Diving in the North Sea during 1978: Situation Report.

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Early in the New Year a diving operation was conducted in a Norwegian fiord to demonstrate the ability of divers to weld underwater in depths in excess of 1000 feet. Unfortunately during preparation for the welding demonstration a diver lost his life at depth. This accident was investigated by the Norwegian Diving Inspectorate and their investigation showed that the welding techniques were in no way involved.

After the investigation the Norwegian Diving Inspectorate gave permission for the demonstration to continue. However this permission was retracted but permission was given to recover all the heavy equipment from the sea bed using divers. This was done successfully.

In the interest of advancing diving knowledge and techniques the company concerned were keen to continue the demonstration and requested permission to conduct diving operations within UK territorial waters. They showed that scientific and work-up trials had already been conducted to the depth of water in which they intended to operate and that, on other diving operations, they had already logged 14,400 man hours in saturation at the 1000 foot depth range in support of open sea constructions. Three hundred and thirty hours of this time were employed with divers performing various tasks actually in the water. In my opinion this had already verified the procedures and the ability of the divers to work safely at these depths.

Following discussions with the company concerned, and the various UK government departments, it was agreed that there was no sound reason why the demonstration should not be allowed to continue in UK waters.

It was considered that a successful demonstration of the ability of divers to produce a pipeline weld in depths of 1000 feet would be a significant step forward in underwater engineering involved with the oil industry and would be of considerable importance when it comes to the development of oil and gas discoveries in deeper waters around the world and, as you all know, this demonstration was successful.

At the back of my mind was the occasion, many years ago, when a diver lost his life at the very start of a major deep diving experiment and because of this the whole experiment was cancelled. In my opinion this delayed the progress of diving and eventual improvement in diving safety for many years.

Minor incidents, near misses and dangerous occurrences continued to occur in the UK sector in 1978 at a level not unlike that of previous years but, we were all extremely pleased to acknowledge, in October of last year that there had been a complete year in the UK sector without a fatality. If only to prove one must not be complaisant, at the end of November, there was an incident in which two divers lost their lives. This particular tragedy occurred during the application of a comparatively new technique of diving from a dynamically positioned vessel.

The employment of these vessels on pipeline work, or work in the close proximity of an installation where the seabed is covered by the various accoutrements of

the trade of offshore oil exploitation is extremely attractive. In many cases the employment of an anchor mooring system is either undesirable or impossible.

However, it is clear that diving operations from a dynamically positioned vessel must be carried out within the safety envelope of the diving system, the vessel, dynamic position system and the prevailing and anticipated weather and sea conditions.

Both the Norwegian Diving Inspectorate and the UK Inspectorate have been trying to anticipate the problems involved with diving from these vessels and only late last year the UK issued a guidance note drawing attention to the problems of a single acoustic system. It is a fact that we are all still on the learning curve with this type of operation.

Our efforts in investigating and assessing the safety parameters of this particular technique have naturally been increased by the unfortunate tragic happenings recently. The UK has now initiated a research project to perform a risk analysis study of diving from dynamically positioned vessels. The object of this analysis being to: establish parameters for the design and operation. The study will take into account and advise on requirements for redundancy in thrusters and screws, propulsion machinery, power supplies, sensor systems and individual sensors and computer hardware. It will also consider the design requirements for computer software and will make recommendations upon these and on operating procedures to be adopted in relation to such facts as operating in the vicinity of fixed structures, both surface and subsea, the proximity of anchor cables and wires, changing the ship’s position both laterally and in asmyth while diving operations are being performed and the limiting weather conditions. In addition it will study and make recommendations concerning on board and diver communication systems.

The results of this project will be published as soon as they are available.

The continuous process of analysing the facts and figures gathered from accident reports and investigations is showing little change and human error still continues to head the list at about 50%. However, I must stress that when I quote “human error” I do not mean just the “diver’s error”. Human error covers every aspect from the human involvement in the manufacture of equipment right through the whole process of diving to the actual man in the sea. We have started a punch card recording system in the UK as a means of collecting as much information as possible on accidents. One must however remember that the end results are only as good as the information that is put into it. Eventually it is hoped to include all this information in a computer.

One particularly worrying aspect in the North Sea in 1978 was the fact that 3 diving bells were dropped for various reasons. This once again generates the almost continual debate on “to have or not to have slippable weights”. It is a fact that more divers have lost their lives through accidental slipping of bell weights than those saved. Because of this some companies have fitted additional external keep pins or chains to bell weights which require the diver, in the event of an emergency, to leave the bell and to remove the external safety device before returning and closing the bottom door or doors before actually slipping the weights.

UK legislation requires a method of recovery in the event of a main wire break and providing there is at least one additional method of bell recovery (for example, recovery by umbilical or guide weight wires) the external pinning of slip weights is acceptable. However, diving companies must take into account the design of the bell system. For bells that sit off the bottom by the by the application of an under slung weight or those that stand on, but clear of the bottom, by the use of legs or some such device under some circumstances it is acceptable to have external safety devices. Where the straight forward bell suspension technique is used it must be appreciated that if the bell is dropped on the bottom the divers may well be unable to leave.

It would seem sensible to ensure that where slippable bell weights are employed as a means of emergency surfacing, the slipping procedure should consist of two positive actions neither of which can be carried out accidentally. It is also desirable to have an interlock between the slipping device and the bottom door to prevent slipping with the bottom door open.

This automatically leads to another practice that appears to be creeping in with some companies, and that is the practice of removing the bell bottom door when operating in saturation diving. There are many attractions for doing this and, generally speaking, it is acceptable when the storage depths of the divers is seabed depth.

However there is increasing activity at the inspection and maintenance role, much of which is carried out at intermediate depths and divers are being saturated at these depths. A dropped bell under these conditions with only an internal pressure sealed door could be disastrous. Prevention must surely be the first line of defence.

All of these problems suggest that a new look at bell designs may be desirable.

During my talk last year I told you that it was the intention of the Government to introduce a new unified set of diving regulations therefore tidying up the present situation which included 4 different sets of statutory instruments.

The proposed regulations will apply to all diving operations whilst at work, both offshore and inshore, including those carried out by employees of the Crown but not, and I repeat not, to sport or amateur diving.

The new proposals include the legislation which the offshore industry in the United Kingdom have accepted and learnt to live with.

Within the proposals there are certain points which tighten up the activities of the diving “inshore” but, in the long term, it is hoped it will not only improve diving safety but introduce a career structure for people involved in the industry.

Some difficulties are being encountered in trying to cater for “scientific diving”. One of the biggest problems has been to define “scientific diving”.

Long term future investigations

The Chief Scientist of the Department of Energy, Sir Herman Bondi, has set up an Advisory Group on the technological development necessary for the progressive replacement of man under water in the long term future. The Advisory Group has been set up to advise on the research and development support necessary to assist the development technology required for underwater engineering to move towards

the progressive replacement of man underwater by remotely controlled systems.

I believe that we all support the policy that if a task can be completed successfully and economically underwater without subjecting man to pressure it should be done that way. I would agree that this should apply, in particular, to very deep water. I do not know where the economically break point is but the present state of the art in deep diving and with the introduction of helium conservation systems I would estimate that manned diver intervention underwater will continue to be economically viable down to depths of 1000 feet for the foreseeable future.

History has also shown that "non diver techniques" have provided an excellent source of diver employment.

Currently in the North Sea manned free swinging submersibles, some with diver lock out facilities are being used. The capability of this class of submersible has improved a great deal in a relatively short time with advances in battery technology, control system, underwater navigation, lighting and viewing systems, and vehicle design. However, the happenings in 1978 suggest that the market was over supplied.

Submersible operations in 1978 in the North Sea were not without their incidents. Early in the year a two manned observation submersible became fouled on the sea bed but was safely recovered after several hours. Early on Christmas Day I was informed that a two man non lock out submersible was fouled in about 400 feet of water but, fortunately the message came through at 3 o'clock in the afternoon that the vehicle was safely recovered.

There was very little activity by the one man one atmosphere type submersibles during 1978 but I anticipate that this type of activity will increase considerably in the future.

Remotely controlled vehicles are being used in a limited way, mainly in the task of inspection and these consist of:

(i) tethered and untethered free swimming vehicles;
(ii) tethered bottom crawling vehicles; and
(iii) towed vehicles.

Some have demonstrated a capability to perform inspection, survey, and some recovery tasks. However, general acceptance of the RCV's as such have not been fully achieved in the oil industry.

Diving Safety Memorandums

Gentlemen, it would be very wrong of me to conclude a diving safety survey of operations in the North Sea without mentioning safety memorandums that have had to be issued.

Individual diver carried decompression meters are extremely attractive for use by divers carrying out inspection and maintenance of structures. However, we had to draw attention to the fact that some meters available on the market are not necessarily safe for this particular diving application.

In February of last year it became obvious that there had been too many serious "near misses" as a direct result of using electrically heated undersuits. We had to say that these suits were not to be used in the British Sector unless the control circuit is so arranged that adequate electrical protection is

provided to minimise the danger from the failure of the insulation and from over current.

Some concern has been expressed on the subject of “diagnosis of decompression sickness”. We have drawn attention to that excellent section of the US Navy Diving Manual headed “Patient Examination”.

The fact that the sea is sometimes very rough and that it is necessary to secure equipment in a seamanlike manner also had to be pointed out.

The fact that this has been necessary may well reflect on the standard of diving supervisors and this I intend to look into.

Discussions on the desirability of having a hyperbaric lifeboat for use in the event of ship or installation evacuation continues. We still believe in the UK that, with the state of the art today, the application of “prevention” backed up by a “flyaway” capability and a ship to ship “lift off” capability fills the requirement of providing “every reasonable practicable precaution”.

During 1978 we also had to draw the attention of diving companies and equipment manufacturers to various defects in equipment. In every case there was a rapid response from the companies responsible.

I also found it necessary to draw attention to the activities of some “diving consultants”

I would now like to touch very briefly on the research projects which we are supporting.

The investigation of unconscious episodes in divers and management of diving accidents continues.

Investigations on anaesthesia at high pressure is progressing well and successful trials have been carried out under controlled conditions at equivalent depths of 1000 feet. (This work is being done by Dr CR Dundas of Aberdeen University).

The investigation into safe thermal conditions of divers is also continuing and I hope that by this time next year one would have some very definite results to report. (This particular project is being carried out by Dr V Flook also of Aberdeen University).

The investigation into diver fatigue at the work site has been broken down into, first of all, the technique for monitoring the diver. It is certainly interesting to note that, with the information that we have today, there appears to be little medical reason for restricting divers’ activities in saturation, length of time in saturation, and number of saturation dives per year.

Carbon dioxide retention in divers and helium breather warning devices are being investigated by the Admiralty Marine Technology Establishment. Dr M Winsborough of the same establishment is responsible for producing tables for oxygen/ nitrogen saturation.

Investigations into electrical safety underwater continues and I hope that in the very near future we shall know the areas in which we have little or no knowledge and will therefore know where to direct future research.

As I told you earlier a research project has been generated to cover the problems

with operating divers from dynamically positioned vessels.

Finally investigations still continue into the long term environmental effects of diving. This is going extremely well and certainly, at this stage, there is no reason to anticipate serious future problems.

The results of all these projects will be published when the projects are completed and, if any particular point of safety arises during the research period this will be published at once.

As you know from some of my statements in previous years I sincerely believe that we should aim for harmonisation of all diving safety regulations in the offshore industry. I still believe this but I think that a word of warning is perhaps necessary. My idea of harmonisation is not the production of detailed legislation. Too much detail can only lead to a restriction in progress and the delay in the introduction of new techniques.

I shall certainly be taking a keener interest in the ILO and IMCO committees in the future.

Finally I can tell you that the English translation of the Norwegian Regulations is now available.

EYE TESTS FOR PENGUINS

Penguins are well known for their ability to “fly” underwater and catch fish, the mainstay of their diet. Because of their expertise at such aquatic manoeuvres, it has been thought that the penguin eye was optically adapted for underwater vision, suggesting that their vision in air must be greatly near-sighted.

Findings by Dr Jacob G Sivak of the School of Optometry, University of Waterloo, Ontario, Canada, however, appears to refute this theory. Impressed by the ability of some penguin species to recognise individual birds on land and to travel great distances over featureless ice using celestial navigation, Sivak decided to test the aerial and aquatic vision of penguins. Blackfoot penguins were given a series of intensive optical tests, the results of which showed that the birds’ eyes were well adapted for aerial, rather than underwater, vision. Sivak also noted, however, that the penguin eye has a very flat cornea, which could function similarly to a skin diver’s mask, reducing the far sightedness that is usually introduced by submerging an eye designed for aerial vision. Studies of additional penguin species (rockhopper, gentoo, king and Adelie) have indicated a similar pattern.

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who are drawn from the ranks of Sydney’s public servants and are all volunteers, are covered by Government sickness and workers compensation benefits. The suspect batches seem to have been uncontaminated when assessed by chemical tests. The article concludes with the comment that despite the well-publicised support for the oyster from members of the State Cabinet, including Health Minister Kevin Stewart, the industry has only just managed to regain the public’s confidence. It will be a great relief to many oyster eaters to know that however ill they may get, the chemical tests were satisfactory!