

# TMPnews

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## TMP's Bare-shaft Division presents SCI8, its integrated compressor for applications up to 20 barg

TMP's Bare-shaft Division has extended the use of SCI8, its integrated solution, so as to work up to 20 barg. In fact, this kind of solution is particularly requested in drilling and naval applications.

Numerical analysis played a key part in validating the quality of the SCI8 design for the 20 barg operating pressure.

In fact, a stress analysis campaign was conducted in reference to two different loading conditions:

1. the maximum operating pressure (22 barg)
2. the hydrostatic test pressure, i.e. 1.5 times the maximum operating pressure (33 barg).

Furthermore, at the end of the campaign, an experimental hydrostatic test was performed at TMP's facilities in order to validate the numerical results.

The analysis was completed using the finite element methods (FEM) which results were illustrated by colored maps of deformations and stresses.

A contact analysis was also performed to evaluate the level of tightness between clamped components. It can be said that the SCI8 design guaranteed an elevated level of tightness and ensured that all the stresses generated by the two combinations of loads previously described had an adequate safety margin from material failure, according to the main International Standards indications.

The main parts considered in the FEM analysis were (Figure 1):

1. the external casing that constitutes a unique casting with rotor casing and oil separation/recovery tank;
2. the external cover from which the gas flows out at pressure discharge condition, separated from oil.

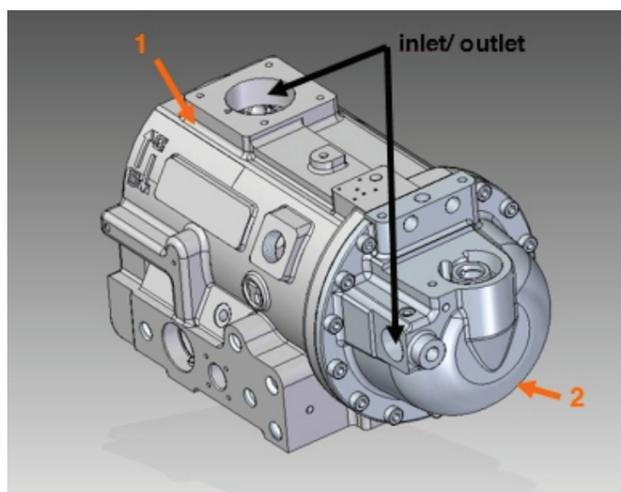


Figure 1 The analyzed components in the simplified model for FEM analysis.

In general, the machine is fixed to the ground during operative applications, therefore the numerical model simulated this boundary condi-

tion constraining all the translational degrees of freedom (DOFs) of the nodes of the fixing holes.

To perform such analysis, the CAD model was simplified by removing all the geometrical details that might have caused poor quality elements in the meshing dominium without increasing the accuracy in describing the stress gradients.

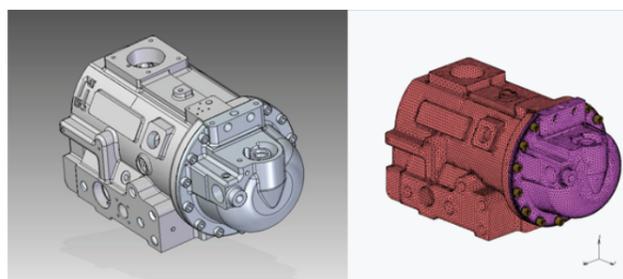


Figure 2 CAD and FEM model.

The mesh included both tri-dimensional elements (tetrahedral for casing and cover and hexahedral for nuts) and one-dimensional elements (for bolts); their transitions were described using multi-point constraints (MPC). Globally, the model had 1'025'037 elements (60 1D elements and 1'024'977 3D elements) and 1'511'328 nodes, meaning 4'545'618 DOFs.

Figure 3 and Figure 4 summarize stress conditions for both of the pressure conditions previously described; Von Mises stresses were plotted over a deformed model (the maps are in real scale); there were no critical zones where stresses could cause unacceptable safety factors.

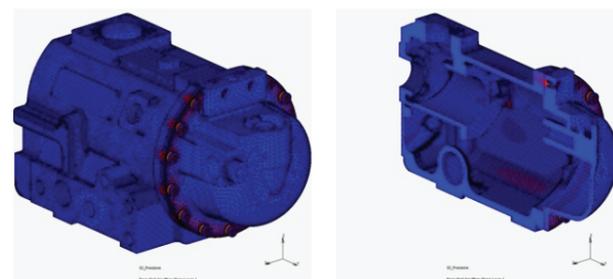


Figura 3 Von Mises Stress [MPa] a 22barg.

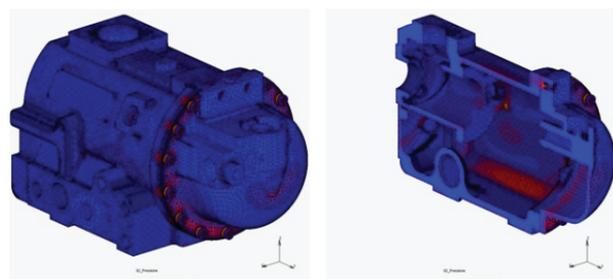


Figura 4 Von Mises Stress [MPa] a 33barg.

On the basis of the numerical results that confirmed the correct design of the component, the external casings and the cover of the SCI8 compressor were verified through a hydrostatic test where the maximum pressure of 33 barg was reached, following the main Standards (e.g., ASME VIII Division 1 paragraph UG 99 - Hydrostatic test, Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery, Directive 97/23/EC of the European Parliament and the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment).



Figure 5 Hydrostatic test pressure.

Such test showed a good accordance between the numerical analysis and experimental test: SCI8 was able to withstand the test pressure without any evidence of damage or deformation that could affect the proper operation of the component; furthermore, the sealing between flanges was guaranteed as an accurate visual inspection revealed no signs of leakage.

We can therefore conclude that the experimental test confirmed the numerical analysis results, i.e. the SCI8 is adequate for the boundary conditions required for drilling and naval applications it was designed for.

## TMP Service Division wins a contract for the nuclear sector

In December 2016, the Service Division of Termomeccanica Pompe won a contract worth over 5 million euros for the supply of 5 pull out vertical pumps with impeller blade pitch control (TMP model 156 C1PPARS 95) for the Yuzhnoukrainsk nuclear power plant in Ukraine.

The customer is the state-owned Nuclear Energy Company, the National Energy Generating Company "Energoatom".

These pumps will suck the water of the Yuzhnoukrainsk lake and send it into large tanks to allow, by means of sprayers, a better efficiency of the plant that draws from the same basin for its cooling system.

The pumps will work at variable flow rates ranging from 49320 m<sup>3</sup>/h to 50400 m<sup>3</sup>/h and with heads ranging from 24.8m to 17.7m. The variation between these two working conditions will be effected by the actuation of a control system of the impeller blades mounted on the pumps and operated by a control panel.

The pumps use an electric motor cooled by water of a rated power of 4.3 MW and are designed with a stator part and a removable rotor part: in fact, due to the performance required in terms of flow, the pump weighs almost 100 Ton while the removable part weighs 50 tons and consequently allows an easier maintenance of the wear parts.

Integrated logistics plays a predominant part in the project. Considering the size and weight of the pumps, Termomeccanica has involved leading logistics companies in the planning of material flows from the start at suppliers' facilities to the delivery of the finished products to the customer.

Deliveries are scheduled to take place over three periods of time: the first delivery is planned for the end of January 2018 while the second and third for the end of February 2018 and the fourth & fifth for the end of May 2018.



Yuzhnoukrainsk nuclear power plant

## A new contract in the Middle East for Termomeccanica Pompe

Termomeccanica Pompe has acquired the order for the supply of 19 high-pressure horizontal pumps for a pumping station in Saudi Arabia. The pumps, powered by an electric motor and with installed power greater than 10 MW each, will be at the heart of the pumping station.

The plant will be located in the Shoaibah area on the Red Sea and consists of doubling the existing pumping station that delivers water from large desalination plants to various sites around the holy city of Mecca.

The end user is SWCC (Saline Water Conversion Corporation), the largest water production and distribution company in Saudi Arabia, while our direct customer, who will build the plant, is RTCC of the Al-Rashid Group.

Termomeccanica Pompe has acquired this prestigious contract not only because of its international player status in the production of high-tech centrifugal pumps but also because of its excellent relationships with both customer and end user.

Such relations have been built over many years of collaboration, years during which TMP has demonstrated reliability and promptness of response in its after-sales service, especially thanks to the local support of its Saudi-based subsidiary, Termomeccanica Saudia Co. Ltd.

Here below the picture of one of the pumps sold during final skid assembly in our workshop.



## TMP takes part in WETEX 2017 in Dubai

Termomeccanica Pompe exhibited at the Water & Energy Technology & Environment Exhibition (WETEX) that took place in Dubai from 23 to 25 October.

This is a very important annual event for the Water, Energy and Environment sectors of the GCC countries and internationally.

It is organized by DEWA itself (Dubai Electricity & Water Authority), the main government purchasing body for energy and water products and services in Dubai.



Present in the Gulf since the Seventies, TMP boasts today a wide pump base installed in major plants in the Energy & Desalination, Oil & Gas, Water Transmission and Heavy Industry sectors. The area is of strategic importance to the company which has therefore decided not to miss the event, a key place for its meetings with its main customers and end users of the area.

TMP took part in the exhibition together with its controlled company, ADICOMP, a company which offers a complete range of compressor and treatment packages for air and gas for applications in the Water, Power Generation and Oil & Gas markets.

### Our mission

To contribute to the success of our customers through our experience and know-how. We pursue this goal giving the utmost consideration to the hard work and commitment of both employees and suppliers, respecting the environment and complying with the expectations of our shareholders.

We think outside the box for you



Chose a unique partner for your unique needs



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