

Virtual Quality Assurance in the Digital Orthopaedic Workshop of the Future — Mecuris

"In orthopaedics, performing evaluations on test stands or human users is time-consuming and involves high costs. Only a limited number of designs can be manufactured and tested. Virtual test stands using Ansys Mechanical and Ansys optiSLang not only enable engineers to test a large set of design variants for medical certification, but also allow them to create a functional product from the first virtual design until the patient fitting of the final product. With this knowledge, we can treat each customer individually with optimized product performance and safety as well as personal aesthetic preferences."

Franziska Glas

Quality Assurance Expert Lead (Simulation & Testing) / Mecuris GmbH / Munich, Germany

Human biomechanics vary by individual; the interaction between a wearer and the orthopaedic device is crucial to overcome any limitation. At Mecuris, we aim to supply each patient with an individually customized product whose quality is assured by simulation based on performance and safety evaluation. The emerging field of virtual medical certification requires accurate and reliable FE-simulations in order to speed up the regulatory approval process of individualized prostheses and orthoses.

/ Company Description

Mecuris develops, together with the certified prosthetist orthotist (CPO) and the wearer, tailor-made orthoses and prostheses. Using the Mecuris Solution Platform, these can be easily and intuitively adapted to the patient's specific needs and design wishes. Mecuris' individual orthoses and prostheses enrich wearers' lives thanks to digitalization and 3D printing.

/ Technology Used

- Ansys Mechanical
- Ansys optiSLang

/ Engineering Solution

Ansys simulation models of Mecuris' medical devices can predict mechanical responses of a complex deformable structure by applying known boundary conditions representing human motion or ISO standards, considering the safety and performance parameters of the product. A design study with many geometric variants can yield meta-models characterizing a large number of possible designs, which helps to investigate the sensitivity of geometric or material parameters. While the worst-case design is tested for certification on the physical test stand, the patient-specific best design variant can quickly be found by individualized optimization tasks with safety and performance objectives.

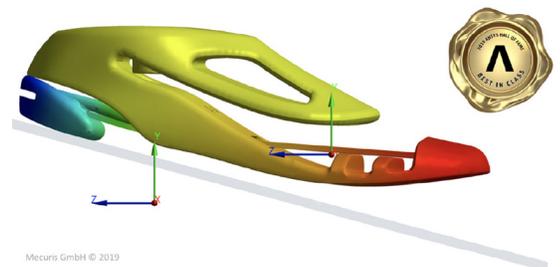
/ Benefits

The simulation tools obtained through the Ansys Startup Program helped us to continuously speed up and adapt product development tools to meet varying wearers' requirements and high safety standards. We were able to significantly reduce the testing costs by avoiding a large number of prototypes, building test stands or renting testing facilities. In a digital orthopaedic workshop, Mecuris supports the certified prosthetist orthotist (CPO) in digital, individualized product design and in manufacturing by 3D printing. For the first time, this process chain includes geometry pre-checks through the simulation of safety and performance parameters.



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FirStep — this 3D-printed children's prosthetic foot includes both aesthetic product design and a fully functional geometry based on finite element analysis using Ansys Mechanical.



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This virtual test stand can characterize the performance of a prosthetic foot during human walking. The Ansys Mechanical and Ansys optiSLang models enable Mecuris to develop a functional product from an early design phase through to manufacturing and patient fitting.

ANSYS, Inc.
Southpointe
2600 Ansys Drive
Canonsburg, PA 15317
U.S.A.
724.746.3304
ansysinfo@ansys.com

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