



Time to dive dry? *What's bubbling?*



Text by Peter Symes and Roz Lunn, with additional quotes from our readers

Autumn is here—at least for those of us who reside in the temperate zones of the northern hemisphere. As the leaves of fall put on their colourful display, we go about stowing away our summer garments and getting out the winter clothes. In regards to what you wear underwater, that means getting out the dry suits.

My late grandmother always professed that there were no such thing as bad weather, only bad clothing, and made us wear our oilskins before she shoved us kids out to play in the rain or snow, so she could have a bit of peace and quiet. She was right y'know. Not about the bit of quiet, but about the importance of wearing the right garments.

I've always been comfortable in the water, and happy as a puppy even under horrible weather conditions, simply because I dressed properly and warmly enough. On a frigid day, that could mean putting on a couple of extra socks, or wearing long underwear.

Diving in winter is underappreciated, I find. The coolness of the water means less algae, and the viz is often excel-

lent. There is also different animal life in the cooler part of the year. Superior thermal insulation is one of the main advantages of diving dry, but you don't have to live in colder climes to appreciate this property. Even in the tropics, the water can be cool at depth, which is why dry suits are also favoured by dive guides and instructors in regards to warmth, and if you engage in any kind of technical diving, they are a must. A more evenly distributed buoyancy is another property of drysuits that the diver soon comes to appreciate.

Getting one

For most divers, a drysuit is the single largest investment in diving equipment they will ever make. So, you better make sure that you make the right purchase and don't rush into anything! Chances are that you will have your suit for many good years.

When it comes to a wish list, where do you start? Checking out

the options and asking around on the internet will soon get you bombarded with (sometimes conflicting) advice from friends, forums, websites and instructors. So, let's start at the beginning.

Define your needs

Most diving in temperate and cold water is now done in a dry suit, simply because it's warmer. But actually, the current thinking is that any type of diving that increases thermal loss, thereby decreasing comfort and safety, may be better done in a dry suit. This includes dives that call for little movement such as photography, deep diving, long dives in warm water (especially if they involve long stops) and repetitive diving, particularly if you tend to chill down easily.

Thermal insulation aside, proper fit and freedom of movement are also important properties to consider. Nothing is more annoying than a suit that doesn't fit, hinders your movement, or worse still, leaks.

While the basic concept and operation of a dry suit has remained unchanged over the years, there have been vast improvements in materials and designs, making them warmer, more flex-

ible, and more durable. Modern dry suits are high tech, too.

As most are probably well aware, dry suits come in two basic flavours, which we can call *membrane* and *neoprene*, with a number of intermediary forms in between.

Membrane suits

A membrane suit is basically just a thin watertight shell under which a separate layer, or undergarment, is worn to provide thermal insulation. Consequently, the suits themselves can be quite lightweight, and therefore, easier to travel with, as they can be rolled up into a small bundle.

Most membrane suits are made from a thin, pliable material called tri-laminate consisting of three sandwiched layers:



In a membrane suit, the diver will have to wear an undergarment for thermal protection. The membrane just keeps the water out. This suit is fitted with a cuff for a dry glove, which just snaps on

“Drysuits aren’t just about thermal protection under-water. They keep you much warmer between dives, particularly on boats, which makes it much more likely that you will do more than one dive per day.”

nylon as the inner lining, butyl rubber as the watertight membrane in the middle, and Cordura as the protective outer layer. This superbly flexible material is extensively used in drysuits, because it is quite resistant to abrasions, punctures and tears. It is also light, very flexible, requires little maintenance and is easy to patch and repair. Some suits also make good use of Kevlar—which is practically impenetrable—either just for patches on particularly exposed areas, such as the knees, or the whole suit can be covered by it.

Typically, technical divers will go for membrane suits, because they offer better freedom of movements, which, for example, is essential when you want to reach your gas valves behind your neck.

But as the suit itself offers the diver no thermal protection, a separate undergarment has to be worn. The diver has, of course, the option of varying their thermal protection according to the ambient water temperature at depth. The combined purchase of a membrane suit and a top-of-the-line undergarment will often be more expensive than buying a neoprene suit.

Neoprene suits

A traditional neoprene dry suit basically has just one main layer, which provides both thermal insulation and a watertight barrier. In its simplest form, it is essentially an upgraded wetsuit, equipped with various seals and a watertight zipper to keep water from entering, plus a couple of valves. This one-layer concept

Neoprene drysuit. Aside from an inner lining, the suit consists of one layer, which provides both the water barrier and thermal insulation. On this particular model, which comes from the lower price range, the zipper is not protected by a flap or cover (compare to the suits pictured on the next page) which means increased wear and tear

New materials. Drysuits are going hi-tech, too. What you see here may be the new thermal protection layers in future drysuits



may provide a more affordable complete solution, but may also come with a number of drawbacks.

One, is the loss of insulation—and buoyancy—as the suit material compresses with depth, something every wetsuit diver is quite familiar with. The loss of insulation can be offset by wearing some sort of undergarment, but you still have the issue of marked buoyancy changes.

Crushed and compressed

Another option is going with more expensive materials such as compressed or crushed neoprene. The main idea of using these materials is that they don't undergo the same degree of compression with depth, and as such, maintain the same level of insulation and buoyancy regardless of depth. In turn, that means that the diver will still need some extra layer of garment underneath for thermal protection, though much less than with a shell suit.

In many regards, suits of compressed or crushed neoprene can be regarded as hybrids, which combine the best of neoprene and membrane suits.

Crushed neoprene has the flexibility of a tri-laminate, the strength of neoprene, and the material stretches slightly. This means that the suit can be cut for a snugger fit without impairing the diver's movement. The diver benefits from no inherent buoyancy changes whatsoever. This suit behaves exactly the same at 100 metres, as it does on the surface. Not unsurprisingly, these types of suits belong with those at the top of the range, both in terms of quality and price.

Clearing up the confusion

Crushed and compressed? The term *compressed* is often used in a confusing manner. Neoprene is a family of synthetic rubbers with a foamy texture in which airspaces are filled with nitrogen. The material is produced in big sheets of different thicknesses, which undergo some compression process during their manufacturing. So, in essence, all diving neoprene is compressed. What is often meant by *compressed* is that a standard 7mm neoprene has been further compressed to say 4mm, but often the 4mm variant is just made of a thinner material. Crushed neoprene has undergone heating and pressure to produce a neoprene that is both tougher and stretchier. Under a microscope, you will find the compressed material still has round bubbles, while the crushed material cells are flat. Microcell neoprene is another material with 20 percent smaller bubbles than conventional neoprene. ■



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Design

The importance of finding a suit that both fits correctly and allows for plenty of freedom of movement cannot be emphasized enough. How flexible the suit is depends not only on which fabrics are used but also on how the material is cut and put together, just like other garments. Fortunately, we have seen much improvement in how suits are designed.

Biased cut is now being adopted by the pro-active manufacturers. Traditionally, fabrics were cut along the warp or weft. Now the manufacturers have discovered that if they cut the cloth on the diagonal to the warp and weft, (known as the bias), the fabric has a lot more natural stretch.

Tri-laminate suits that do not utilize the bias cut have less inherent stretch, so they tend to be cut on the generous side to allow the diver a full range of movement. They also are more baggy to allow for the undersuit, (providing the thermal protection). This can result in the diver suffering from drag, as they move through the water. Some membrane suits are also designed with telescoping torsos, which can make a huge difference when it comes to freedom of movement.

Fit

Neoprene suits have a snugger fit, because they are cut differently, as there is not such a need to wear so many thermal layers to keep the diver warm. Whilst the diver benefits from a sleeker fit, they can lose out in other ways. The snug fit makes it harder to don and reduces flexibility, impairing the diver's movements. If you are thinking about moving into technical diving, this is not a suit for you. Gas shut downs can be a nightmare, or worse, impossible. Unfortunately, as neoprene ages, it becomes less flexible, worsening this problem. Another property, which is also lost as the fabric ages, is insulation.

Try it on!

Some manufactures offer made-to-fit, or bespoke, dry suits at a nominal extra charge. So, if any of their standard stock sizes do not fit you well, it will often be worth the extra expense to get it custom fit. In particular, you need to check if you can move your arms freely, and that you can reach the valves.

Does the suit allow you to stretch an arm without pulling on a sleeve and tugging on a wrist seal so it will let in water? Can you turn your head freely? And does it allow you to squat?

Often the standard across-the-shoulder configuration of the drysuit zipper will make it more difficult to reach behind your head.

Zipper configuration

The standard arrangement is placing the zipper across the shoulders, as it is shown on the first page of this article. Here, it is less exposed to wear and tear, but

unless the diver is a contortionist, the zipper is out of reach, so closing and opening the suit will require the assistance of a buddy.

In our recent survey, most divers stated that they preferred to be able to take their suit on and off without assistance. The two suits depicted on this page show two other zipper configurations: one that goes diagonally across the shoulders (center), and one that goes across the chest (right). These configurations are usually a bit pricier, but is often worth it.

The way the suit on the right is designed also provides for what is called a telescopic torso, which gives the diver more mobility lengthwise. Other, but now mainly obsolete, ways of placing the zipper includes running it between the legs and around the head.

Since the zippers are exposed to wear and tear they will ultimately wear out and have to be replaced. The zippers are not cheap, which is why, on some

It would be nice if the industry realized that short females also want reasonably priced drysuits that fit



Order it to fit, don't try to save a few quid.

Some drysuits come with fixed boots. Others, like the one shown here, come with separate outer boots, often referred to as *Rock boots*



models, the zipper sits protected under a flap or outer layer.

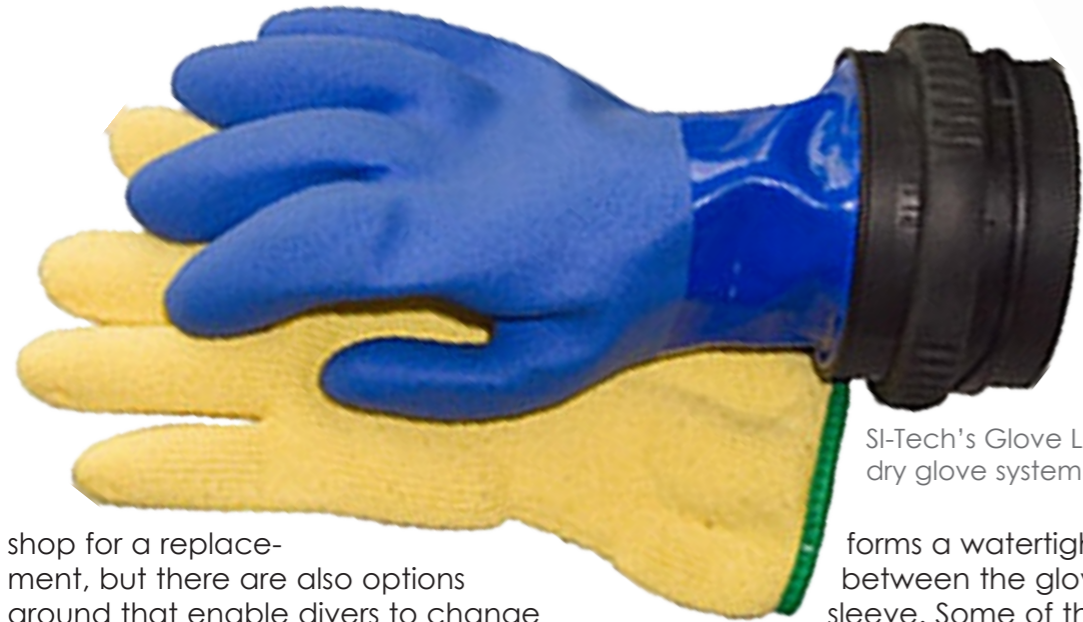
Seals

Latex or neoprene is the main choice though silicon has just been introduced as third alternative—good news for those who have a latex allergy. Latex has a snugger fit, but doesn't insulate like neoprene, so the diver needs other thermal protection at least around the neck. Latex also tears easily—a careless diver with a sharp finger nail can poke right through the material. Neoprene seals are warmer, but fit less tightly, which may be an issue for some. A neoprene seal is to be folded back and tucked in, like an inverted turn-up, in order to seal properly.

Few items are as useless as a drysuit with a torn seal. Often, it can only be fixed by a trip back to the repair

Beware: Sunscreens and oils can deteriorate latex seals





SI-Tech's Glove Lock dry glove system

shop for a replacement, but there are also options around that enable divers to change seals themselves—something that could save a weekend. Some user-replacable neck seals are shown on page 67.

Dry gloves

If you are diving in cold water, there is no way around dry gloves. A number of brands have marketed various designs over the years, but they are all variations of the same basic theme in which a two-part locking system

forms a watertight seal between the glove and sleeve. Some of the designs work using friction where the diver just squeezes the glove onto some sealing o-rings, while others have twisting rings that lock and/or unlock the glove.

Hoods

Using loose hoods seems to be gaining popularity, and not without reason, as one can essentially find the hood that suits one best. Also a separate hood



makes it more comfortable to wear the drysuit between dives i.e. while underway to a dive site.

Boots

The vast majority of suits have built-in boots, though it is possible to opt for good ankle seals instead. Some of the

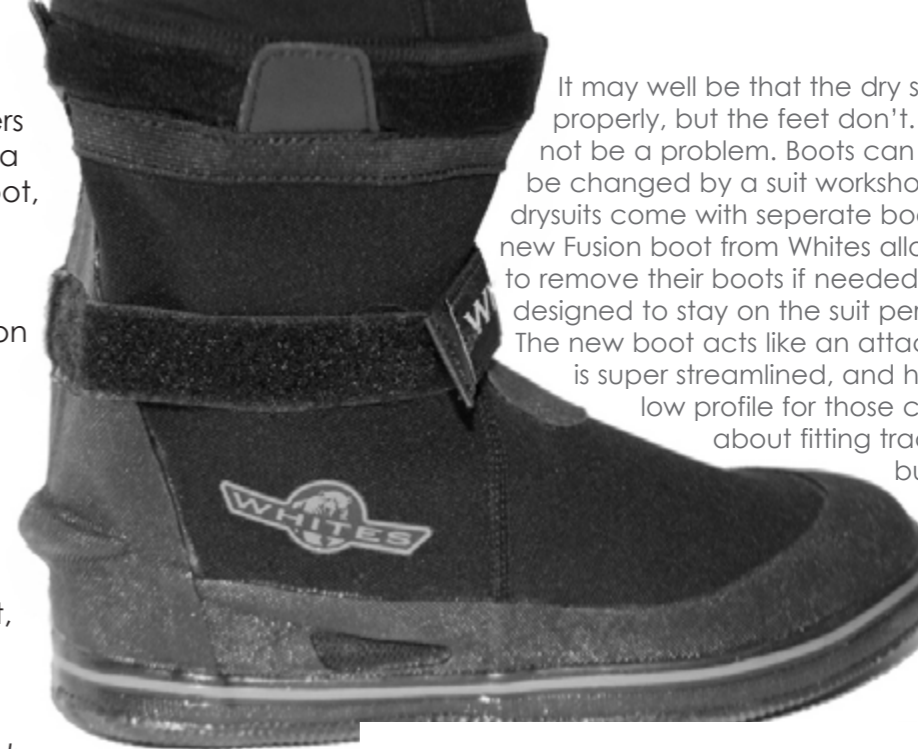
I cut my fixed hood off and use a wet hood. I did not like the restriction of the fixed hood.



manufacturers will give you a choice of boot, and again, wear your thickest thermal protection to help get it right. It's not really worth going for boots with thin soles. Although they are light, you do get to experience the

"ooh-aarrh-ouch" factor in its full glory, as you trog over rocky shores and stones. Neoprene lined boots are warm and snug, so this can mean you have to go up a size, but all in all, these are a popular choice. For those of you who teach on a commercial basis, heavy duty boots, especially heavy duty boots with a heel, are worth considering. Commercial divers are catered for with heavy duty steel boots complete with steel soles and toecaps.

Never use a fixed hood on a dry suit for sports diving. Use it only if you hate working. It can hurt your muscles in the neck.



It may well be that the dry suit fits you properly, but the feet don't. This need not be a problem. Boots can easily be changed by a suit workshop. Some drysuits come with separate boots. This new Fusion boot from Whites allows users to remove their boots if needed, but is designed to stay on the suit permanently. The new boot acts like an attached boot, is super streamlined, and has a super low profile for those concerned about fitting traditional bulky drysuit boots into their existing fins

Hotfoot drysuit socks from Fourth Element are made up of a high density fleece combined with water resistant outer fabric. Designed to fit the feet, these socks will stay on when taking off your drysuit



Valves

Most suits are already fitted with valves, so most of the time, you don't really have an option of choosing. Inflators and suit dump valves are dominated by two manufacturers: SI-Tech and Apeks, which over the years have constantly strived to design more streamlined products with low profile.

A good inflator valve should be able to swivel in full circle, so you

And then you have DUI. They have always done things differently, and until recently, I really hated their boots because they were effectively socks with a sole glued to the bottom. Horribly flappy things, and it was this one feature that really put me off buying one of their suits. Happily, this all changed with the advent of the Rock Boot. These days the diver still has a "sock" on the end of their suit, but they now don a pair of rugged boots to dive in. A boon for divers who walk and climb to sites.



Standard placement of the valves on a drysuit valves. Make sure that you can easily reach and operate both of them. This suit comes without a fixed hood



can route your inflator hose any way you want. Your dumps and inflators should be of the same brand, as the two products have been designed and tested to work together.

The inflate button on my suit can be difficult to find within the large inflator assembly. Having a raised, or otherwise obvious, inflator button would be nice, especially because thick gloves are used, and hands are sometimes too numb to feel the button accurately.

When it comes to dumps, there are two main types—shoulder dumps and cuff dumps—though the latter seems to be going out of fashion. A cuff dump is automatic and idiot proof, and approximately the size of a small marmalade lid. A cuff dump is normally located on the left hand arm, above the wrist seal. To vent air, the diver just raises their left hand. This can cause problems with involuntarily dumping of air when teaching, photographing, deploying a surface marker buoy, or hanging onto a shot line.

A cuff dump also means that you might not be able to have a computer on that wrist, as it will impair air flow. That said, this is a good option for new divers, because it is so simple to use.

I prefer a shoulder dump. It's adjustable. By turning the dump valve, you can control the degree by which the air is vented off. This means that I can screw it down to stop gas escaping, if I have a very long decompression stop. It can be set to automatic, so as you rise, the air inside the suit expands and thus escapes through the dump. Alternatively, you can hold the dump down to allow more air to escape.

Gaiters or ankle weights

Ankle weights are an easy way to distribute weight more evenly along your body and help keep



Drysuit gaiters from Halcyon attaches with velcro

your feet down, if you have a tendency to have floaty legs. If you don't like finning with added weight around your ankles, gaiters, which wrap around your shins, may be the solution for you.

P-valves and zippers

Sorry, gals, these inventions just cater to men's needs. A p-zipper, like the one depicted below, allow the gent with an urgent need to perform his business without having to get out of his suit. These extras are a bit on the pricey side and constitute an added point of failure, so why not just make it a habit to go to the men's room in a timely fashion?



A convenience zipper is mostly for users who wear their suit all day long, such as professionals

A P-valve is a device for technical divers allowing the diver to urinate into the water at depth by the means of a condom-like attachment and hose that passes through the suit.

Pockets

Pockets are invaluable for stashing all sorts of things such as a spare mask, D-SMB (Delayed Surface Marker Buoy), a reel, a slate, and a backup torch.

Placing cargo pockets on the front thigh seems a good idea, but positioning them on the side is often a better option. There is less in-water drag, as the pockets are in the slipstream of your shoulders, whilst giving easy access to the contents.

This is something you need to keep in mind should you start using side-mounted stage cylinders. When you are diving with a stage, accessing a front cargo pocket for your D-SMB is a bit tricky.

Front-mounted cargo pockets can also get in the way when you are rib diving, as they tend to catch when climbing back into the boat.

When you stand with your arms by your sides, the bottom of the pocket should be placed in line

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www.fourthelement.com



with the ends of your fingers, whilst being sufficiently above the knee, so that the pocket doesn't get in the way of your finning.

As for fastening your pocket, one camp advocates that cargo pockets should be zipped up, so that items don't fall out. Others say that Velcro is best for easy access, arguing that zips may jam when you least want them to. Drain holes are a must, and it's a sensible idea to have a method of attaching things to prevent everything from falling out. Bungee is a popular choice. It allows you to pull out the entire contents of your pocket, grab what you want, and replace the remainder.

A bungee loop is better than a clip, as you can always cut a piece of bungee should it get tangled.

Brace yourself

If your suit does not come with braces, or suspenders, go and get yourself a 'Fit your own braces' Aqua Pack. Braces also allow you to wear your suit partially donned without you having to clutch great armfuls of suit. If you are not careful, you can damage your zip should you wear your suit half donned.

With a front donning diagonal entry suit, it is better for the suit if you wear it either fully on, or take it off. If you wish to wear it half



Drysuit zippers must be lubricated prior to every dive with bee's or paraffin wax. Only the outside of the zipper should be lubricated, and it's best to do it with the zipper closed



Looking after your suit

Drysuits require more maintenance than wetsuits. Be sure to rinse your suit with fresh, clean water after every dive.

Inspect the seals, valves and zippers for damage, and get repairs done on any item that is not operating properly. If the inside of the suit is damp, or wet, it must be rinsed, too. Check for moisture in the bottom of the boots. After rinsing the suit, hang it over a clothesline (out of the sun) to dry. Don't use a hanger, as this places stress on the suit. Turn the suit inside out carefully. Never put your suit away for storage unless it is completely dry inside, or you'll end up with mold or mildew.

Drysuit zippers must be lubricated prior to every dive with bee's or paraffin wax. Only the outside of the zipper should be lubricated, and it's best to do it with the zipper closed. Be sure to wipe off any bits of wax that fall off the zipper. Never use silicone spray on any part of your drysuit. It will work its way into the base suit material, making it difficult to make good repairs in the future. Different manufacturers recommend different methods for storage. Some say to roll the drysuit up and leave the zipper open, while others recommend closing the zipper. However, all manufacturers agree drysuits should be stored in a sealed bag in a cool, dry place, away from sources of ozone, such as electric motors or hot water heaters. Follow these simple drysuit diving tips and you'll soon be diving like a pro. There's no substitute for a drysuit when the water turns chilly! ■

donned between dives, then take time to pull the arms through the braces to take the weight of the suit, or knot the arms around your waist. If you let the full weight of the suit hang down on the braces, over time, the zip can suffer unnecessary strain because it is bouncing on the braces, and it will bend and flex. A front-donning suit zip can last longer than a back entry zip provided you don't go around with the suit open, folded back, and hanging on the braces. ■



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The *Some of the* latest & hottest

Some two months prior to going to press, we wrote all known manufacturers of drysuits asking them to supply us with information and images on the latest models.

Whites' Fusion

The popular Whites Fusion has won over countless divers over for the last couple of years. One of the popular benefits of the Fusion is the removable, replaceable skin. Canadian manufacturer Whites has now launched four new Fusion skins in addition to the lycra sport skin, limited edition skin, and the tech skin with grey graphics. The flagship tech skin will now be available in black with red, yellow, navy, and pink graphics. Users can now have a different skin for different dives; for the cost of a wetsuit, you have a drysuit that looks brand new! Check out Whitesdiving.com for more information.

Reviewed in
X-RAY MAG # 26
[Read review here](#)



Poseidon's Evolution

Fresh out of the oven, the image is less than 24 hours old as we closed this edition. The Evolution is the Swedish drysuit veteran's first suit with latex. The flexible and durable 3mm compressed neoprene, tightly designed around your body, will still be tight and prevent air movement and expand when you add more underwear, while remaining soft and flexible enough not to restrict movements, preventing squeeze. Use less underwear for warm waters and more for cold, preferably Merino wool, which is warm even if wet and found in the nearest sorts store at reasonable prices. Knees and backside have been reinforced with Kevlar.

Poseidon.se



Hollis Biodry

Constructed with patented WearForce material, which is a lightweight non-woven nylon material laminated to a heavy-duty, stretchable polyurethane, the BioDry BX200 Drysuit is said to be like no other suit on the market. Strength and stretch with a complete range of motion allows for a more streamlined fit. Say goodbye to bunching and rigid material. Coming soon at

Hollisgear.com



Gravity Zero

Italian Gravity Zeros flagship model is the TLS Ranger Limited edition produced in flexible and soft 350 G/MQ Trilaminate fabric, which is highly resistant to abrasion. Designed with a telescopic torso with an adjustable waist, the suit provides a great degree of freedom of movement. Neck and wrist latex seals according to military grade specifications while separate hood is optional. The front zipper configuration makes the suit easy to put on and off. The inside is covered with a smooth fabric and mounted with elastic braces. The boot is made of 2,5 mm CNX neoprene.

Gravityzero.it



Aquata

Trockentauchanzüge is German and means drysuit. The Aquata

Crush, from the renowned German manufacturer of wetsuits, rescue suits, and drysuits, is made from 5mm crushed heavy-duty neoprene, which is tripled glued, blind-stitched sewn on the outside, and neoprene-taped on the inside. The horizontal back zipper is made of anti-corrosive metal and protected by a neoprene cover. The neck seal is made out of neoprene. Covered arm seals are made of heavy-duty latex, compatible with Dry-Glove Ring-System. The boots are fitted with the dry-sock system and separate protection-shoe made of 6mm neoprene in variable size. The hood is made from 6.5mm neoprene with metal-plush coating and double seals for full-face mask, hood deflator, and small collar with velcro tape for attachment to the suit. Additional features include heavy-duty knee-, shoulder- and side-protection; voluminous leg pocket; and carrying bag. Two pockets for lead. **Aquata.de**



Waterproof D1 Hybrid

Don't be fooled by the seemingly unassuming look of the prototype above. The interesting parts are in on the inside. It may look like another membrane suit, but thermal insulation is provided by a completely new porous insulation material, which Waterproof predicts will create quite a stir among dry suit aficionados. We weren't given a lot of detail as the suit won't be formally presented until DEMA 09, but we tried it on, and it was very soft, comfy and remarkably stretchy. It will be a high-end suit, so we don't expect it to come cheap. **Waterproof.se**

DUI

DUI's legendary CF200 has gotten a bit of a fashionable face lift.

Recently, DUI has incorporated a computerized pattern design and cutting system, which allows them to make continuous changes to their patterns, so they fit better than any other drysuit in the world for both men and women. In addition to the sizing, DUI Special Production drysuits allow you to truly design a unique drysuit just for you. With a Special Production, you now get to choose your own styling. More info on **Dui-online.com**



Otter

UK-based Otter has been around for longer than many of the other manu-

facturers put together, but that doesn't mean they are out of touch. Au contraire, their new Travellite is the response to the many travelling divers who want to bring a drysuit on their vacation. Weighing only 7lbs, or 3.5kg, this is a light-weight membrane drysuit with telescopic torso to facilitate the use of it's diagonal front entry zip with outer cover. To be worn with Rock Boots. **Drysuits.co.uk**



I wish there was some way to travel with it without feeling like you're taking the house with you.



Camaro

The new Arctec pro from Austrian Camaro consists of a very special high-tech four-layer material, which is highly elastic and flexible. This means the suit can be cut 30-40% slimmer than other drysuits, which results in a smaller volume, more freedom of movement and higher comfort. The extra light and very thin material can be packed very small and is perfectly for trips abroad. Over the latex arm- and leg-cuffs, there are additional neoprene cuffs to build a thermal bridge, which supports heat insulation. The Arctec Pro comes equipped with Camaro's own open hood construction, which is fully adjustable for personal fit. On the surface, it can be easily opened and pulled over the head. Also brand new are the attached thermosocks, which allows the user to select the boots of his or her choice, but Camaro will fit Explorer or Classic Boot at no extra charge. Last but not least, a very important feature is the front zipper, which allows single-handed dressing without any assistance.

Camaro.at



O'Three

O'Three has been the preferred brand for many of this magazine's technical dive gurus, including Leigh Cunningham and Pascal Bernabé. Their top-of-the-range Ri 2/100 has been specifically designed with the technical diver's interests paramount throughout its evolution. Hyper-compression creates an extremely dense wall of protection and ensures virtually no buoyancy change at extreme depth.

The neoprene has not been crushed, so a good degree of insulation is maintained. The resin-impregnated outer lining creates a finish that makes the Ri 2/100 extremely strong and snag-resistant.

Unlike other conventional outer linings to neoprene suits, the Ri coating is also impervious to water. This will enable the suit to dry in minutes and will reduce wind chill considerably.

Othree.co.uk



Ursuk

Heavy Light Cordura RedQ has been developed by the Finnish suit specialists especially for demanding wreck diving and technical diving, where it is essential that the suit remains intact. The three layer fabric with Cordura surface is in a class of its own, with high tear, puncture and wear resistance, and a special seam technique. The ergonomically fitting neoprene hood has a face seal that allows use of either regular or full-face masks. The telescope waist of the FZ-model allows persons of different heights to use the same suit. Includes integrated suspenders and crotch strap as well as loops for hanging it to dry; knee and back reinforcements; 5 mm neoprene boots with a latex surface, which reduces the need for extra insulation; and heel strap retainers that keep the fins safely in place. The bottleneck-shaped wrist seals are made of heavy duty latex.

Ursuk.com

SeacSub

SEAC drysuits are born in Italy where prototypes are designed, styles are developed and cut, and top-notch Si-tech valves are assembled under the utmost individual quality control standards. The anatomical cuts designed specifically for men and women guarantee excellent fit and optimal comfort. The 3.5 mm high-density neoprene, which is highly resistant to compression, guarantees the best possible combination of thermal insulation, fit and comfort. The exterior of the seams are blind stitched and taped on the inside with neoprene tape. The heavy duty exterior lining, the plush Helioflex inner layer, the Glide Skin collar, the Glide Skin wrists will make this suit a popular choice for the demanding diver.

Seacsub.it



Under garments

One of the great things about a drysuit is that you can use it in a broad range of water temperatures. All you need to change is the insulation (underwear) you wear beneath the suit. Your insulation will vary according to the water temperature and your activity level. For example, during the summer months in Southern California, you might be able to dive with nothing more than a cotton sweatsuit underneath your drysuit. Yet, to dive the northern Channel Islands in January, you would probably want to wear drysuit underwear made from Thinsulate or Polartec, which provides substantially more insulation. Wear too much insulation on a dive during the summer, and you'll overheat. Wear too little insulation on a dive in the winter, and you'll be cold. You must learn to adjust your insulation and the amount of weight you wear with it, from dive to dive.



The outer layer in **Fourth Elements Ozone** undergarment complements their Arctic, Xerotherm and Drybase as part of a complete thermal protection system. Windproof and waterproof, the Ozone layer is designed to be worn over the Arctic and/or Xerotherm to provide additional warmth, and to provide weather protection before and between dives. The soft shell outer fabric has been developed to maximise warmth for very little additional bulk, and the system of vents ensures management of air within the drysuit is not hindered by the undergarments.

www.fourthelement.com

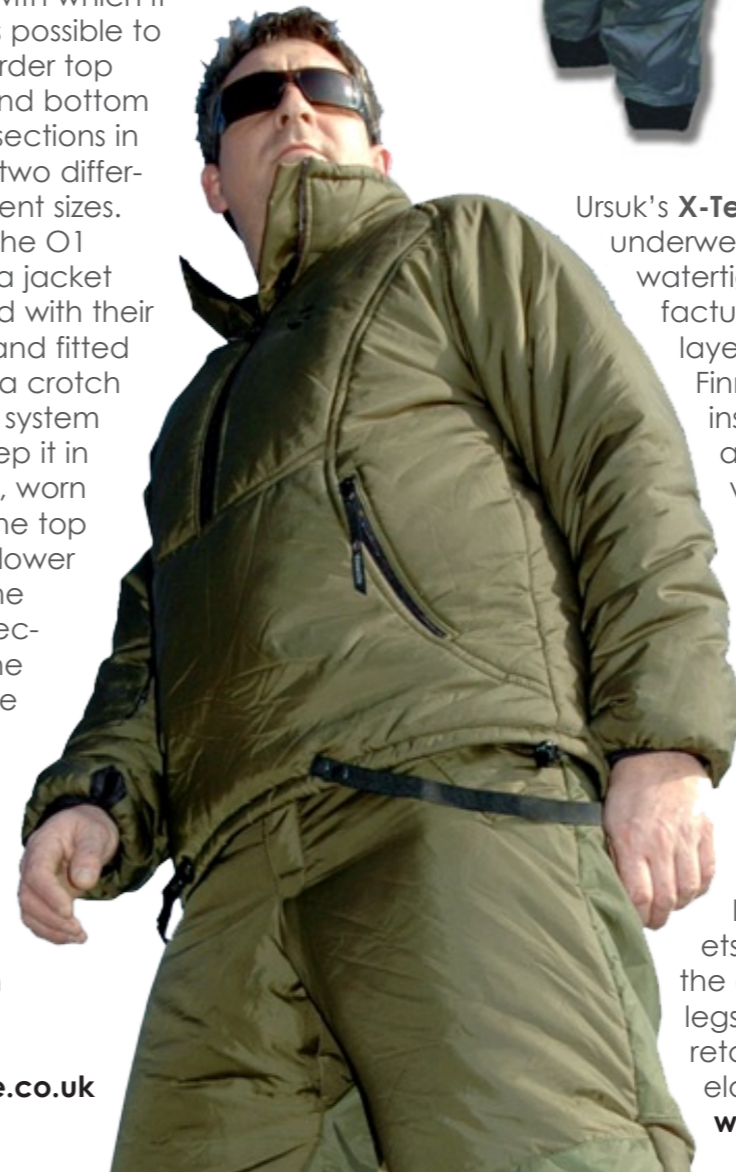


The **Oxygen undersuit from Weezle** comes in two parts the O1 and the O2. Developed in conjunction with Fraser Bathgate at the IAHD, Weezle has produced a two-piece Undersuit

with which it is possible to order top and bottom sections in two different sizes.

The O1 is a jacket lined with their TS1 and fitted with a crotch strap system to keep it in place, worn over the top of the lower part. The lower section is the salopette style O2 trousers, also fully lined, making them suitable for use with most styles of drysuits.

www.weezle.co.uk



Titan undersuits from Glasgow, Scotland-based Lomo Watersport are high specification diving undersuits made of a three-layer sandwich of material consisting of an outer windproof shell, a 100g thinsulate core and a 150g polar fleece inner material. This sandwich provides great functionality both in and out of the water. The fleece lining is extremely comfortable

and complements the Thinsulate core extremely well.

www.ewetsuits.com

Ursuk's **X-TEX/Finnfill** underwear is elastic, watertight and manufactured in a four layer material, with Finnfill fibre as insulating layer, and breathable watertight X-TEX membrane as intermediate layer. The surface is of elastic and slippery tricot fabric, and the inner lining of fleece. The suit features are front zipper with double locks, chest pocket with zipper, large hip pockets, elastic fabric in the collar, cuffs and legs, thumb and leg retainers and strong elastic waist band

www.ursuk.com





Waterproof is about to introduce silicone seals as an alternative to latex. There are several advantages to this material. It is medically inert, something divers with latex allergy will surely appreciate, but above all, it does not tear easily, like latex does. And, relax, it will be available in a range of different colours other than this rather skanky hue

We didn't get a name for this fancy material we saw at a leading dry suit manufacturer in Sweden. This ultra-light honeycomb structure material is seen as the future in thermal insulation of drysuits. It doesn't compress laterally, and the hollow structure even allows for a more even and less restricted distribution of gas in the suit—a boon if you use Argon for suit inflation. We tried the prototype suit, which was a neoprene type. It was very comfy, stretchy and very easy to get in and out of. The suit will be revealed at the 2009 DEMA show



Jacques-Yves Cousteau in an early drysuit. No vavles, no zipper. Donning and doffing was done by crawling through the neck seal

Fresh thinking



No more cold water rushing in around the neck! The idea behind this innovative neck seal from Waterproof is to prevent the hood from gaping when the diver looks down by having it already stretched over the flange



SI Tech Necktite, could turn the potential disaster of a torn neck seal into a mere inconvenience, saving you time, money and possibly some dives. The lower ring has to be fitted on the suit either by the manufacturer, or be retro-fitted the next time your suit goes in for repairs or seal replacements



Another SI Tech innovation is this boot connection system, which lets the diver quickly change boots, or go for another size, easily without alot of work. The suit will need a corresponding connector

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A visit to Ursuk

Where drysuits are manufactured

Andrey Bizyukin recently paid a visit to the Ursuk dry suit factory in Finland and had a look behind the scenes before trying out some of their products under demanding Finnish conditions.

Ursuk's managing director Marko Kallionpää deeply engaged in a discussion of the design of a new suit

Finnish company Ursuk Ltd has been manufacturing dry suits for 40 years. "Right from the beginning we have focused solely on dry suits, and do not produce protective suits at all," explains Marko Kallionpää, the managing director.

According to Kallionpää, there is an important distinction between floatation suits, diving suits, and survival suits. Floatation suits and wet suits let water inside the suit, which under cold conditions, quickly leads to decreasing body temperature. Therefore, the technical quality and protection these suits can offer is inadequate for demanding conditions and professional use.

As a manufacturer of waterproof suits, Ursuk Ltd.'s long history has given a whole new basis for product development. Once 100 percent waterproof items became more commonplace, Ursuk Ltd was able to move its focus from mere protection against cold water, to ergonomics and clothing. People dislike clothing that doesn't fit, and the same applies to dry suits.

Intensive product development has made vast improvements to survival suits. Not too many years ago, a dry suit was used only for special situations and emergencies, and the suits were quite uncomfortable, and among recreational divers, they were a rare and expensive luxury. By contrast, a modern dry suit can be worn constantly, as a part of normal

working clothing, thanks to breathing materials and other modern fabrics.

Rise to fame

Rising to a leading role as a manufacturer of survival and diving suits didn't happen by chance. Just 10-15 years ago, Ursuk Ltd had an image of manufacturing reliable but traditional products. When new product development was initiated in the 1990s, Ursuk Ltd could already offer a dry suit solution for any conceivable need.

But it was a breathing and waterproof survival suit that firmly established the company's position among professionals. The growing popularity of fast RIB boats in professional navigation led to an increasing popularity of survival suits, because to the professional navigators, a survival suit is an obvious solution.

When missions don't require working under the surface, a breathable but still fully waterproof survival suit is a more useful choice than a suit designed purely for diving. The breathable fabric of a survival suit also keeps the user dry from moisture coming from inside the suit, which is important during long working hours. Sea rescue officials, military and semi-military personnel working close to water, and flight crews working in variable conditions have become users of survival suits.

"In a test conducted by one of our customers, a basic model survival suit made out of Gore-

Tex was worn for 12 hours in field conditions (completely immersed in the water) where water temperature was +2°C, and there were no symptoms of hypothermia or lack of working order," Kallionpää clarifies. "Without a survival suit, he could probably have survived for only 30-60 minutes. So, in very extreme conditions, a survival suit is really helpful," he added.

Today, the line of survival suits covers about 20 different models in all sizes and various colours. Even though their standard suits have proved to be good, and they have been made in large production series, all customers have different needs and expectations. When these needs and expectations are to be met, suits are modified for each user group, because the demands can be very different—for example, a fighter pilot flying Mach 2, compared to a rescue officer in a storm at sea.

Commercial standards

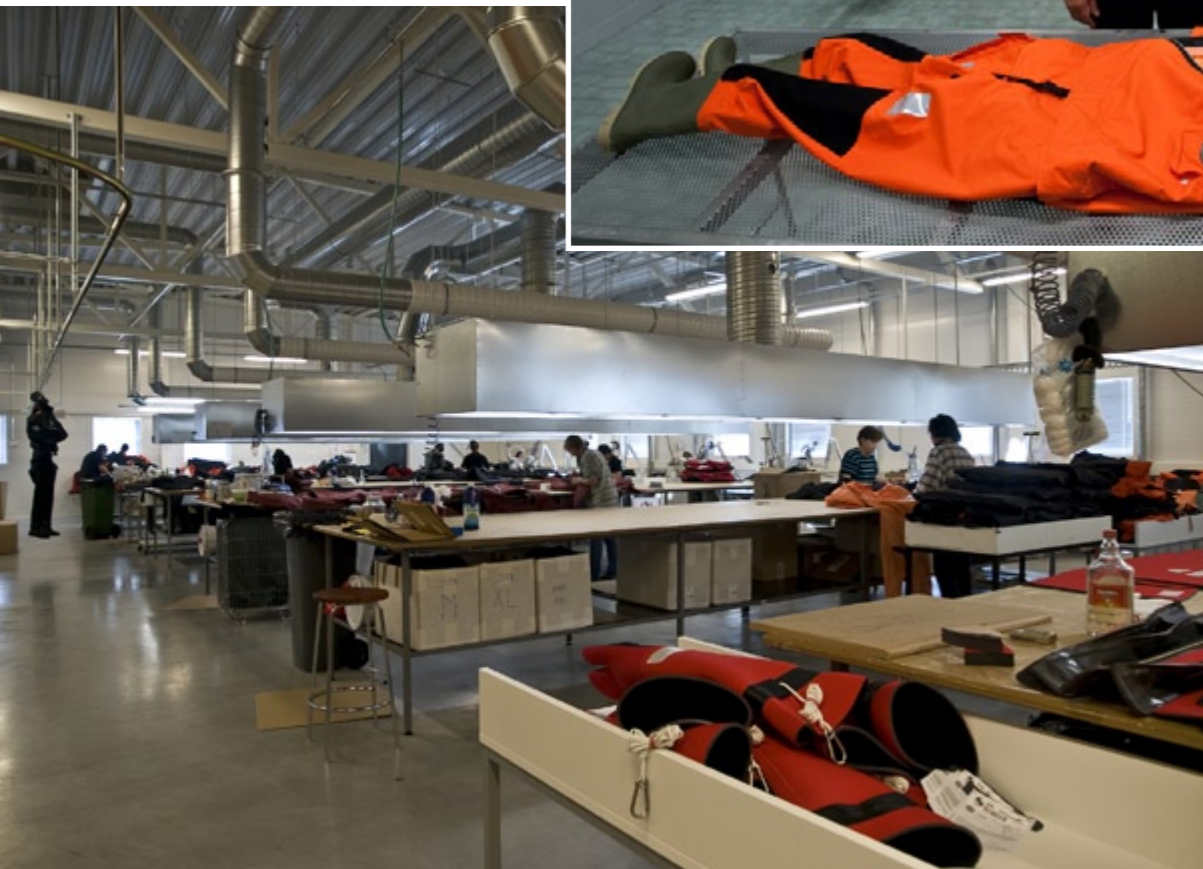
Ursuk Ltd then focused on developing drysuits for professional groups with special requirements such as police and special forces.

Their needs are quite very different from other professional groups due to the relatively high amount of work done above the surface. Ergonomic demands are also high due to the nature of difficult missions. The model range which was developed over many years in close collaboration with professional divers lends itself naturally to demanding sports diving.

Text and photos by Andrey Bizyukin, PhD
Edited by Peter Symes



Marko Kallionpää demonstrates how each Ursuk suit is individually tested before leaving the factory



Thousands square meters of manufacturing halls are filled with production lines for many kinds of dry suits. Ursuk is entirely a Nordic manufacturer

BELOW: The Ursuk factory headquarters



Andrey Bizyukin tries out the Heavy Light Cordura RedQ in the Finnish archipelago

Almost all production of diving suits takes into consideration different conditions and optional equipment and are therefore often tailored to meet customer needs said Kallionpää.

Ursuk currently produces seven models of dry suits for sport divers up to professional diving. All Ursuk dry suits comes with a fixed hood, which the company believe is a better solution, stating it is more comfortable and warmer under water.

According to Kallionpää, the volume of production in the manufacturing plant in Turku, located in the west coast of Finland, has been rising strongly in the past few years, which supports Ursuk Ltd's vision of customer satisfaction and success in product development. Before leaving the factory each suit is individually tested and provided with a factory warranty.

The proof is in the pudding —diving the suit

I went with the 'Heavy Light' drysuit model and Finnfill underwear for a few days of diving in the Finnish archipelago. The drysuit fabric was soft and had a pleasant feel to it. Even the standard size fit me very well, and it was flexible and allowed for freedom of movement in all directions, in part, thanks to the telescopic torso. The fixed hood was very comfortable and fitted perfectly due to good design. The front zip, which sits protected under another outer protective zip, was easily zipped without any assistance needed from a buddy. The heavy duty seals looked reassuringly reliable.

After a week of diving in the cool Finnish water, I was very pleased with the

suit. I never had a leak, I was never cold, and I never felt restricted in my movements. Both the boots and the fixed hood kept me perfectly warm at all times, perhaps not so surprising since all Ursuk suits

are made for diving in cold Scandinavian waters. I liked the bright red colour, too, which I think looks great oin photographs.



Ursuit diving dry suits can be divided into three major groups depending on the usage:

- Surface rescue and combat missions. The material and details of the suits are designed to ensure maximal operating ability. Surface rescue missions require visibility in dark and often rough sea conditions. This important factor has been witnessed in many operations, such as the Estonia rescue mission.
- Training missions, demanding great durability, for instance field practice, occupation exercises and heavy work diving. These work missions demand great durability together with ergonomic qualities. The material used are resistant to abrasive and sharp surfaces such as metal objects inside a wreck.
- Dirty and contaminated conditions. Different occupational groups must sometimes work in contaminated and/or very dirty conditions such as harbours, possible oil leak areas or during shipwrecks. This group has its own material and model range. ■