

## DIVING ACCIDENTS - NORTH SEA OIL AND GAS INDUSTRY, 1971-1975

We all know that diving is a hazardous business, but there is no doubt that the number of accidents that have been encountered, in particular in the offshore industry, is far too high. The United Kingdom Government has appreciated this and has introduced legislation to try and improve the situation.

However, this particular discussion paper is not designed to deal with legislation but, as a point of interest, I will tell you that the United Kingdom is drafting a common set of diving regulations which will include the existing Factory Acts, Offshore Installations, Submarine Pipelines and some of the Merchant Shipping Regulations.

Within the United Kingdom all fatal and serious diving accidents have to be reported to the appropriate Government Authority immediately. All fatal accidents are then investigated by the Government Department concerned and the police. For example, in the offshore industry, as soon as information is received that a fatal accident has occurred a diving inspector immediately proceeds to the site of the accident. Almost invariably one meets up with a team of police investigators on the way. The accident is then investigated on site. Statements are taken, details of the techniques employed before, during and subsequent to the accident are recorded. Copies of all records are taken, gas samples and where applicable the equipment is taken away and sent to the Admiralty Experimental Diving Unit for investigation. The body of the deceased is taken to the mortuary for the pathologist to do his work. This part of the investigation is almost invariably assisted by the doctor concerned who is called out for the particular emergency.

The next step almost invariably is to discuss the details of the accident with the pathologist.

I then co-ordinate all the results of everybody's investigations and provide a full report. This report is then forwarded to the appropriate Procurator Fiscal or Coroner to help him to conduct his Public Inquiry.

At the eventual Fatal Accident Inquiry in Scotland or the Coroner's Court in England all the details are made public, anybody concerned can be legally represented if they wish, including the next of kin, and any member of the public can purchase a transcript of the proceedings. Our aim is to ensure that every relevant detail is brought out at this Inquiry.

If however, during the investigation anything comes to light which might indicate the method of saving life in the future or preventing accidents, this information is immediately distributed to all diving companies and interested parties. We are also fortunate in that we have the full support of the RN Medical Services and can call on their assistance in our investigations.

At present the reporting system requires only fatal and serious accidents to be reported but this does include bends. It is sometimes difficult to differentiate between a "serious accident" and an "accident" with diving and in the future we shall require immediate reporting of fatal and serious accidents and periodical reporting of all other accidents including cases of decompression sickness. I am pleased to say, however, that diving companies operating offshore are very forthcoming with details of all their incidents.

I don't wish to anticipate any discussion on Central Registries for the collection of diving data but I must state that it is difficult to detect a trend in accidents either from the physiological side or from the equipment side unless one has the complete picture. Without the full picture, it is difficult for diving companies to avoid certain incidents and even more difficult for Government to introduce legislation to cover a particular problem.

I propose to concentrate now on the fatal diving accidents that have occurred in the offshore industry in all sectors of the North European Continental Shelf.

Some of the older records are unfortunately lacking in detailed information.

The first fatal accident recorded in the Department of Energy records happened to a diver in February 1971. He was diving in the Norwegian sector to a depth of 200 feet without a diving bell. The cause of death was drowning.

A month later from the same installation Diver No 2 diving to 200 feet with a diving bell died to decompression sickness. The actual details of these two accidents are rather scarce.

In November 1971 Diver No 3 died after a dive of 275 feet from the drill ship Glomar 3. My broad interpretation from the available records is that the diver carried out a dive to a depth of 275 feet for a bottom time of well over 45 minutes. He had previously carried out a dive to this depth within the preceding 24 hours. Having completed his task at the bottom he started his ascent and his lifeline or airpipe reportedly became fouled. It would appear that during the process of clearing himself he became free and he blew to the surface. The pathologist's finding was that this diver died from embolism.

In May 1972 Diver No 4 was lost from the rig Britannia during a dive to 44 feet. The cause of death was drowning and at the subsequent Coroner's Inquest, grave doubts were expressed as to whether the deceased had in fact been trained as a diver and whether he was qualified.

In August 1973 Diver No 5 died of pulmonary haemorrhage whilst diving to a depth of 320 feet. Scientific evaluation of the breathing equipment subsequent to the fatal accident led to modifications.

In December 1973 No 6 disappeared whilst diving from Blue Water 3 and the body was not recovered. The task he was required to do was simple and the depth was only between 60 and 70 feet. He was an experienced diver and for some reason or other cut his communication lifeline and was lost. At the time of the inquest the only logical conclusion that could be drawn was that for some reason or other the diver got into a panic. However, we know that he was cold and shivering as a result of a previous dive and our subsequent investigations of the effect of cold on the diver suggest that he might in fact have carried out his illogical actions during the onset of hypothermia. This can only be surmised in hindsight but I am prepared to say that everything points to the fact that cold is a very real menace and may well trigger off other problems.

In January 1974 two divers (Nos 7 and 8) operating from the drill master rig in the Norwegian sector at a depth of 250 feet lost their lives when the bell accidentally surfaced. Subsequent investigation showed a breakdown in company communications correcting the drill after a modification to the weight slipping devices.

In April 1974 Diver No 9 was drowned whilst diving from a drill ship Habdrill at a depth of 300 feet. This was an unfortunate case of panic by the attendant in the bell. The diver was carrying out the first operational dive from Habdrill on that particular site. The diving team had carried out several practice dives and they were very enthusiastic to get down to work. This may have had some bearing on the accident which really started when the diver overworked. He carried out his task in almost record time and in spite of the fact that he was advised several times to slow down. Having overworked on the task the diver was in some distress and swam rapidly back to the bell, but unfortunately he took a turn around one of the bell's weight wires with his umbilical. The bell assistant tried to assist him into the bell by pulling on his umbilical which in turn pulled him under water. A series of panic actions by the attendant led to him cutting the diver's umbilical and shutting the bottom door and screaming to the surface to be brought up.

In June 1974 Diver No 10 got into difficulties whilst diving to a depth of 200 feet from a pipe-laying barge. He was surfaced and carried out a surface decompression routine albeit one that was well outside the normally accepted 5 minutes technique and died from decompression sickness. The eventual postmortem showed that the deceased was suffering from heart and respiratory diseases. He was also obese.

In July 1974 Diver No 11 died from a pneumothorax after a dive of 492 feet. This particular fatality was well publicised in Britain at the time because the doctor concerned failed to diagnose a pneumothorax.

In August 1974 Diver No 12 was lost while diving in a bell from an installation in the Norwegian sector. He collapsed and died from anoxia. Failure in communications when ordering the gas, and an error by the supervisor in failing to test the gas, led to the diver being fed pure helium.

In October 1974 Diver No 13 died whilst carrying out a surface swim from the installation Waage 1. At no time did he dive below the surface. The subsequent postmortem showed that he died from drowning aggravated by vomit and that he also sustained broken ribs. It is difficult to categorise this as a diving accident and even more difficult to state how the diver sustained his broken ribs and, in fact if they were the cause of his drowning. However it is possible that he may have struck the sponson or the "cow catcher" in the swell.

In October 1974 Diver No 14 was lost while operating from a bell in the Norwegian sector. The fatality occurred due to a breakdown in communication between the divers in the bell and the control on the surface. This led to a temporary switching off of the diver's gas supply and when realising that he had lost his main gas supply, the diver rushed back to the bell but became fouled on the way.

In December 1974 Diver No 15 operating from an installation in the Irish sector of the Celtic Sea was lost through asphyxia. He was carrying out a dive from a bell in bad weather and it would appear that the movement of the bell sheared his umbilical on some obstruction. For some unknown reason the diver did not use his emergency gas supply. The weather was cold and the diver had no artificial heating and once again one cannot help thinking, in hindsight, did cold play an important part in this accident?

In December 1974 diver No 16 operating in the sheltered waters of Scapa Flow to a depth of 100 ft was trapped in a pipe by suction. It would appear that a pipe on the pig trap of the pipe was damaged, probably by the jet sledge or the anchors of the barge, and the diver displaced the valve causing a massive suction which partially sucked his shoulder and arm into the pipe.

In March 1975 a Norwegian diver died whilst operating to a depth of 460 ft from the Borgny Dolphin in the British sector. There was no doubt that cold played an important part in this particular accident. We know that the diver made himself heavy to operate on his tasks. We also know that he was swimming at the job. He worked rapidly and refused to take the advice of surface control to slow down his operations. The cause of death was anoxia but it is difficult to establish how one can die from anoxia when the breathing gas contained more than adequate oxygen and the equipment was working satisfactorily.

We know that hard work increases the O<sub>2</sub> uptake. We know that shivering can increase this uptake by as much as 100%. We also know that the onset of hypothermia causes respiratory and cardiac systems to behave abnormally. I believe that a combination of these three things can lead to fatalities such as the one I have just described.

In March 1975 diver No 18 died during or soon after a dive to 240 ft operating from a gas platform in the southern north sea. The cause of death was pulmonary oedema caused by cardiac myopathy and the Coroner brought in a verdict of natural causes.

In June 1975 a diver was lost from a barge in the Norwegian sector. This accident is still being investigated by the Norwegian authorities and I cannot say any more than that.

In July last year two divers were lost on a pipe suction accident. The accident occurred in 120 ft of water and it was clear that the real problem of differential pressures was not fully appreciated.

In September last year two divers were lost after a successful dive to 390 ft. Having completed their dive with no problems the divers locked through into the main living chamber. This chamber was heated to between 110° and 120°F and due to a series of errors this temperature was probably increased and the divers were unable to get back to the transfer under pressure chamber to cool off.

In the past, particularly in the North Sea, the emphasis has always been on keeping the diver warm. It now becomes obvious that care must be taken to keep the diver in thermal balance at both ends of the spectrums.

In 1975 a fatality occurred in Stavanger Fjord during the construction of a Condeep platform. The diver dived to 140 feet and for some unknown reason slipped his helmet and umbilical and disappeared. Subsequent enquiries into the background of the deceased suggest that there was a lack of basic training.

Again in 1975 a fatal accident occurred in the Dutch sector of the North Sea when a diver operating in comparatively shallow water on air cut his lifeline; he floated to the surface and then sank and was not recovered.

In January 1976 a diver was drowned when operating a depth of 480 feet and it is possible that he accidentally switched off his own gas supply by knocking the ball valve control.

Again in January a diver was lost through pulmonary Barotrauma when a diving bell accidentally surfaced. His bell companion in this particular accident was also seriously injured.

In May a diver was drowned whilst operating in 120 feet due to the fouling of his umbilical.

Another diver died from Pulmonary Barotrauma after a dive to 120 feet in Loch Fyne. Diver No 30 was lost through drowning whilst diving on air at a depth of 120 feet off Anglesey.

Diver No 31 was lost whilst operating from a barge in the North Sea almost certainly due to his main gas supply becoming disconnected at his mask.

Time does not permit me detailing all the other accidents and near misses but from the information that we have, an initial analysis of figures suggest a broad breakdown of the reasons something like ...

Human error	16	Lack of equipment	3
Poor physical condition	3	Inadequate medical supervision	2
Inadequate training	6	Poor diving supervision	6
Equipment failure	9	Poor equipment maintenance	4

In addition cold has certainly been a contributing factor in at least three and probably more cases.

Reports have been received as a result of accidents and also through the grape vine of divers becoming unconscious under water for no apparent reason. The Department of Energy has instituted a research project to investigate this particular problem.

In addition to the introduction of legislation the Department of Energy now issues diving Safety Memos on points of diving safety as soon as they arise. One in particular applies to the topic for this paper and that is Diving Safety Memo No 14 which draws attention to the need to provide a hoisting harness for the diver which lifts him from the pelvis as opposed to the chest or shoulders.



*Carelessness kills more than we do!*