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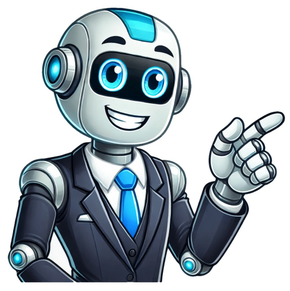

Byford dolphin accident bodies

The Byford Dolphin oil rig(Image: Bloomberg via Getty Images)It's gone down in history as one of the most horrifying diving accidents which led to the grisly yet instant deaths of five divers.The Byford Dolphin incident in 1983 saw the men "explode from the inside" after one of them was blasted through a jammed door hatch "like a cannonball" and "torn to pieces."Three others were killed by their blood reaching boiling point within seconds when a compression airlock malfunctioned. Only one diver miraculously survived, but not without life changing injuries and trauma.READ MORE: Woman swallowed whole by 13ft shark while swimming with friends – and nobody noticedGet the latest news on the Daily Star homepage.Their highly paid jobs as saturation divers involved them living and working for weeks at a time inside a cramped pressurised metal tube only six metres long and two metres wide, with a detachable "diving bell" to transport them to and from the ocean floor.Two of the men who tragically lost their lives, Roy Lucas and Billy Crammond READ MORE: Mother of deadly mass shooter shares regret she will have for the rest of her lifeREAD MORE: Last words of Nutty Putty cave explorer who ended up 'crawling into his own grave'Leaving only to perform sensitive engineering work on the Frigg Gas Field - the world's largest and deepest offshore gas field beneath the North Sea - they worked long hours in the pitch black, freezing cold water alone.At that depth, they need to breathe pressurised air that dissolves nitrogen in the blood. Resurfacing too quickly can cause the nitrogen to form bubbles in the body, a condition commonly called "the bends," and so decompression stops are needed.But the chamber on the rig allowed the men to work for 28 days at a time at a consistent pressure with only one decompression period after their work was done.But on the fateful day of November 5, 1983, the diving bell detached from the pressurised living chamber before the doors were fully closed. The rapid depressurisation from nine atmospheres of air pressure to one atmosphere caused a crushing blast rapidly forcing the nitrogen in three of the divers' blood turned into bubbles, effectively boiling them from the inside.A diagram shows the position of the divers and their dive tenders when tragedy struckREAD MORE: Brit mauled by shark would've been 'head-butted' by beast before it tore chunk off himThe men who died at 4am that morning were British divers Edwin Arthur Coward, 35, and Roy P. Lucas, 38, and Norwegians Bjørn Gicever Bergersen , 29 and Truls Hellevik, 34.Truls was pushed through a small hatch door opening less than 60 centimetres (24 in) in diameter. His spine was ripped from his body and found almost 10 metres away.One of their dive tenders responsible for attaching the diving bell from the outside, William Crammond, 32, was also killed by the outside force. The other dive tender, Martin Saunders was left with devastating injuries after being crushed underneath the four tonne diving bell.The official report into the disaster said Hellevik "shot out through the small jammed hatch door opening and was torn to pieces."A hyperbaric chamber used by divers for decompression(Image: Getty Images/iStockphoto)"Fragments of his body were found scattered about the rig. One part was even found lying on the rig's derrick, 10 metres (30 ft) directly above the chambers. His death was most likely instantaneous and painless."The report also noted that autopsies had revealed solid lumps of fat in the men's arteries, as normal fat cells in the blood suddenly became solidified by the change in conditions which caused them to "explode from the inside out."It took the families of the victims 26 years to receive compensation from the Norwegian Government after it was finally accepted that the equipment was faulty and there were no fail safes.The grim story recently resurfaced on YouTube after being posted by Storified and attracting over 2.6m views.Only Martin Saunders survived(Image: Storified)One viewer wrote: "Lessons from Youtube: 1. Never go diving. 2. Never go caving."Another said: "A truly terrible accident and a truly nasty way to go. Hopefully it was quick and the pain and distress only momentary."While one added: "My uncle was on the Dolphin when this happened. Said it was the most horrific thing he has ever seen. Body parts were being found for days afterwards."For the latest news stories from Daily Star sign up for our newsletter. In our constant need for oil and gas, many corporations conduct offshore oil and gas drilling. Basically, this means setting up oil and gas drilling rigs in the middle of the ocean, with the ends of the rig itself extending to extreme depths so as to make contact with the seafloor and beyond. Most of these can be done using machines thanks to recent developments in robotics, and indeed, a lot of current offshore operations rely on various robots to do the bulk of the deep diving. That being said, there are still responsibilities that only a human diver can pull off, like routine maintenance, spot checks, or anything else that might require fine motor skills. For these divers, going that deep into the deep blue sea often requires descending and ascending in an extremely accurate and controlled fashion. Failure to do so, and divers risk life and limb to decompression sickness. In 1957, the U.S. Navy devised a way for offshore oil rigs to minimize the risk of decompression sickness in deep-sea divers, and that's namely to just keep them underwater for extended periods of time. They called this technique "Saturation Diving", and for a long time, this technique managed to drastically reduce the number of offshore diving-related accidents. That is, until 2002, when the Byford Dolphin, an offshore semi-submersible drilling rig operated by Dolphin Drilling, became the center of a saturation dive catastrophe. But First, Why is Decompression Sickness So Bad? A brief explanation of decompression sickness One of the most feared conditions amongst deep-sea divers (more than a chance meeting with a Kraken), decompression sickness happens when a diver ascends from the murky depths too fast, causing their blood to literally bubble up as if it was boiling. Known as 'the bends' amongst divers, it's one of the most challenging parts of diving simply because no amount of fancy or high-tech equipment can save a diver from it. During a scuba dive, divers take on an extra amount of oxygen and nitrogen in their compressed air tanks. Most of the oxygen is used up in your bloodstream, while the nitrogen is absorbed into various tissues. As divers go deeper and deeper, the literal weight of the ocean starts to bear down on them, creating intense pressure that compresses even the oxygen and nitrogen molecules in your tissues, causing the nitrogen molecules to dissolve much quicker and in higher concentrations. When a diver ascends too fast, the sudden drop in pressure causes the dissolved nitrogen molecules to suddenly bubble up as if it was boiling, causing a host of nasty and horrible conditions: excruciating pain, paralysis, sudden confusion, and in many cases, even death. Should a diver survive the initial shock of the bends, they'll need to be treated in a recompression chamber, where they will once again be put under intense pressure and have that pressure removed very slowly over a long period of time. This is because of simple physics: normally, the lower the pressure of a gas surrounding a liquid, the lower the temperature at which the liquid will boil. Simply put, liquids will boil over once the vapor pressure is equal to the atmospheric pressure, even at room temperature. In a bad case of decompression sickness, the nitrogen molecules in our tissue start to bubble because of the sudden drop in atmospheric pressure. However, what happened in the Byford Dolphin Incident was a case of explosive decompression. The change in pressure happened so fast and so drastically that the liquids inside the chambers of the rig literally flash boiled, meaning they were brought from an inert state into a state of extreme temperatures in the blink of an eye. Basically, this meant that the divers onboard the Byford Dolphin at the time of the incident suffered an intensely gruesome death that we'll cover later on. Proper technique is required for deep-sea divers to avoid getting decompression sickness, but this requires spending an appropriate amount of time ascending after every dive. For scientists and even recreational divers, this might not be a problem; for military personnel and deep-sea divers working on oil rigs, this extra amount of time simply cannot be sustainable, which is why the U.S. Navy pioneered the Genesis Project, thus giving birth to the concept of Saturation Diving. A Brief Explanation of Saturation Diving In one of the earliest attempts to study long-term deep-sea diving, researchers Edgar End and Max Nohl spent 27 hours breathing compressed air in a specialized facility in the County Emergency Hospital of Milwaukee back in 1938. The study was successful, with researchers determining various physical changes in blood chemistry because of the experiment, although the researchers required a 5-hour decompression which left Max Nohl with a mild case of the bends (although this was resolved with a short recompression therapy session). Shortly after, in 1942, USN Physician Albert Behnke proposed saturating humans with inert gases using increased ambient pressures to avoid decompression sickness, a field of study that was explored further by another USN Physician, Captain George F. Bond. Captain Bond began the Genesis Project in 1957 to prove the human body's capability of withstanding extreme environmental pressures and different breathing gases, a field of study that the U.S. Navy was keen on exploring to improve their submarine technology and giving birth to the Man-in-the-Sea program. By 1965, the Genesis Project had given birth to a wide array of research findings, allowing Westinghouse to perform the first commercial saturation dive to replace the Smith Mountain Dams trash racks, which were located more than 60 meters below the surface. What the Genesis Project and the Man-in-the-Sea program created was the birth of what-we-now-call Saturation Diving. In saturation diving, divers stay under intense pressure for a period of time long enough so that their bodily tissues achieve equilibrium with their breathing mixtures inert gases, usually consisting of either nitrogen or helium. This equilibrium, known as Nitrogen equilibrium, is when the net intake of nitrogen is equal to the net outtake of nitrogen, resulting in normal bodily functions. This is usually impossible during regular dives, as the gases in compressed air tanks usually have higher levels of nitrogen to lower the risk of oxidation or other chemical reactions in the tank. As divers go down the deep, the pressure forces the nitrogen molecules to collect in the body, upsetting the balance and creating more nitrogen intake than outtake. During a saturation dive, however, scientists use a series of decompressions and recompressions –along with a series of different breathing gases –to keep the body at a nitrogen equilibrium. Once they achieve bodily equilibrium, the divers are kept in these conditions for prolonged periods of time, usually by building pressurized living quarters. The divers are shuttled between their living quarters and underwater via a pressurized diving bell, so as to keep the environmental pressure as constant as possible. Often, saturation divers are kept in these conditions for weeks at a time, with decompression only being performed once their tour of duty is completed. Although saturation divers are compensated generously (as they should be), their living conditions during their saturation have been described as intense, exhausting, and claustrophobic at best. Many saturation divers have reported getting constant chills because of their specialized breathing gases, usually containing helium. Although studies have yet to be conclusive, scientists are finding various medical complications arising from saturation divers because of their extended stay in extreme depths. Because of the extreme health risks and the constant risk of untimely death, the U.S. government imposes a very long list of extremely strict regulations meant to mitigate the risk of sickness and death during saturation dives, ranging from constant equipment checks, timed dives, and forced time-off. But despite these regulations, the risks have scared off enough people that saturation diving became one of the most specialized jobs in the country, with the Federal government listing less than 400 saturation divers as of 2021. Accidents involving saturation dives are, thankfully, very few and far in between. That being said, the Byford Dolphin incident of 1983 was one of the saddest and most heart-breaking accidents involving saturation divers. But first… A Quick Look at the Byford Dolphin The Byford Dolphin is a semi-submersible, column-stabilized drilling rig operated by Dolphin Energy. It started operation in 1974 and was drilling for various companies in the North Sea. Originally named Deep Sea Driller, the Byford Dolphin is the first-of-class of the Aker A-3 series of drilling rigs. The Byford Dolphin measured at an overall length of 355 ft or 108.2 meters, with a breadth of 221 feet or 67.4 meters, and a depth of 120 feet or 36.6 meters. It was built to be operational up to a water depth of 1,500 feet or 460 meters, with a maximum drilling depth of around 20,000 feet or 6,100 meters. At the time of its completion, the Byford Dolphin was equipped with the most advanced drilling equipment of its era. However, although the Byford Dolphin's equipment passed the strict levels of certification required by Norwegian law (it operated in Norwegian territorial waters at the time), the Byford Dolphin's equipment at the time of the incident had already been deemed obsolete and necessitated replacement (a fact that will be brought up during investigations). To counter drift and ocean currents, the Byford Dolphin was equipped with its own engines capable of speeds of 4.5kn, although long-distance relocations required the use of specialist tugboats. The Byford Dolphin Incident wasn't the first –nor the last –fatal accident that the rig would see: in 1976, just three years after its launch, the Byford Dolphin ran aground during transit from the Frigg oil fields in the North Sea to the port of Bergen. All crew was evacuated onto lifeboats; however, because of rough seas at the time, 6 people died after falling off the lifeboats. Meanwhile, in 2002, a Norwegian worker was killed during an unspecified industrial accident on the rig, with the worker being struck on the head fatally with a piece of metal. These accidents, although few, far apart, and involved separate different types of errors, not to mention the rig's lack of newer and better equipment and lower demand for oil thanks to green living and alternate energy sources, resulted in it being laid up in 2016, with its remains being beached in Aliağa, Turkey. What is the Byford Dolphin Incident? The now infamous Byford Dolphin incident happened on November 5, 1983, and involved the deaths of four divers and one dive tender via explosive decompression as the divers were returning from a routine procedure. In the Byford Dolphin Incident, divers Edwin Coward and Roy Lucas were in chamber 1 of their compressed living quarters where they were resting. Meanwhile, divers Bjørn Bergersen and Truls Hellevik were entering chamber 2 via a trunk connected to the diving bell. The trunk secured the bell to Chamber 2 via the use of clamps, which are operated by diving tenders William Crammond and Martin Saunders. In a normal situation, the pressure within all these chambers, the trunk, and the diving bell must be kept in perfect balance. This ensures that the diving bell can be connected and disconnected from the chambers safely. The diving tenders are in charge of this procedure, and it must follow certain protocol: First, the diving bell door must be closed and secured. Second, the pressure in the diving bell is increased to help seal its doors. Third, Chamber 1 must be closed off from the trunk. Fourth, the trunk that connects the diving bell and the chambers is depressurized to a pressure of 1 atmosphere. Finally, the clamp is released, allowing the diving bell to be set free from the chambers. Although everyone in the team was highly experienced, a fatal and catastrophic explosive decompression incident happened, killing all 4 divers and 1 of the tenders, leaving tender Martin Saunders as the sole survivor, albeit with severe injuries. Initial investigation by the Norwegian government theorized that diving tender William Crammond had made the fatal error of releasing the diving bell before the diving bell's pressure could be increased and before sealing off Chamber 1 from the trunk. Because the trunk, the living chambers, and the ocean itself, all had different pressures of extremely varying degrees, the incident caused explosive decompression, instantly killing all the divers in the chambers, with the trunk itself striking both tenders resulting in 1 fatality. The Byford Dolphin Incident is also noted for the gruesome and violent deaths suffered by the divers. Although forensic reports say their deaths were near-instant, it was definitely not painless. Medical reports did not specify which divers suffered what, and for good reason: because of the intense pressure differences, the sudden and intense explosive decompression had caused 3 of the 4 divers' blood to flash boil. Meanwhile, the 4th diver was severely mutilated and dismembered after the rushing air caused by the decompression forced his entire body through a partially opened doorway only 24 inches long, severing various body parts and even launching vital organs as far as 30 feet away. The explosion was so strong and so sudden that preliminary investigators noted that the 4th diver was mangled so precisely that they described some of the organs as being without damage, "as if dissected out of the body." The Byford Dolphin Incident Revisited Due to its gruesome and heart-breaking results, the Byford Dolphin incident precipitated the formation of the North Sea Divers Alliance, a coalition that lobbies for the protection of North Sea divers. Formed from the relatives of all 6 victims of the Byford Dolphin incident, the group filed a lawsuit against Dolphin Energy, citing the lack of safety equipment on board the rig and questioning whether the cause truly was human error. Finally, in 2008, after 26 years of lobbying, the North Sea Divers Alliance obtained a report that showed, without a doubt, that the real cause of the Byford Dolphin incident was not human error: rather, it was faulty equipment, with the trunk clamps being cited as one of the prime suspects of the incident. At the time of its completion, the Byford Dolphin was using state-of-the-art drilling equipment of its era, with all of its components passing the very strict regulations of the Norwegian government. However, as time went on, many of its components became obsolete, with very little being done to keep them up to date. By 1983, most of the equipment onboard the Byford Dolphin during the incident was already considered obsolete, with many of the same types of equipment actually banned from Norwegian waters because of their failure to adhere to then-updated regulatory requirements. This forced the Norwegian government, where the Byford Dolphin was operating at the time, to pay compensation to the surviving family of the victims and completely absolving William Crammond of any and all responsibility for the accident. Finally, in 2016, after 42 years and an increased demand for renewable energy sources, the Byford Dolphin was finally put to rest. The Byford Dolphin incident was a sad reminder to everyone that, despite more than half a century of research, we know only a terrifyingly small amount when it comes to the science of decompression and saturation diving.