

The first ever offshore regasification platform in Italy is a result of the synergic commitment by three of the Mapei Group's European subsidiaries.



WHAT A GAS!

Large construction projects are a routine challenge for Mapei, a Company with the capacity of also playing a leading role in this sector. To be the world's leading Company for products used in the building industry, and a multi-national corporation operating in a number of countries all over the world – either directly or through subsidiaries – means having the know-how, products and highly-specialised teams which can meet the challenge of the complex nature which typically characterises such projects.

An emblematic example is the experience and skill demonstrated during the construction of a plant which was recently welcome by Italy's leading institutional representatives, a project which involved the coordination of various international companies, one of which was Mapei. This plant will supply about 10% of the Italian country's current demand for natural gas, and its contribution will be paramount in assuring Italy's energy requirements and the competitiveness of natural gas on the Italian

market.

The plant in question is the offshore LNG (Liquified Natural Gas) platform (see box), set on the sea bed off the coast of Rovigo since September 2008. With a regasification capacity of 8 billion cubic metres of natural gas per year, the terminal will increase Italy's regasification capacity by 200%. The "LNG Adriatic" regasification plant left Algeciras – at the southern tip of Spain on the Straits of Gibraltar – on the 30th of August 2008. It was welcome on the 20th of September 2008 at the Porto Viro



The long journey of the regasification plant.

In particular, Mapei supplied cementitious products and protective, flexible epoxy resin-based paints used to make the structure suitable for the particularly aggressive environment it will have to withstand, while remaining immersed in sea water at a depth of 28 metres for an extremely long period of time.

Mapei's part in the project was not limited to the simple supply of special systems. The Company was also involved in an engineering consultancy during the design definition phase of the project, organised a special team of technicians and equipment for technical assistance and trained the building companies used to carry out the work regarding the correct methods to use when applying the Mapei products supplied.

The Mapei Group was an ideal partner for this international project, in that it is able to offer a well-coordinated service of technical consultancy, highly specialised and high quality systems, specific training programmes and technical supervision, both during the design phase and on the various sites where the structures which make up the platform took shape.

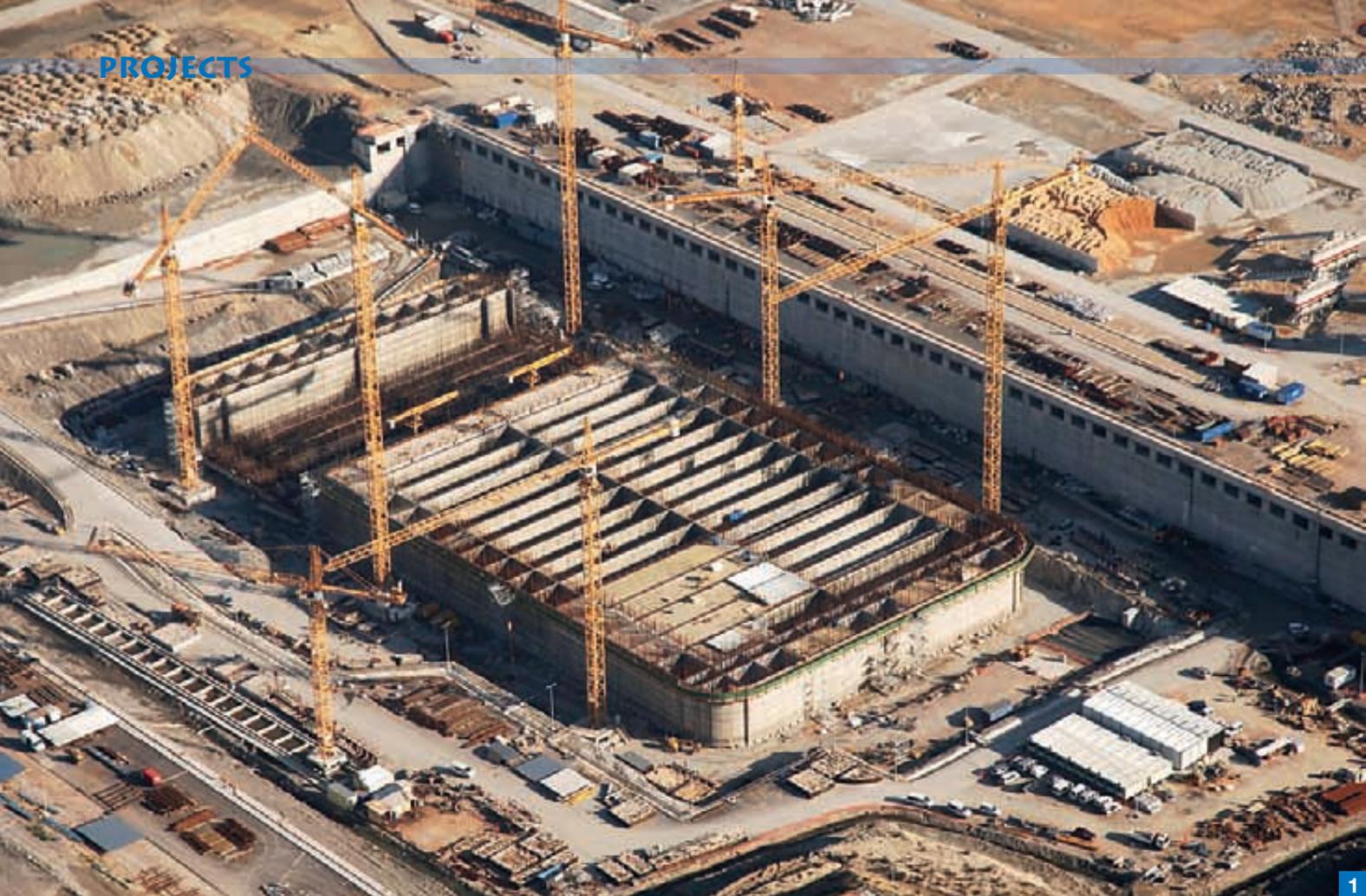
"It is enormously satisfying for us at Mapei to be able to declare that we took part in the construction of the first offshore platform in the world in reinforced concrete to be used for receiving, storing and regasification of LNG", explained Giorgio Squinzi, CEO of Mapei S.p.A. and President of the Mapei Group.

"Yet again, we were chosen for the quality of our products, which offer the best hold and seal and highest levels of safety in the open sea, and for the efficiency of our Technical Service team which were always present on site. Mapei's trump card is our constant attention in the research for continuously innovative solutions".

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terminal in Rovigo (in Northern Italy), in the presence of the Italian Prime Minister, Silvio Berlusconi, the Italian Minister of Economic Development, Claudio Scajola, and the President of the Veneto region, Giancarlo Galan. This has proved to be an extremely complex and strategically important project, and Mapei's contribution to its construction proved to be extremely important. Mapei supplied 450 tonnes of cementitious products and protective, flexible epoxy resin-based paints used to construct the plant, Italy's first

offshore regasification platform (and the first offshore terminal made of reinforced concrete in the world). Three subsidiaries from the Mapei Group were involved in the project: Mapei SpA (Italy), Ibermapei SA (Spain), and Rescon Mapei AS (Norway). The reinforced concrete used in the construction of the degasification plant was specially treated after casting using extremely high quality Mapei products to protect the concrete and guarantee high durability over the years.



A Masterly Piece of Work with an Outlook on the Future

At 15 kilometres off the Venetian coast, the platform was lowered down until it rested on the sea bed at a depth of 28 metres. Seawater flowed into the lower and lateral compartments of the structure, followed by 300,000 tonnes of solid ballast to stabilise the entire structure. Thereafter, several activities have been completed and others are currently being carried out to complete the

structure’s installation and ensure its full functioning within 2009. The plant is managed by Terminale GNL Adriatico Srl – a partnership between Qatar Terminal Limited (45%), ExxonMobil Gas (45%) and Edison (10%) – and will be the first offshore structure in reinforced concrete in the world to be used for receiving, storing and regasifying liquefied natural gas. The regasification platform and all the auxiliary structures have been manufactured according to the highest international

environmental and safety standards. The liquefied gas will come from the “Giant North Field reservoir” in Qatar, the largest gas reserve in the world, which, with an ascertained availability of 25,500 billion cubic metres, makes Qatar the third most important country in the world for gas reserves. The gas will be liquefied in Qatar by means of a cooling process which will lower its temperature to -162°C, with a reduction in volume to 600 times lower than its original volume, so that higher vol-

LNG (LIQUEFIED NATURAL GAS) AND THE ADVANTAGES IT OFFERS

LNG: LNG (Liquefied Natural Gas) is quite simply methane which is liquefied by lowering its temperature so that it may be transported by ship. The liquefaction of methane gas is a process which lowers its temperature to -162°C, with a reduction in volume to 600 times lower than its original volume. Liquefied gas is transported using special ships. Around one quarter of gas currently transported all over the world uses this method, which is now well-tested, safe and reliable. Ships used to transport LNG, and also regasification platforms and terminals, are designed and built to extremely high safety levels, according to the most advanced

standards in the sector and in compliance with all current norms and regulations. Ships and terminals are also administered using the most advanced operating procedures. In more than 45 years of operations, ships used to carry methane have covered more than 100 million miles without any serious incident. LNG technology offers an alternative to traditional gas pipelines, connecting markets a long way from where gas is produced, supplying energy resources by ship which would otherwise be unavailable. The technology used to liquefy large volumes of gas has led to an acceleration in

the development of the global commerce of LNG, which today accounts for approximately 25% of the total of international gas trade. LNG technology means that countries which can not be connected to traditional gas pipeline systems for logistical reasons may now export the raw materials which they would otherwise be unable to export. In Italy, LNG represents only 5% of the total amount of gas imported, but it is destined to play an increasingly important role, by diversifying the traditional supply lines used for importing gas, thus increasing the safety and competitiveness of the acquisitions.



Photo 1.
The regasification plant under construction in the Algeciras basin (Spain): detail view of the various compartments delimited by the "cellar walls".

Photo 2.
Detailed view of one of the concrete compartments before being waterproofed.

Photo 3.
Application by spray of MAPECOAT CFS on the walls of one of the compartments.

Photo 4.
MAPECOAT CFS applied on the anti-wave deflector and vertical pillars.

Photo 5.
Close up of the anti-wave deflector protected using MAPECOAT CFS.



umes of gas could be transported to Italy. Once arrived at the LNG terminal, it will be regasified and sent to the national distribution network through two methane pipelines. The first one, with a diameter of 76 cm constructed by Terminale GNL Adriatico, will cross 15 km of sea, 10 km of the River Po delta and 15 km on the mainland, to end its journey at the metering station in Cavarzere, near Venice. The second pipeline, with a diameter of 90 cm constructed by Edison, will be 84 km long, and will carry the gas from Cavarzere to the national distribution takeover point in Minerbio, near Bologna. Let's now take a closer look at Mapei's contribution to the project and how the Company interacted with the Norwegian, Spanish and Italian subsidiaries involved in this important "double site" in Spain and Italy.

In Norway

In order to take full advantage of its experience developed over the years, and in the light of a long-running tech-



TECHNICAL DATA OF THE REGASIFICATION PLANT

The reinforced concrete load-bearing structure is 180 metres long, 88 metres wide and 47 metres high, measurements equivalent to the area of two football pitches and the height of a 10-storey building, most of which is below the surface of the sea.

The concrete structure contains two LNG storage tanks, each with a capacity of 125,000 cubic metres. On the top of the structure there is the regasification plant and auxiliary equipment, such as the gas turbine electrical generator units, a helicopter landing pad and the living quarters.

The platform is anchored to the sea bed in an area where the water is approximately 28 metres deep, and is kept stable using ballast stored in special hollow spaces within the structure. The structures for the docking bays and for off-loading the LNG were designed and tested so that ships with various tonnage ratings used to carry the methane can carry out manoeuvres safely, even in severe sea and weather conditions. The structure will be connected to the national gas network with specially designed pipeline. The first part, constructed by Terminale GNL Adriatico, crosses 15 km of open sea, 10 km of the River Po delta and 15 km on the mainland, to end its journey at the metering station in Cavarzere, near Venice. The second pipeline, constructed by Edison, is 84 km long and carries the gas from Cavarzere to the national distribution takeover point in Minerbio, near Bologna.

80% of the regasification capacity of the terminal, or 6.4 billion cubic metres per year, will be piped off for 25 years to the Edison company, as stipulated in contracts signed in 2005 with the Qatar company RasGas II, while the remaining 20% will be available for the general market, according to procedures established by the authorities.

The open season procedure, which is currently running, will come to an end within 2009. Qatar currently has a number of ships for transporting methane and five of them have recently started operating, and will cover the route from Doha in Qatar to the Adriatic sea. In fact, the terminal will be supplied two times every week by methane-carrying ships from Ras Laffan (the industrial zone located near Doha).



Technical partnership between the two companies, the Norwegian company Aker Kvaerner contacted Rescon Mapei AS in 2005 on a consultancy basis, to help in the design of special solutions for the LNG Adriatic project. This consultancy involved both the development of a specific project and the evaluation of on-site problems.

Indeed, Rescon Mapei is well-known in the international context for its experience with such challenging projects. Since 1983, with its first intervention on the Statfjord platform, Rescon Mapei AS has developed considerable, certified experience in the Oil & Gas sector. A range of systems has been designed and developed dedicated to such applications, such as adhesives, mortars and epoxy products applied by injection for both underwater applications (up to a depth of 300 metres below sea level) and surface applications in marine environments, including protective flexible epoxy paints, polyurethane coatings and specially designed admixtures for concrete.

To make sure these systems are used safely and efficiently and to certify them, in 1983 Rescon Mapei formed Resconsult AS, a team of highly quali-

fied technicians dedicated to consultancy work in challenging applications, such as offshore platforms and industrial infrastructures, which today has accumulated more than 100 site references.

In Spain

In 2006 the first intervention was in the construction of the reinforced concrete load-bearing structures in a dry dock. MAPECOAT CFS (flexible, epoxy coating with high mechanical resistance and excellent bond strength to concrete structures) protects the concrete walls (cellar walls) which delimit the compartments used to balance the flotation of the structure, the final ballast and to house mechanical equipment. MAPECOAT CFS was also used to form a protective coating around the post-stressing headers and in the anti-wave deflectors. The NONSET 50, NONSET 120 and NONSET 400 range of cementitious mortars (high-quality cementitious mortars which expands 1-3 before setting) were used to fix the structure in place accurately by casting below the support plates. MAPEGROUT T40 and MAPECOAT I24 were then used to repair and protect the concrete struc-



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tures of the water deposits. This phase was completed using the two-component cementitious mortar MAPEFINISH concrete, reinforced with FIBREGLASS MESH (which acts as a safety barrier and extra strengthening covering layer). During the works Mapei technicians supplied on-site training on the correct use of the above-mentioned systems, controlling all the building operations.

Photo 6.

The final phase in the construction of the regasification plant in the dry dock, which has already been filled with water.

Photo 7.

A view of the various plant and service equipment (topsides) installed on the concrete structure.

Photo 8.

One of the base pillars for the topsides anchored in place using cementitious mortars from the NONSET range.

Photo 9.

Detailed view of the concrete base, highlighting the tubes and one of the formworks used for injecting cementitious mortars from the NONSET range.



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Mapei Products: the products mentioned in this article belong to the "Building Speciality Line" and "Admixtures for Concrete" ranges. The technical data sheets are available on the "Mapei Global Infonet" DVD or at the web site: www.mapei.com.

Fibreglass Mesh: alkali-resistant fibreglass mesh (4 x 4.5 mm) in rolls of 1,000 mm.

Mapecoat I24: two-component epoxy paint for acid-resistant non-toxic coating of concrete surfaces.

Mapecoat CFS: flexible, two component epoxy used as a coating. N.B. This product is manufactured and distributed by the Mapei Norwegian subsidiary Rescon Mapei AS. For further information see the website www.resconmapei.com.

Mapecure E: anti-evaporation agent in water emulsion to protect concrete surfaces from drying too quickly when exposed to sun and wind.

Mapefinish: two-component cementitious mortar for finishing concrete surfaces.

Mapegrout T40: medium strength shrinkage-compensated fibre-reinforced thixotropic mortar for the repair of concrete.

Nonset 50, Nonset 120 e Nonset 400: cementitious dry mortars for bolt anchoring, injection, joint filling and grouting under baseplates. N.B. These products are manufactured and distributed by the Mapei Norwegian subsidiary Rescon Mapei AS. For further information see the website www.resconmapei.com.

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TECNICAL DATA

LNG Adriatic Terminal - Porto Viro (Province of Rovigo, Italy)

Work: building an offshore terminal for receiving, storing and regasifying the liquefied natural gas (LNG).

Works Year: 2005-2008

Works Place: Algeciras, Cadiz Province (Spain) and Venice shipbuilding yard (Bacini dell'Arsenale) (Italy)

Customer: Terminale GNL Adriatico Srl

Project: Aker Kvaerner (now called Aker Solutions)

Work Management: Aker Kvaerner

This important building work involved three Mapei Group's European subsidiaries (Rescon Mapei, Ibermapei and Mapei SpA) working together during three phases:

1st Phase (Rescon Mapei, Norway)

Work: consultancy support during the drawing up of the design specifications and quick answers to various on-site problems

Reference Figures: Kjell Tore Fosså (Aker Kvaerner)

Mapei Coordinator: Trond Helgedagsrud (Technical Service Director of Rescon Mapei AS)

2nd Phase (Ibermapei, Spain)

Work: construction of the load-bearing structure in reinforced concrete (Gravity Based Structure – GBS)

Contractors: Acciona Infraestructuras (for the reinforced concrete load-bearing structures) and Dragados Offshore (for the installation of storage tanks)

Reference Figures: Kjell Tore Fosså (Aker Kvaerner), Ruben Ortiz (Acciona), Javier Neira (Dragados Offshore)

Mapei Coordinator: Antonio Faura (Ibermapei Building Line Development Manager)

3rd Phase (Mapei SpA, Italy)

Work: construction of the structures for the docking bays and for off-loading the LNG were designed and tested so that ships with various tonnage ratings used to carry the methane can carry out manoeuvres safely.

Contractors: Eng. E. Mantovani S.p.A.

Reference Figures: Massimo Maso (Project Manager) and Umberto Crocco (Site Manager)

Mapei Coordinator: Claudio Azzena (Mapei SpA)

In Italy

The Italian part of the project was coordinated by Mapei SpA, and included the construction of the structures for docking and unloading ships carrying LNG.

These structures are capable of handling various sizes of methane-carrying ships in complete safety.

Construction started in 2007 in the Venice shipbuilding yard, and upon completion in September 2008, the structures were towed out into the open Adriatic sea using the same pro-

cedures as for the complex built in Algeciras. The structures were built by Mantovani SpA, with Mapei's contribution being particularly important to make sure that they will be capable of resisting the harsh operating conditions, due to them being completely immersed in seawater for a very long time.

The concrete was treated after casting using MAPECURE E, while MAPECOAT CFS was used to treat those areas of concrete where the concrete cover was not considered suitable. 

Photo 10.

The Italian site in the dry dock at the Venice shipbuilding yard.

Photo 11.

The concrete pylons used for mooring the methane ships, with the base treated after casting with MAPECURE E and protected in the parts most subject to expansion between the reinforcement rods and concrete using MAPECOAT CFS.

Photo 12.

An aerial view of the regasification plant on its arrival off the coast of Rovigo.

