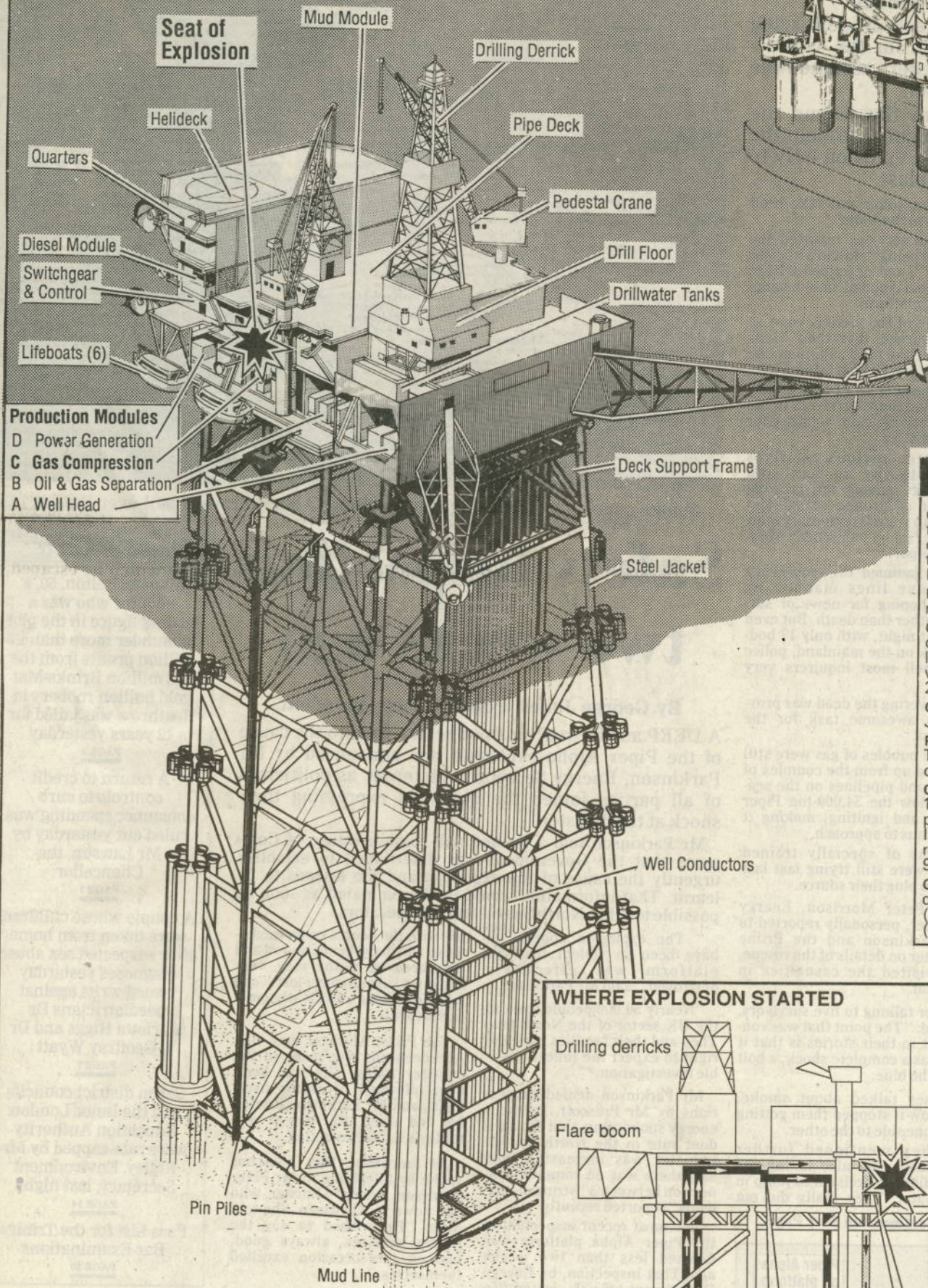


PIPER ALPHA OIL PLATFORM



PIPER ALPHA FACTS

Owners: Occidental North Sea Consortium, formed in 1971, comprising Occidental Petroleum, Getty Oil, International Thomson and Union Texas Petroleum

Field discovered January 1973, 120 miles north-east of Aberdeen

Construction: Designed by Bechtel Ltd of London and built in Ardersier, Scotland, and Le Havre, France. Platform weighs 34,000 tonnes and stands nearly 200 ft above sea level in 474 ft of water

Cost: cumulative development cost at Jan 1, 1988 \$901 m

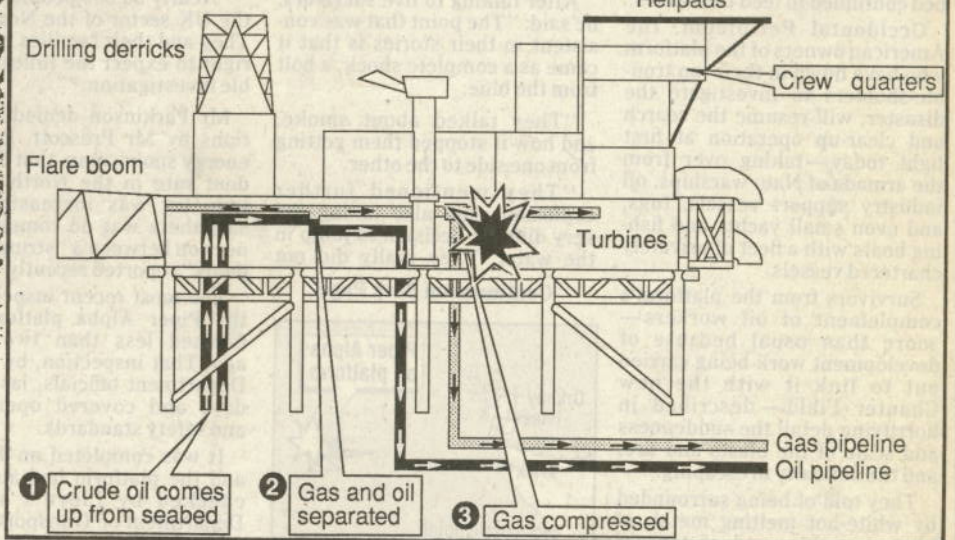
Personnel: normally 200 at any one time. Two crews work 12-hour shifts on week on/week off basis

Oil production: began in December 1976; now estimated at 167,200 barrels per day, piped via 30 in pipeline to Flotta Island terminal in Orkney. Ultimate recoverable oil reserves estimated at 963 million barrels

Gas production: 23 million cubic feet per day; mainly methane (81%), ethane (12%), nitrogen and carbon dioxide (5%) and propane (2%)

Graphic: Alan Gilliland, Glenn Swann, Peter Williams

WHERE EXPLOSION STARTED



Blast blamed on compression chamber leak

By Roger Highfield, Technology Correspondent

THE CAUSE of the explosion that ripped the Piper Alpha platform apart was probably a leak of gas into the platform's 'C' module, the chamber where gas is compressed (see number 3 on diagram above) before it is transmitted down a major pipeline, Occidental Petroleum said last night.

This finding was based on initial eye-witness accounts. But the company's spokesman added: "We do not know the answer and may not do for a fairly long period of time."

A oil platform is a huge chemical factory separating a number of volatile and potentially explosive materials. From the start, two ingredients of the disaster were clear — a leak of flammable gas and a source of ignition.

It is the first time a whole platform "has gone up in smoke", said a spokesman for the magazine Offshore Engineer.

In petroleum extraction, the oil rises under natural pressure

from wells on the sea bed. Its rise is assisted by forcing sea water and gas downwards into the rock where the oil lies.

When the oil reaches the platform it passes through a range of processes, all of which offer the possibility of leakage, particularly because of the high pressures used in production.

The oil first enters the well-head module. It then passes into a module where the oil and gas are separated. The gas then passes into the compression module. From there some goes to the platform's turbines, some is diverted back under the sea to help "lift" the oil, and some is burnt off on the flare boom. But most of the gas, of course, goes by pipeline to the shore.

It would appear that the first explosion occurred because of a leak of gas in the compression module.

However, the spokesman for Occidental Oil added that other eye-witnesses thought the origin of the explosion was in the mod-

ule where the oil and gas are separated.

This area is critical, said Mr Chris Willy of the UK Offshore Operators Association. "That is where the gas is separated out and piped away from the oil. There is an enormous amount of separation on these platforms at pretty high pressures."

A massive leak in one of the production modules could have been caused by a range of factors including:

- Metal fatigue.
- Fracture due to a pressure surge. This is normally controlled by pumping mud into the well or by using a huge valve called a "blow-out preventer".
- An explosion in one of the gas turbines used to power the rig. It is a critical area, according to Mr Willy. They are extremely powerful and used to operate the pumps on board. Some "could power a small town," he said.
- Corrosion in the gas separator module. Dr Stephen Montgom-

ery of the Non Destructive Evaluation Centre in London said corrosion can be caused by sulphur and other materials in the crude oil.

Normally a gravity separation method is used, where oil drops to the bottom and the gas is drawn off.

With the gas and oil at high pressure, "any leakage with a local ignition source — it is like your local petrol station, if you start lighting matches when you are filling your car you could get an explosion."

As for the cause of the series of explosions, Dr Andrew Sneddon of the Robert Gordon Institute of Technology said a number of volatile materials were stored on the platform in addition to the oil and gas.

There was bulk storage of diesel to run generators, found in the diesel module under the crew's quarters. It would also probably have methanol, he said.

A production module, though

not the gas compression module, has caused problems before. On March 24, 1984, 175 men were evacuated from Piper Alpha by helicopter to the Tharos after an explosion and fire. Four men suffered slight cuts and bruises.

Department of Energy inspectors began an inquiry into the explosion and Piper was shut for a time. They found it was caused by an explosion in the gas module, where the natural gas liquids are separated from the gas.

Last night a Department of Energy spokesman claimed that the report could not be released before today because it was an internal report and "the only copy is stored in Essex."

Mr Steve Worley of Worltech Marine, a company which designs some production facilities, said it was puzzling there was so little warning of disaster.

"If you were in the processing module there are all sorts of warning by gas detectors. You could have localised fires but nothing as explosive as happened there."

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