

The layering system

Much has been written about interactive layering systems, three layer systems and moisture management control. Whatever you might think about all the jargon, the actual principle is very sound and is essential if you are to make the most of your waterproof breathable clothing.

My first long sailing trip was at the age of nineteen delivering a 26 foot boat from Poole Harbour to Gibraltar, long before I had turned my mind to developing sailing clothing. My kit consisted of cotton t-shirts, an oiled wool sweater and some heavy PVC oilies. I can still remember the damp clammy feeling in the early hours of the morning as the clothing had absorbed moisture rather than wicked it away.

As illustrated earlier, cotton clothing absorbs moisture - anything up to 25% of its own weight in water. Damp air then transfers heat away from the body twenty times quicker than dry air. Sailing is a sport where you can be sitting still for long periods then along comes a sail change or requirement to put a reef in and all hell breaks loose for a few minutes. You then sit down again. If you are wearing cotton clothing next to the skin it will absorb the moisture and suck the heat out of your body leaving you feeling cold and clammy and tired.

However, if you are wearing a thermal underwear base layer it can physically wick the moisture away from the body (polyester absorbs less than 1% of its own weight in moisture), keeping you dry and warm even after a burst of activity.

This first layer or base layer is known as the **wicking layer** and its main purpose is to keep you dry next to the skin.

The second layer, often referred to as the mid-layer, is the **insulating layer**. This is the buffer between the warm skin and the cold air outside. It is important that this layer is highly breathable and any moisture can continue its journey into the great outdoors. This middle layer is key and can be illustrated by a recent example. The crew of illbruck were using foul weather gear made from some of the most breathable fabric available at between 75% - 80%. In the few days before arriving in Cape Town (where the conditions are particularly

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1
LAYER 1
Base or wicking layer



2
LAYER 2
Mid or insulating layer



3
LAYER 3
Weather protection

wet and humid), they believed their foul weather gear might not be breathing as it should and asked us to perform some checks on the gear. We put the garments on the waterproof pressure tester and everything was fine; we sent some of the fabric out for independent breathability tests and there were no problems. A lot of head scratching later our technical came up with the probable solution. On their usual thorough belts and braces approach, illbruck had selected the mid-layer to be totally waterproof with taped seams as opposed to our normal micro fibre which was highly breathable but only lightly water-resistant.

Our technicians did a calculation which showed that from a highly breathable outer fabric at 80%, each layer underneath would reduce the amount of breathability. If you assume a waterproof mid-layer and the inevitable overlaps around the middle caused by chest high trousers the actual end % is nearer 15 to 20% . In an area of particularly high humidity this can lead you to believe the gear isn't breathing properly.

The outer layer is where the real protection against the elements takes place and it must be completely water and windproof. In order to work most efficiently, the fabric will be breathable and it will let the moist air escape that's built up inside the garment. We recognise that not all waterproof clothing is breathable and on a non-breathable fabric the moisture can condense on the inside of the garment and run down the inside between the outer shell and the lining. Not ideal but considerably better when worn with the layering system. The real key is to get as much moisture away from the body as possible.

The important things to remember are

- 1) Never wear cotton, particularly next to the skin.
- 2) The base layer is the wicking layer
- 3) The mid layer is insulating and should be adjusted accordingly
- 4) The outer layer is the weather protection layer.