TMPnews

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Termomeccanica supplies water injection pumps for U.A.E. offshore fields

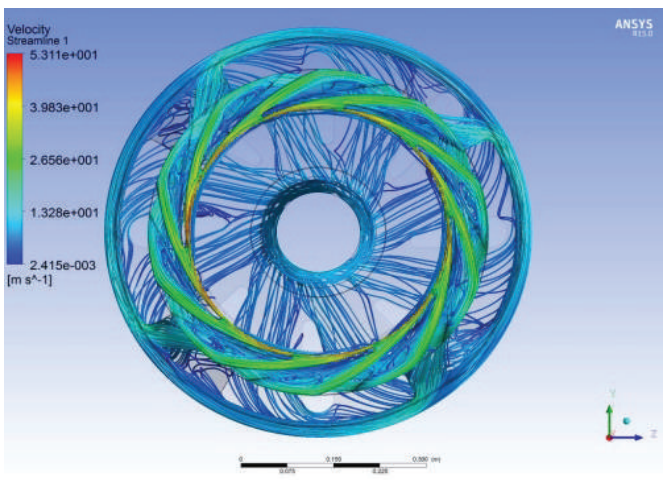
During the first months of the year, Termomeccanica started the delivery to NTC, a joint venture between Technip Abu Dhabi and NPCC, of the water injection pumps for the Umm Lulu oil field.
The supply consists of 4 groups aimed at pumping seawater into the field for the development of its phase II, exploited by Abu Dhabi Marine Operation Company, a.k.a. ADMA-OPCO

Ummlulu platforms

The four pumps are API 610 BB5 type multistage pumps made of super duplex stainless steel, characterized by a 300 m^3/h flow, a 2,160 m head and driven by a 3 MW motor rotating at 3000 rpm.
Each pump is equipped with a double seal, an 11/62 plan system and an API 614 lubrication system. An API 671 coupling is fitted onto the skid, which is installed on a 3-point base plate with gimbal-type ball joints. An API 661 air-oil heat exchanger will also be installed outside the skid.
The choice of super duplex A890 gr.5A for wet components was made in agreement with the EPC engineering team, considering the characteristics of the pumped fluid, i.e. seawater, so as to guarantee the best protection against corrosion.

One of the main features of these pumps, however, is the back-to-back impellers solution. This configuration combines the advantage of the balanced hydraulic thrusts derived from the back-to-back impellers with the reduced thicknesses of the castings of the BB5 barrel solution in comparison to the usual split case solution. The reduction of the castings thicknesses was particularly critical given that the type of pumped water and its pressure required the use of super duplex stainless steel for the pressure components.

In fact, Termomeccanica had to reconcile the mechanical features of the pressure components, that pushed towards increasing thicknesses, with the metallurgic difficulties of super duplex production that grow in parallel to the increase of the material thicknesses. The first technical challenge was the development of a barrel casing of proper dimensions, without unnecessary layers of material and, most important of all, with regular and constant thickness along its entire length. Once the design of the barrel casing was finalized, the second challenge consisted in adjusting it to make its casting feasible, i.e. respecting the restrictions related to the pouring of this type of material, finding the proper and most suitable process and the right size and position of risers and sprues to guarantee a successful outcome. For Super Duplex material, this part of the design is fundamental to prevent unwanted severe defects due to the formation of fragile phases and to achieve the proper final result in terms of mechanical properties. The use of the most advanced computational tools and a close collaboration with not only foundries and pattern makers but also with NTC materials engineering experts allowed to perform a detailed analysis of this specific design and to define the most suitable heat treatment cycle process.
A third engineering challenge was faced for the design of the crossover related to the back-to-back impeller configuration of the pumps. In fact, the pumps have 10 stages with the 5th impeller counter-posed to the 10th. The crossover downstream the 5th stage is fed by 4 channels and the flow is then directed to the 6th stage impeller through a 7-chamber channel. It was fundamental to engineer this crossover in order to guarantee the feeding of the downstream impellers without relevant pressure loss and to maintain the desired efficiency. The design of the crossover was carried out through a large use of CFD analysis (see pictures – CFD simulation in pump crossover area 1&2), which allowed to detect possible complications, such as anomalous flows, performance and pressure loss between stages or pre-rotation phenomena. Based on the results of such analysis, various precautions were adopted to prevent the occurrence of the above-mentioned detrimental behaviors: improvement of channels section, addition of flow rectifier in specific directions, upgrade of the shape of deflectors and optimization of blades and inclination angles of borders.



CFD simulation in pump crossover area

During the development of the project, FEM analysis also played a key role in assisting the design of the pumps. For example, the Finite Element analysis was used for the design of the shear rings to verify the stress level for induced by the internal pressure in the test at 480 bar. FEM analysis was also used to optimize the design of the baseplate. Termomeccanica Pompe preferred to supply a 3-point baseplate installed on gimbals given that this solution, although somehow detrimental to the project efficiency due to extra costs, weight and complexity, allowed to overcome the difficulties created by the unavailability of precise data for the interface design incoming from the EPC. Such baseplate solution also allows to cope with unexpected behaviors from the interfacing deck. As per TMP standard for this type of pumps, computational aiding tools were also used to perform torsional and lateral analysis.

The entire manufacturing of the pumps was carried out at Termomeccanica's main workshop located in La Spezia (Italy).

During the machining and assembly phases, the material used (super duplex stainless steel) required particular care. Indeed, it was necessary to follow specific handling procedures in order to prevent contamination. Remarkable difficulties also had to be faced for the machining of the casings due to the intrinsic characteristics of the super duplex material (as well as to the particular geometric shape of the casing itself).

Umm Lulu water injection pumps in Termomeccanica's warehouse - preparation for shipment

As it is usual for such complex projects, this supply is comprehensive of a complete string test for each pump, test to be performed at the supplier's facilities, i.e. in Termomeccanica Pompe's case, at its La Spezia test center, recently renewed to increase testing capacity to 15 MW.

For this specific supply, all the pumps were tested with the noise hoods installed directly on their skids to guarantee the requested noise level.

Over the last few years, the leading players of the Oil & Gas market have been driven by the search for projects characterized by higher value-added, i.e. by higher complexity such as offshore and upstream projects in general.

Termomeccanica Pompe has followed this market trend, implementing a specific investment program (involving engineering, R&D, manufacturing and testing facilities) geared towards serving the high value added Oil & Gas market segment.

Such strategy has borne fruit and allowed the company to confirm its prominent role in this demanding market.

TMPnews

Termomeccanica Service Sud performs the partial maintenance of the steam turbine of the BS1 section of Enel's "Federico II" Power Plant in Brindisi

In February last year, Enel entrusted directly to Termomeccanica Service Sud the major overhaul of the steam turbine of one of the four groups of Brindisi's Federico II power plant; Termomeccanica, in addition to being a historic partner of Enel, is present in the plant with a fixed structure in charge of three maintenance contracts related to rotating machines (seawater pumps and compressors).
The site of Cerano, a coal-fired power plant with a total installed capacity of 2640 MW, extended over about 270 hectares, is Italy's second largest thermoelectric power plant and one of the largest in Europe, the first in Italy in terms of importance until the conversion of the thermoelectric power plant in Civitavecchia.

Enel Federico-II thermoelectric power plant

The plant consists of four steam cycle sections with a capacity of 660 MW each. In this specific case, Termomeccanica operated on the steam turbine of the first BS1 group:

- Manufacturer: Franco Tosi
- Power: 660 MW (subdivided into one HP, one MP and two LP sections)
- speed: 3000 RPM
- Inlet pressure: 246 kg / cm^2
- Inlet Steam Temperature/ Overheating: 538 °C
- Outlet pressure: 0.05 kg / cm^2
- Year of construction: 1987

The site was opened on January 31, 2017 and the activities begun on February 4, 2017, with on average 6/7 units, a team leader and a supervisor of works, a container for the equipment and another one used as an office. The original steam turbine overhaul program included the preparation for quick cooling off (opening of non return valves on extraction flows of turbine), the overhaul of the oil circuit lubricating the main turbine (activity in confined spaces), the major overhaul of the main turbine turning gear and the replacement of gasket on flanged joints of cross-over turbine of LP and MP, in addition to the overhaul of the oil circuit lubricating the auxiliary turbine (activity in confined spaces). In the course of the maintenance, some auxiliary activities were added, some of which of some relevance, such as the replacement of 4 BP1 / 2 BP1 / 2 casing rupture discs and lower bellow gaskets of the left BP2 (activities in confined spaces), control of the HP VR4 regulating valve, opening of bearing casings 4 and 5, control of TP turning gear alignment, opening/closure of the lower inspection door BP2 and control of bellows tightening of the right BP2 – left BP1 . The activity was assigned directly to Termomeccanica Service Sud a few days before the start of the plant shutdown with a first contact on January 20, 2017. After the on-site plant inspection and the related issue of the technical and financial offer by Termomeccanica Service Sud, on January 27, the plant issued the pre-order to allow the opening of the work site and the beginning of the activities.

The Termomeccanica Service Sud team was set up the week before the start of the activities and contemporarily followed the safety training necessary to enter the plant site which was provided by Enel.
All activities were carried out directly on behalf of Enel, who had arranged for an Alstom / GE supervisor. During the entire shutdown, Enel entrusted the Safety management to an internal team, with the precise task of monitoring external companies while executing their work. Termomeccanica Service Sud received positive feedback from such body regarding its work site organization, its work team set up, its PPE supply, the cleanliness of its work areas as well as its compliance with Enel's EHS regulations and procedures.
Enel's Safety team particularly appreciated how Termomeccanica Service Sud
- delimited its work area with a physical enclosure, an area affected by the maintenance activities and the related handling of materials / equipment by the bridge crane of the machinery area;
- managed all the operations in confined spaces (oil trunks, BP casing bellows, etc.)
- made use of trained personnel, authorized to handle the bridge crane of the machinery area (in loan for use granted by Enel)
- carried out operations in confined spaces
- left the turbine area clean after closing its work site.

Franco Tosi steam turbine

Enel was satisfied of having chosen Termomeccanica Service Sud as supplier for the maintenance contract in question not only because of the technical quality of the work performed but also because of the particular attention given to safety issues.

Following Enel's checks and inspections, the steam turbine was launched at 11 am on March 8 2017 and did not show any malfunction.

This intervention was instrumental to the successive maintenance works which are still under way at the plant (BS4 turbine maintenance subcontract to Ansaldo Energia, replacement of the inner of Flowserve's boiler feed water pump) and paved the way for the possible future development of Termomeccanica Service Sud's activities at the Cerano site.

Termomeccanica Pompe consolidates its presence on the Egyptian market

In October last year, Termomeccanica Pompe was awarded by Ansaldo Energia the supply of the main pumps for the project of conversion to combined cycle of the 6th October plant, plant located in Cairo's satellite city holding the same name and located in the Giza Governorate in Egypt.

The supply consists of three 3.3 MW high-pressure boiler feed water skids, three 180 kW low pressure boiler feed water pumps and four 660 kW vertical condensate extraction pumps.

With this new acquisition, Termomeccanica Pompe increases its installed product base thus reinforcing further its already strong presence in the North African country.


simple-6th-OF-OCTOBER-II-POWER-PLANT-4X160-MW-2-1

The editors of this issue are:

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