



THE GREAT DAM

On the 20th of May 2006 the last concrete was cast on the Three Gorges Dam jobsite, marking the completion of the dam body a whole 4 years ahead of schedule.

Let's go back to the Three Gorges Dam. An in-depth article was dedicated to the project in issue N° 63 of our in-house Italian language magazine "Realtà Mapei", published at the beginning of 2004. Construction of this enormous hydro-electric dam (the largest of its kind in the world) in Yichang on the Yangtze river (in Hubei Province in southern China) commenced in 1993, and up until now has cost 17.5 billion Euros.

When the article was published (in the beginning of 2004), the second work phase had been completed, with the dam being partially opened in June 2003 with the start of the generation of electricity on site. We may now announce completion of the dam body: a structure which is 2,309 metres long along the crest and 185 metres high, inaugurated on the 20th of last May. The dam will allow the reservoir of the Three Gorges to reach a depth of 175 metres (with a total capacity of 40 billion m³ of water) a whole 4 years ahead of schedule.

In fact, it will be in 2009, rather than in 2013 as previously scheduled, that all 26 turbines in the dam will be in full production with an output of 84.7 billion kilowatt-hours per year.

The acceleration of the work, which continued non-stop in a 24-hour and 7-day manner for 13 years and involved a total manpower of 60,000, was obviously motivated by China's enormous hunger for energy. In fact, the Chinese government plans on doubling the production of electricity by 2020 to support the staggering growth in the country's economy, a growth which was widely discussed in the preceding pages.

Apart from the obvious benefits regarding the supply of energy, the Chinese authorities also expect that the opening of the dam will offer an enormous help in the control of flooding (a centuries-old problem which has hit numerous areas in the south of the country) and an overall improvement in the navigability of the Yangtze river.

THE DAM BY NUMBERS

- 1993:** construction work started
- November 1997:** completion of the first work phase
- June 2003:** completion of the second work phase and start of the generation of electricity
- 20 May 2006:** completion and inauguration of the dam body
- 4 years:** number of years the dam body was completed ahead of schedule
- 2009:** all 26 turbines in full production of hydro-electric energy
- 17.5 billion Euros:** total cost of the project
- 2,309 metres:** length of the dam body
- 185 metres:** height of the dam body
- 84.7 billion kw/h:** annual energy production capacity of the dam
- 40 billion m³:** volume of water in the reservoir behind the dam



FROM DAM TO DAM

A TECHNICAL SYMPOSIUM HELD IN YICHANG HIGHLIGHTED THE LEVEL OF MAPEI'S EXPERTISE IN THE HYDRO-ELECTRIC CONSTRUCTIONS SECTOR.

A wide range of factors helped play a part in the rapid completion of the Three Gorges Dam's body, such as the valuable technical support of both Chinese and foreign experts. The precious collaboration and the exchange of useful, specialist knowledge among the experts were exactly the main aims of the technical symposium organised on the 9th of last March in Yichang, in collaboration with the CTGPC (China Yangtze Three Gorges Project Development Corporation). Various members of the Board and experts from within the Mapei Group took part at the event, including Veronica Squinzi, Strategic Planning Manager, Marco Squinzi, Director of the Milan Research & Development Laboratory, Enrico dal Negro, Product Manager of the Underground Technology Team (also known as UTT, the department Mapei devoted to large underground projects), John Almas, UTT Local Manager for China, Richard Andrew Schulkins, UTT Area Manager for the Far East, and Will Guan, General Manager of Mapei companies in mainland China.

Their presence at the event was due to the company's vast experience in the Large Projects sector, sites all around the world which transversally involve a number of departments and production lines. In fact, Mapei has advanced technology which may be applied in a wide range of projects, including hydro-electric power stations and underground construction work.

In particular, large hydro-electric plants, with their associated hydraulic works, are the most technologically advanced in terms of the highly specialised personnel required for their design and the high performances required by the materials used in their construction. Therefore, large hydraulic infrastructures, such as the Three Gorges Dam project, require a synergic approach between the specialists involved in the design phase of the work and, also, the technicians involved in



Veronica Squinzi, Strategic Planning Manager for the Mapei Group, opens the proceedings of the symposium by illustrating the activities carried out by Mapei. Her speech was followed by technical presentations by Marco Squinzi, Enrico dal Negro, John Almas, Richard Andrew Schulkins and Will Guan.

their construction.

On this occasion, experts from the UTT sector supplied valid support, by illustrating the advantages of Mapei product systems specially designed for underground applications, such as alkali-free accelerators for shotcrete, high quality super-plasticisers for concrete and products for concrete repair.

The symposium was intended to satisfy the interest arisen in the Chinese experts by the painstaking research work conducted in 1998 in the Mapei R&D Laboratories. This research, pursued under the guidance of Pasquale Zaffaroni, Product Manager of the Building Speciality Line, individuated the most suitable formula for the concrete for the Three Gorges Dam's spillways. The numerous tests carried out on the composition of the mix under

Since the 1990's Mapei has taken part in the rebuilding and construction of dams all around the world. For further details of these projects please visit our website at www.mapei.it and search the records available in the "References" section by using the word "dam" as the key word.

Kali Gandaki hydro-electric power station Mirmee - Nepal

Mapei contributed to the construction of this power station in Nepal between 1998 and 2001, supplying MAPEPLAST N10 and MAPEFLUID X404 admixtures. The former was used to formulate the concrete used for the body of the dam; the latter was used to prepare the concrete for the spillways, in order to make them highly resistant to mechanical stresses (abrasion, impact, etc).



the lead of Gianluca Bianchin, Head of the Admixtures for Concrete Division, assessed the performance of both the raw materials and the concrete under laboratory conditions, as well as the performance of the concrete in the mixing plants and directly on site. The results demonstrated the suitability of the Mapei superplasticisers, such as MAPEFLUID X404. This product has the capacity of reducing the amount of water used for mixing while guaranteeing the concrete's high mechanical strength and workability retention. In combination with a proper mix design, MAPEFLUID X404 is able to reduce the hydration heat and, consequently, the risk of cracks formation. The precision and reliability of these tests highly impressed many of the Chinese experts from the construction and chemicals sectors: the symposium was just intended to be an ideal opportunity to increase their knowledge.

In particular, if MAPEFLUID X404 belonged to the so-called 1st generation of polycarboxylate-based admixtures, this event drew the participants' attention to the 3rd generation of Mapei nano-structure admixtures, that is, those belonging to the DYNAMON SYSTEM.

Indeed, after a general presentation of the company's background history and main activities by Veronica Squinzi and an introduction to the Mapei R&D laboratories by Marco Squinzi, the presentations by Marco Squinzi, Enrico dal Negro and Richard Schulkins mainly focused on acrylic superplasticisers, admixtures for self-compacting concrete and alkali-free accelerators. After a brief presentation of those Mapei products used for repairing concrete, in the final speech of the symposium Enrico dal Negro illustrated numerous examples of hydro-electric projects which have made wide use of the solutions, technology and experience offered by the company. This presentation included plenty of photographs and in-depth explanations which were to only further convince the public of the quality, durability, efficiency and safety of construction works carried out using products supplied by the Mapei Group. The speakers were then able to answer all the questions posed by the local experts during the relaxed, cordial atmosphere of the gala banquet which closed the symposium, an ideal occasion to exchange opinions and further information on the arguments discussed during the various presentations.

In view of the great success of the event, the company expects to develop the cooperation with these Chinese experts and to be involved in other important projects which in the next few years will lead to the construction of other new dams, such as those at Xilodu, Xiangjiaba, Baihetan, Wudongde, etc. To this aim, Mapei may count on a long experience gained over the years by participating in large hydro-electric projects all over the world (see the box on the left).

Besides, the company has already taken part in the construction of numerous hydro-electric projects in China, examples of which are illustrated here on the right.

DM

PROJECTS PORTFOLIO - CHINA

**Shuibuya dam - Hubei Province**

The construction work for this hydro-electric facility, which is due to be completed next year, will include approximately 150 tonnes of DYNAMON SR3.

Ziping pu dam - Doujiangyan, Sichuan Province

DYNAMON SR3 admixture was used to formulate the 40,000 m³ of concrete for the feed conduits of the four turbines in the dam and the lower layer of the overflow channel which is continuously subject to impact by debris carried by the water.

