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The CHRYSO Newsletter

QUALITY, SAFETY, ENVIRONMENT: TOP PRIORITIES FOR CHRYSO

EDITORIAL

The **CHRYSO** team welcomes you back for the 16th **CHRYSO** newsletter.

As we promised at the beginning of the year, 2006 has been full of events and achievements, such as the launch of new products to meet customer demand for higher quality concrete, the development of solutions that respect health, safety and environmental criteria, and the continuation and reinforcing of **CHRYSO**'s safety strategy.

CHRYSO has kept its promise to become France's first admixture manufacturer to obtain OHSAS 18001 certification for its safety policy and environmental action with the latest in its range of non-chloride hardening accelerators, **CHRYSO®Xel Time,** a high-performance, non-toxic product that poses no risk to users.

In this issue, you can also find out about **CHRYSO**'s latest success stories: the incredible construction project for the new Moroccan port, Tanger Med, and the advantages of the superplasticizer **CHRYSO® Fluid Optima 175**, which has been chosen for the thousands of cubic metres of concrete required to build the port, as well as the fruitful partnership between L'INDUSTRIELLE DU BÉTON and **CHRYSO** thanks to the qualities of the new generation superplasticizer **CHRYSO®Fluid Premia 196**, which is particularly well suited to heavy prefabrication.

WENDEL INVESTISSEMENT

Finally, we're bringing you news of the Materis group, with its four areas of activity (admixtures, aluminates, mortars and paints), which had a change of shareholder in April, when Wendel Investissement replaced LBO France. The spirit of the 2001 leveraged buyout continues: Wendel wanted to step up the group's development while working closely with management. Materis was created in 2001 following the acquisition of Lafarge Matériaux de Spécialités by CVC, Advent and Carlyle. LBO France took a stake in Materis in 2003.

NEWS

IN THE FIELD

NEWS

CHRYSO, the first French admixture supplier to obtain OHSAS* 18001 certification for its safety policy

Since 1999, **CHRYSO**, the French leader in chemical solutions for construction materials, has been fully committed to its comprehensive safety policy. It has created a great number of resources and documents and has designed training programmes and information campaigns to improve the safety of the daily working environment for all the men and women working at its 11 sites around the world.

Eighteen months ago, **CHRYSO France** was proud to celebrate 1,000 days without a single accident** at any of its sites. In September 2006, this total had risen to 1,600 days.

In order to ensure that these excellent results continue in the long term, **CHRYSO France** has now become the first French admixtures company to obtain OHSAS 18001 certification for its Sermaises du Loiret site. This is a double victory, as **CHRYSO Italia** has also just been awarded this certification, becoming the first company in the Materis group to obtain the three certifications: ISO 9001, ISO 14001 and OHSAS 18001.

CHRYSO AND OHSAS 18001 CERTIFICATION: SAFETY IS PARAMOUNT

OHSAS 18001 certification is the equivalent in the field of safety as ISO 19001 for quality management systems or ISO 14001 for environmental management systems. This certification covers a number of criteria relating to organisation, methods, expertise, documentation, identification tools and risk prevention. With very few manufacturers committed to a strict safety regime, **CHRYSO** is leading the way in this area.

CHRYSO considers this policy to be a key management tool that enables it to pursue several objectives:

- to continuously improve employee safety,
- to make safety a value shared by everyone, internal and external: directors, employees, suppliers, etc.
- to guarantee long-term results by relying not just on individuals but by creating tools, methods and know-how.

AFAQ OHSAS 18001

The awarding of OHSAS 18001 certification has validated **CHRYSO**'s choice of methods and resources deployed to improve safety in recent years, while highlighting several weaknesses on which the company will now focus.

THE CHRYSO SAFETY POLICY: AN ESSENTIAL ELEMENT OF AN INTEGRATED APPROACH

The **CHRYSO** safety policy has been intensified in the past three years through its integration into the global management system, with its three permanent components, Quality, Safety and Environment.

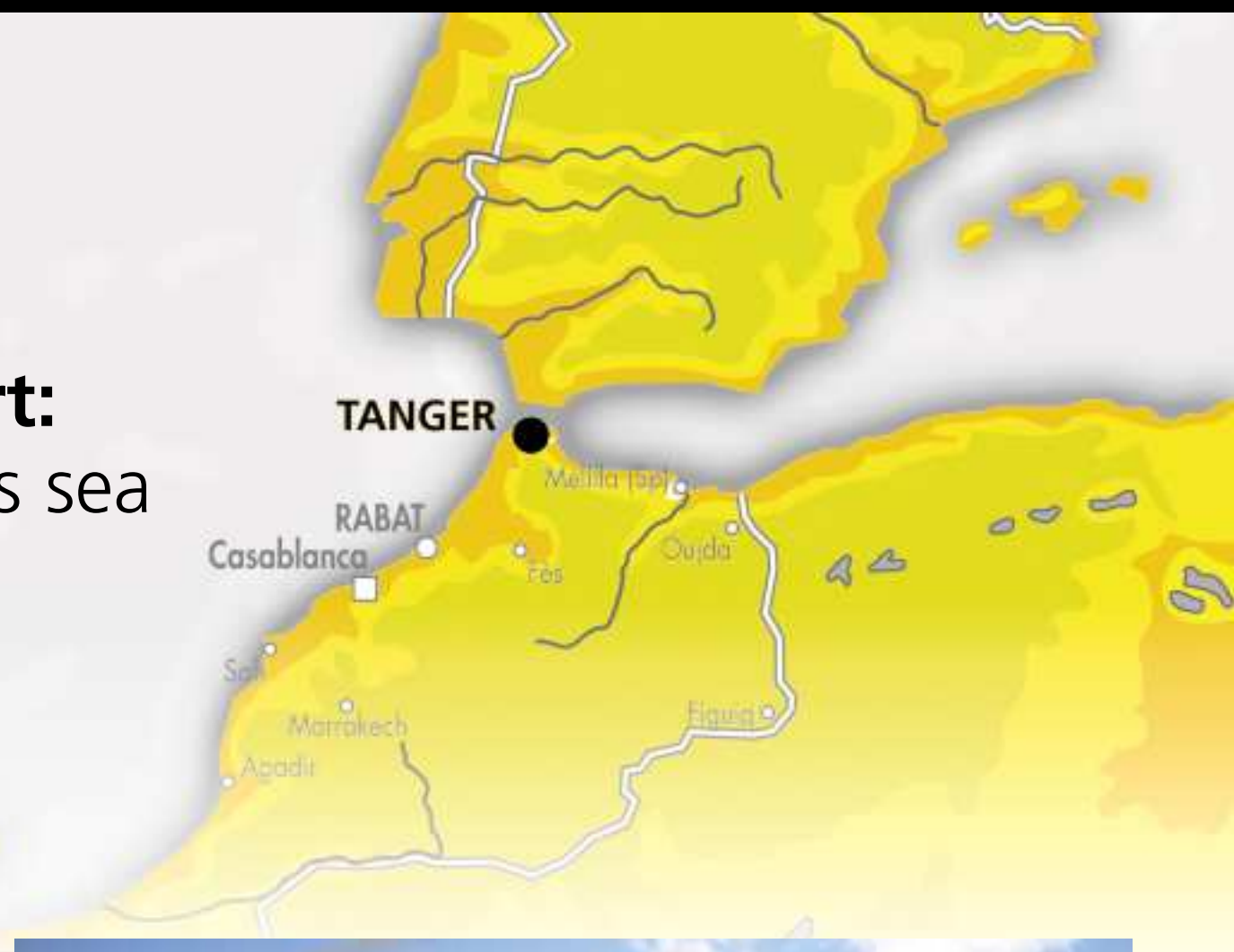
This integrated approach means that **CHRYSO** can now tackle these three issues together in a single approach with a single goal: to create added value for its customers, employees, partners and suppliers.

** Occupational Health and Safety Assessment Series.*
*** Accident in the workplace with sick leave.*

IN THE FIELD

Tanger Med Port: where the world's sea routes meet

Situated in the Strait of Gibraltar across from Algesiras in Spain, the new port of Tanger Med aims to become, from its inauguration in 2007, a key port and hub in the Mediterranean region for the transhipment of containers between America and Europe and between the Middle East and Asia.



Presented as a multi-purpose port, Tanger Med has five terminals reserved for containers, cereals, TIR and passenger services, the import and export of merchandise, and oil tankers. The port itself comprises two container terminals. The first terminal covers 40 hectares and has an 800-metre linear dock. The second covers 39 hectares with an 812-metre dock. The port backs onto three Free-Zones (logistics, industrial, commercial) covering 500 km². All areas will be linked by a network of rail and road routes.

The main project consists of the construction of the sea wall that will protect the port and the docks from the open sea.

Bouygues TP (in association with Saipem and Bymaro) won the contract for the sea wall by offering an economic alternative that has increased the dock area by nearly 18 hectares and lessened its environmental impact by reducing the surface area of the built structures and therefore the completion time (the quantity of materials required for filling in has been reduced to 7 million tonnes, compared to 21 million without the caissons).

The Accropode™ units require up to 16 m³ of concrete.

The sea wall was built in two stages:

- the first section was built in shallow water, formed of an embankment reinforced by 7,500 Accropode™ units,
- the second section used forty prefabricated caissons made of reinforced concrete for areas where the water is over 20 metres deep.

7,500 Accropode™ units are required to protect the sea wall in shallow water.

7,500 ACCROPODE™ UNITS

The first part of the main sea wall, 2,053 metres long, takes the form of a standard embankment 964 metres long with a maximum height of 37 metres. After building up the mound and positioning the boulders, a protective armour for the sea wall was formed on the sea-facing side, made up of 7,500 Accropode™ units in three sizes (4 to 16 cubic metres), with the heaviest weighing 40 tonnes. Accropode™ units offer forty times the protection of tetrapods.

They are prefabricated on site at an average rate of 30 per day, and stored there before being definitively positioned on the sea wall.

In terms of durability, although they have no steel reinforcing, Accropode™ units are expected to withstand sulphate and chloride attack from seawater, hence the use of a special cement formulated for seawater exposure, dosed at 320 kg per cubic metre.

* *Accropode™ units were developed and patented by SOGREAH for the protection of port sea walls and coastal structures.*

ACCROPODE™ FACTS AND FIGURES

- **3 sizes, from 4 to 16 cubic metres**
- **Weighing up to 40 tonnes**
- **Average rate of production: 30 units a day**

115,800 CUBIC METRES OF CONCRETE REQUIRED FOR 40 CAISSONS

This project was unusual because of the 40 four-cylinder caissons that form the main sea wall. Each caisson weighs 7,900 tonnes, has a surface area equivalent to two tennis courts and is as high as a ten-storey building (L 28 x W 28 x H 35 m).

The caissons are made in three stages, at a rate of one per week. The first stage takes place on land on a special prefabrication site. The first nine metres are fabricated here. After two days maturing, the caisson is then transferred to the water and the next 15 metres are cast in the docks. Finally, the caisson is moved to its final position where the last 11 metres are fabricated.

The caissons, which have a guaranteed lifespan of 100 years, must be able to withstand the problem of corrosion of the steel frame due to the effect of chloride ions. To combat this, three criteria must be respected:

- The steel reinforcing must have a concrete cover at least 8 cm.
- The concrete's permeability to chloride ions must be less than 5 10^{-12} m^2/s.
- The Concrete must be crack-free.

It took nearly a year in the Bouygues research lab to develop the concrete formula, which had to meet the following specifications:

- W/C : 0.33.
- Development of a special CEM II 52.5 R SRC cement in partnership with Lafarge containing fly ash, with a dosage of 480 kg/m^3.
- Use of four aggregate sizes to obtain a continuous particle size distribution of the concrete (0/1, 1/4, 4/12 and 12/20).

The concrete, which has a high density (~ 2.51) and is close to a "self-levelling" consistancy, must also meet the following application criteria:

- Slump: 220 ± 20 mm.
- Workable time: 1.5 hours.
- Compressive strength at 28 days: 90 MPa.
- Compressive strength at 90 days: 130 MPa.

The inclusion of the superplasticizer **CHRYSO®Fluid Optima 175** in the formulation of the concrete used for the Accropode™ units and the caissons enabled all specifications to be met. In fact, **CHRYSO®Fluid Optima 175** is particularly well suited to the demands of the project, as it combines a good workable time with water reduction and cohesion of the concrete.

In the formulation for the concrete used at the Tanger Med port, the use of **CHRYSO®Fluid Optima 175** guaranteed a 90 minute workability retention to ensure good cohesion between each layer of concrete (the sliding form advances at a rate of 20 cm per hour), but also sufficient rigidity to enable the form to be lifted after four hours, while keeping the option for finishing.

Partners

Contractor & project manager:
Agence Spéciale Tanger - Méditerranée (ASTM).

Group: Société de Réalisation du Port de Tanger Méditerranée (Bouygues TP, Saipem and Bymaro, Moroccan subsidiary of Bouygues Bâtiment International).

Concrete supplier: S.R.P.T.M.

The caissons are allowed a maximum permeability of 5 10^{-12} m^2/s to chloride ions.

NEWS

CHRYSO®Xel Time, a non-toxic, non-chloride hardening accelerator

Following the launch in 2003 of three environmentally-friendly mould release agents, then the 2005 launch of CHRYSO® Reductis 50, a Chromium (VI) reducing agent, followed by CHRYSO®Dem LVA, a pure vegetable-oil based, biodegradable immediate mould release agent, CHRYSO now presents CHRYSO®Xel Time. This hardening accelerator contains no chloride, is classified as "harmless" and carries no risk warnings. CHRYSO®Xel Time is the latest addition to the range of non-chloride hardening accelerators available from CHRYSO (CHRYSO®Xel AD and CHRYSO®Xel 650).

CHRYSO®Xel Time: OPTIMUM PERFORMANCE

Increased early strength, optimised production and good safety credentials are all advantages of the **CHRYSO®Xel Time** hardening accelerator. Its acceleration qualities make it one of the best products on the market. It is aimed at the prefabrication industry and ready-mix producers.

CHRYSO®Xel Time: OPTIMISATION OF PRODUCTION

CHRYSO®Xel Time is a hardening accelerator that produces very rapid strength gain. The rate of acceleration depends on the dosage used.

It achieves the following results:

- considerable time and productivity gains with faster demoulding and releasing of prestressing wires,
- energy savings due to the reduced time and temperature required for steam curing (average time saving of one hour of steam curing),
- production rate maintained even in cold weather.

CHRYSO®Xel Time: EASY AND SAFE TO USE

CHRYSO®Xel Time is a high performance non-chloride hardening accelerator classified as "harmless", which is very easy and safe to use. It has a low alkaline level, meaning it can be used with a wide range of aggregates and cements in order to comply to regulations covering the prevention of ammonia reaction risks.

With CHRYSO®Xel Time, is anticipating regulatory change by responding to all health and safety issues and to contractors who are increasingly demanding the use of non-toxic products.

CHRYSO®Xel Time:
TECHNICAL DATA

Nature: yellow liquid
Density: 1.27 ± 0.03
pH: 7 ± 2
Cl content: 0.10%
Na^2O equiv: ⩽ 2.80%
Dry extract (EN 480-8): 39.00% ± 1.90%
CHRYSO®Xel Time conforms to NF certification.

CHRYSO®Fluid Premia 196 *can be used to formulate a self-levelling concrete workable for 30 to 45 mins.*

IN THE FIELD

L'INDUSTRIELLE DU BÉTON finds the solution with the superplasticizer **CHRYSO®Fluid Premia 196**

L'INDUSTRIELLE DU BÉTON, a company based in Boran-sur-Oise, specialises in the prefabrication of concrete structural components for the construction industry (posts, beams, hollow core floors, etc.), mainly for the private market but sometimes for the realisation of civil engineering structures. The company's know-how and control over the prefabrication process (including an in-house design office) enables it to construct extremely high buildings with beams of up to 30 metres long and weighing more than 42 tonnes. It produces 40,000 m^3 of concrete per year which is used in all markets: offices, car parks, shopping centres and civil engineering structures.

It is therefore essential to formulate concrete that is both aesthetically appealing and of very high quality at this prefabrication factory specialising in large precast structures for names such as Ikea, Carrefour, Senoble and Clarins, as well as for major property developers, the French railway SNCF (TGV East warehouse at Pantin) and the public infrastructure authorities (Alençon bypass).

To achieve an optimal finish, L'INDUSTRIELLE DU BÉTON elected to work in partnership with **CHRYSO** and for the past few months has been using **CHRYSO®Fluid Premia 196**, a superplasticizer that allows the fabrication of concrete architectural elements such as wall panels cast in self-levelling concrete or very high quality beams. **CHRYSO®Fluid Premia 196** contributes to the appearance of facings and the consistency of concrete colour without having to rework exposed concrete.

L'INDUSTRIELLE DU BÉTON HAS CHOSEN CHRYSO AND ITS SUPERPLASTICIZER CHRYSO®Fluid Premia 196, SPECIALLY AIMED AT HEAVY PREFABRICATION, TO OPTIMISE THE PERFORMANCE OF ITS CONCRETES

In 2001, the company decided to switch production at the Structure workshop to self-levelling concrete. The main motive was to improve working conditions for employees by greatly reducing the noise generated by the vibrators, which was between 115 and 120 dB(A). The switch from vibrated concrete to self-levelling concrete generated a higher cost of the concrete formulation. This was quickly absorbed by the lack of vibration costs and the increased lifespan of forms, and gradually, through tests, a better quality concrete was obtained.

Today, in the Structure factory, the noise level is greatly reduced, at less than 80 dB(A); the loudest noise now comes from the travelling crane.

In 2004, the company decided to relaunch tests in order to assess the new superplasticizers that had come out and to resolve problems of rheology and segregation of its concretes. Until then, the formula, was very sensitive to changes in raw materials and could have led to segregation in summer, when the temperature in the factory reaches or exceeds 30°C.

CONTRACT SPECIFICATIONS:

- to formulate a mobile concrete with low air-entrainment and high early strength: 40 MPa after 20-24 hours,
- to obtain a cohesive concrete with a high course aggregate content.

Tests using admixtures from various suppliers were carried out over a year before L'INDUSTRIELLE DU BÉTON finally found the solution and chose, for its intrinsic qualities, **CHRYSO**'s superplasticizer **CHRYSO®Fluid Premia 196**, an admixture that met every specification for the project.

Launched in 2005, **CHRYSO®Fluid Premia 196** is a new-generation superplasticizer specially formulated to meet the demands of heavy prefabrication.

CHRYSO®Fluid Premia 196 achieves the following results:

- high early strength. This increased strength leads to time and productivity gains (faster demoulding and releasing of prestressing wires), energy savings (reduced duration and temperature of steam curing), ease of use and optimisation of the concrete formula (less cement required).
- flexibility of use: concretes are less sensitive to changes in raw materials and are workable for 30 to 45 minutes for greater ease of application. The concrete remains consistent throughout despite vibration during transport from the station to the concreting facility or when there are major variations in water content due to aggregates,
- high quality finishes.

A close partnership was formed between L'INDUSTRIELLE DU BÉTON and **CHRYSO**, which also shares the same high safety standard.

The present formulation of self-levelling concrete with **CHRYSO®Fluid Premia 196** means the concrete can handle slight variations in water content, is more cohesive and has a good surface finish due to the rapid release of entrapped air.

Last but not least, this formula means the form can be removed after five or six hours while preserving a high quality finish.

The latest use of **CHRYSO®Fluid Premia 196** at the INDUSTRIELLE DU BÉTON prefabrication factory is in the formulation of the concrete for 28 beams, 28.60 metres in length and weighing 26 tonnes each, to be used in the Alençon bypass. Performance achieved: the concrete had set within 6 hours and the form could be removed to produce a good quality finish with a high strength.

L'INDUSTRIELLE DU BÉTON specialises in the prefabrication of long beams.

L'INDUSTRIELLE DU BÉTON has been part of the independent international group CRH since 2003. CRH was created in Ireland in 1970 from the merger of two companies, Irish Cement and Roadstone (aggregates) and now operates in 23 countries on three continents. L'INDUSTRIELLE DU BÉTON generates sales of €22 million (2/3 from the fabrication of concrete elements and 1/3 from cellular floors) and employs 110 people at its site in Boran-sur-Oise. This location in the Paris region benefits from excellent river, rail and road links that place it at the heart of a dense transport network, enabling the prefabrication unit to obtain contracts several hundred kilometres away (Ikea Dijon, Casino Saint Étienne, etc.), even as far as the Belgian border. L'INDUSTRIELLE DU BÉTON was one of the first companies to start fabricating structures in self-levelling concrete, in 1990.

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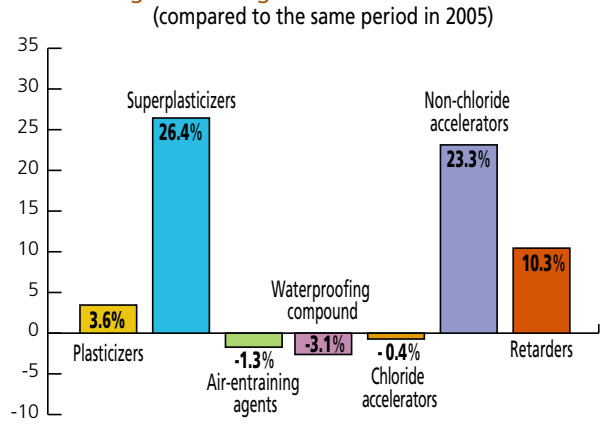
OUTLOOK

Admixtures key figures…

Change in tonnage over the first 9 months 2006
(compared to the same period in 2005)



Source: Synad
(National concrete and mortar admixtures association)

www.chryso.com

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