to maintain pressure. It yielded 123 530 tonnes of oil per day and 340 000 cubic metres of gas.

Occidental also owns the pipeline that carried oil from Piper Alpha and five other oil fields—Scapa, Petronella, Tartan, Chanter and Claymore—to Flotta in the Orkney Isles (see map, over page). Wednesday's explosion ruptured that line, disrupting supplies from these oil fields.

A bend in the pipe at the Alpha Piper end is effectively preventing oil spilling into the sea. The company says it will fit a valve in the pipeline near to the Claymore field, so that the other fields can begin production

again. Claymore, however, will not be able to resume full production because compressed gas from Piper Alpha was used to pressurise the field to raise the oil.

Occidental's engineers say that it is too early to say whether Piper Alpha will be able to produce oil and gas again. On Tuesday, a team led by Red Adair, the Texan troubleshooter who is under contract to Occidental, was still trying to clear debris from the wrecked platform, before capping the wells to prevent the escape of oil and gas. Bad weather made it difficult for his team to land on the platform on Monday.

Oil platforms have automatic safety systems that close down the wells if there is a loss of pressure or a fault in electrical systems. The wells can be closed either on the surface or on the sea bed. Last week's explosion ripped the top from the wellheads, and five of the valves on the sea bed will not close. John Archer, professor of petroleum engineering at Imperial College, says that Adair will have to fit new valves. If that fails, water, which is denser than oil, could act as a plug, and in the worst case, the team will have to pour cement into the wells.

Piper Alpha produces both oil and gas. When the mixture, which also includes water, reaches the surface, a baffle plate slows down the flow. The mixture then separates according to its density, with water at the bottom, oil in the middle and gas at the top.

The oil is pumped ashore, and the gas serves a variety of purposes. Up to 10 per cent drives turbines to produce electricity on the platform. Some is pumped to the wells to pressurise them and force the oil to the surface. The rest is piped ashore. The gas needs to be compressed to 14 million Pascals to flow along the Frigg gas pipeline to St Fergus, north of Aberdeen. It is a gas compressor, powered by a Rolls-Royce RB211 turbine, that is thought to be the cause of last week's explosion.

Archer says he can imagine several mechanisms that could have caused a leak, such as moving parts shaking with a frequency that harmonised with the natural frequency of, say, a pipe or valve. The resonance would cause an even greater vibration that could cause a crack. Once the gas escaped, a spark from the moving parts could cause the explosion.

The number of deaths last Wednesday was so high because the gas compression module is below the accommodation module. At about 2130 hours, when the first explosion occurred, only 60 men were on duty. Many others were in the accommodation module. Beside devastating the accommodation module, the explosion also destroyed the control room, which sets off alarms and safety systems.

Archer says that "with hindsight" we must ask whether a compressor should be

OBSERVER David Austin



so close to living quarters or a control room. Compressors are not new equipment and, according to Archer, were probably not regarded as highly dangerous. A fault with the compressor was particularly bad for Piper Alpha, according to Archer. "On most platforms there is space around the compressor. That was not so on Piper."

The platform is inspected by Lloyd's Register of Shipping for insurance purposes. The DoE issues certificates on the basis of Lloyd's inspections. Piper Alpha had a certificate until 1991.

In the meantime, the oil companies do their own maintenance checks. Roger Spiller, offshore coordinator for the Manufacturing Science Finance union, is concerned about the decrease in maintenance. He says that last year Amoco sent out a memo asking for suggestions to cut maintenance by 50 per cent.

Spiller's main concerns are the need for an inspectorate independent of the DoE trade union representatives on safety committees for offshore platforms, and an end to the secrecy that surrounds some reports prepared by the DoE.

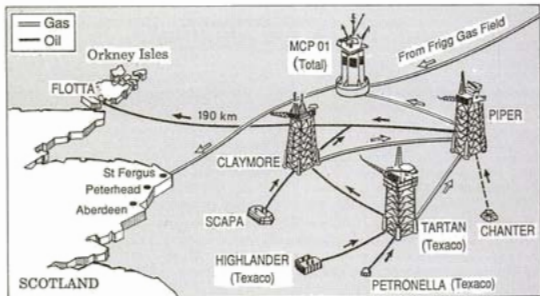
Currently, the Health and Safety Commission pays the DoE to oversee the safety of offshore installations. The department is also responsible for production levels, and Spiller thinks this leads to a conflict of interests, "not by the inspectors", he says, "but by their political masters".

The DoE has eight inspectors. One of these visited Piper Alpha eight days before the disaster. The inspections are visual and rarely involve testing equipment, according to Spiller. The inspectors also examine documents to ensure that people have the correct permits for dangerous occupations

such as welding.

Different regulations govern the role of unions in offshore and onshore oil industries. On land, the unions have the right to insist on a safety committee that they find acceptable, and can nominate safety repre-

People wear immersion suits to keep warm, if they have to jump into the icy waters of the North Sea. It commissioned the report because of problems with valves in the suits. These valves let the air out so that the body is not too buoyant and an uncon-



sentatives.

In 1984, an explosion near the gas conservation module on Piper Alpha hurt four people. The DoE investigated the accident and decided that no prosecution should follow. The report was not widely circulated, but it was shown to the company.

More recently, the department commissioned the Robert Gordon Institute of Technology, in Aberdeen, to check the effectiveness of immersion suits and life jackets.

scious person does not tip face first into the water.

The study looked at six types of life jacket and four types of immersion suit. Of the 24 combinations, only six kept the mouth and nose of an unconscious person clear of even a calm sea. "The DoE says it cannot publish the findings because of commercial confidentiality," says Spiller, "but I don't see why. The oil companies could get together and commission their own study." □

AFTER the explosions that wrecked the Piper Alpha oil platform last week, Occidental Petroleum must consider the future of the Piper field.

Piper came on stream in December 1976 and Occidental estimated then that the company could recover 925 million barrels of oil. The reservoir is also thought to contain about 3-4 million barrels of natural gas liquids (mainly propane and ethane) and 10 to 15 billion cubic feet of methane gas.

Occidental has two options which might allow it to restart pumping oil from Piper Alpha.

Option one is to repair the wreckage of the platform damaged last week. It will take some time to find out whether or not the supporting structure—or jacket—can be repaired and how expensive it will be. The topside, which sits on the jacket and incorporates the accommodation, drilling and production modules, was virtually destroyed and would have to be completely replaced.

If Occidental decides on a repair, then, when the field runs dry, the company would have to pay for the platform to be removed. Earlier this year, a firm of stockbrokers, County NatWest Wood Mackenzie, estimated that it would cost about £70 million to remove the platform, which weighs more than 14 000 tonnes

Rise of the semisubmersible?

and stands in 145 metres of water.

Option two may prove the most attractive solution. The company could remove the remnants of the old platform and install a Floating Production System (FPS) of the type used for many tasks in the North Sea.

There are two fundamental types of FPS. One is a purpose-built or converted oil tanker containing production equipment to extract the oil and gas, process it and feed it into pipelines going ashore. There are few of these vessels in the North Sea and all are committed to lengthy contracts with other oil companies.

The second method involves using a semisubmersible vessel such as those used in the early exploration of the deepwater fields of the North Sea. These can float into place, anchor over the site and "plug in" to the oil field.

These two methods will produce oil from the field sooner than repairing the existing platform and, when the oil is exhausted, the tanker or semisubmersible can be floated away and used again or sold.

Like the tanker, the semisubmersible could be purpose-built or converted from a drilling rig. Such conversion is presently being carried out in the Charlton Leslie yard on Tyneside. The present low price of oil means that semisubmersibles are relatively inexpensive. It could cost Occidental between £100 and £150 million to buy and

convert a vessel, which would take about 6 to 8 months. This week, Occidental revealed that the subsea pipeline and well-head equipment is severely damaged. The wells will need to be redrilled. This could cost a further £50 million.

Most semisubmersible drilling rigs are put into dry dock every two years for a complete inspection. Such rigs are not suitable for use as a production vessel that is required to stay in position for about 10 years.

The problem of removing the wreckage at Piper Alpha will remain regardless of which solution is chosen. Last year, the United Kingdom Offshore Operators Association considered different methods of abandoning platforms. The three basic strategies are: topping, partial removal and complete removal. For a platform such as Piper in the central North Sea, topping would cost half as much as partial removal, which in turn would cost three quarters as much as complete removal.

Occidental would, however, be able to claim tax relief proportional to the amount of money that the government has taken from the field in Petroleum Revenue Tax. This might mean that the British government could foot up to three-quarters of the bill for decommissioning the platform. **John Howes**