

# TM.P news



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## A.R.D.E. PROJECT

Reaching for Excellence

2008 Progress Report

2009 Programme

The A.R.D.E Project (“Alla Ricerca dell’Eccellenza”), born a year ago, is now half way through its course. Up to today, 26 courses have taken place, amounting to a total of 650 teaching hours and involving 60% of the Company’s population.

A.R.D.E. is a training project designed to develop the employees’ technical and professional stock of knowledge and the courses it offers prove to be of significance both in terms of teachers involved and topics covered.

More specifically, a Mechanical Design Course took place in 2008 in collaboration with one of the most prestigious European institutes and the New Product Development Department attended the Design Software Workshop organized by Concept-NREC in Wilder, VT (U.S.A.). In the wake of last year’s successful programme, 2009 will remain a year highly committed to training: the courses on Non Destructive Testing (NDT) will start, the “International Welding Specialist” course organized by The Italian Welding Institute of Genoa will continue and the Health & Safety courses called QSE (Quality, Safety and the Environment) will be completed.

The Foreign Languages courses organized with International House (IH), leader in the field of language teaching, will also continue throughout 2009. Furthermore, the path to Cultural Change set in parallel to the A.R.D.E. Project with the collaboration of I.E.N. – Istituto Europeo di Neurosistemica (European Institute of Neurosystemics) will carry on and reach completion by the end of 2009. A “Company Core Competencies System” encompassing the values, competencies and behaviours unique to the “belonging” to Termomeccanica Pompe was defined during the 2008 workshops. January 31<sup>st</sup>, otherwise known as “Competence Day”, represents a particularly significant date for TM.P. In fact, the day was dedicated to the Competences shared by the entire Company and allowed to define the Competences Manual.

The Core Competences identified are: **RESPONSIBILITY**, knowing how to **FORESEE AND SOLVE PROBLEMS**, **TEAMWORK**, **INITIATIVE** and **FOCUS ON COMPANY GOALS**.

## INSTALLATION OF TM.P. PUMPING SYSTEMS & PLANTS IN DRY DOCKS



Many of TM.P. pumps are installed in pumphouses that control the filling and emptying of dry docks.

Over the last decade, the Italian nautical and shipyard industries have both undergone an unprecedented growth, with an increase of the tonnage handled in the dry docks structures (both fixed and floating), almost reaching record levels. As a consequence, there has been a continuous request for the modernization, development and overhauling of the existing dry docks structures, mainly built in the beginning of last century. The new shipyards require an ever-increasing automation and efficiency as well as a shorter basin emptying time. Furthermore, the new contract work philosophy is orienting itself towards the now famous “turn-key” solution, i.e. a complete service from the supplier ranging from the supply itself to installation, start-up and after-sales technical assistance.

TM.P. has decided to take on the challenge and respond to this market evolution by extending its offer from the “traditional” product offer (pumping system) to a more complete Service approach so as to answer all possible customers requests. Following the success achieved a few years ago for the Fincantieri San Marco di Trieste Dry Docks where TM.P. had the customer requests entirely fulfilled (by overhauling the main dry docks pump and supplying all the electrical equipments which had seriously been damaged by an exceptional wave of bad weather), the company signed last year a contract with CAV dry docks (Costruzioni Arsenal di Venezia) for the supply of new equipments to be installed in the historical site located in the heart of Venice and in operation since the 1920s.

The scope of this supply is the replacement of the pumps installed in the medium basin (with a capacity over 28.000 m<sup>3</sup>) with new pumps from Termomeccanica Pompe. The renewed dry dock will be used as the main structure for the recovery and maintenance of the equipments from the “MOSE” project which objective is to safeguard the Venice Lagoon.

TM.P. technicians have studied, designed and carried out all of the customer’s requests geared towards the

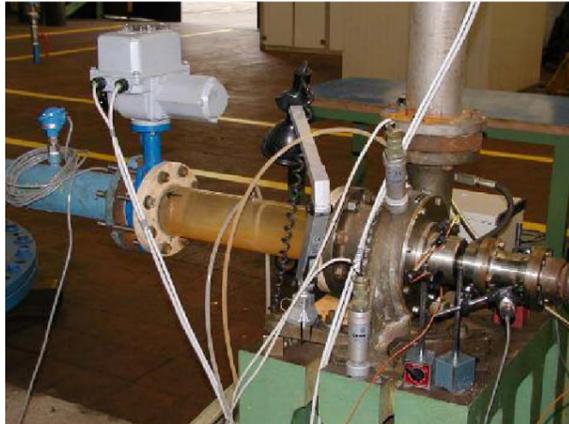
efficiency, efficacy and energy-saving of the plant, abiding by the regulations imposed by the MOSE project as well as the Water Magistracy which is very strict in the matter. More specifically, TM.P. has studied and implemented the most suitable solutions so as to guarantee the safety and easy operations of the system. For example, a submersible motors solution was supplied for all the equipments operating under sea water level, analysing their operating capacities at the various speeds based on the dry dock water level progressive reduction.

As a whole, TM.P. has supplied **two new engineered pumps** to interface with the already existing flanges and pipelines, a **“bailing” pump** (a technical term which refers to the final draining of the basin bottom) able to operate in the harsh suction conditions entailed by the basin structure itself, **the piping linking the pumps to the final discharge, all the plant valves as well as all the machines control panels**. With regards to the existing structure, TM.P. has also provided the latest equipments, technologies and innovative solutions. It is important to note that the installed pumps and related equipments have given excellent performance results, certified by TM.P.’s own specialized in-house Test Centre. The testing was witnessed by the Customer as well as all the Venice Lagoon Quality Control Authorities.



Courtesy of: www.cav-venezia.it - Costruzioni Arsenal di Venezia

## Modal Analysis In Vertical Pumps



The dynamic behaviour of vertical pumps is a rather complex phenomenon to analyse due to the particular complexity in creating a reliable mathematical model for the pump/ motor system installed in a plant.

In order to validate the theoretical results of the modal analysis, which are performed with the support of Nastran code, Termomeccanica Pompe has recently conducted a series of studies and measurements on its large-sized vertical pumps for Brine Recirculation in MSF Sea Water Desalination Plants.

The pumps concerned are single-stage, double suction impeller and volute casing design vertically suspended canned pumps (TM.P. CEXD line – VS7 type according to API 610 standards) with flow rates over 10.000m<sup>3</sup>/h and powers ranging from 3.000 to 5.000 kW.

Special attention has been given to the development of the experimental modal analysis in order to determine the pumps natural frequencies and the dumping factors associated to the various vibrating modes.

The field measurement campaigns conducted have made it possible to highlight all the natural frequencies of the system and to obtain an efficient representation of the structural strains in the various areas of interest.

Although the examined pumps are of similar design for the various plants, they have different dimensions, performances and rotating speeds. In some of the plants, the pumps have registered vibration levels superior to the maximum acceptable values and for some of them these vibrations have led to the breakdown of structurally critical parts.

The Spectrum Analysis carried out on the field has revealed the existence in all the plants of forced vibrations at sub-synchronous frequencies within the range 3 –5,5Hz. Such frequencies are quite distant from the frequencies corresponding to the rotating speed (around 40 - 50% of the number of turns), however, they have turned out to be very close to the natural frequencies related to the first and second vibrating modes of the pump/ motor system.

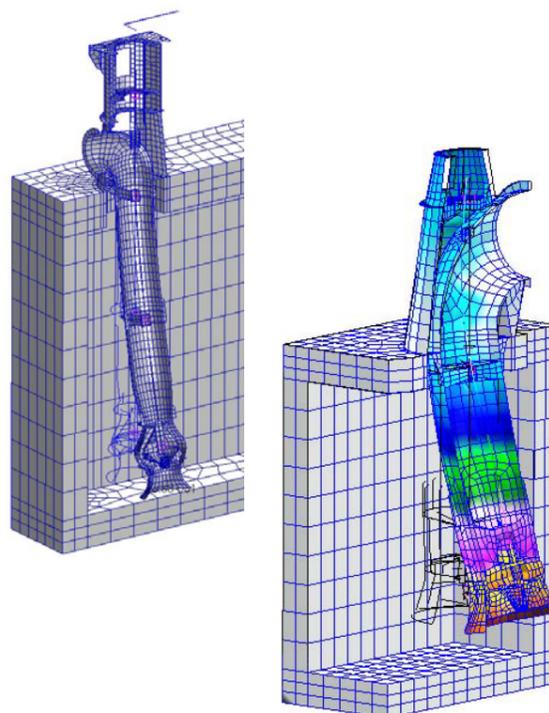
A good correspondence between the calculated modal analysis and those resulting from the field surveys has been observed. However, although there are in all the pumps similar situations of external exiting forces against natural frequencies, TM.P. has had to take note that, in some cases the dumping factors have played a decisively favourable role and maintained the amplitudes of the vibrations at very low levels whereas resonance has prevailed in other cases where the pumps have suffered damages.

The origin of these forced frequencies is amenable to phenomena of fluidodynamic instability in the flow through the can which are hard to predict as they are related to the real operating conditions of the machines, the suction piping layout and the

complex design of the components of the pump (the piping connecting the volute to the column, the volute itself, the suction bells). TM.P. solved the problems faced by increasing the stiffness of the most elastic parts of the pumps on which the above-mentioned fluidodynamic forces were releasing themselves.

After having increased the stiffness of the inferior plate of the discharge elbow and the upper column, which is an integral part of the discharge elbow, the vibrations were reduced to levels noticeably below the maximum acceptable limits and the machines have gone back to working problem-free for a quite a while now.

**In conclusion**, the information collected during this field measurement campaign have allowed TM.P. to update its design standards for this type of pumps, adopting criteria for the dimensioning and checking of the critical pump parts that guarantee the absorption of the variable external forces of fluidodynamic origin and keeping to low levels both stress and strain values.



## flash news

In early 2009, **TM.P. SpA - Termomeccanica Pompe** signed its first contract with the EDF Group (Electricité de France) for a total of 10 million Euros. TM.P. will supply circulating water pumps and boiler feed water pumps for the combined cycle power plants of Blenod (EDF – France) and West Burton (EDF Energy – U.K.).

**TM.P.'s Oil & Gas Department** has just been awarded the centrifugal pumps package related to the project for the modification of the arrival manifold and the low pressure facility at Bu Attifel in Lybia. The End User is ENI Oil Lybian Branch. Delivery will be completed by the end of Summer 2009.

At the end of November 2008, **Termomeccanica Saudia Co. Ltd.** has obtained its registration as a Qualified Vendor to Saudi Aramco, world leader in the field of Oil & Gas.

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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 employees and suppliers, respecting Environment and complying with expectations of our Shareholders.

