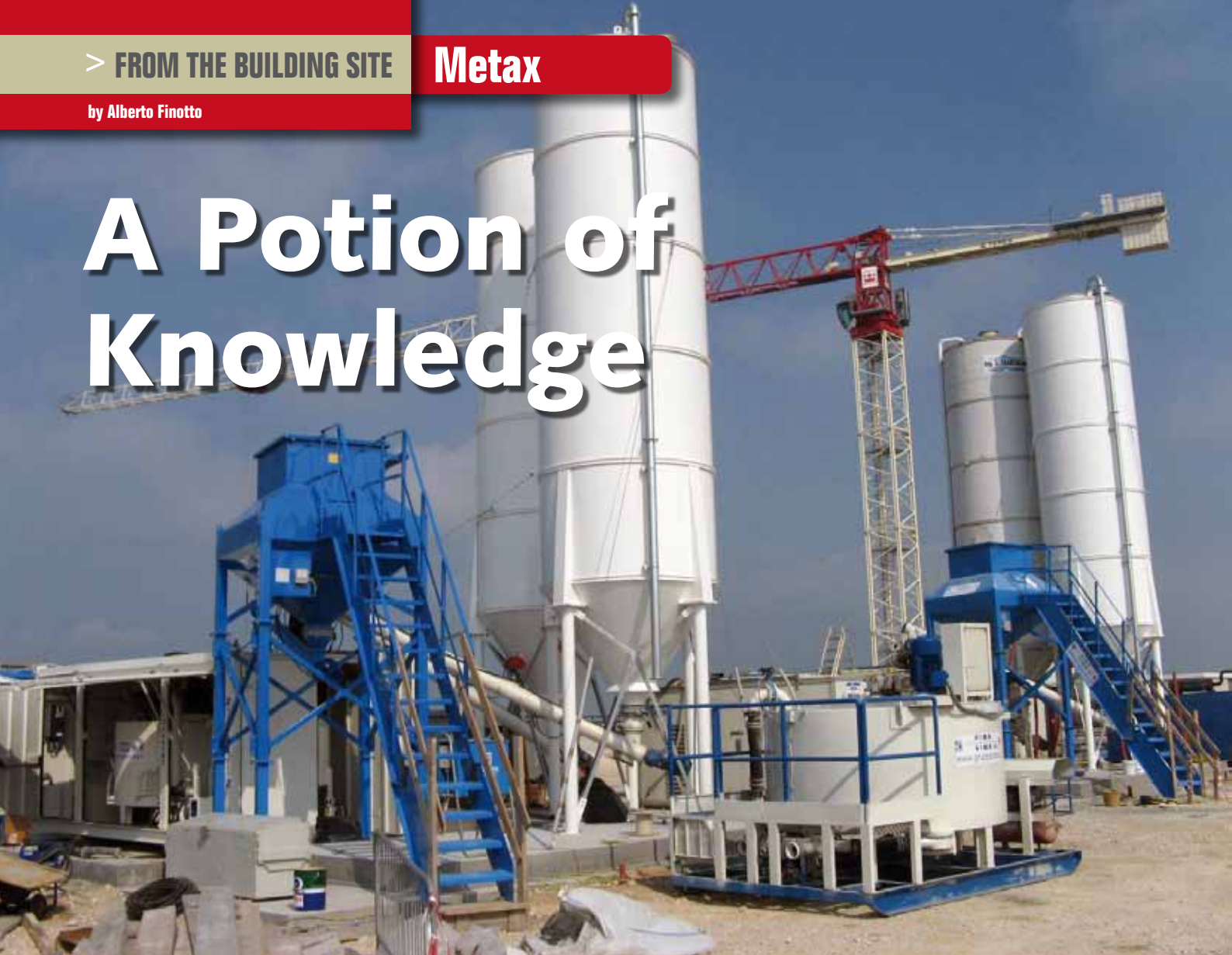


A Potion of Knowledge



The MOSE (Experimental Electromechanical Module) is a project intended to protect the city of Venice in Italy, from floods. This project has been carried out by the Consorzio Venezia Nuova on behalf of the Ministero delle Infrastrutture e dei Trasporti (Italian Ministry of Infrastructures and Transport) and of the Magistrato alle Acque di Venezia (Venice Water Authority). It is supported by a “sample” of batching and jet grouting injection plants. Let’s see the details of the project.

On the MOSE’s building site of Lido Nord Treporti (one of the planned sites, together with the ones of Chioggia and Malamocco), they are now carrying out the progressive positioning of the threshold caissons in the trench system, previously dug in the area of Bocca di Lido. The caissons consists in concrete blocks that will support the protection gates of MOSE; the ground consolidation of this installation requires a complex intervention that involves the most advanced technological skills of the company Mantovani Spa, assisted by the project creativity of Metax, engineering division of the company Cima Spa, that offers diversified solutions to the specialized high-profile building industry since 1987.

Movable mixture

CWe are in the company of Mr. Pasquale Triggiani, qualified technician and Managing Director of Metax division, on the

north-east side of Bocca di Lido, in front of the waterway that leads to Treporti. Within this area there are two facilities, which are dedicated to the production of cement mixtures used for consolidation injections into the seabed. In particular, our visit to the building site regards the new JM40PV plant, which runs fully automatically, according to the sum of the weight method. The role of these facilities is essential, and the construction of the structures was made in a specific way, paying great attention to details, on behalf of the Metax research and development department. *“The first system of this kind has been designed with the aim of producing cement mixtures also using sea water, reducing high costs due to the traditional use of fresh water”*, explains the industrial expert Pasquale Triggiani. *“It is a technology developed in co-operation with the company Mantovani Spa and implemented after a series of successful tests, already in the first start-up years of the MOSE building site, at the end of 2004.*

The first installed batching plant was the JM30, which is still running. Then, we made a revised and corrected version, enhancing the whole system with the implementation of an inverter and the use of a series of innovative technologies that enable the management of a highly complex mixture that has a very high density and a very low viscosity”.

The operation of the facilities delivered by Metax division is shown directly by the person entrusted with the production and injection of cement grout at Lido Nord Treporti, Mr. Silvio Dell’Andrea, mining technician and co-ordinator within the special foundations division at Mantovani Spa: “The new JM40PV represents the crucial plant dedicated to consolidation injections during the laying of the caissons in the seabed. In recent months, with the help of several tests, we have studied the ideal mixture for injections, that have confirmed the excellent quality of viscosity and of the specific weight combined with high flow capacity”.

The main parts of the JM40PV are: storage silos, hopper for additives and special powders, water tank embedded in the plant, electronic control unit with weighing system (for the control up to 10 components for 20 different type of mixture that are stored in the memory). “However, with this plant we control up to six or se-

Metax, geotechnics passion

The Metax division was founded in 1987 with the aim of designing and manufacturing machinery for the specialized building industry. The product range consists of high-pressure pumps for jet-grouting applications, for the pumping of drilling mud and for the transferring of fluids. The constant growth and development of the company has later allowed to create a sales and service network on a global scale, providing a tailored, geotechnical consulting service to overcome the choice of drilling and injection systems, the information on the type of equipment to be used, the start-up of building sites, training of personnel and rental of special equipment.

Product diversification has later included the Oil and Gas drilling and Directional Drilling fields. The original production is today flanked by mud pumps specifically used for these activities, with innovative control and remote con-



trol systems, managed by dedicated computers.

In 2000, Metax was awarded the ISO 9001 certification from BVQI, independent certification body of Bureau Veritas accredited by Sincert and operating on the basis of national and international regulations in 140 countries, and in 2002 it joined the Group CIMA Spa, which includes three pre-existing divisions that refer to the same property: Cima Snc (production of steel structures and installations for the cement industry), SICOM Snc (production of special fittings, tubes and flanges made from calendered sheet) and Metax Snc, which is the geotechnical division of the Group.

ven components”, points out Triggiani. “All operations can be recorded and controlled by means of a data logger, also conceived by Metax division, which delivers functio-

nal reports in real time. Each hour, during the standard operation, the system carries out a series of tests on the viscosity and the specific weight of the mixture. Even for



The batching plant JM40PV



Max. production (binary mixture 1/1)	40 m ³
Total absorbed power (min.-max.)	57-78 kW
Max. weighting system capacity	4.000 kg
Nominal mixer capacity	2.000 l
Mixer pump flow rate	3.600 l/min.
Storage tank nominal capacity with agitator	4,2 m ³
Agitator's pump flow rate	2.100 l/min.
Max. water tank capacity	1.600 l

Injection... of trust

The two batching and injection plants produced by Metax division represent the key machinery and the origin, under a logistic point of view, of the injection and consolidation operations in the seabed of Bocca di Lido.

According to the schedule of the building site at Treporti, the current work phase regards the installation of seven threshold caissons plus the two shoulder ones previously installed in the basin of the refuge haven (dried up and dug up to a depth of about 8,7 m above the medium sea level value). It is precisely now that the key operation regarding the consolidation injections takes place. "The mixture prepared by the plant is injected into the seabed of Bocca di Lido by means of an underwater pipeline, that is more than 700 m" long", explains Silvio Dell'Andrea. "The flexible pipeline reaches a pontoon on which an agitator with a 6 m³ capacity (made by Metax

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weightings of 500 or 1,000 kg, we were able to obtain a difference of 1 or 2 kg only, bringing the qualitative results reached in the laboratory at an industrial level".

Still speaking about the technological improvements of the JM40PV compared to the primitive model JM30, the new machinery is equipped with a centrifugal pump with vertical axis, both in the mixer and in the storage tank with agitator: this innovation allows the obtainment of an excellent mixing quality by significantly reducing maintenance costs at the same time.



division) is installed; in the agitator, the mixture is stored and put in a kind of "large bag". The so-called "large bags" consist in 16 containers of 8 m³ each, in which the cement grout is injected; these are captured in the space between the caisson and the previously levelled and compressed sub-foundation, at a depth of -14,7 m. At the end of the operation, a part from the 16 large bags, a last large bag with a 14 m³ capacity will be filled with a more malleable mixture. "It takes two days to complete this operation for each caisson", adds Dell'Andrea. "Seven people are required for this operation: four on the building site where the two Metax batching plants are installed, and three on the pontoon, who have the task of monitoring the injection phase". The injection operation into the large bags represents, as already explained, the fundamental support of the nine caissons installed in the seabed: "The function of the large bags - points out engineer De Polli - is first of all to support the caisson and then to encourage the cre-



ation of compartments in the sub-foundation at the same time, in order to carry out an additional jet of cement grout between each large bag. 24 hours after completion of the injection work of all large bags, we can

already transfer the caisson load (which, in the meanwhile, has been partially ballasted) by means of the jacks which supported it on the seabed of the lagoon, with a millimetric precision". ■