UNDERWATER

The Official Publication of the Association of Diving Contractors International

THE INLAND SECTOR

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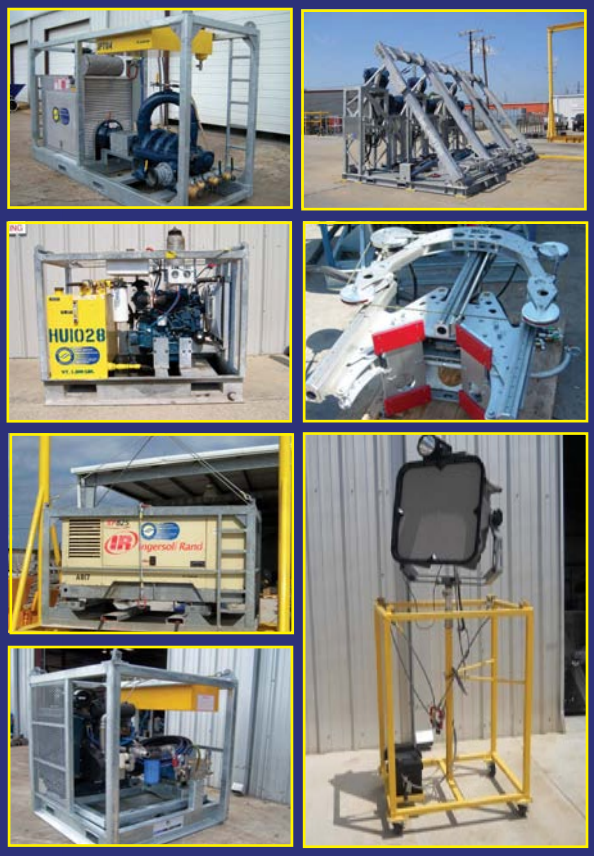

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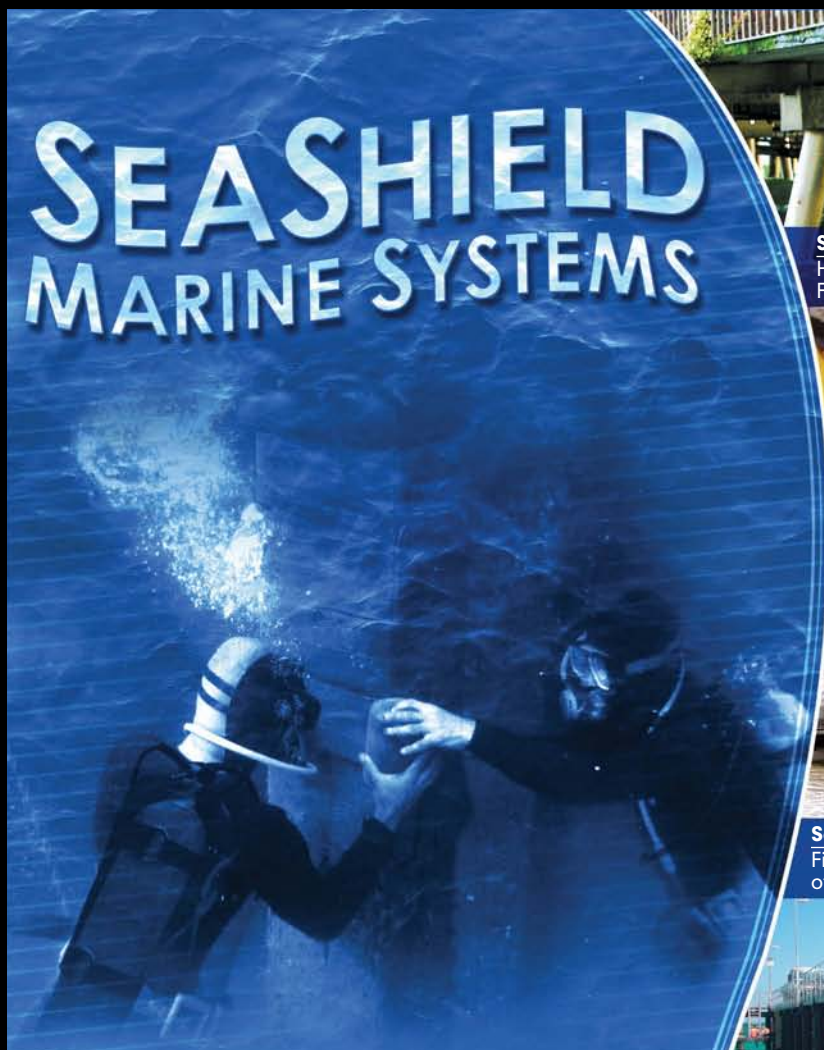

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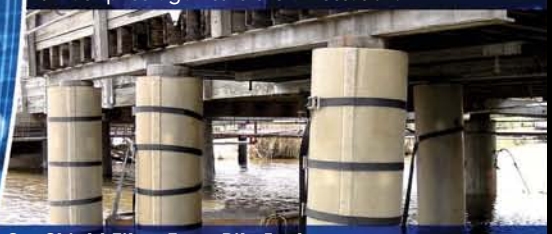

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INSIDE

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I'M NOT SURE WHERE THE time has gone. Here we are almost halfway through 2012 and it seems like just a few weeks ago many of us gathered in New Orleans at UI 2012.

Activity for most of the underwater contractors worldwide is increasing dramatically, particularly in the Gulf of Mexico and North Sea as the weather patterns have moderated considerably. Unfortunately with summer's mild weather cycles in North America comes Tropical Storm and Hurricane season. That being said, I encourage those of you who have the possibility of Tropical Storm exposure, as a homeowner, Contractor or both, to be well prepared with emergency supplies, evacuation plans, emergency contact information, etc. As one who has experienced very personally dozens of Hurricanes over the decades first hand, I am witness to the chaos and confusion that always ensues when the wind stops blowing and the sun comes back out. Be prepared.

In late April I participated as one of the vice-chairs in OGP's Inland Diving Workshop held in Houston, Texas. There were approximately 80 folks in attendance, including the US Coast Guard and US Navy, many operators and contractors and other interested, concerned and passionate professionals. It was a long day of educating, sharing and networking around the inland and ships husbandry sector of the commercial diving industry. Unfortunately, the same week the workshop was held, our Industry experienced two diving fatalities; one while a Diver was inspecting a vessel thruster and the other a lone SCUBA diver taking samples for a municipality. Ships Husbandry and Inland Diving. We still have a long way to go to educate all the stakeholders, to include clients, divers, and regulatory entities.

Until next time, Plan for Safety,

Mike Brown

A MESSAGE FROM THE EXECUTIVE DIRECTOR ■ PHIL NEWSUM

IT HAS BEEN A VERY interesting period for the commercial diving industry. Several different initiatives have evolved that I personally feel are truly in the best interest of the worldwide industry. I want to begin by discussing the newly formed U.S. / Gulf of Mexico Diving Work Group, which truly is a landmark achievement in terms of a collaborative relationship between the money paying for the work and the parties performing the services (operators and contractors). So where does the ADCI and IMCA fall into place with this work group? Well, the ADCI and IMCA are on the outside looking in. And as for this Executive Director, I'm perfectly comfortable with this unfamiliar position. In fact, I think that this alliance between operators and contractors is so healthy for the industry that I willingly offered our Association's by-laws and membership applications to serve as a model for theirs.

Both the ADCI and IMCA will be major factors in the mission of this group, but in a different role than in the past. It is the mission of this group to offer recommendations to regulatory authorities and trade associations that provide guidelines for the commercial diving industry. In fact, this group will also provide recommendations to the International Association of Oil and Gas producers (OGP), who's relatively new *RP 411*, requires review every three years. The ADCI holds reviews of their *Consensus Standards for Commercial Diving and Underwater Operations* annually, allowing all industry stakeholders an opportunity to submit recommendations on existing guidelines or feedback on newly proposed guidelines. With no intention of establishing new guidelines, the new U.S. / GOM Diving Safety Workgroup will solely focus on making recommendations on challenges that face the offshore industry, specifically in the Gulf of Mexico. Whether the geographical focus for this new workgroup evolves to areas outside of the Gulf of Mexico remains to be seen.

So, what motivated a group of oil and gas operators and diving contractors to strike out and establish a workgroup that represents interests in the Gulf of Mexico? It's my feeling this was done in response to other parts of the world that wanted to tell the Gulf of Mexico (which represents the greatest volume of offshore production and commercial diving in the WORLD) how best to conduct operations safely. I have to chuckle every time someone from outside of the Gulf of Mexico wants to tell contractors "how to" in our fields. I would bet a month's pay on a Gulf of Mexico contractor's ability to work a job more safely and efficiently than anyone from outside of the Gulf. I have always felt that this was nothing more than an end run by outside parties to gain entry into our waters. Let the Gulf operators and contractors work the Gulf and let other regions' operators and contractors work their Fields. Sounds fair enough to me!!

I look forward to reviewing the recommendations from the U.S. / GOM Diving Safety Work Group. They have assembled a diverse base of major and mid-major operators and diving contractors. I think some very worthwhile input will come from this group that will lead to the betterment of U.S., as well as worldwide offshore diving.

Another initiative that has cropped up is the OGP's Inshore Diving Safety Workshop, which took place on 25 April, in Houston. I was very curious about the OGP's agenda of this workshop in the U.S., as the majority of our inland diving doesn't involve support of the oil and gas industry. After much discussion at both the Executive and Board level, the ADCI agreed to support the OGP's Inshore Diving Safety Workshop. The Association helped coordinate and actively participated in the workshop, which I personally think gave regulators, operators and contractors much to contemplate when looking at how we can address the issue of inshore diving and the high loss–time-incidents which occur in this sector worldwide.

I don't know what follow-up initiative, if any, the OGP has planned, but the ADCI will look to seize the momentum from the workshop to propose a smaller scale conference / seminar for the inland diving sector in the U.S., which will tie-in with other sector conferences (bridge inspection and hydroelectric power). The one thing that is absolutely clear is how critical the need is for greater client awareness when looking at diving contractor selection. For me, this was the greatest "take away" from the inshore workshop.

In closing, these are just two developments that have occurred over the course of the first half of 2012. All of the above mentioned items have me that much more excited about the first annual review of the Consensus Standards for Commercial Diving and Underwater Operations (6th ed.), upcoming this July.

Be Safe.

Lessons Learned By an Underwater Bridge Inspector

That Which Doesn't Kill You Makes You Stronger

BY DAVID R. RESER, PE
CEO, INFRASTRUCTURE ENGINEERS, INC.

I REMEMBER, AS IF IT were yesterday, the first time somebody told me, "That which doesn't kill you makes you stronger." I was a young Army officer training for Ranger School at Ft. Belvoir, Virginia. I had voluntarily attached myself to a large tree trunk, upside-down, arms and legs wrapped around the trunk — a position that the Army Ranger instructor yelling at me called the "koala bear." As I struggled to keep from falling off the tree, I briefly reflected on the logic behind that phrase.

Before the wounds I received hanging upside down healed, my life changed forever; I was offered the opportunity to become an Army Diver. After 26 years as a military and civilian deep sea diver, I now know that the Army Ranger had it all wrong. He should have said, "That which doesn't kill you makes you SMARTER."

My diving career has been predominately in the field of underwater bridge inspection. I realize that this small market is often the subject of jokes by the real working divers, but I need to do my part in shedding some light on this industry, which can provide diving challenges to test the most experienced commercial diver. I'll share with you some of my lessons learned over the years, a few of them the result of a near-death experience (or two).

Lesson 1 – Timber Debris Can Move

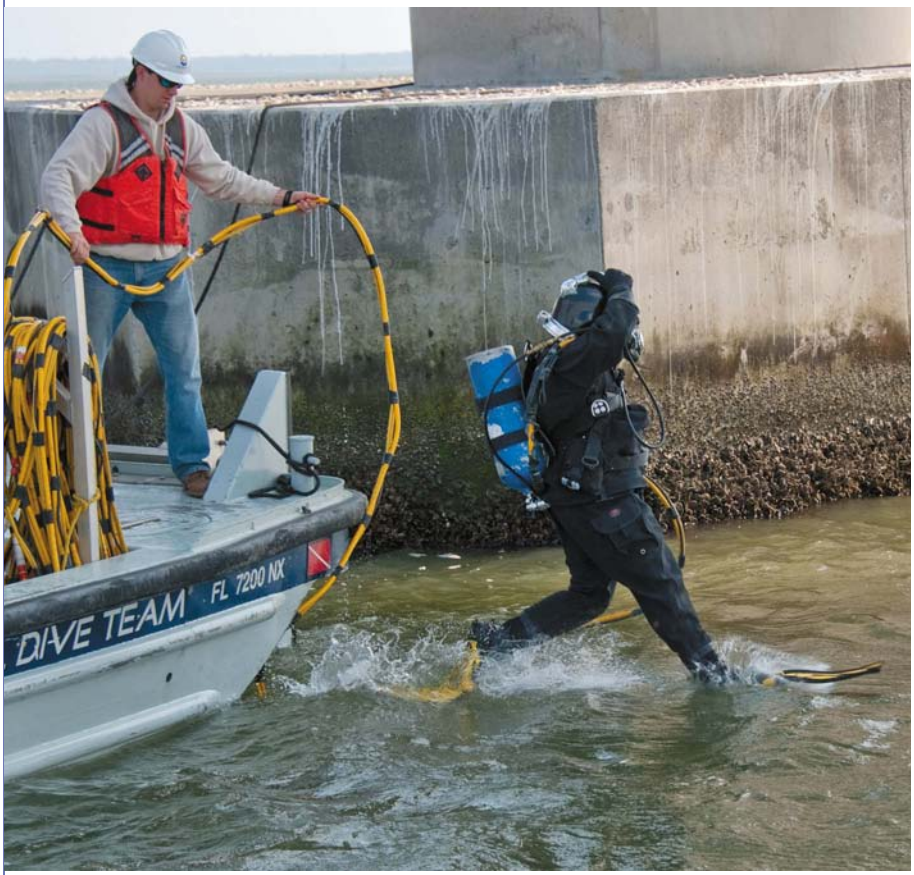
There is almost always timber debris stuck on bridge piers in inland rivers. Sometimes it is small stuff, like twigs, and sometimes it is the big stuff you can't wrap your arms around. I like timber debris because it gives you something to grab onto during your dive if flow is a problem. But timber debris is never permanent; it moves, shifts and can change significantly over time. Always assume timber is going to move when you get on it. That way when it does, you won't be in the wrong place, as I have been on several occasions.

Lesson 2 – Submerged Timber Doesn't Always Cause Turbulence on the Surface

There have been many times in my career when I was diving a bridge pier and the water surface gave no indication that there was timber debris below. I like to enter the water at the upstream nose of a substructure, which coincidentally is a favorite hang-out of timber debris. Always assume there is timber debris just under the water surface when you jump in. This is a hard lesson to learn. I am still trying to learn it — last year, I jumped in on a White River bridge only to land on a log two feet below the water. At least my feet were together!

Lesson 3 – The River Will Almost Always Win a "Street Fight"

This is a tough lesson for young divers to learn. I call it a "street fight," when you have extremely difficult diving conditions and you try to take a shortcut. Young divers like shortcuts — things like not using the extra rigging to help move around a pier, refusing to reposition the boat multiple times to avoid spending the time, etc. My team was diving a bridge with relatively fast flow and had just finished inspecting one side of the pier. The diver said he could go around the upstream nose with some slack and inspect the other side without repositioning the boat. I agreed to give it a try. He did inspect the other side, but flow was stronger than we thought and he could not



pull himself back up against the current using his umbilical. I had to perform a risky maneuver with the boat to provide the diver more slack, enabling him to surface on the downstream nose. If you take shortcuts during a dive, you are asking for a street fight. The problem with these shortcuts is that you get lucky and win one occasionally; when that happens, you forget about the other 20 times that the river won.

Lesson 4 – Never Beat Too Hard on a Bridge Foundation That Is Settling

I didn't learn this lesson directly, but another former Army Diver did, whom I'll leave unnamed because I don't want to embarrass him. I was diving with the unnamed diver to perform an emergency inspection to determine why a pier settled overnight under its own weight. We were in 40 feet of black water when the other diver decided to crawl into an 18-inch gap of undermined footing to inspect the condition of the timber piles while I tended him from the opening. After a few minutes, I heard – and felt – him beating on the piles with a hammer. Fortunately we were using four-wire communication and I reminded him that the bridge pier above him had settled nine inches just a few hours earlier without him beating on the foundation piles. After reflecting on his situation, he crawled out.

Lesson 5 – Look Around the Entire Bridge for Possible Diving Hazards

I learned this lesson the hard way. We were doing deep dives to 130 feet on several piers in a lake and had set up our recompression chamber at a boat ramp near the bridge. We immediately went to the middle of the lake to begin diving the deepest pier first. During the dive, the diver became fouled on ascent on what we later realized was an underwater cable, and it took us roughly 30 minutes to get the diver free. As it turned out, it was a telephone cable, originally attached to the side of the bridge, which had loosened and was now sagging about 60 feet below water. Had I looked around the entire bridge prior to heading out, I would have noticed the cable and been able to incorporate that possible hazard into the pre-dive brief.

Lesson 6 – Gill Nets Work on Divers Too

I was supervising a dive on the Columbia River, where a local Indian tribe had special permission to fish using gill nets. The tribe found the local bridge an ideal location to attach the nets, a practice the Department of Transportation had grown to accept. As we worked the bridge piers to perform the inspection, the diver would get fouled on the nets when he was within five feet of them and had to cut himself free on a few occasions. As a result, I moved the standoff distance to 10 feet to reduce the entanglement problem.

Lesson 7 – Let the River Do the Work

The thing I like about this lesson is that once you learn it, you have loads of fun watching other divers learn it. If you're a betting person, you can even make some money. I was diving with a new, young diver a few years back; I was in my mid 30's and he was 21 and a body builder. We were diving a group of short-span pile bents using surface-supplied air in fast tidal flow. The young guy was looking forward to making me look bad, so I challenged him to see who could do the most bents in one hose stretch. I used the techniques that I had learned over the years: working downstream when moving bents and moving upstream on the bottom when inspecting the bents. I inspected five bents on my hose stretch, while the younger diver inspected two, all the while getting fouled. I have repeated this training session many times over the years in various forms.

Lesson 8 – Always Double Line When You Tie Up to a Bridge in Flow

The same former Army Master Diver from Lesson 4 taught me this lesson. When a boat is tied to a bridge pier in flow, the rope can fray and break due to abrasion on the concrete or marine growth. If your tie-up rope breaks with the diver in the water, you are in trouble — unless you expect your diver to become the anchor (some divers are best suited for this type of job). Always use two ropes, one several feet longer than the other to provide slack. If the first rope breaks, the second one will take over, allowing time to abort the dive.

Lesson 9 – Live to Dive Another Day

Two-part lesson: First, there are some bridges that you just can't dive safely and perform a good inspection at the same time. Sometimes you have to yield to your instincts. These bridges are best inspected with advanced techniques, like acoustic imaging systems, and FHWA will allow these systems if you can justify your reasons. Second, work for a company that knows and understands commercial diving. There are many companies that say they do, but you will generally figure out their knowledge in the first month of employment. There are always good jobs for smart divers that know when to walk away from dangerous ones.

Snoqualmie Falls Hydroelectric Plant

BY AARON M. LAY

Rehabilitation

FOR FANS OF THE EARLY '90s serial television drama, "Twin Peaks," Snoqualmie Falls is instantly recognizable from the show's iconic opening sequences. But for the nearly two million visitors the falls receives every year, it is so much more. Located about 30 miles east of Seattle, Snoqualmie Falls is one of the most popular scenic attractions in the Northwest U.S., and for good reason, too. The 270' falls and the surrounding 10-acre recreation area, wildlife habitat, kayaking areas, hiking trails and observation platform offer visitors a truly remarkable experience.

However, like "Twin Peaks," there's *a lot* more going on beneath the surface than meets the eye.

Entombed in a bedrock cavity 260' below ground, Snoqualmie Falls' hydroelectric powerhouses 1 and 2, built in 1898 and 1910 respectively, make up the world's first completely underground power plant. This plant has been producing clean power for Puget Sound Energy and its customers for over a century and helped facilitate the early industrialization of the Seattle area at the turn of the century.

But it's high time for an overhaul.

The impetus behind the plant's restoration comes down to efficiency. The aging infrastructure of the plant can currently meet the needs of 33,000 households, but subsequent to the rehab, Snoqualmie Falls will add an additional 7,000 homes to that number. And it's been no small, swift task.

Together with Barnard Construction of Bozeman, Montana, Associated Underwater Services, Inc. (AUS) has been assisting in the rehabilitation of this historic plant since 2010. Dave Cleary, area manager for AUS in the western Washington state region, has been on the job for much of the time – that is, when the river allows him to be. "The Snoqualmie River is one of the major drainage rivers for the Cascade Mountains, and in the wintertime when these big fronts hit Seattle, the river moves *way* too fast for anybody to work in. So, we wait until summer when it's far more workable," he said.

Like most jobs in the inland sector, river current isn't the only obstacle to overcome. Access to the plant's intake water tunnels is "very poor," according to Cleary. In order to allow Barnard's crews to gain access to the two intake tunnels on each side of the river, temporary cofferdams (made of one-yard capacity Super Sack bags

filled with smaller sandbags) must be installed and then removed each season. "Basically, we just built a pyramid. We went six wide and then row by row until we had a large dam made out of one yard bags, then we put a liner on the upstream side of it. Water pressure pushed the liner against the cavities of the bags that existed between the spaces. That sealed all the water off, and it was very dry. Once they put the pumps in and pump the water out, the area dried out really nicely," Cleary said.

Cleary acknowledges that timing has been an ever-present factor with the project. "All this work has to be done in the summer, and these Super Sack dams are temporary because we have to have every bag out of the water by October 31st because of the fisheries' laws in this area. So these have to be installed and ripped out every season. Plus, like I said, the river's currents in the winter are so extreme that they could easily destroy these dams we install. This river fluctuates horrendously."

The usual array of unique circumstances a crew faces when working an inland sector job can certainly keep things interesting for divers, to say the least. But unlike some inland gigs, depth is not issue at Snoqualmie – it's all about the current. "We're only in about ten feet of water, but there's raging current depending on the time of year – up to 3,000 cubic feet per second – which is not the fastest we've worked in, but it's certainly a safety issue" Cleary admitted. He added, "It's a real work out just spending three or four hours being in that river setting bags. But obviously, the biggest hazard is our proximity to the falls themselves because you're only 200 to 100 feet away from the drop off, and if you were to go over it, it would be fatal. So, you're having to be very careful about where you step, but the divers are always tended 100% of the time, no question."

AUS' crew implements a few extra safety provisions to ensure there's no chance whatsoever of anything going wrong while working in such precarious conditions. "There are a couple of extra safety precautions to make sure the diver stays on the hose no matter what. First, more hose than he needs *never* gets into the water. And in addition to the tender holding onto the hose and pulling up or letting out slack as necessary, there's a large man-rated carabineer (from umbilical to harness), and the diver's hose is usually tied on to a secure point from there. So, even if the tender were to drop his hose or make a mistake, the diver wouldn't be able to get very far away before being pulled back," Cleary said.

The crew also employs the Super Sacks themselves as an added and fairly convenient safety measure. Cleary states, "Once a number of bags are in the water and blocking the current enough, we try to work behind them as much as possible. See, these bags have handles on them, and we use carabineers to tie off to the bags as well. Once we get the bags in the river, our operation is pretty efficient."

Safety doesn't stop with the divers in the water. Each and every member of AUS' team is secured in some way – even the diving supervisor inside the diver control station wears a secured safety harness. Cleary explains the rig used by the guys working topside on the Super Sack dam, "The tenders wear full harnesses on self retracting lines called 'yo-yos.'" These ensure that even if a man goes in the river, he's not going over the falls.

These measures put into place to keep divers and crewmembers safe on the job would not be as ubiquitous in *either* sector as they

are today without ADCI's Consensus Standards. Cleary expressed his profound approval of the Standards in today's commercial diving industry, "Well, AUS has been a member of ADCI since at least 2000, and I think (the Consensus Standards) have been a great benefit to the inland diving sector because they have educated both clients *and* contractors about really important job details like manning levels, the necessary equipment required for each job, and the precautions that need to be taken – especially when working around these dams and hydroelectric plants."

When asked whether or not the Standards are now relatively well known in most facets of the industry, Cleary replied, "These days, people that hire us expect us to be ADCI members, and oftentimes, it is getting written into job specifications that people must comply with the Standards."

AUS is about 70% complete with their part in the Snoqualmie Falls project. However, additional construction on the hydroelectric powerhouses as well as major renovation and general improvements to visitor facilities will continue until early 2013.

Puget Sound Energy spokesperson, Roger Thompson, spoke of the unique sense of pride that accompanies such a project, "Snoqualmie Falls is an important part of our legacy as a company. The fact that it's still operating to this day is kind of a testament to the engineering acumen of those who built (the hydroelectric plant) well over a century ago, so for us to be renovating and upgrading that facility, it's not *only* a tremendous honor, it's allowing us to *renew* a *renewable* resource, which will allow us to continue to use this facility to serve our customers for decades to come."

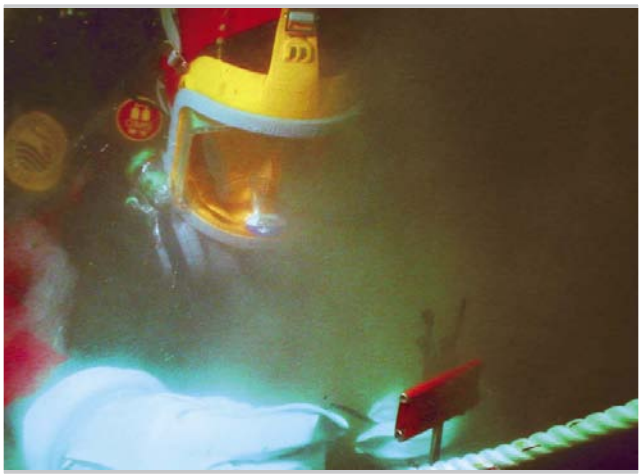
EPA's Use of Online CONTAMINATED WATER DIVE Planning Tools

BY SEAN SHELDRAKE, ALAN HUMPHREY, AND ROB PEDERSEN, USEPA

POLLUTED WATERS ARE A CONCERN for all types of professional divers including those in the commercial sector. With the 6th edition of ADCI consensus standards now out, standard procedures are available for contaminated water dives. But how do you find out about pollution at a dive site? Though not explicitly listed in the 6th edition, there are online resources available to help determine if your next dive is in contaminated water.

Potential pollution exposure led the U.S. Environmental Protection Agency (EPA) to upgrade protective measures for its dive teams conducting work in harbors and other areas, such as keeping the diver completely dry, e.g. drygloves, drysuit, dry-hood, full facemask or helmet,—and other upgrades to personal protective equipment (PPE), e.g. hazmat valves, requiring 40 hour HAZWOPER initial training and annual refreshers, decontamination, medical monitoring, and immunizations. Unlike some EPA divers conducting sampling, most divers do not seek out contaminated water dive sites. However, as pollution becomes an ever-increasing problem, commercial divers should also know how to identify and assess polluted waters that are either part and parcel to the dive project, or simply exist nearby, totally unrelated to the diving objective. There are several online tools available for planning a polluted water dive or ensuring the dive you are planning is not a likely polluted water dive.

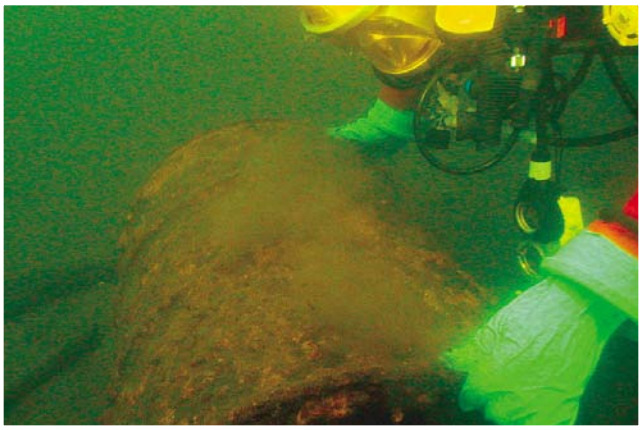
In waters near metropolitan areas, bacteria in the water column can be a problem from a variety of sources, including pet waste and sewage overflows. EPA's Beach Environmental Assessment and Coastal Health Program (BEACH) (1) provides regular bacterial counts at popular marine and Great Lakes recreational sites. Information on sewer discharge location, overflow frequency and publicly available bacteria count information can be a valuable



EPA diver Brent Richmond installs solid phase microextraction devices (SPMD) at the Wyckoff Superfund Site to determine if the cap is still effective in containing creosote contamination. Due to the potential for creosote contact, divers are fully isolated and undergo decon. after each dive. Photo by Sean Sheldrake, EPA.

Diver Sean Sheldrake inserts a piezometer designed to measure shallow groundwater contaminant concentrations. Surface supplied diving equipment is ideal for contaminated water diving operations, such as those undertaken by EPA Region 10 and the Environmental Response Team due to the virtually unlimited air supply. The air supply is helpful in low visibility environments, as well as environments requiring extensive decontamination. Photo by Chad Schulze, EPA.

As pollution becomes an ever-increasing problem, commercial divers should know how to identify and assess polluted waters that are either part and parcel to the dive project, or simply exist nearby.



EPA Region 10 diver discovers a drum on the bottom of Lake Union in Seattle, WA during a dive survey. Photo of EPA diver Rob Rau was shot by Sean Sheldrake, EPA.

dive planning tool on whether to dive, or when to upgrade PPE and other measures.

In addition, chemical and biological contaminant trends in the water column are available through NOAA's Mussel Watch Program (2) in many harbor areas. Mussels accumulate contaminants from the water column that can be at concentrations too low to see at one particular point and time, or spike to high concentrations on such an irregular basis that they are hard to sample, but nevertheless become part of diver exposure at a site. Outfalls, which are places where drains or sewers empty into a body of water, can also discharge a variety of harmful chemicals to the dive site. EPA's Envirofacts (3) database presents outfall location and data that can be of use in planning for worst-case water quality at a particular dive site. You can also obtain a list of chemically impaired water bodies from EPA's 303d list (4). This list very likely includes a river or lake in your diving area that is known to have chronically elevated levels of contaminants in the water column. Even use of up-to-date navigation charts can provide some level of outfall information. Internet searches on fish (5) and shellfish (6) advisories may also help identify polluted waters. While fish advisories can apprise a dive team of a variety of contaminants in the water column and sediment, shellfish closures can do the same—but also typically provide pinpointed information about repeated high coliform bacteria counts in a particular area.

It is important to note many Superfund Sites (7) in various stages of cleanup are near or include bodies of water, which typically must be treated as polluted water dives by EPA divers. Most Superfund sites have some online chemical data available for the water column and/or sediment. Sites undergoing other types of cleanup, such as RCRA corrective action (8) may also be nearby, which can present exposure issues for divers as well. In addition, recent chemical spills or releases can be queried via the National Response Center (9) and NOAA's Office of Response and Restoration Incident News (10) website. Overall releases into the environment can be found on Toxics Release Inventory (11) website.

If specific chemical contaminants are known or suspected on a site, a hazard analysis should be included in the dive plan to address potential exposure pathways and identify specific equipment or procedures necessary to minimize risk factors. Several online chemical data bases, such as EPA Integrated Risk Information System (IRIS) (12), NOAA CAMEO Chemicals Database of Hazardous Materials (13), Center for Disease Control (CDC) NIOSH Pocket Guide to Chemical Hazards (14) or CDC Agency for Toxic Substance and Disease Registry (15), contain useful information on chemical properties and chemical hazards to human health.

EPA Divemaster Chad Schulze preparing an EPA diver in a superlite 37 mated to a Viking drysuit. Photo by Sean Sheldrake, USEPA..

EPA often uses protective gear and protocols when diving known or suspected contaminated areas (e.g., hazardous waste sites, urban areas, ports/harbors, sites with fish or shellfish consumption advisories, or sites with a high number or close proximity of outfalls) rather than relying on real-time water analyses as levels can change with the turn of a valve or after a heavy rain event. To safely dive in chemically or biologically polluted water, divers must receive proper training to recognize and mitigate hazards. Online tools will help divers assess what contaminants may be present at the dive site, what effect these contaminants may have on the diver or the diver's equipment, and what equipment and decontamination procedures may be necessary to protect the diver. Many persistent chemicals present in sediments (PCBs, metals, and heavy oils), which pose potential hazards to divers, cannot be analyzed on a real-time basis.

In the next issue, look for more information personal protective equipment (PPE), training, decontamination, medical monitoring, and immunizations used by EPA dive units.

Photo of EPA diver Bruce Duncan measuring the Wyckoff Superfund Site groundwater treatment plant outfall diameter to report back to the project manager. EPA divers also conducted sampling of sediment near the outfall to determine if low level contaminants would pose a hazard to humans or aquatic life. Photo by Sean Sheldrake, EPA.

Notes:

(1) See http://water.epa.gov/type/oceb/beaches/beaches_index.cfm
(2) See http://ccma.nos.noaa.gov/about/coast/nsandt/musselwatch.aspx
(3) See http://www.epa.gov/enviro/
(4) See http://yosemite.epa.gov/R10/WATER.NSF/TMDLs/CWA+303d+List/
(5) See http://www.doh.wa.gov/ehp/oehas/fish/ps10duwamish.htm
(6) See http://wdfw.wa.gov/fishing/shellfish/beaches/
(7) See http://www.epa.gov/superfund/sites/npl/where.htm
(8) See http://www.epa.gov/osw/hazard/correctiveaction/facility/index.htm
(9) See http://www.nrc.uscg.mil/nrchp.html
(10) See http://incidentnews.gov/
(11) See http://www.epa.gov/tri/index.htm
(12) See http://www.epa.gov/iris/
(13) See http://www.cameochemicals.noaa.gov/
(14) See http://www.cdc.gov/niosh/npg/
(15) See http://www.atsdr.cdc.gov/

For more information on polluted water diving available from EPA:

- EPA scientific diving publications: http://yosemite.epa.gov/r10/OEA.NSF/investigations/divepubs
- EPA safety and standard operating procedures for polluted water diving: http://yosemite.epa.gov/r10/oea.nsf/Investigations/Dive+Team+Safety
- Online planning resources: http://yosemite.epa.gov/R10/OEA.NSF/Investigations/Dive+Team+Links

Disclaimer: This paper is an illustration of steps that dive units can take to avoid or minimize polluted water exposure and is not the official view of the USEPA. Mention of any specific brand or model instrument or material, or protocol does not constitute endorsement by the zUSEPA.

At Work in the Inland Sector

ABOVE & BELOW THE H_2O

Santa making deliveries at Sub-Surface Progressions (dive store), Fort Bragg, CA.

Above & Below the H20 Diver Jordan Stovall & Tender Ryan Raposa suiting up for sediment removal from a reclaim basin Azusa, CA.

AMERICAN INSHORE DIVERS CORP

Out of the Mire – An emergency dive to retrieve a 72" drill bit stuck in a 90' deep Caisson filled with drilling mud. Photo taken by Mike Aiken, Owner – American Inshore Divers Corp.

ATLANTIS DIVING CONTRACTORS INC.

Diver Juan Colon preparing to enter a Potable water reservoir.

Water Authority Project PR.

Diver Christian Carreras getting ready for a sediment removal job.

Divers Luis Colon and Strelnikov Cram after a sewage diving.

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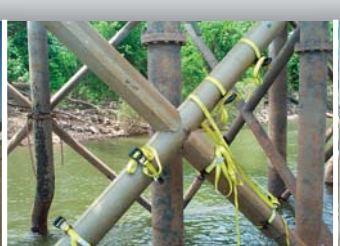
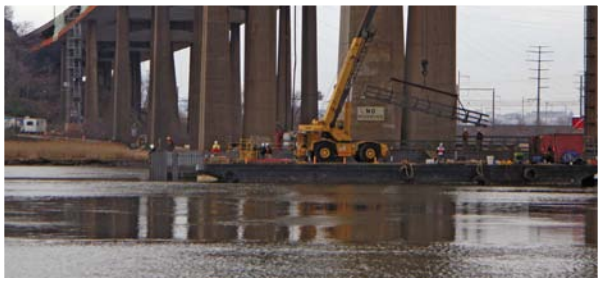



THE CASTLE GROUP.....

Installation of pile dolphins.



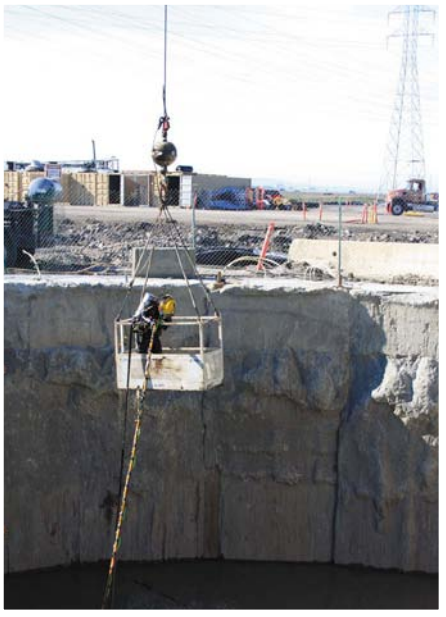
Installation of catwalk.

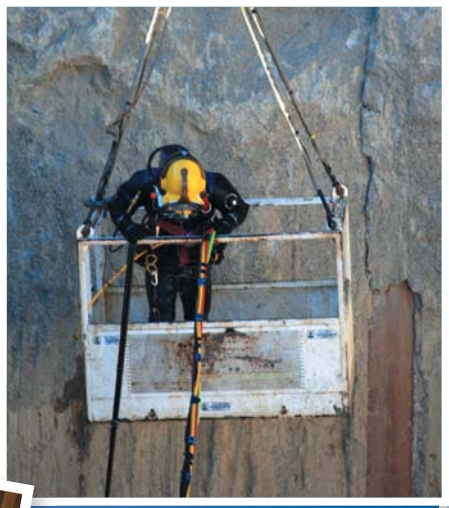
Hydro-Marine workers removing the existing timber fender.

Diver performing underwater work utilizing a man lift.

GLOBAL DIVING AND SALVAGE

Diver and outside tender being lowered into West Point sewage treatment facility tank, Seattle, WA.





Diver entering vertical shaft.

Divers working in heart of San Francisco to repair connection of drill casing.

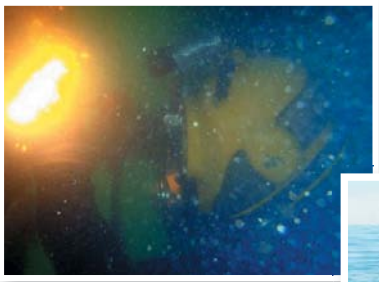
No road into reservoir. All barges and equipment had to be flown in with heavy lift helicopter, CA.

Diver on stage being lowered into river.

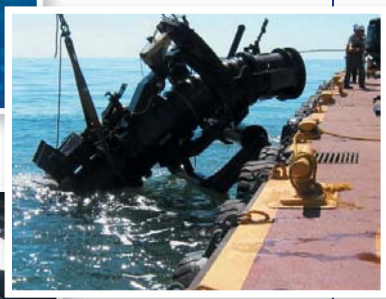
Mercer Island Lakeline, Washington.

KCI TECHNOLOGIES, INC.

Endless Pier Inspection, KCI Technologies, Inc. Photo by Ikaika Kincaid.



Logan Diving & Salvage – Jacket Leg Removal, Puerto Rico.

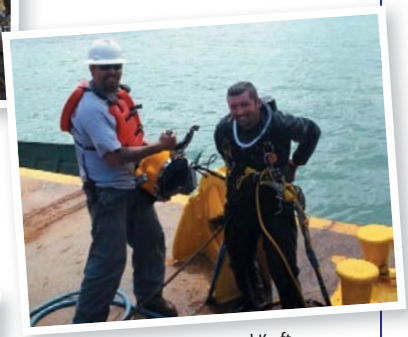


Logan Diving & Salvage Dredge Drag Arm Salvage, Offshore Florida.

Logan Diver Art Tiedeman – Jacket Leg Repair, Puerto Rico.

Logan Diving & Salvage Diver A. Moss – Bridge Repair.

Logan Diving & Salvage – Jacket Leg Removal, Puerto Rico.



Logan Divers McMillian and Kraft – Puerto Rico.

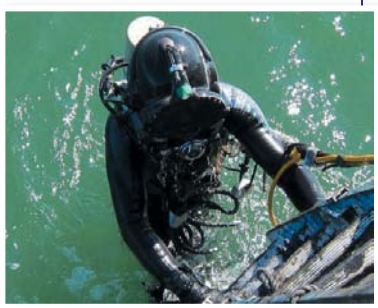
LOGAN DIVING & SALVAGE

Logan Diving & Salvage Divers Hernandez, Anderson, Martinez, Dibble, Tiedeman and Davis – Puerto Rico.

Logan Diving & Salvage Diver Troy Dibble – Jacket Leg Repair Clamp, Puerto Rico.

Logan Divers J. Christensen and J. Ennenking – Right Whale Data Buoy Support.

Underwater Jacket Leg Welding Honduras.



Diver Joe Enneking – Dredge Drag Arm Salvage.

MAINSTREAM COMMERCIAL DIVERS, INC.

Drill stem pulled to surface from 110 ft of water one half mile offshore, preparing to install back reamer.

Drill site.

Moving equipment into a contaminated lagoon.

Setting stop logs at a power plant, decompression chamber in conex shown.

Winter dive spread.

Diving through the ice, heated decompression chamber conexes and dive station.

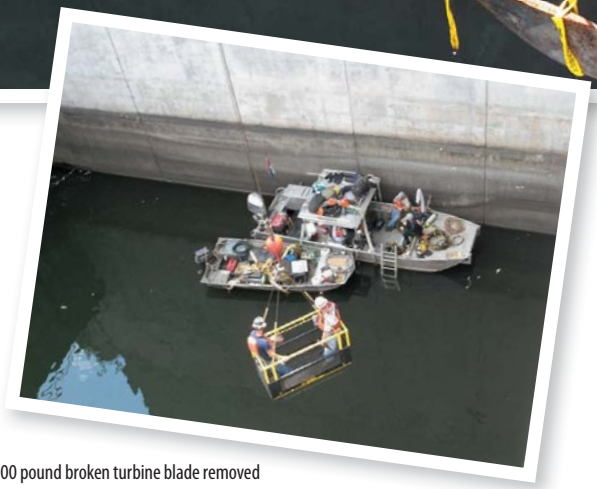
SURDO2 operations on construction project at a dam.JPG.

Wintertime fun, barge sections and equipment covered in ice.

Moving equipment to a job site during 2011 flood event, when dry this is a highway.

Inland Contaminated Diving Operations.

Repairs to intake structure at industrial site.



14,000 pound broken turbine blade removed from draft tube at hydroelectric dam.

Confined space entry.

Inland work at an industrial site.

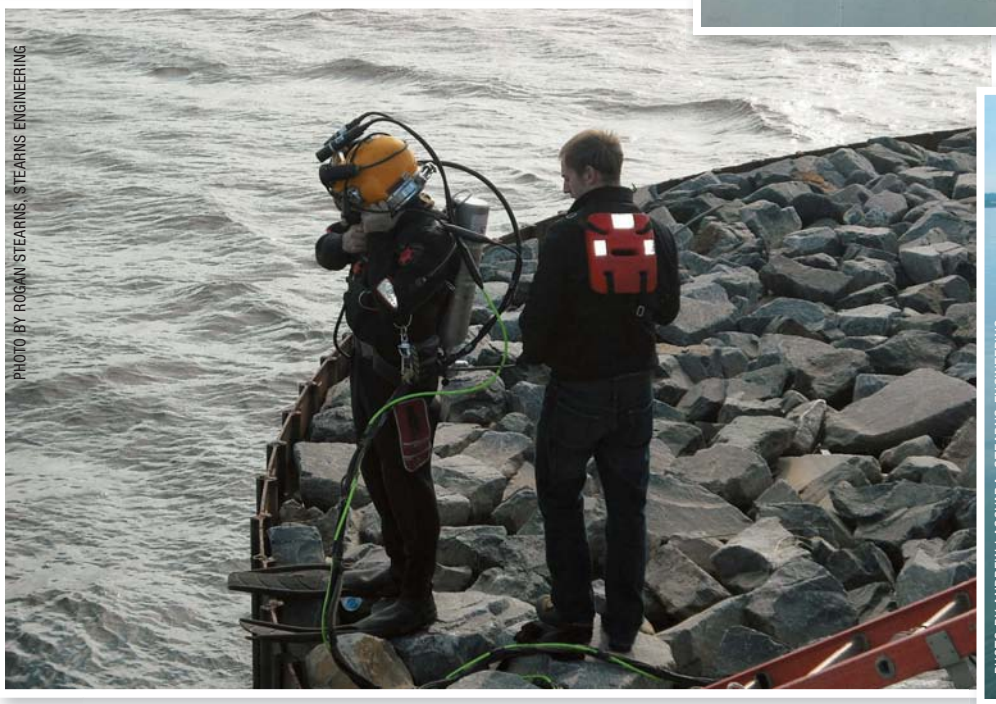
STEARNS ENGINEERING

In the distance, an engineer-diver enters for routine inspection.

Engineer-diver completes impact inspection.

Engineer-diver after quality control inspection of pile repairs.

Job site hazards.



Preparing for inspection of cathodic protection recently constructed cellular cofferdams.

Entry on a dead calm day.

MATE ROV Competition
Exposes Students to Marine Technology Skills and Careers

STUDENTS PARTICIPATING IN THE MARINE

Advanced Technology Education (MATE) Center's International Student ROV Competition learn how to design, build, and pilot ROVs and are exposed to marine technology careers, professionals and organizations.

MATE coordinates the annual competition and a network of 21 regional ROV contests that take place across U.S. and in Canada, Hong Kong, Scotland, and Japan. Student teams from upper elementary, middle schools, high schools, home schools, community colleges, universities, and community organizations such as the Boys and Girls Club and 4-H participate in the competitions, which consist of three different "classes" that vary depending on the sophistication of the ROVs and the mission requirements.

The 2012 ROV competition will be held June 21-23 in Orlando at the YMCA Aquatic and Family Center.

Students Experience Real-World Technical Challenges

The MATE ROV competition is designed to present students with the same types of challenges that scientists and engineers face when working underwater. It uses ROVs to teach the technical, engineering, scientific, and math skills needed to complete tasks that simulate real-world problems from the ocean workplace. In addition, students develop the ability to problem-solve, think critically, and work as part of a team. By connecting students with employers and professionals from the workplace, ROV competitions expose students to ocean-related career opportunities and help them to see the pathways to those careers.

The contest encourages students to think like entrepreneurs while creating and testing their ROV. To develop the teamwork, creative thinking, and problem solving skills that make them competitive in today's global workplace, students form "companies" tasked with designing specialized tools to help shipwreck assessment and remediation.

Each year, the competition has a different theme. The 2012 contest focuses on the role that ROVs play in assessing World War II shipwrecks and the potentially hazardous fuel oil that they may still contain. Teams participate in mission tasks, piloting their ROVs to assess the condition of a simulated shipwreck and determine a course of action if oil is still on board. In addition, they must prepare an engineering report, make a presentation to a panel of judges who represent various aspects of the marine industry, and create a poster display. Each team is evaluated on the design, construction, and performance of its ROV; its members' ability to communicate what they learned; and how they put their knowledge to use in designing and building their ROV.

MATE has been conducting its competition, the first student robotics contest to focus exclusively on ROVs, since 2002. Before the June event, teams from across the world participated in MATE's network of regional contests that feed into the international event. Currently, 21 regional competitions are part of the MATE Center's network:

- Big Island (Hilo, Hawai'i)
- Carolinas (Myrtle Beach, South Carolina)
- Egypt (Alexandria, Egypt)
- Florida (Cocoa, Florida)
- Great Lakes (Alpena, Michigan)
- Hawaii (Oahu, Hawai'i)
- Hong Kong (Hong Kong)
- Japan (Tokyo, Japan)
- Mid-Atlantic (Norfolk, Virginia)
- Monterey Bay (Monterey, California)
- New England (Buzzards Bay, Massachusetts)
- Newfoundland & Labrador (St. John's, Newfoundland and Labrador)
- Nova Scotia (Halifax, Nova Scotia)
- Pacific Northwest (Seattle, Washington)
- Pennsylvania (Villanova, Pennsylvania)
- Scotland (Aberdeen, Scotland)
- Midwest (Chicago, Illinois)
- Southern California Fly-Off (San Diego, California)
- Southeast (Savannah, Georgia)
- Texas (Houston, Texas)
- Wisconsin (Milwaukee, Wisconsin)

Organized by MATE and the Marine Technology Society's (MTS) ROV Committee, the ROV competition is supported by the MTS ROV Committee, the National Science Foundation (NSF), Oceaneering, Schilling Robotics, OceanWorks, and other ocean- and space-related organizations.

What is the MATE Center?

MATE has been funded as a National Science Foundation Advanced Technological Education Center of Excellence since 1997. Headquartered at Monterey Peninsula College in Monterey, California, MATE is a national partnership of organizations working to improve marine technical education and prepare America's future workforce for ocean-related occupations.

MATE works with community colleges, high schools, universities, research institutions, professional societies, working professionals, and employers to develop multi-disciplinary, technology-based courses and programs that prepare the future workforce for ocean-related occupations. With an emphasis on workforce assessment and development, MATE uses information from employers to improve and develop marine technology education programs that prepare students to participate in the science, technology, engineering, and mathematics workforce, producing future employees with the knowledge and skills needed by industry.

In this way, MATE helps create a flexible education system that meets the needs of students, working professionals, employers, and educators, and that promotes interactions among these groups. MATE also works to increase the awareness of ocean-related careers and provide students, educators, workers, and employers with up-to-date information to assist them in making informed choices concerning their education and future directions.

Join MATE in Orlando!

If you're in the Orlando area between June 21-23, be sure to come by and see MATE's students compete. For more information, or to view a live stream of the competition, visit www.materover.org.

MATE International Student ROV Competition

Who: Students from upper elementary, middle schools, high schools, home schools, community colleges, universities, and community organizations such as the Boys and Girls Club and 4-H.

What: Student teams compete with ROVs that they design, build, and pilot.

When: June 21-23, 2012

Where: YMCA Aquatic and Family Center, Orlando, Florida

Why: Students learn science, technical, engineering, math, critical thinking, and team-building skills and are exposed to marine technology careers, professionals, and organizations.

OGP Inland Diving Safety Workshop

An Overview

On April 25, 2012, diving contractors, operators, U.S. Navy and Coast Guard representatives and other industry stakeholders came together in Houston to attend the first Inland/Nearshore Diving Safety Workshop held by the International Association of Oil & Gas Producers (OGP). The purpose of the workshop was to raise client awareness of the best and safest inland commercial diving practices and of the repercussions of awarding work to contractors that compromise safety in order to provide an attractive bid.

The workshop had an expert panel leading the event with Nigel Lusby, Chair OGP-DOSC, acting as discussion leader and moderator, and was chaired by Mike Brown, Epic Divers, President ADCI, and Cato Hordnes, Statoil. The topics and presenters were diverse and covered disparate perspectives on diving safety, technical diving, class, regulations and management.

Commander Robert Smith, USCG and designated federal officer of the National Offshore Safety Advisory Committee (NOSAC), provided pertinent opening remarks that addressed the complexities of commercial diving activities and the need to disseminate the message of safety to clients throughout the inland sector. "The time to get on board with safe diving practice is now," noted Commander Smith. "[We need to] challenge ourselves to improve. The best way to achieve this is through transparency, and transparency breeds accountability." Commander Smith was an active participant throughout the Q & A sessions following presentations and a valuable resource during the breakout sessions where he provided a regulator's perspective on topics and relayed information that would not have been learned in his absence.

Commander Robert Smith, USCG

Nigel Lusby kicked off the educational presentations with a talk on diving safety – key risks and controls. Lusby reiterated the need for better client awareness in the inland sector and provided eye opening statistics of just how dangerous commercial diving can be when a contractor or operator compromises safety. As Lusby noted, commercial divers face a 2.5 greater risk than a frontline soldier in a warzone when unsafe company practices are in play. In many cases, clients do not know what is at stake in commercial diving operations. In differential pressure situations, for example, clients must be made aware of the dangers and it is the contractor's responsibility to provide this education. Lusby suggests installing a site-specific diving plan detailing the roles, responsibilities and equipment of all parties on site. "Diving must be controlled by uniform safety standards," Lusby said. "Practice should be based on these standards and not the minimum regulatory allowance."

Michael Dean of the U.S. Navy followed Lusby's presentation with a comprehensive overview of the Navy's approach to using commercial diving contractors and safety. Dean noted that the Navy's goal is to be proactive rather than reactive with regard to safe operations. "Accident investigation is reactive. Accident prevention is proactive." Dean walked the audience through the Navy's process. Prior to the contract award, the Navy reviews the diving contractor's management plan. Once the contractors are on site, job specific JSAs are reviewed and daily safety briefs are given as needed. Post operations, feedback mechanisms should be in place to communicate what went right, what went wrong and how to approach a similar operation in the future. As Dean notes, "Uninvestigated accidents will reoccur…Safety must be involved at every level."

The educational sessions continued with a diving technical block that included presentations on the history of underwater welding by Ken Elliot, Phoenix International; prop/thruster removal and installation by Rick Shilling, Subsea Solutions, and Shawn Henderson, Miami Diver, LLC; and quay side inspection and anode removal by Roddy James, Stork.

Elliot took the audience on a fascinating ride through the history of underwater welding, beginning in 1911 with the first electric arc

welding, through the 1930s, where Konstantin Khrenov made the first underwater weld, and culminating in the present where welding technology is still evolving. Elliot discussed some of the safety hazards associated with welding and the differences in the hazards between underwater welding and burning.

Rick Shilling's and Shawn Henderson's presentation on a 46-ton thruster installation project in Brazil worked well to inform the audience of the logistical complications of completing such a feat while simultaneously emphasizing the importance of safety. As Schilling noted, "Planning is the key to success…Clients can't afford delays, so planning facilitates speed while maintaining a safe operation." During operations, Shilling said "communication is the number one priority to mitigate hazards. Four-way comms and full video – helmet mounted and hand held – are ideal." Like the presenters before him, Shilling pressed the fact that everyone involved on the project, at every level, needs to know what he is accountable for. It is important to perform job hazard analyses to determine the risks, define the threat level and develop processes and implement guidelines to reduce or eliminate threats to safety.

To cap off the diving technical block, Roddy James provided an in-depth look at structure inspection and the effects of corrosion. James relayed the different types of corrosion and presented slides that showed its most aggressive forms.

Before the breakout sessions was the educational block dedicated to class, regulations and management. Robert Rostron, DNV, provided an overview of class/IMO requirements. Rostron discussed the different regulatory requirements for different flag states and what diving companies need to show for certification. Rostron noted that the onus is on the dive company to provide proof of safe practices and sound methodologies.

David Parkes, CEO Diver Certification Board of Canada, provided a regulator's perspective on diving safety. Parkes noted that "the people who hire diving contractors can have the biggest impact on safety for the inland sector." Parkes cited examples of clients outlining safety requirements during the bidding process, which placed all contractors on a level bidding field, as they were all aware of the requirements to dive and work for the companies. Ultimately, Parkes' message conveyed that safety depends on clear and enforced regulations, clear industry guidance, competent diving personnel and knowledgeable clients who insist that regulations are followed.

Michael James' presentation covering inshore terminals and refineries diving echoed what many of the other presenters emphasized; that is, client education is of vital importance in the inland sector. James, of Magellan Marine International, LLC, outlined all of the knowledge and responsibility necessary for a client to be aware of before hiring a diving contractor or opening up a project for bidding. He noted that only prequalified diving contractors should receive a bid package from a client. This vetting process will ultimately wean out unqualified contractors that cannot pass qualifiers.

After the presentation portion of the workshop concluded, the audience was invited to breakout and participate in five discussion topics: 1. International Gaps and Classification Societies, facilitated by Nigel Lusby; 2. Hazard Identification and Mitigation through Hierarchy of Control, facilitated by Billy Bratkowski, EPIC; 3. Communicating Lessons Learned, facilitated by Travis Detke, Aqueos; 4. Client Responsibility and Exposure, facilitated by Phil Newsum, ADCI; and, 5. Site Specific Emergency Planning, facilitated by Sue McDonald, Chevron.

The goals of the breakout session were to identify industry gaps and address them; identify systematic global solutions and to condense those solutions into priorities. Each group was successful in recommending solutions to the issues that the inland sector faces, and each facilitator summarized the findings and opened the topics up for discussion in a Q&A with the larger group. Hopefully in the coming months the industry will receive updates from OGP on safety committee formations and other take-away items from this meeting.

Indeed, the workshop was a success in opening up a dialogue between contractors, operators, regulators and other industry stakeholders. Thematic throughout the event was the overriding theme that client education is one of the most important factors in ensuring safe diving operations in the inland sector, which marries well with the ADCI's mantra of Safety, Education, Communication.

A Look
Into the Lion's Mouth

IT'S ABOUT MONEY, ABOUT FAME, adventure, the desire to escape the mundanity of the everyday. Whatever a prospect's reasons, there is something attractive about becoming an offshore commercial diver. Richard Walker and Skip Guiel were both drawn to the profession, and it gave them the money and adventure that so many seek. But, not long after arriving offshore, they were introduced to a world of unsafe practices that ultimately caused their demise.

In his book, *Into the Lion's Mouth*, Michael Smart presents Richard's and Skip's journey through the commercial diving industry in the 1970s and the years of torment their families suffered searching for justice and closure in the aftermath of tragedy. Though, Smart's book does more than tell Richard's and Skip's story. *Into the Lion's Mouth* was carefully researched and annotated with academic rigor, and can serve as an historical record of the state of offshore oil and gas operations in the 1970s.

Smart tells Richard's and Skip's story looking through a lens that provides a global picture of the environment that lead to their unnecessary deaths. Maritime legislation, unenforced and ineffective inspections and investigations by the Department of Energy, and a burgeoning offshore oil industry in the North Sea where diving was left largely unregulated, as Smart indicates, are just some of the factors that lent to an atmosphere that would allow relative newcomer, Brian Masterson, owner of Infabco Diving Services, Ltd. and Richard's and Skip's employer, to conduct large-scale offshore commercial diving operations with little or no oversight.

Into the Lion's Mouth is a wonderfully written account of how two professional divers who did everything right died because of an unorganized mess topside. Smart walks the reader through each painful phase of the incident aboard the *Wildrake*, the vessel on which the tragedy occurred. It is difficult not to become engrossed by Smart's prose. Though the reader knows of the ultimate outcome before the description of the rescue attempts, one cannot help but to hold out hope that Richard and Skip somehow make it through the tragedy. Throughout the text, Smart paints a picture of Richard and Skip not as two more names on the long list of diver fatalities in the North Sea, but as a loving brother, a loving husband, two creative and passionate human beings with full lives that were prematurely taken by negligence, lack of oversight and, in the case of Masterson, probable corruption.

Since the *Wildrake* event, steps have been taken to help guard against such avoidable tragedies. Indeed, offshore commercial diving today is much safer than it was in the 1970s. Today, there is much more industry regulation and a greater emphasis on safety. When asked how organizations like the Association of Diving Contractors International (ADCI) have helped change and shape the industry's attitude and approach toward safety, Phil Newsum, executive director ADCI, replied as follows:

"I think associations such as the ADCI have helped contractors, regulators and clients understand the importance of safe operations in the commercial diving industry. The ADCI's Mission statement reflects its unwavering commitment to safety.

- To promote the highest possible level of safety in the practice of commercial diving and underwater operations.
- To promote proper and adequate training and education for industry personnel.
- To foster open communication within the underwater industry.
- To hold all members accountable in adherence to the International Consensus Standards for Commercial Diving and Underwater Operations.

The mitigation of fatalities and loss-time-incidents has been an evolutionary process that has come at great expense to families, contractors and clients. To this end, the ADCI has worked very hard over the years to shed light on how operating in a safe manner can actually contribute to the overall profitability of all industry stakeholders. When operational safety is embedded in a company's corporate culture, the levels of trust between employees and management rise, allowing for higher morale. And this ultimately translates into greater operational efficiency. **More importantly, so that we never witness or tolerate an incident like that of the *Wildrake* again."**

Newsum goes on to point out that Smart's book is a valuable asset to commercial diving community:

"Into the Lion's Mouth is a must read for anyone wanting to enter the industry, as it is clearly outlines how things can become disastrous without adhering to the four bulleted items mentioned above. The book can easily be understood by both industry experts and layman alike. The book will complement the teachings of commercial dive school instructors, as they try to impress upon their students the importance of understanding the need for proper risk assessment and hazard identification. For the contractor, it serves as a stark reminder of what their ethical and legal responsibilities are towards providing operational safety for employees in the underwater industry. I wish this book had been written years ago."

Into the Lion's Mouth comes highly recommended. Every operator, contractor and diver (in fact, anyone with any stake in the commercial diving industry) should make reading this text a priority. Mike Brown, VP EPIC Divers and ADCI President, agrees that Smart's book is a must read:

Into the Lion's Mouth

The Story of the *Wildrake* Diving Accident

Michael Smart

"I recently completed reading Michael Smart's book *Into the Lion's Mouth*. It is a very detailed, well written, well researched, and sobering true story of the Commercial Diving Industry in the North Sea in the 70's and 80's, and the myriads of fatalities that did not have to occur as a young Worldwide Saturation Diving Community learned (or in some cases didn't learn) through terrible incidents. There are so many lessons to be learned from the book that it should be required reading for everyone involved in Commercial Diving, from entry-level to Senior Management."

new gear

CTC Marine Projects Invests in Integrated Trenching Spread Solution

The North Sea's Most Capable and Cost-Effective Trenching Solution

CTC Marine Projects, Ltd., a subsidiary of DeepOcean Group Holding AS, announces the introduction of an industry leading integrated trenching spread.

This month, CTC will mobilise the DeepOcean Group owned Northern Wave vessel for trenching support operations. The vessel will be equipped with 1.5 Mega Watt jet trencher PT-1 and mechanical trencher T2.

This complete trenching package, comprising of the North Sea's most powerful jet trencher and a track-based mechanical cutter from a company owned vessel with in-house survey crew, will provide the ideal cost-effective trenching solution from a single platform. With the added advantage of a pre-mobilised spread, CTC is ideally positioned to undertake short lead-time projects and other spot market activities.

CTC is in the process of adding jetting capabilities and 3 metre swords to T2 making this track- base vehicle the ideal trencher to operate in high current areas that predominate in shallow water regions where offshore wind projects are planned.

Pierre Boyde, CTC's Commercial and Business Development Director says of the new investment, "We are excited to be introducing the most capable, versatile and cost effective trenching spread in the North Sea."

About Deep Ocean Group

DeepOcean Group is an integrated provider of comprehensive subsea engineering solutions and has a demonstrated track-record in highly-engineered, complex subsea construction projects for the oil & gas, offshore wind and telecommunication industries. The company has a capable fleet of subsea vessels, ROVs, and trenching assets. DeepOcean Group strives to be among the safest subsea operators in the industry and its relentless commitment to safety for its employees without sacrificing quality service for its customers, distinguishes the company from its peers. The company is a leading IMR contractor and trenching operator in Norway and the North Sea, with an unparalleled track record in engineering and project management, and has a global presence with offices in Norway, UK, Brazil, Mexico and Singapore.

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Government Agencies Engage in Underwater Search Operations

Tafton Fire Company's Jon Tandy (L) and JW Fishers technician Brian Awalt with side scan sonar. Inset photo – side scan image of bridge debris.

Los Angeles Harbor Department, UAE Environmental Agency, North Carolina's Department of Transportation, Tafton Fire Company in Pennsylvania, and the Oklahoma Highway Patrol are a few of the diverse group of government agencies engaged in underwater search and survey operations. They are using a variety of equipment including underwater metal detectors, video cameras, and side scan sonars.

The Port of Los Angeles is the number one container port, by volume, in the United States. The value of cargo passing through the port annually is approximately $250 billion. To protect this valuable economic resource, the port has is its own police force. The Port Police are assigned to the City of Los Angeles Harbor Department and they patrol the waterfront by boat, bicycle, vehicle, and helicopter. Their job is ensure security of the port and the safety of all passenger and cargo vessels passing through it. This includes guarding both topside and underwater areas against possible terrorist threats, monitoring discharge pollution, and checking ship's hulls for compartments carrying drugs or other contraband. To assist in these efforts the department has acquired JW Fishers SeaOtter-2 ROV. This highly maneuverable underwater vehicle is equipped with four powerful thrusters and has high resolution color cameras in front and rear. Compact size and light weight make it easy for a single officer to deploy and operate the system. The vehicle is manipulated with a hand-held controller connected to a rugged topside console. The operator views video from the underwater cameras on a built-in, ultra bright flat screen monitor. Using the ROV the officers can actually put their eyes on any submerged structure in the port.

Nestled between Saudi Arabia, the Arabian Gulf, and the Gulf of Oman is the United Arab Emirates (UAE). It's one of the smallest, but wealthiest countries in the Middle East. The UAE is a signatory to the Convention on Biodiversity and the Convention on International Trade of Endangered Species. These two conventions require participating countries to establish protected areas, and to promote the conservation of ecosystems and habitats. At the end of 2008 the UAE had more than 5,000 square kilometers of protected marine area, which represents about 5% of the Emirate. The country's Environment Agency is one of the groups charged with the responsibility of managing this resource. To assist in the work, the agency is using Fishers TOV-1 towed underwater video system. Ashraf Al Cibahy, a manager with the agency's Department of Biodiversity and Conservation reports, "Our coral reef team is employing the TOV-1 to establish a methodology for transect and analysis of video data. Upon completion of the initial survey we will have a baseline to compare future results."

Tafton Fire Company and North Carolina Department of Transportation are both using side scan sonar in their operations, but for completely different tasks. Side scan produces high resolution images of the bottom of a river, lake, or ocean, and any objects lying there. The DOT is using their sonar to check support structures of bridges that cross over water. In addition to viewing the condition of the support's base and the bottom around it, the DOT's side scan towfish is equipped with adjustable transducers that allows the sonar to view vertical structures as well. This lets the inspector examine the entire submerged part of the bridge support. The Tafton Fire Company utilizes their side scan system in recovery operations. It assists in locating drowning victims, finding sunken vessels, and searching for vehicles driven into local lakes and rivers. With the sonar they can cover large areas quickly, saving the department time and money. It also increases safety for the team as a diver need not be deployed until a target is identified.

The Oklahoma Highway Patrol is using an underwater metal detector for the same purpose as many law enforcement dive teams around the world; to locate evidence disposed of in a waterway by a criminal that believes it will be lost forever. Fishers Pulse 8X detector is routinely used by police divers to locate weapons, shell casings, stolen objects, and even explosive devices.

For more information on Fishers complete line of underwater search equipment go to www.jwfishers.com.

SAAB SEAEYE AT SEAWORK

Four key underwater vehicles are featured at the Saab Seaeye stand D16 including the new double-hulled Sabertooth AUV/ROV.

Double-hulled Sabertooth AUV/ROV

The new double-hulled version of the Sabertooth offers twice the operational duration of the single-hulled Sabertooth launched last year.

It can have a range of over 40 miles, has 14 hours duration and can be depth rated to 3000 metres.

The unique Sabertooth concept combines the technologies of both AUV and ROV into a single unified resource with the range and manoeuvrability of an AUV and the tooling capability of a light-work ROV.

Three operational modes are possible: autonomous roaming; attached fibre-optic cable and umbilical for power and communications.

It can embark on long-range programmable missions or under operator control around set targets, with obstacle avoidance and precise manoeuvrability. It can work down deep tunnels or inside complex structures where its 360 degree manoeuvrability allows it to orientate into any position – even directly up or down.

And in places where access is seasonally restricted, it can remain underwater for a year at an isolated location ready to be deployed as needed. Tooling packs can be stored at its docking station; batteries can be re-charged, data and video downloaded and fresh instructions uploaded.

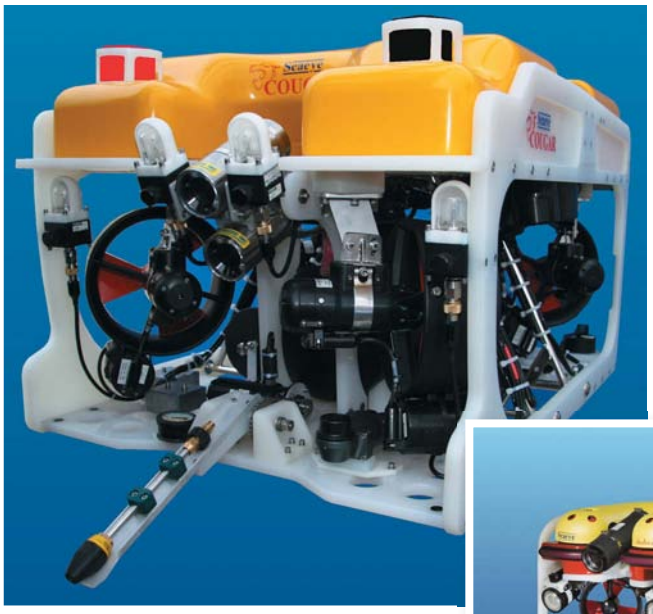
Panther XT Plus

The new Panther XT Plus sees a breakthrough in power management that offers 50 per cent more power.

Fitted with ten powerful thrusters it can swim 30 per cent faster than any other electric work ROV in its class.

This unrivalled thruster power means that the Panther XT Plus can maintain position whilst working in strong currents greater than 4 knots.

For an operator, this exceptional number of thrusters also delivers a reassuringly high level of redundancy.



A greater payload, along with a re-designed frame, offers more heavy-duty power and space for fitting a greater range of tools and sensors, including industry standard Schilling seven function position feedback manipulators.

Having the work class capability of a small hydraulic work ROV, the Panther XT Plus, offers a considerably lower cost of ownership, including a need for a quarter less deck space than an equivalent hydraulic vehicle and fewer crew.

Cougar XT Compact

For operation in high currents and shallow waters typically encountered in offshore wind farm installations a new compact version of the successful Cougar range has been created to minimise the effect of current velocity.

The result is an ROV with a reduced frame size, buoyancy and weight. A thinner 17mm tether also minimises drag. Overall, the compact design has the highest thrust to weight ratio in its class.

The Cougar XT's unrivalled power and manoeuvrability comes from six thrusters: four vectored horizontal thrusters and two vertical thrusters. Each has velocity feedback for precise control in all directions and is interfaced to a fast-acting control system and solid-state gyro for enhanced azimuth stability.

Falcon

With over 270 Falcon ROVs in use around the globe, its success has come from a design that makes it small enough to manhandle into the water, yet powerful enough to hold steady in strong cross currents and operate a range of accessories and tools.

Its trusted design is packed with technological innovations such as intelligent 'plug-and-go' electronics for rapid role-change during operations. This means that up to 128 different devices can be fitted, including extra cameras, lights, tracking system, manipulator and sonar, plus the option of adding special tooling on a removable skid.

For survey work, the Falcon has the advantage of a low electrical and acoustic noise signature that allows for optimum survey sensor data.

Its unrivalled maneuverability comes from five brushless DC thrusters with velocity feedback for precise and rapid control in all directions.

Saab Seaeye *is the world's largest manufacturer and market leader in electric ROV systems, and provider of autonomous and hybrid underwater vehicles. Markets include offshore energy, defence forces, marine science and hydro engineering.*

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The Secret Weapon for Longer Bottom Time

New nitrox membrane systems improve diver productivity

BY STEVEN M. BARSKY
MARINE MARKETING & CONSULTING

IN THE COMMERCIAL DIVING INDUSTRY, we are always racing against time. All things being equal, it's a commonly accepted fact that whichever company can get the job done the fastest, without sacrificing safety, is generally going to be the most successful. Productivity is key and when a diver is working underwater, every minute counts.

If you have two commercial diving companies working side-by-side on a diving job at air diving depths with similar equipment and similarly experienced divers, how can a company increase its ability to perform work without compromising its divers? The simple answer is to use enriched air nitrox.

Like all businesses, the diving industry has become increasingly competitive and the pressure to be more productive in the same amount of time is constant. With nitrox you can utilize each diver's

time underwater so that more time is spent working and less time is devoted to decompression.

Nitrox is simply a mixture of nitrogen and oxygen that contains more oxygen, and less nitrogen, than standard air. By reducing the amount of nitrogen in the gas mixture, we can reduce the amount of nitrogen absorbed, shrinking the diver's decompression obligation for the time spent at any given depth.

Using nitrox gives the diving company a competitive edge that is easy to obtain and becomes particularly important when working in areas where there are short weather windows. In areas where there are extreme tidal flows, nitrox can also be a real time saver, allowing the divers to make the most out of the slack tide periods.

Although recreational and scientific divers use PO_2s (partial pressure of oxygen) as high as 1.6, for use on a prolonged commercial

diving job, where the divers are diving day after day, a PO_2 of not more than 1.4 is considered the maximum allowable exposure. Most commercial diving companies that use nitrox on extended jobs are even more conservative and prefer not to use a mixture with a PO_2 "hotter" than 1.2 to help avoid problems with oxygen toxicity.

The most significant benefits of using nitrox occur in the 60-80 FSW depth range. For example, using a mix containing 40% oxygen with a PO_2 of 1.13 at 60 feet provides an astounding 210 minutes of dive time with no required water stops, compared to a 60-minute allowable bottom time on air. That's more than three times the normal no-decompression limit! According to Tim Beaver, CEO of Global Diving and Salvage, "Nitrox is the biggest thing to happen to the commercial diving industry since saturation diving!" Diving companies that use nitrox also include.

Even at a depth of 95 FSW, using a nitrox mixture that contains 36% oxygen provides 40 minutes of bottom time, compared to 25 minutes on the U.S. Navy Tables. When you can extend your no-decompression bottom time by 60% with no decompression penalty, that's a significant savings in time and money!

In addition, although there have been no scientific studies to confirm it, anecdotal reports by many divers suggests that divers who use nitrox suffer less fatigue following a dive than when they make a similar dive using air. Also, since the diver is breathing a mixture that contains less nitrogen, the effects of narcosis are also probably decreased, although there have been no scientific studies to confirm this either. Of course, divers, supervisors, and rack operators must be properly trained to use nitrox efficiently and with proper safety precautions.

For many years, nitrox was not routinely used for most dives in the air diving range simply because it was not practical to transport the large volumes of gas needed, or safe to mix it offshore. When mistakes were made in calculating the mixing ratios and in physically mixing the gas, crews would end up with the wrong nitrox mixtures. Fortunately, those days are long past with the new nitrox systems available today that can automatically create the mixture you need simply by dialing in the percentage of oxygen you desire. These systems are simple to use and take all of the guesswork out of using nitrox in commercial diving.

Nuvair, a nitrox system manufacturer located in Oxnard, California, uses a unique semi-permeable membrane in their compressor units that filter the nitrogen molecules out of the air, leaving a mixture that is richer in oxygen. They have designed a number of different systems including turnkey low-pressure systems, as well as turnkey high-pressure systems. These high-pressure units can be used to charge gas racks, as well as fill bail-out systems, with any nitrox mixture containing up to 40% oxygen.

With Nuvair's systems, there is no need to mix a cylinder of gas and then wait for 24 hours to ensure that there is no stratification of the gas in the cylinder. You can have the mixture you want right now. You want continuous feed low-pressure nitrox?

You need to fill a bank of storage bottles? You want to fill a bail-out bottle with nitrox? All of these tasks are possible with Nuvair nitrox systems.

Cal Dive in Australia has been using the Nuvair Voyager system in their offshore operations for some time now. The Voyager IV is a self-contained high-pressure nitrox system that can deliver air at up to 6000 p.s.i. and nitrox up to 3600 p.s.i. The system is unique in that besides including an oxygen analyzer alarm and shutdown, it also includes both carbon monoxide (CO) and carbon dioxide (CO_2) alarms and shutdowns. Of course, it also is equipped with high-pressure, high temperature, moisture, and low oil pressure shut downs, too. Other companies who are using nitrox systems include American Marine, Titan Salvage, Parker Diving, and CanPac Divers, to name a few.

Part of the beauty of using a membrane system of this type is that there is no need for oxygen cleaning when using gas mixtures containing up to and including 50% oxygen for dive operations conducted in the USA (OSHA, the Compressed Gas Association, and the ADCI allows the use of up to 50% oxygen without oxygen cleaning, special o-rings, or lubricants, standards in other parts of the world are more demanding). The new Voyager IV commercial system provides 100% oxygen compatible air, or nitrox, for use with oxygen clean equipment as per IMCA requirements. This unique capability is possible because the Voyager IV uses a special synthetic lubricant that is compatible with pure oxygen, although as a safety precaution the system is incapable of producing 100% O_2. Harbor Offshore Services, another commercial diving firm with offices in Ventura, Spokane, Seattle and Hawaii, also uses Nuvair systems.

The Hankinson low-pressure filtration system contains four filters with a 500-hour element life. Another unique feature is the built in CO_2 scrubber, which lowers the carbon dioxide in the compressed gas to less than 400 PPM, which meets the most stringent industry standards.

The Voyager is a completely self-contained unit that is ready to go once you put it down on the deck and make the required electrical connection. From there, the only other item to be connected is your fill hose and you are ready to start pumping nitrox. The system has a small footprint that requires about 15 square feet of deck space. The package weighs just 1550 pounds.

For more information on the Nuvair Voyager IV and other Nuvair systems, visit the Nuvair website at www.nuvair.com. Email: info@nuvair.com. Tel 805-815-4044. FAX 805-815-4196. 2949 West 5th Street, Oxnard, CA 93030, USA.

About the author

Steven M. Barsky is a former commercial diver who worked as a saturation diver in the North Sea and Gulf of Mexico for SubSea International. Following his offshore time, he worked for Kirby Morgan and Viking America. He currently operates his consulting business, Marine Marketing & Consulting in Ventura, California. Contact Steve through his website at www.marinemkt.com.

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