



In a matter of weeks, the 2000 Olympics will have ended, the gold medals decided and the circus moved out of town, ready to reappear in four years time. In all probability, the public will have forgotten the names of the winners in the Olympic pool but many will know which brand of swimwear swam off with the honours.

Cutting through the water

The Olympic swimming trials held in the United Kingdom were of great interest to the textile community. There had been so much leaked and written about the newest shapes and silhouettes. To the casual observer, however, what came across was the sheer diversity of styles - shorts, half body suits, full body suits, total body suits. What came across, too, was that the old maxim 'no new thing under the sun' still had a ring of truth, even though that proverb had first appeared over 5,000 years ago. For those with a sense of history, the newest racesuits all had their origins in the Olympics of nearly a century earlier, when male swimmers made their appearance in, yes, full bodysuits back in 1896. And very avant garde they were then. It almost seemed, too, as if the designers of the day had paged through back copies of Punch

magazine. Cartoons published in 1847 show ladies bathing in one piece outfits (admittedly away from any viewers), while an 1891 drawing shows an elegant lady stepping out from a bathing machine.

So, if the style is barely different, what has made the difference. The fit, the cut and the fabrics are clearly high-tech. But, before reviewing what has been catching our attention, have the newest offerings made any difference. The trials clearly showed that the new styles and fabrications could not win a place at the Olympics and as many 'old' style designs won through as 'new', that it did not depend on whether it was a full bodysuit or half a bodysuit, with arms or without arms. The reason was surely that the individual swimmers were not sufficiently close in their best times for the suit to make a difference.

Speedo Fastskin Wetsuit.

One can therefore theorise that only in the finals will the design of the suit and structure of the fabric provide an advantage. If the eight swimmers in a final race are only separated by fractions of a second, then the difference between winning a medal and not, a result measured in 100ths of a second, could be the design of the swimsuit. (Wouldn't it be a textile writer's dream line-up in a final: three medal winners, in three different bodysuits, with each swimmer only separated by one one-hundredth of a second?)

The big names will all be in the pool, including Speedo with its Fastskin racesuit, adidas with its Equipment full bodysuit, and Arena with its Powerskin suit as well as Tyr with its Aquapel suit. The ultimate test is upon them all, whether the concepts of hydrophobic fibres and fabric mixtures, structures, constructions and shapes will provide the winning edge.

Adidas has developed its Olympic products based on the concept of energy maintenance, a way of looking at sports and sports equipment that enables the company to develop products designed to enhance athletes' performance. The idea is this: Energy is used in all athletic movements, whether it be a swimmer or a sprinter covering 100 meters as fast as possible or a fencer lunging to hit the mark. And each of these movements has inherent traits that mean a detrimental loss of energy. And while some of these losses are unavoidable, products developed with the Energy Maintenance philosophy minimise the dissipation of energy, leading to better performance.

"We cannot make an athlete perform above his or her potential," notes Ciro Fusco, a member of the adidas Innovation Team responsible for developing the new products. "Take a male sprinter who runs 10 seconds flat for 100 meters. He is using all of his effort to achieve this. But of all the energy his body generates, let's say that five percent is lost due to various inefficiencies of movement, meaning he is running at only 95 percent efficiency. If, through developing a product that better maintains the energy he uses, we cut this to a three percent loss, then we see a two percent gain in performance. This might mean he then runs 9.98 seconds and that could be the difference between a medal in the Olympics or nothing at all."

By examining six sports, including swimming, the motions involved and the athletes' needs, adidas has made advancements that should help athletes minimise energy loss and maximise performance in Sydney.

It won't be for lack of testing if performance is not improved. In swimming, one of the main tests was conducted in Sydney. The experiment involved an ideal mathematical model for each swimmer, including top Australian swimmer Ian Thorpe. The athlete wore various suits, including a competitor's model, and the performance in each suit was compared against the mathematical ideal. Measurements were taken

for starts, turns and swimming speed. Besides gauging speeds at various points using timers, the study measured stroke length, frequency and hand speed relative to horizontal stroke speed. This was accomplished with the help of two cameras (one underwater and one overhead) and strategically placed timing gates. By using the timing devices and the cameras, performance was shown to be more closely correlated with efficiency of movement than laminar flow (hydrodynamics).

It was back in July 1998 that adidas made history when it announced the launch of its revolutionary Equipment Full Bodysuit. The claim was that it provided swimmers with a product that helps them fulfil their potential, be it a personal best or even a world record. Since then it has been fine-tuned to address the needs of today's top swimmers.

Based on the energy maintenance concept, adidas has developed a series of suits that caters for swimmers in three disciplines: freestyle (full bodysuit, full-length arms and legs), breaststroke (bodysuit with half-length arms and legs and cut to accommodate for the specific movements of the stroke) and backstroke (bodysuit with half-length arms and full-length legs along with a cut that allows for freedom of movement during the stroke).

The new Equipment Full Bodysuit is seen as the ultimate in performance swimwear while offering the swimmer maximum comfort and fit, as well as the benefits of compression. The suit is anatomically shaped to follow the natural contours of the human body, meaning compression can be applied in different degrees in different areas (this is known as gradient compression). Certainly the body suit fits like a second skin, reducing water penetration and chafing. Teflon coating is used to speed up drying time, being intrinsically water repellent.

The compression enhances proprioception, the body's ability to sense changes in position. Because the skin's pressure receptors are stimulated when covered, awareness, sharpness and accuracy of movement are improved, meaning more efficient strokes. While swimming, the body experiences muscle vibration, particularly in the thigh and upper arm region, which is a loss of energy. Compressing the muscles, using Lycra Power fabric, reduces the amount that they oscillate. Engineered compression improves accuracy and reduces fatigue, resulting in better performance.



Ian Thorpe wears Adidas.

*Maru Extreme.*

Aquapel has been targeted quite specifically too at elite swimmers, combining high velocity, compression biomechanics and turbulence control. The TYR swimsuit will make its first appearance at the Olympics. The manufacturer claims that high velocity is achieved through a series of treatment given to the fabric. Powerful rollers thin and lighten the DuPont Lycra T-152 blend, while retaining its strength, density and recovery properties. It is then 'seared with a thermal heat application' to give a silky smooth, flattened finish. Aquapel is then treated with a water repellent, hydrophobic finish. Together these treatments are designed to reduce drag whilst improving hydrodynamic efficiency and glide time.

The suit uses compression dynamics to give a tight and uniform fit. The fabric has high-density power and 'memory' technology to hold in body mass, quieting muscle vibration and thus reducing fatigue. By preventing or minimising the swimmer's skin and the fabric from undulating during motion, it creates a consistently smooth surface, which is said to dramatically improve fluid dynamics.

A complex system of panelling, seaming and channelling in the construction provides turbulence control. Bisecting hydrodynamic flow panels at the most 'turbulent' areas of the body - the chest and rear - create a buffer zone between the body and water, improving glide efficiency. The panels channel water away from the body, again resulting in a substantial reduction in drag. Compared with some fabrics, drag is reduced by 6%. It might not sound much but, remember, one hundredth of a second could be decisive.

Not all the new swimsuits are necessarily aimed at getting the swimmer into an Olympic final. A great deal of investment has been made in swimsuits designed more for training and developing performance than actual competition, where the life of the swimsuit may be quite short by comparison. Maru for instance has introduced its Extreme swimsuit using Meryl microfibre and Lycra, a fabric designed for in-pool performance as well as easy use and care. Claimed to fit like a second skin, it has less water resistance than skin and the fabric combines all the attributes of lightness, smoothness, high strength and support without constriction. It also enjoys high air permeability (drying faster) and higher chlorine resistance, maintaining its strength and durability for some 25% longer than traditional nylon elastane.

Beware of sharks

When Speedo set about developing its swimsuits, it was already building on the success it had achieved at the last Olympics. In this instance, however, it began by looking at creatures thoroughly at home in water, capable of fast speeds but not naturally hydrodynamic in order to find a design worth copying. It came up with the shark, with its highly developed skin to minimise drag.

The Fastskin fabric has a surface print effect which resembles the denticle shape of the shark's scales, which in turn resemble tiny hydrofoils/spoilers with v-shaped ridges. Large vortices are formed by the fabric print and they flow in the opposing direction to the small vortices formed in the fabric ridges. This ensures that the water is sucked closer to the body which reduces friction drag by allowing surrounding water to pass over more effectively.

The fabric also contains a higher content of elastane than traditional swimwear fabric, providing greater stretch, improved shape retention and fit. Muscle fatigue is taken care of by compression generated by the fabric.

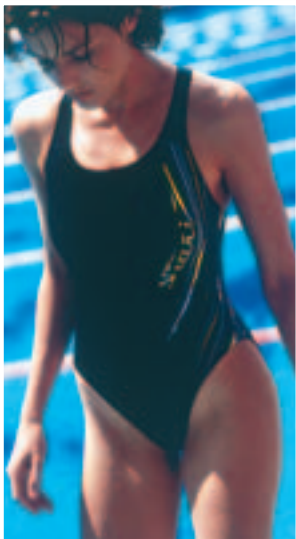
It appears that all the major manufacturers have been following similar lines of development but Speedo has also concentrated heavily on the method of construction. In fact, it is the cut, seaming and stitching which will make its suit

*Olympic swimmer
Martina Moravcova
wearing TYR Female Full
Body Aquapel Suit.*





Above: Speedo Fastskin Triathlon race suit. Equally at home on land or in the water.



Left: The Cardio Powerback Placement suit in Speedo's Endurance fabric.

easily identifiable on the edge of the pool and on the podium - any arguments among the Olympic authorities on the wearing and display of logos will be academic; disputes about sponsored teams and sponsored swimmers causing clashes of brand loyalty will be of similar interest.

Speedo, too, has been undertaking a revolutionary body scanning process to determine top swimmers' measurements. While swimsuit patterns are normally flat and not three-dimensional, Speedo has created a 3D-garment cut to the shape of the elite swimmer. The cut emphasises good body position in the water and reduced form drag of the swimmer.

Through combination panels and unique seaming, the anatomic swimsuit pattern reflects the muscular system and increases coordination of muscles to allow motion to occur more efficiently. Seams act like tendons and provide tension in the suit. The number of stitches is much higher in Fastskin seams than other swimwear, says the company. It has 26 stitches per each 3 cms of seaming and uses 52 cm of thread per 1 cm sewn. The direction of the seams is designed to follow the direction of the water flow over the body. Speedo research has also highlighted another aspect of top competition swimming. Athletes concerns focus upon a loss of the 'feel of the water' along the inner forearm. Apparently most swimmers do not shave this area of the body in order to retain the required feel. The full body Fastskin suit takes this into account, incorporating a high drag, gripper fabric along the inner forearm which mimics skin and replaces the sensory requirements of the swimmer.

If some of the sports governing personalities have their way, all this research could yet be consigned to the Olympic dustbin or trash can by 2004: concerns have already been expressed about swimmers being provided with unfair advantages, with the full bodysuit even acting as a buoyancy aid. 

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