

Femap · NX Nastran

Ruhrpumpen

FEA combats high material prices and ensures leak-free pumps

Industry or product

Machinery

Business initiatives

New product development

Business challenges

Improve the design of pressure bearing components

Lower costs

Reduce rework

Keys to success

Precise finite element models

Preprocessor support for contact surface problems

Material database expanded to include proprietary information

Clear presentations of analysis results

Results

FEA results and physical prototypes concur

Leaking problems are identified and counter-measures are initiated early

Material savings of up to 20 percent are possible

The Femap and NX Nastran solutions lower costs by identifying excess material and boost quality by accurately predicting leaks

Specialists in pumping technology

Ruhrpumpen GmbH provides centrifugal pumps for water management, for the oil industry (onshore and offshore sectors) and for ship and dock building. The company was founded more than 50 years ago and is now part of Corporacion EG, of Monterrey, Mexico.

Ruhrpumpen's product line is divided into several series covering many installation sizes, with pumping capacities ranging from a few cubic meters to more than 26,000 cubic meters per hour. Specially trained, highly qualified employees design and manufacture the pumps. Ruhrpumpen currently employs approximately 400 people worldwide, 200 of whom work in Witten, Germany.

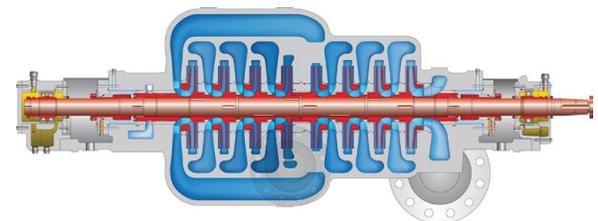
Advanced design process includes FEA

Ruhrpumpen uses advanced 3D CAD technology in the development of its products. To boost the effectiveness of the design process, especially in regard to pressure-bearing components, the company introduced the NX™ Nastran® and Femap™ finite element analysis (FEA) solutions from Siemens PLM Software.

This system was chosen over other FEA options because it supports adaptive meshing and can model and analyze contact surface problems. Ruhrpumpen also put to good use the expandability of the material database.

Analysis reveals potential material savings

Femap and NX Nastran are currently being used to analyze the casings of multi-stage centrifugal pumps. These casings are axially divided and are braced with bolts. Three important points must be considered for the calculation: 1) What surface



Solutions/Services

Femap
siemens.com/plm/femap
NX Nastran
siemens.com/nx

Customer's primary business

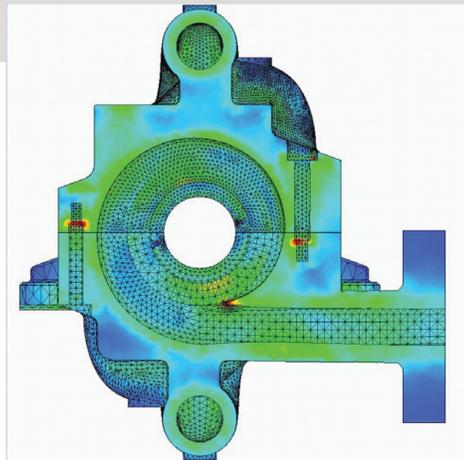
Ruhrpumpen GmbH manufactures a wide range of pumps used for diverse applications.
www.ruhrpumpen.com

Customer location

Witten, North-Rhine/Westphalia
Germany

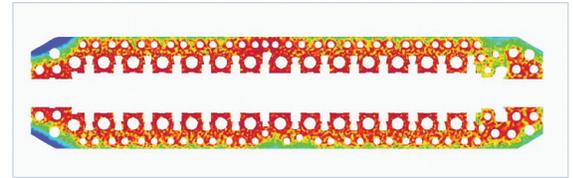
"An important consideration in our selection of Femap was the fact it can handle contact surface problems."

Dirk Koep
Designer
Ruhrpumpen



pressure is generated in the casing due to prestressing? 2) How does the surface pressure change if the operating pressure or the test pressure is applied? Can the sealing still be guaranteed? and 3) How does the structure (bolt and casing) behave under the pressure of the liquid?

To answer these questions, CAD models are converted to the Parasolid® format and imported into Femap. Mesh generation and the input of calculation parameters takes place here as well. In this phase, it is particularly important that the contact surfaces between the casing and the seal can be precisely modeled. The actual calculation is executed with NX Nastran. Finally, the calculations are evaluated using the Femap postprocessor.



Even the first calculations showed that the virtual model and the practical results correlate very well. The simulation of bolt forces concurs with the specification to +/- three percent. Leaks occurred on the test rig precisely where they had been shown on the simulation. Furthermore, the analyses showed that material savings could be made for the pump casings. This is a big advantage considering current material prices. A savings potential of around 20 percent appears to be realistic.

Siemens Industry Software

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