

EU project designs novel support stockings that are both 'loose and tight'

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An EU-funded project has designed and modelled a support stocking for varicose vein sufferers that significantly improves upon what is currently available.

The research has already led to patent applications, and the stockings should be on the market by early 2008.

Varicose veins are one of the most prevalent chronic conditions in Europe. This makes it all the more surprising that little has been done to ease symptoms since the invention of compression hosiery in 1947.

Varicose veins occur when veins become enlarged and twisted. The term commonly refers to the veins on the leg, although varicose veins can occur elsewhere.

Veins have leaflet valves to prevent blood from flowing backwards. When veins become enlarged, the leaflets of the valves no longer meet properly, and the valves no longer work. The blood collects in the veins and they enlarge.

Support stockings have been effective to an extent in preventing the worsening of varicose veins, but they are not without problems. The main wearers - the elderly - have difficulty putting on the stockings: the garment must be very narrow in order to provide genuine support, but must be pulled over the foot, which is wider than the lower shin and ankle area.

The team from the LOOSEANDTIGHT project, funded under the Sixth Framework Programme (FP6), looked at the problem from a new angle. Instead of using textiles themselves to maintain the constant pressure levels necessary in compression hosiery, the researchers experimented with putting superelastic alloys within the textile structure. The experiment paid off.

The team found inserting superelastic wires bent into a certain shape into the stocking meant that it could be stretched, and then return to its original shape.

The particular shape into which the wires must be bent has presented its own problems, but the LOOSEANDTIGHT team has already come up with solutions.

CORDIS News spoke to project coordinator Dante Galli from Italian engineering

company D'Appolonia. He explained that making the wire into a snake shape at such small dimensions, putting a covering around the wire and then inserting it into the textile had all presented challenges.

The wire would normally be manufactured in lengths of between 2,000 and 5,000 metres. The industrialisation of the process to manufacture the wire in such a shape and such a length was the first hurdle. Two other research partners in the project, Grado Zero Espace and the Institute of Physics at the University of Prague, worked on the manufacturing process both at laboratory scale and at industrial scale. They came up with several different ways of manufacturing the wire, and the methods have had good results at the prototyping level.

Next, project partner Grado Zero Espace succeeded in manufacturing several samples of Nitinol 'snake' wire, of up to 2,000 metres in length. This ensured the industrial validation of the approach.

'That was a great result,' said Mr Galli.

Once the wire had been manufactured, it could not be inserted uncovered into the hosiery. But putting a covering on a wire that has been bent into a snake shape is not practical.

The answer, as Mr Galli explained, was found to be heat treatment. The team found that, by using a special shape setting method, it was possible to obtain the required snake configuration, and then to temporarily straighten it. The straight wires can thus have their covering put in place before being inserted into the stocking using a knitting machine. As the force is released, the wires return to their snake shape, giving the stockings the flexibility that is needed

'We are exploiting the superelasticity of the wire,' said Mr Galli. He added that this unique process could also have other applications, in situations where controlled extensibility is required, for example in technical sports clothes.

The final garment is also lighter than traditional support stockings - sufferers are currently wearing quite heavy hosiery that is uncomfortable in warm weather.

Knitting trials have already been performed by project partner TEA srl. Different combinations of textile fibres were mixed with both superelastic Nitinol 'naked' wires and Nitinol wires covered with complementary wires. The result? 'Very good aesthetic and comfort results, the proof of feasibility in terms of workability of the materials with standard circular knitting machines have been achieved,' according to Mr Galli.

Mr Galli speaks very positively about the project. The team comprised nine partners, six of whom were small- or medium-sized enterprises (SMEs). While it can sometimes be difficult to bring SMEs fully into the fold of a collaborative project, all partners in LOOSEANDTIGHT were very committed, and very involved. Mr Galli made sure that this would be the case by checking that all partners agreed on the direction of the project so that they would not lose interest.

The project team is currently testing the process to cover the wires, and intends to patent the method if successful. The heat treatment process is also the subject of a patent application, as is the mathematical model that can calculate what the compression level will be when details of the material used are provided. In the coming months, the LOOSEANDTIGHT team is also planning to extend their patents to the rest of Europe, Japan and China.

As if this were not reason enough for optimism, Mr Galli is also confident that prototypes will be in place by the end of the year, and that the product will then be on the market by early next year.

Before that time the model must be checked against standards, but the project

coordinator is confident. The team already knows, for example, that a wearer cannot feel the metal when he or she is wearing the stockings.

The team is hoping to receive a project extension until the end of 2007 to cover the final test.

For further information, please visit:

<http://www.dappolonia-research.com/loose&tight/>

<http://www.newsfood.com/Articolo/International/20070904-EU-project-designs-novel-support-sockings-loose-tight.asp>