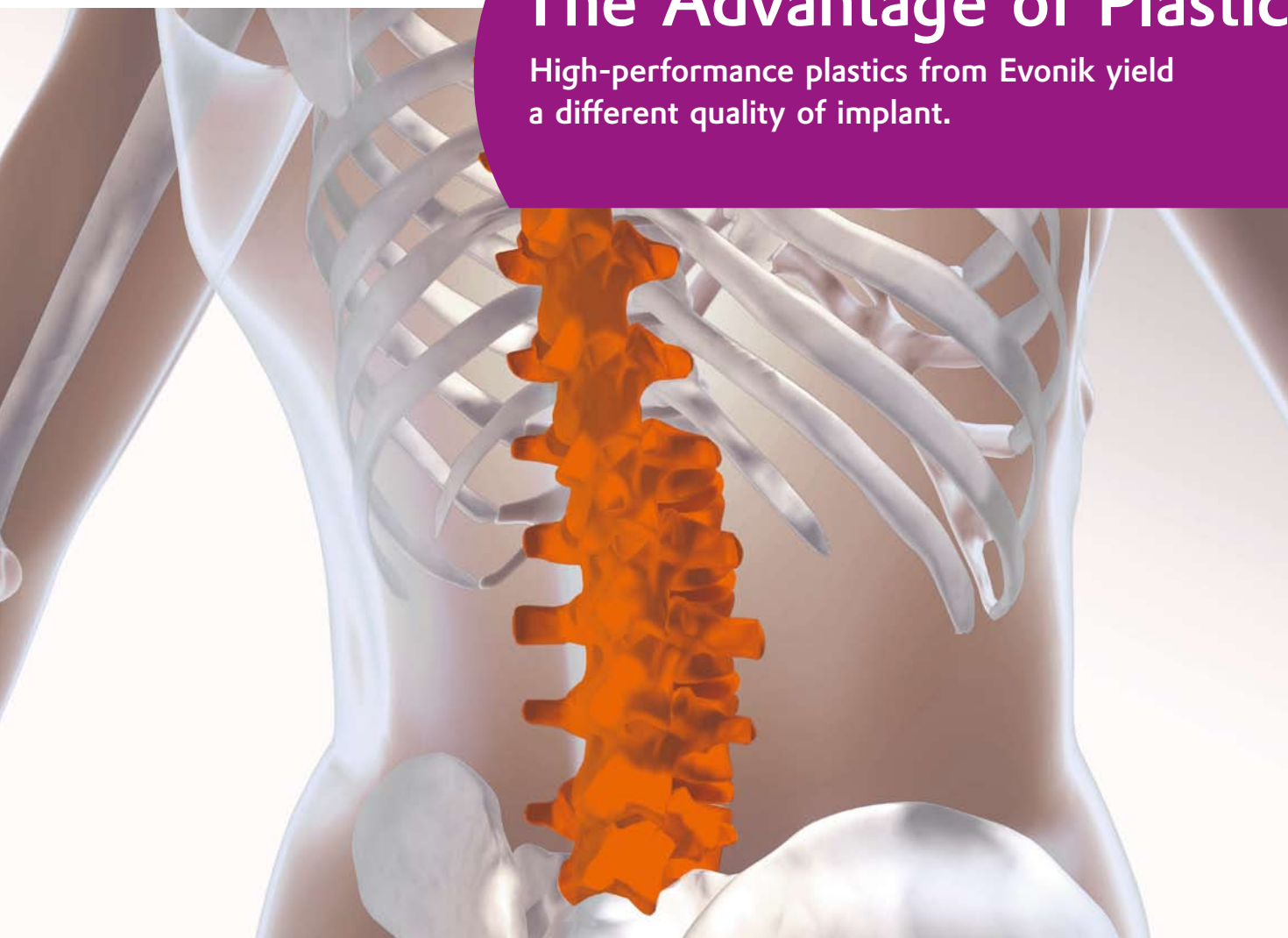


The Advantage of Plastic

High-performance plastics from Evonik yield a different quality of implant.



Implants for the human body place heavy demands on the material used. For a long time, the materials favored for the purpose were the metals titanium and cobalt-chromium. But now high-performance plastics are gaining ground.

Evonik Industries AG
Rellinghauser Straße 1–11
45128 Essen
Germany

Contact
Alexandra Boy
PHONE +49 201 177-3167
FAX +49 201 177-3030
alexandra.boy@evonik.com

Ruben Thiel
PHONE +49 201 177-4299
FAX +49 201 177-3030
ruben.thiel@evonik.com

Text and images available to download at
www.evonik.com
May be reproduced free of charge, provided
source is stated

When neither back exercises, nor massage, nor drugs could help her anymore, Wilma Wirbel decided reluctantly to speak to her orthopedist about a surgical solution. For a long time she had been suffering from a slipped disk in the neck region, which considerably restricted her movement and caused severe pain. Now a millimeter-sized piece of plastic sits between two of her cervical vertebrae.

Plastic you say? "For a long time, metal implants were the number one choice, but the high-performance plastic polyetheretherketone (VESTAKEEP PEEK) has now become a serious competitor," says Marc Knebel, Evonik expert for medical applications of plastics. Implants must, after all, be well tolerated and last a lifetime, which is why titanium and cobalt-chromium have so far been the materials of choice. But newly developed plastics also offer these properties—and other advantages besides. It has not really been possible so far to perform surgery with the aid of computer tomography or magnetic resonance imaging, or to monitor the healing process and check the result. "Metals, because of their density, are opaque to x-rays. This gets in the way of a complete and reliable analysis of the image. High-performance plastics, on the other hand, are x-ray transparent and therefore invisible, allowing good monitoring of bone growth and the healing process," explains Knebel.



A polyetheretherketone (VESTAKEEP PEEK) sample is checked in the laboratory before being dissolved and analyzed.



Another disadvantage of metals is their high rigidity, which is significantly above that of bone material. This means that the implant takes a large part of the mechanical load, while the bone is shielded from stress. This stress-shielding effect can have wide-ranging consequences: Because bones need mechanical stress both to regenerate themselves in the healing process and to retain their strength over the long term, healing can be protracted and the bone that is shielded from stress may even degenerate in the course of the years. High-performance plastics, by contrast, have higher elasticity, lying in the range of that of bone material. For Wilma Wirbel this means that the load on her cervical vertebrae is not entirely relieved by the implant and so the vertebrae will retain their strength over many years.

“Because of their x-ray transparency and elasticity, high-performance plastics have established themselves over the last few years as the most significant option to metallic implant materials,” adds Knebel. The relatively new high-performance plastics have been on the market only since the early 1980s and are used whenever components must stand up to a tough environment.

In addition to VESTAKEEP PEEK’s mechanical properties and x-ray transparency, its excellent sterilizability and biocompatibility are major advantages in medical applications, for example, in spinal implants, orthopedic implants, dental implants, and trauma surgery, in which fractures are set or bone fragments replaced. Biocompatibility is the crucial factor determining the basic suitability of a material for implants; the material must not be cytotoxic, mutagenic, or carcinogenic, and must have no allergenic properties. Evonik has commissioned an independent testing institute to carry out extensive investigations to confirm the biocompatibility of its high-performance polymers. “Because back pain is now by far the most common disorder, we expect that the market for implants will continue to grow, also as a result of increasing life expectancy,” says Knebel. And Wilma Wirbel is one satisfied customer: She can at last move her neck again without pain.



For the purpose of quality control testing, VESTAKEEP PEEK is broken down with concentrated nitric acid for further investigation.

*VESTAKEEP® is a registered trademark of Evonik Industries AG or its subsidiaries.
It is presented in capital letters throughout this text.*