

MAGIC MARINE

HIGH QUALITY MATERIALS AND SMART SAIL CLOTHING

Sailors need clothes that not only protect, but also contributes to performance. Along with Magic Marine, students and staff of the TU Delft design projects on innovative clothing where modern, high-quality materials are used in smart clothes. To learn more about the interaction between clothing and the sailor, test setups were made. For example, for an understanding of the distribution of pressure on the legs while hanging and the measurement of the air resistance of different types of weather gear.

Magic Marine has been providing innovative, performance-based sailing clothing to top sailors since 1989. The brand is constantly looking to improve its high-tech sailing gear even further, so when they were approached by InnoSportLab Sailing to participate in a project aimed at

developing next-generation Olympic sailing gear, Magic Marine were happy came aboard. Sales manager Linda Bomhof looks back on the three-year project.

"We are a partner in InnoSportLab, and we were pulled to see if we would be able to take projects to the commercial side. The idea was to produce new Olympic sailing clothing for the Dutch team. We had a number of TU Delft students here working on this." The students embarked on several projects aimed at different aspects of sailing. "Sailing is a very diverse sport; all classes of boats are different and that makes for different necessities in terms of gear," explains Bomhof. "That was the first question mark: how can we focus better on each particular type of boat? 1

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Another aspect is that when you sail, half the race might be extremely hot and the other half very cold. So one of the questions was: are there any techniques or smart fabrics to bridge that gap?" Other projects focussed on the design of a lightweight buoyance aid, and a leg support for hiking.

Aerodynamics

Some fundamental questions were addressed too, on aerodynamics for example. The assumption was that a reduction in the drag caused by the sailing clothing will increase the speed of the boat. An idea that was inspired by the results of earlier research on clothing for ice-skaters. To verify the assumption, TU Delft arranged wind tunnel testing, which had some surprising outcomes. "We found out that the

faster the boat is, the more the clothing influences the performance. But the differences were so minuscule that we were able to say, don't worry about it." "They did find out though, that the way the sailors hold their body does make a lot of difference, so that was an unexpected result." This is especially important in hiking, where the sailor's body leans over the edge of the boat.

Comfort

Comfort is the most important factor when it comes to clothing, believes Bomhof. "Sailors should not feel, or be affected by their clothing. At the same time, it should prove the warmth or cooling that is needed at that particular moment." So you need clothing that is adaptable." Scientifically speaking, this is all about thermodynamics, where heat is generated by the body exercising and then exchanged with the environment. This influences sailors' thermal comfort as well as performance. Smart clothing design and materials may be the answer. As part of the project an intricate simulation model was developed that can be used to evaluate the effect of a sailing suit and suit designs on the body's thermal balance during a race. "We found one smart material that will

close its weave when it gets wet, so it is more breathable than anything else there is on the market." So far, the sourcing of such a material has proved difficult, but that doesn't faze Bomhof: "A lot of knowledge has been built over the past few years. Even if nothing has been commercialized yet, the goal is to do so in the future."

Closest to realisation are the assignments that were aimed at specific products from the start, i.e. the buoyancy aid and the hiking pads. "We looked into designs for a more streamlined life jacket. The problem is that the CE rules by which you have to abide, are very strict. That is why buoyancy aids are so bulky and heavy. We came up with some promising new ideas and we now have some prototypes. However, the arduous certification process means that these have not hit the shelves yet.

Certification plays no part in the design of hiking pads, so this is the project closest to fruition. Hiking puts pressure on the thigh; to counteract this pads are worn around the leg to protect it from the boat. "The old-school solution is to have fibreglass pads underneath the leg, but new materials and technologies such as laser cutting

make for stronger and less invasive products." To help sailors choose what they should wear on a given day, an app was conceived that combines information on water temperatures, windspeeds, scientific qualities of the fabrics, and so on. "According to what boat you are sailing, it will show you what to wear", says Bomhof. "The app centres on an incredibly complicated algorithm. As a commercial company we would never have had the time to spend on that." This was the main benefit for Magic Marine. "Our in-house design team does not have the time to go into projects at such a deep level. These students could really go into the mechanics and other aspects. This way, we built up a lot of new insights and knowledge that we can now make further use of."

Bomhof enjoyed working with the students, and was impressed with their knowledge on research and design. She also had a good rapport with her counterpart at TU Delft, Dr.ir. Arjen Jansen of the Faculty of Industrial Design Engineering, who was in charge of the project. Arjen Jansen ensured that the projects were interesting on a commercial level, so that there was the feasibility of an actual product. Four TU Delft MSc students have graduated on their research at Magic Marine.

Partners

Magic Marine, Sailing Innovation Centre The Hague

TU Delft scientific expertise

Dr.ir. Arjen Jansen and graduate students, Faculty of Industrial Design Engineering

More information

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