The Dams Newsletter

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WORD FROM THE PRESIDENT

C.B. Viotti

Dams represent an important asset , although sometimes not adequately acknowledged, of the complex system that sustains the modern world. It is only through exceptional conditions, like those lived by New Yorkers and other Americans this last summer, that the fragility and the importance of this complex system are recognised. Indeed, dams are aimed at improving the well-being and wealth of society as a whole, and it is indisputable that dams have already played a crucial role in alleviating the disastrous effects of floods, increasing food production, improving navigation, producing electric power, and providing drinking water. In the last few decades, mankind has been re-evaluating every aspect of human activities under its new conscience of the vital importance of environmental considerations and sustainable development. Dams have also been subjected to this scrutiny, and some cases of under-performance have been used to diminish the role of dams in general. We consider this to be not acceptable, and that these exceptions should be treated as such.

On the other hand, we are sure that the community of dam specialists has greatly contributed to the development and implementation of the technical, social and environmental procedures. Nevertheless, we are eager to take any measure to improve every aspect of a dam implementation and are open to discussion regarding what must be done in this respect.

The newsletter you have in hand will be published quarterly and I hope it will serve these goals : to make dam's contributions to the well-being of humanity better known and to answer critics which appear groundless, like the ad from the WWF that recently appeared in the English-speaking media.

Beyond that, I also wish it were used as a communication tool between the National Committees and the Central Office, so that ICOLD as a whole will intervene more efficiently in the world debate around dams. I am particularly thankful to the Chinese committee for writing and translating very fast the article we requested from it, on the subject of cracks in the Three Gorges Dam. I am sure that it will bring useful information to every dam engineer in the world, who is often asked about the Three Gorges. Hoping that this newsletter will make possible more such exchanges, I wish you a pleasant reading.

Cassio Baumgratz Viotti

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Three Gorges dam delivers its first kilowatt hours!

The mammoth-sized project, to be completed in 2009, will cost 180 billion yuan (US$22 billion, 20 billion euros), a sum equal to the economic loss the severe Yangtze flooding in 1998 inflicted on China.

The world's largest dam has begun generating electricity on July 10, at 0131 local time, when the first of the dam's 26 generators was connected to the power grid. The reservoir began to fill on June 1 and the water has now reached the depth necessary to allow ships to sail on it. Most of the world press coverage on the Three Gorges had been pretty negative, especially in the Anglo-American media. But now that the dam nears the achievement, of its second phase, they are forced to recognize the engineering feat. The mammoth-sized project, to be completed in 2009, will cost 180 billion yuan (19 billion euros), a sum equal to the economic loss the severe Yangtze flooding in 1998 inflicted on China. As of this writing, three generating units (# 2, 3 and 5), 700 Mw each, have been connected to the power grid. Six generationg units, 700 Mw each, have been connected to the power grid. Each generator is delivering 13 000 kWh daily and this electricity is welcomed by the ever hungry power grid. Most regions in China are facing shortages. "Without the Three Gorges project, China's power shortage this year would be much worse", said Gu Biquan, a spokeman for Huaneng Power International Company, China's largest power company. According to Li Yongan, vice President of the Three Gorges Development cooperative, "From now on, 4 sets of generators will go into operation every year. By 2009, the plant will generate nearly 85 billion kilowatt-hours of power." Already, the City of Shanghai, which recorded a peak demand during the summer heat wave, was saved from a blackout similar to the one lived by New York City, thanks to supplementary power it got from the Three Gorges hydroelectric and Qinshan Nuclear power plants.

The anti-dams activists have now moved their focus from the resettlement of the people forced to move, to the cracks that have appeared during the construction. Those 80 cracks have appeared on the whole upstream face of the 483-metre-long spillway section, and they extend from 1 to 1.25 metres in the dam. Zhang Chaoran, chief engineer of the Three Gorges Project Development Corp, explained that "This is a normal phenomenon and cracks such as these can be observed in almost all large dams in the world." (See Mr Zhang's article in this issue p. 5.)

The press conference of Pan Jiazheng, head of the expert team of the Three Gorges Appraisal Team held by the State Council Information Office on June 12, has created the opportunity for a lot of catastrophist papers on that subject. The media usually make selective quotes from Pan's speeches, keeping only those parts where he is warning about the possible problems. They try to create fear on that basis. "During the inspection, we found that some of the vertical cracks on the dam that were repaired have reopened, even though we put a great deal of money and effort in the repair work. It appears that during the concrete pouring, we put too much emphasis on the goal of achieving a very high degree of strength. But it has turned out that a high degree of strength does not necessarily mean good quality in a concrete dam. We have achieved an unnecessarily high degree of strength

and a lot of cracks in the dam by pouring too much concrete and spending a great deal of money. I feel it's too early to be proud of ourselves and we have a long way to go" explained Mr Pan, who is also a member of the Chinese Academy of Sciences. He also said that "If water enters these cracks, there could be negative effects, so we are fixing them very carefully".

The anti-dams activists have now moved their focus from the resettlement of the people forced to move, to the cracks that have appeared during the construction.

This may sound very disturbing. But here is a more precise explanation given by Mr Pan, generally omitted from the media reports : "Generally speaking, there are different types of dam cracks. Embedded cracks are one kind that might destroy the concrete structure, and accordingly cause safety problems. Fortunately, we don't have such cracks in Three Gorges dam. Another kind of crack, which is shallow and slight, only exists in the surface of the dam. We've found this in the dam." Pan gave a number of causes for the appearance of those cracks. For example, in the building process, the concrete surface of the dam was not well protected during the winter, or the sharp parts of the dam easily cracked because of a design problem. Most importantly, according to Mr Pan, the cracks in the surface **do not affect** the dam's safety. Meanwhile, the market expressed its confidence : in November, Chinese investors rushed to apply for Initial Public Offering (IPO) by Yangtze Electric Power. Retail investors tried to buy nearly 70 times the number of shares on sale, for $1.19 billion, which will finance the second phase of the project, due to begin next year. ●

AOL Time Warner group contributes some 1,000,000 euros to WWF anti-dam campaign

You may have seen those ads, printed in *Time magazine*, on two pages of glossy colors. A dam is replaced by a tombstone, which reads "The true cost of a dam never shows up on a balance sheet". The message is clear : dams kill. This is part of the "Dam Right! WWF's 2003-2004 Dams initiative" launched by the most powerful green organization on the planet.

The ad has been prepared by Ogilvy & Mather, one of the leading advertising company, which works for giant companies like Unilever, American Express, Coca Cola, Ford, IBM, Kodak or Omo. Ogilvy & Mather has worked for free on the WWF ad.

The ad has appeared at least 8 times during the months of June, July and August. The normal cost for such an appearance is 120 000 euros per issue. The total cost is then near 1 000 000 euros, for Time Europe only. But the WWF, however rich it may be, did not pay a cent. The ad space was given for free by *Time*.

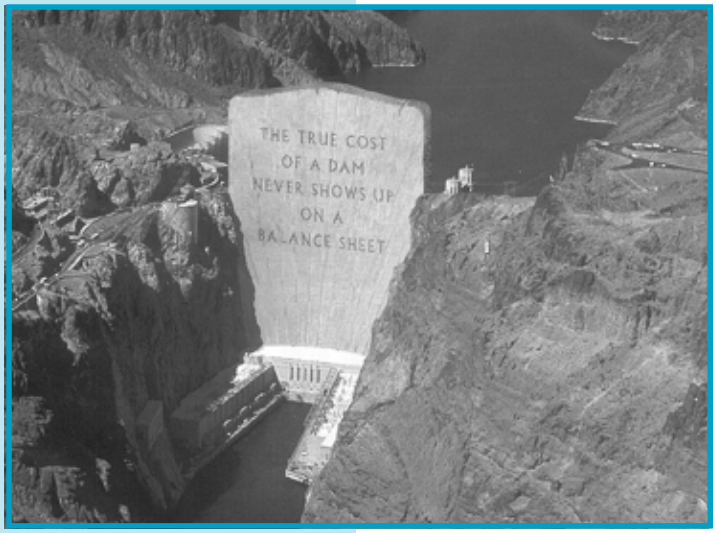
Time reaches 24 millions readers every week. It belongs to AOL Time Warner, the world's leading media and entertainment company, whose businesses include interactive services, cable systems, films, television networks, music and publishing. Time Inc. regroups 140 magazines with a total readership of 300 millions. The ad also appeared in The Economist, a

weekly generally considered as "the voice of the City".

How is it that powerful companies, such as Ogilvy & Mather or AOL Time Warner, decide to help the WWF campaign ? We have asked them and they did not answer !

The dam campaign pretends to be "reasonable". For example, it says that "not all dams need to be bad dams"* and recognizes the positive impact . The general line is that, "OK, dams can be useful, but they can also be destructive; therefore, why don't we try to find other solutions ?". Says their leaflet, "The WWF is calling on governments, industry and financial institutions to implement the WCD guidelines to ensure that the damage caused by dam projects is minimised."

The problem arises when you look at the alternatives proposed by the WWF : most of them are either inefficient, insufficient or plainly inoperative. For example, they propose "rainwater harvesting" as "an alternative to large reservoirs", where the rainwater harvesting, however useful it may be for a domestic use, is absolutely unable to answer the needs of agriculture and industry. Or, in the energy domain, they claim that "run of the river schemes can provide a lot of the benefit [of a large dam and a reservoir] at far lower cost." The opposite is true ! run-of-the-river schemes cost more than 3 times than a large dam (in terms of installed kW) and bear the same environmental risks, with a much higher risk for the security of the persons.



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Another example of the bad faith of WWF : they propose "inter basin water transfer" as a supply-side management option which makes unnecessary the construction of a dam to insure water supply. But, at the same time, the WWF is waging an international campaign against a Spanish government project of water transfer from the Ebro river to the southeast part of the country. They are claiming that "Water transfers are increasing the water crisis" and they say, about another water transfer project : "The Tagus-Segura water transfer is a clear example of how a big volume water transfer between river basins can sharpen the social, economical and environmental problems instead of solving them. WWF considers the Tagus-Segura water transfer a big mistake. The lessons from the past should lead to new ways of water management instead of more big volume water transfers, like the Ebro water". So, to replace large dams, the WWF is proposing a solution already condemned by itself!!!

The fact is, while shedding crocodile tears on the poor populations — the seven billions people in 60 countries who are expected to face water scarcity by 2050 or the two billion people currently without access to electricity — the WWF is denying them the right to develop. The final paragraph of their pamphlet is worth quoting : "There are financial implications of investing in dams rather than alternatives. An important implication of this is that all the investment is made up front. If the dam is constructed and fails to perform as anticipated then virtually 100% of the investment could be at risk, with a continuing need to amortise the debt. On the other hand, alternatives may be perceived as lower risk investments." WWF tries to scare the investors out of dams, by replaying the old "small is beautiful" song from the 1970's. Could it be that the financial community supports that anti-dam campaign because it needs the money somewhere else ? If not, what is the true reason for the AOL Time Warner group's support for the WWF? ●

* : All quotes from the WWF are coming from the website of WWF international (www.panda.org) or from the fact sheets distributed by WWF.

The dam safety of Three Gorges project is absolutely reliable

By Chaoran Zhang, Three Gorges Project chief engineer

This article includes editorial suggestions by Robert Charlwood, Chairman of ICOLD's Technical Committee on Concrete for Dams, based on information from E. Mitchell. The pictures were kindly given by Mr Mitchell.

1. General Description of the Three Gorges Project construction

The Yangtze Three Gorges Project with the comprehensive benefits of flood control, power generation and navigation, a major project in developing and harnessing the Yangtze River in China, will have a great effect on the development of Chinese society and economy. The project consists of dam, hydropower station and navigation structure. The whole project will be constructed in three stages according to its design. In June 2003, the water level of Three Gorges Reservoir was impounded to 135m and twin-5-stage ship locks were put into operation. In July 2003, the first four generating units (700MW each) were put into operation, showing that the second construction stage was successfully completed. The project began to contribute greatly on the society and economy of China.

During the construction of Three Gorges Project, scientific methods of quality control and project management have been used strictly. As a result, the project is of high quality. 10,024 monitoring instruments of all kinds were installed in the project, and 6,252 devices were embedded in the dam. As the reservoir was impounded to 135m, data from the monitoring devices shows that the deformation of dam foundation is less than 1 mm, and seepage through foundation is less than one tenth of the design value. The horizontal displacement and stress distribution of dam are both within the range of allowable design value. The requirements of design were fully satisfied. The dam safety of Three Gorges project is absolutely reliable.

2. Dam structure and construction of Three Gorges project

Three Gorges project is a traditional concrete gravity dam, which is 2,309m long along dam axis. The spillway section which has been completed in the middle of river is 483m long, and powerhouse and non-flow section on the left bank is 1,091m long. The length of spillway section and dam section on the left bank is 1,574 m, 68 percent of the total dam length. Up to August 2003, a volume of 22 million m^3 concrete has already been placed. The annual concrete placement between 1999 and 2001 has set the world record.

The maximum height of Three Gorges Dam is 181m, and its maximum width is 126m. Dam concrete was placed section by section along axis, block by block from upstream to downstream, layers by layers with 1.5m~2.0m thickness of each. The construction method is traditional one. Longitudinal and transverse construction joints between concrete blocks must be grouted when the dam is cooled to the design temperature so as to form a gravity dam.

Two sets of copper water-stops were designed not only in the upstream side but also in the downstream side of dam transverse joints. Drainage and inspection pits are designed between the two copper water stops. In order to improve seepage control, concrete with high quality in durability and impermeability is placed in the upstream part to a thickness of about 10m. At the same time, drainage galleries and drainage pipes are designed behind the upstream impermeable concrete to manage any unexpected seepage flows that might occur.

Three Gorges Dam is constructed by Chinese Hydro-construction enterprises with excellent achievements in dam construction. From raw material selections to every working process and technique adopted during dam construction, quality control was strictly executed.

In May 2003, the second stage in which the reservoir was impounded to 135m, the permanent ship-lock was completed and put into operation for navigation. It has passed the experts' safety evaluation procedure organized by the Chinese government. The conclusion is that the design, construction, manufacture and installation in each stage of the project met with all the demands of national and ministry technical specifications, and the requirements for dam operation are fully satisfied.

3. Causes and Extent of Cracks in the Concrete Spillways

Three Gorges Dam is a structure of massive concrete. Heat is generated by the chemical reactions involved in the setting of concrete and temperatures increase in the interior of such large masses since diffusion is poor for these kinds of structures. Transient tensile stresses develop in concrete because of the difference of temperature that develops between the concrete body and its surroundings. Cooling systems and other measures are taken in the large concrete structures to reduce the effects of this heating. When the tensile stress in concrete during placing and cooling of the concrete is larger than its tensile strength, cracks will occur, usually starting at the concrete surfaces and propagating inside the structure to some extent. This phenomenon is very common in massive concrete structures such as those at Three Gorges Dam and, if managed properly, does not cause a reduction in dam safety.

Much attention has been paid to temperature control in the course of design and construction of Three Gorges Dam. In order to prevent or reduce the concrete temperature cracks, a carefully designed system of joints and blocks has been adopted in the structure with optimized concrete mix proportions. At the same time, integrated temperature control techniques with both pre-cooling of the concrete aggregates and post-cooling of the placed concrete to meet international standards have been used in construction, to ensure construction quality and reduce, and even prevent temperature cracks. It has been found that the above measures are effective. Up to the present, no hazardous embedded foundation cracks have been found in Three Gorges Dam, and the number of surface cracks expected in each 10,000m^3 of concrete placed is much smaller than that expected based on comparisons with statistical data from similar international cases.

The possibility of surface cracks developing in the upstream or downstream surfaces of the dam were carefully checked and monitored. Dam concrete was placed starting in 1999. By the end of Oct. 2000, one vertical crack was found at the upstream surface of #16 spillway dam section midway between the low level intakes. No other cracks were found in the further checking on other spillway dam sections at that time. In the middle of Dec. 2000, as the air temperature was decreasing again, some similar cracks were found at the other five spillway dam sections in both the upstream and downstream faces.

No new cracks were found in the following checks from Sept. to Oct. in 2001. During the following winter season, new cracks were found by the end of Jan. 2002. The number of cracks was carefully analyzed and it was found that there were 40 vertical cracks in the upstream surface of the spillway dam section and 38 vertical cracks in the downstream surface. These cracks were 0.1mm~0.3mm in width and less than 3m in depth, occurring both in the upstream and downstream surfaces of the structure between the temporary bottom outlets. These cracks were found in time and handled comprehensively before water impounding, as part of the ongoing work of dam concrete construction. Authoritative Chinese experts were invited for evaluations of these cracks. The conclusion was that the cracks found were surface cracks and they were mainly caused by high transient temperature gradients on some exposed concrete surfaces in addition to temperature difference between the inner mass concrete and the outer concrete of dam body. The Three Gorges Dam spillway structures were particularly sensitive to such temperature variations due to the

Figure 1. A General view of the upstream face of the spillway.

Figure 2. Typical Crack Repair Location between Low Level intakes.

presence of three layers of large outlets in this section of the dam. Thermal stresses tended to concentrate near these water passage openings.

A general view of the upstream face showing the low level and mid level intake openings in the right hand part of the photo (taken after the repairs were complete) is shown in **Figure 1**. A typical location of the upstream cracks is shown in the photo in **Figure 2** and the schematic in **Figure 3**. A photo of the downstream face, at the time of breaching the cofferdams and flooding the downstream area, is shown in **Figure 4**.

There was some concern that, if the cracks penetrated deeper into the dam body, that some leakage might occur into the upstream inspection and drainage galleries. However, it was clearly recognized that such surface cracks would not affect the overall stability of the dam.

Comprehensive numerical modeling was performed to fully understand the thermal cracking behavior in the spillway structures. The analyses showed that these cracks will not expand after water impounding because the stress conditions will improve as time passes and the temperature in the dam body reduces and the differential is reduced, plus the fact that the surfaces that were exposed in 2000 and 2001 would become submerged thereby reducing future surface temperature gradient extremes. Therefore it is expected that these surface cracks will not propagate any deeper into the dam body and in fact will tend to close with the passage of time. Therefore these cracks will do no harm to the Three Gorges Project.

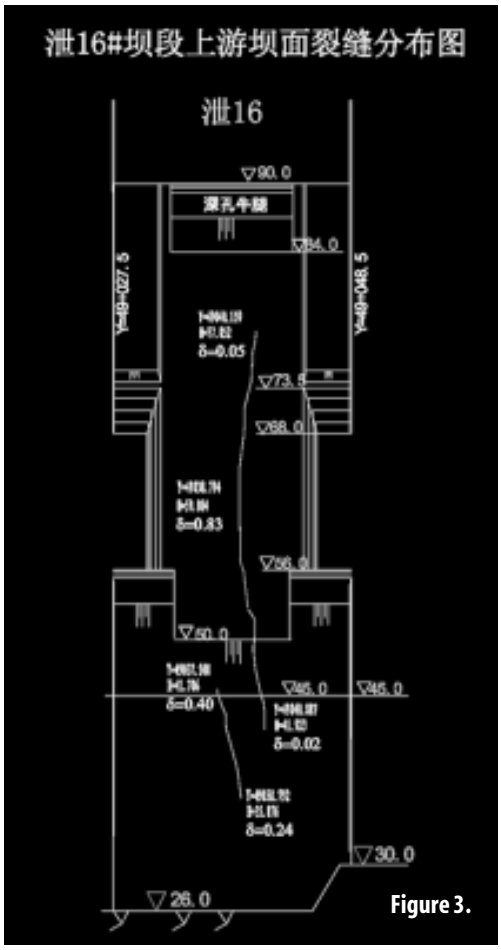

Figure 3. Schematic of typical Crack Repair Location between Low Level intakes.

4. Repairs to the Cracks in the Upstream and Downstream Faces of the Spillway

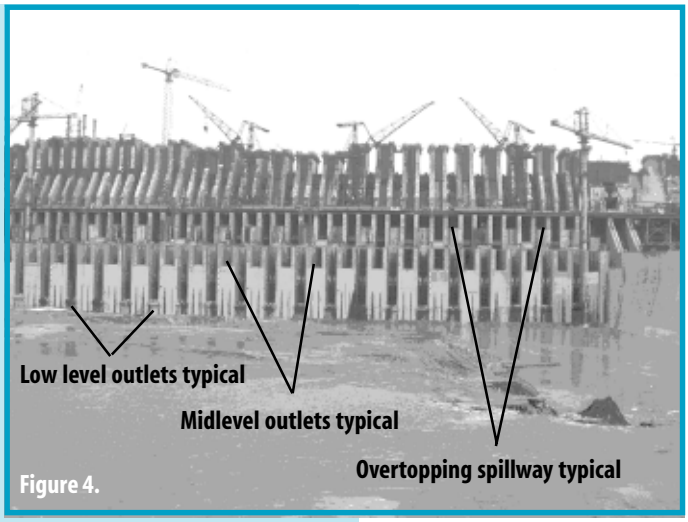

Figure 4. A photo of the downstream face, during the flooding of the downstream area, showing the three levels of outlets.

Notwithstanding the clear indication that the cracks will close with time, and were not of concern as there are now, based on successful experiences on handling cracks in China and abroad and results achieved by in-situ. test, it was decided, based on experts suggestions and comprehensive analysis, that, in order to provide maximum safety, to apply the principle that no concealed defect is allowed to remain in the dam. The following five-step repair scheme was therefore implemented for cracks in the upstream face:

(1) Grout the crack with Master Builders LPL low-viscosity bi-component injection resin;

(2) Saw cut and chip the surface each side of the grouted crack to create an 8 cm wide by 5 cm deep groove which is filled with SR2 material (a bituminous material) and trowelled flush with the surface;

(3) Adhere a polychloroprene (rubber type material) plate cover on the surface locally over the crack areas;

(4) Attach a foil backed SR2 covering;

(5) Install a 10 m wide reinforced concrete cover slab over the entire repair system. The thickness of the slab is 40cm below El. 45m, and 25cm above El. 50m. In the inverse slope areas between elevations 45m to 50m, the surface of SR2 cover plate is protected by a PVC cover with 2cm thickness. For #5 to #17 spillway dam sections below El. 30m, the concrete slab is placed to protect the SR2 cover plate.

Figure 5. Construction of concrete blocks at the heel of the dam below low level cracks.

Other small cracks in the area, as well as at the ends of the repaired cracks, were grouted using LPL resin to avoid crack extension or leakage around the repair.

Some cracks occurred in the spillway dam sections of #18 to #23 close to the foundation. In order to prevent high-pressure water into the cracks through rock fracture after water impounding, concrete blocks have been placed at dam heel and consolidation grouting with acrylic material has been carried out through it. The concrete blocks are 10m x 3m x 2m and their construction is shown in **Figure 5**.

For #5 to #23 dam sections, KT1, a special anti-seepage material, was sprayed within 6.5m outside SR2 cover plate. At the same time, for dam sections lower than elevation 45m, 8cm to 10cm polypropylene fiber concrete was sprayed within 2m outside reinforced concrete slab.

Three-dimensional numerical model analysis of the spillway dam sections #1 to #4, under the most unfavorable loading case, showed that the tensile stress in parts below the elevation of 30m would be is not larger than 0.09 Mpa. These values are much less than the allowable tensile stress of the concrete and it is therefore not possible for the cracks to extend. Therefore, crack treatment of the spillway dam sections from #1 to #4 was only done down to elevation 24m. In the galleries located within 10m of the upstream surface, located at El. 15m and El. 49m, drainage and relief holes were made to a depth of 3m to 4m in the direction of water flow. A section of the finished upstream surface showing some of the sloped sections covered with a PVC layer and the vertical sections with a concrete cover, is shown in **Figure 6.**

Joint gauges for observation have been placed in #2,#9, #16, #22 and

Figure 6. A finished area of the downstream face showing the concrete and PVC covers.

#23 spillway dam sections as representative ones, and osmometers have been placed in the upstream parts of #2, #22 and #23 spillway dam sections.

Repairs to the cracks in the downstream side were comparatively simple:

(1) Grout the crack with Master Builders LPL low-viscosity bi-component injection resin;

(2) Saw cut and chip the surface each side of the grouted crack to create an 8 cm wide by 5 cm deep groove which is filled with SR2 material with a cover ;

(3) Cover the surface with a special mortar layer; and then :

(4) Coat with the KT 1 anti-seepage material.

5. Conclusions

The above measures are all finished before water impounding and their qualities are satisfied with requirements completely. It has passed the safety evaluation organized by the state government. When the water level reaches 135m, we can see very clearly from the installed monitoring instruments that the observed cracks are all in the state of closing. It indicates that the crack treatment is totally successful and the safety of Three Gorges Dam is absolutely secured. ●

Narmada positive impact finally recognized !

The people living around the Narmada dam project are known around the world as among the most fierce opponents of dams, popularized by media stars like Arhundati Roy and Wandana Shiva.

But are they really? Is this preposterous?

Not so, if you read the June 8th edition of ***The Sunday Express***, one of India's biggest newspaper. They devote their main story to the way water from Narmada changed life in the area around the dam. An electrician from Vallabhipur taluka, a formerly water scarce village from the Bhavnagar district, is quoted: *"Nobody wanted their daughter to marry someone from our village. All these years, my wife had to wake up before the sun rose and trudge two km to collect drinking water from the river. Now, that's all in the past."* The villagers would take fresh water from the river, for tea and dal, and would use the brackish water available in the village for other needs. *"All that changed with the supply of piped water from the Narmad, which made its way here through the dam 350-odd km away."*.

They've seen the future, and it's green

JANYALA SREENIVAS
SARDAR SAROVAR DAM SITE | KEVADIA

IT'S a 100-metre race like no other. In five weeks, the height of the Sardar Sarovar Dam has to touch the three-figure mark. "(The work involved in raising the dam height) it equivalent to building a mid-size dam, since we have to augment the storage capacity by 500 million cubic metres," says executive engineer Ashok Gajjar. "Construction of a mid-size dam usually takes seven to 10 years, we're aiming for completion in 60 days."

But why the rush? The simple answer, the monsoons. That is when 22 million acre feet of water will gush into the 100-km-long, 1-km-wide dam reservoir. In subsequent years, the same quantum of water will be shared among Gujarat, Maharashtra and Madhya Pradesh.

"This is a once-in-a-mil-

DHIRAJ JOY

Villagers at Shira, one of the first villages to receive Narmada waters for irrigation, enjoy their future

lennium opportunity," says economist Y K Alagh. "Gujarat must recharge its groundwater tables and fill up every river, pond and lake. There is a tremendous possibility of augmenting the state's resource base."

Explaining the happy coincidence, Sardar Sarovar Narmada Nigam Limited (SSNNL) officials say that by 2004 monsoons, the Indira Sagar dam under construction in Madhya Pradesh will be complete, and will restrict the free

If the engineers succeed in raising the dam height to 100 m before the rains, Gujarat has a unique chance to recharge every river and lake

flow of all the water in the catchment area to the Sardar Sarovar Project (SSP). On paper, Gujarat will receive about 11 million acre feet of water, around half of what it may expect in the upcoming monsoon season.

This is just one of the many assessments being thrown around as SSP construction reaches a crucial stage. Though the project is behind schedule by a year, SSNNL officials hope to complete work by June 2006, provided they receive the Narmada Control Authority's permission to graduate to the projected final height of 138.68 m. At present, the dam stands 97 m tall.

"In Gujarat, we have already completed the relief and rehabilitation work. If MP and Maharashtra wrap up their R&R packages, we can even complete the construction by the original target of June 2005," says SSNNL managing director S K Mohapatra. "So far, we have been seeking five-metre height increases at a time. But once we reach 100 m, we want clearance for 110 m."

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Shira and Pala are among eight villages which have formed a cooperative society and registered it in keeping with the Participatory Irrigation Management (PIM) scheme of the government. Under the scheme, between 200 and 500 hectares — christened the Village Service Area — will receive water on volumetric basis.

While farmers were charged Rs 157 for each hectare watered last year, the amount will go up in the new calculations. The projected 4000-odd farmers' cooperatives will have to pitch in for part of the construction. But Sardar Sarovar Narmada Nigam officials already apprehend it will not be easy to convince the cooperatives to take the responsibility. "They want the government to pay for everything," says one official.

Pala is among the few villages where most have agreed to pay cash for water. Hasmukh Prajapati, who heads the cooperative society, however, advises caution in the celebrations. "Problems related to distribu-

Can Narmada change Gujarat?

PRADEEP

They've seen the future, and it's green

According to Alagh, the next five years are crucial for the project. "The Narmada main canal will be like a river in space right up to the Gujarat-Rajasthan border. It will change the landscape of much of the state, including Kutch, because every river, pond, lake, reservoir, well and canal on the way will be filled with Narmada water. It will be used for irrigation as well as drinking," he says.

The other long-term benefit of the project lies in power generation. "Once the dam height touches 110 m, generation will start," says P K Lahiri, chief secretary and SSNNL chairman. Two powerhouses are planned near the dam, a 1200 MW one on the riverbed and a 250 MW one at the canal head. The second is nearing completion and engineers hope to test it when the dam touches 100 m.

So far as water supply and irrigation is concerned, though, SSNNL director (civil) N B Desai sets the date for completion of the 458 km Narmada main canal — currently 265 km long — around June 2006. Moreover, 42 branch canals that will take Narmada waters to Central, North and South-West Gujarat and parts of Saurashtra and Kutch are yet to be constructed.

"At present, we're supplying drinking water to 1,200 villages, we're working on covering 1,400 more," says K Kailashanathan, secretary, water supply. "On completion, we can supply water for drinking and irrigation to 8,200 villages."

According to SSNNL officials, 74 small and big rivers that cut across the Narmada main canal, the Saurashtra branch canal and Kutch branch canal will be fed with Narmada water once the main canal is ready. The Narmada main canal will feed 27 rivers, the Saurashtra branch canal another 27, and the Kutch branch canal six, while the other branch canals take care of 14 more rivers.

tion, accounting the quantum of water received by each farmer, collecting payments will come up," he says.

At Kasimbhai says, water changes lives. If, after the first flush of receiving water, Pala and Shira are gearing up for the associated catches, the 52 villages in Vallabhipur is looking to assured water supply to end the migration of the middle-classes from an area that so far had no industry.

Lives as villagers wait for job opportunities to materialise, at least one person is happy his workload is down. Dr C K Sutaria glances at the empty beds in his private hospital, before saying, "Water-borne diseases like gastro-enteritis and other diseases caused by excessive salt and mineral intake — fluorosis, kidney and urinary stones, joint pains — have gone down by at least 60 per cent. Usually, at this time of the year, I would have five new patients every day." Water, he knows, changes lives.

Bringing water, bringing life

"Till last September, I was so worried I would lose my crop when there was no sign of a last spell of rain. Since my village is barely 30 km from the dam site, it seemed I had been hearing of the Narmada waters forever. But when the branch canal finally brought the waters here, I realised it was a miracle. My crop got a new lease of life." The article continues with other graphic examples, showing how Narmada completely changed the life for the whole region. True, 14 villages were submerged, with 4,600 families displaced. But the dam now delivers drinking water for 8,200 villages and 135 towns, alleviating the stress from drought for millions of people. And the article ends with a quote from a local doctor : *"Water-borne diseases like gastro-enteritis and other diseases caused by excessive salt and mineral intake have gone down by at least 80 per cent. " "Water can change lives"*, concludes the journalist. And when water is not offered by nature, like in this India region, only dams can make it available. ●

NEWS FROM ICOLD

The 71st Annual Meeting and the 21st Congress of ICOLD were held in Montreal

The 71st Annual Meeting of ICOLD was held in Montreal, June 11-15. It was followed by the 21st Congress of ICOLD, where questions 80 to 83 were examined. Despite unpredictable world events (the war launched against Iraq and the SRAS epidemic) which have make the organizations of both meetings very delicate, the outcome was successful.

During the 71st Executive Meeting, 50 countries were represented through their Official Delegates. Cassio Viotti (Brazil) was elected President after the second ballot. C.B. Abadjiev (Romania) was elected Vice-President for the Europe zone and Jia Jinsheng was nominated Vice-President for the Sixth post. The assembly rejected a proposal from the Swiss Committee for extension of the term of the office of the President to 4 years instead of 3. The assembly adopted unanimously a proposal from the French Committee to promote the circulation of ICOLD bulletins in languages other than English and French.

The arrangements for the May 2004 annual meeting in Seoul (Korea) were presented and the Initial Bulletin was distributed. It has been decided that the 73rd Annual Meeting would be held in Tehran (Iran) in May 2005. In 2006; the Annual Meeting and the 22nd Congress would be held in Barcelona (Spain), possibly in June.

On proposal from the President, a new Committee on Dam Surveillance has been created, with Term of Office 2003-2007. It will be chaired by B. Goguel (France). A New Committee on the Environment has been set up, with the same Term of Office, under the chairmanship of K. Baba (Japan). Same thing for the Committee on Dams and Water Transfers, under the chairmanship of C.D. Thatte (India).

Two technical reports were submitted to the executive meeting : *Embankment Dams on Permafrost* (Committee on Materials for Fill Dams) and *Risk Assessment in Dam Safety Management* (Committee on Dam Safety) and approved unanimously. They are available on ICOLD's website.

Three persons were awarded the title of Honorary Members of ICOLD: Marla Barnes (managing director, HRW, USA), Jay Narayan Vyas (former Chairman, Sardar Sarovar Project, India) and Yong-Nam Yoon (Prof. Of Hydrology and Hydraulic Engineering, Korea University, Seoul). ●

NEWS FROM THE NATIONAL COMMITTEES

From the Spanish and Chinese Committees

Dear ICOLD Members,

The Spanish National Committee on Large Dams (SPANCOLD), the Chinese National Committee on Large Dams (CHINCOLD), and the Spanish Institute of Cement and its Applications (IECA), are going to celebrate the 4th. INTERNATIONAL SYMPOSIUM ON ROLLER COMPACTED CONCRETE (RCC) DAMS, in Madrid (SPAIN) from the 17th. to the 19th November 2003.

The information on the Symposium can be consulted on the WEB site: http://www.rccsym2003.org

For this Symposium 150 reports coming from 30 countries have been presented. These reports will be analyzed and discussed in the diverse sessions, in those that will also develop nine special conferences, imparted by eminent world experts in RCC dams. We believe that the Symposium will suppose a complete description and a deep analysis of the current state of the art in the field of the RCC dams.

I would appreciate that your National Committee makes an ample spreading of the Symposium, and propitiate the attendance in Madrid in November, 2003.

I am at your disposition for any suggestions and commentaries you may have.

Yours sincerely,

Luis Berga.

Chairman SPANCOLD.

From the German Committee

In Octobre 2004 the DTK, the German National Committee on Large Dams will hold the 13. German Dam Symposium (In German: 13. Deutsches Talsperrensymposium)in the beautiful city of Weimar in the province of Thuringia.This symposium will cover presentations, technical exhibitions and excursions to some very interesting construction sites.

The conference language is German, but we encourage exhibitors from other countries to present their products and/or services.

Please find details on the website of the German National Committee:

http://www.talsperrenkomitee.de/dtk/index.cgi/page/talsperrensymposium13

Christian Heitefuss,

Secretary of the German National Committee on Large Dams

From the Japanese Committee

The Japan Dam Foundation, member of JCOLD, has published a CD-ROM specially devoted to children education about dams. The CD-ROM is being translated under the supervision of ICOLD vice-president Kyohei Baba. The English version is expected in a few months. The Japan Dam Foundation, which owns the copyright on the CD-ROM, has agreed to distribute the English version to ICOLD members, through JCOLD.

AGENDA

■ February 4-6, 2004 ■

New Delhi, India

International Conference on Water Resource Development - Flood control, Irrigation, Drinking water, Waterways, Electric Power and its Transmission System

More info: Contact C.V.J.Varma at cvj@vsnl.com or see www.india-power.org

■ April 26-28, 2004 ■

Teheran, Iran

International Conference on Hydraulics of Dam and River Structures

The objective of this conference is to bring together researchers and practitioners to exchange views and experiences on hydraulics of structures associated with rivers and dams. This would lead to a state of the art of the current practice to improve design of hydraulic structures especially in developing countries.

Contact: Dr. Farhad Yazdandoost (Chairman) or Dr. Jalal Attari (Co-Chairman)
E-mail: hdrs@pwit.ac.ir
Website: http://hdrs.pwit.ac.ir

■ May 16-22 2004 ■

Seoul, Korea

ICOLD 72nd Annual Meeting SYMPOSIUM on May 22
Theme: Environmental Considerations for Sustainable Dam Projects
Sub-topics
• Natural Environment
• Water Quality and Ecological Environment
• Socio-Economic Environment
www.icold2004-seoul.or.kr

■ May 23-25, 2004 ■

Yichang City, Hubei Province, China

The International Conference Hydropower IV 2004 will be held on May 23-25, 2004 in Yichang City, Hubei Province, China, as post-activities of ICOLD 72nd Annual Meeting that will be held in Seoul from May 16 to 21, 2004. After a successful and fruitful meeting of Hydropower 96 (1996) and Hydropower 98 (1998), this conference will concentrate on hydropower facilities and structures, especially design, construction, monitoring and operation of high CFRD and concrete dams and the stability of large hydroturbine sets of power station and relevant operation experiences.

All pre-registration forms, abstracts and correspondence concerning the Conference Hydropower 2004 should be sent to Secretariat of LOC, to the following address:
Mr. Gao Fenglong
Secretariat of LOC,
Hydropower 2004
IWHR
20 West Chegongzhuang Road,
P.O. Box 366,
Beijing 100044, P.R. China
Tel: +86-10-68412173
Fax: +86-10-68412316
Email: hanlm@iwhr.com
Website: http://www.icold-cigb.org.cn

■ June 7-24 2004 ■

Trondheim, Norway

Hydropower Development and Management (HDM2004)

The 6th international training programme in the planning and management of hydropower resources will be held in Trondheim, Norway, 7 - 24 June 2004.

For the development of hydropower resources it is increasingly necessary to have knowledge of new available legal and institutional frameworks, pivotal issues concerning the deregulation, liberalisation and privatisation of a countrys energy organisations. This course will prepare delegates for new arising topics as well as economic and financial issues both in the planning and development of hydropower resources.

More info: http://minilien.com/?vIpWe3Aa3F

Contact: line.fjellvar@ich.no

■ June 22- 26, 2004 ■

Canterbury, U.K.

13th Biennal Conference - ICOLD European Symposium 2004, *Long Term Benefits and Performance of Dams* to be held at the Universuty of Kent, Canterbury, U.K., June 22-26 2004

http://www.britishdams.org/meetings_events/04-06-22%20BDS%20Meeting.pdf

■ June 28- July 3, 2004 ■

Stockholm, Sweden

22nd IAHR Symposium on Hydraulic Machinery & Systems

The Stockholm Symposium will be a great opportunity for researchers and manufacturers to present the latest news within hydropower and pump technology. We also invite hydro plant owners and operators to attend the Symposium to present their need for new inventions regarding rehabilitation of existing plants.
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brittmaria.persson@swedpower.vattenfall.se
Website: http://www.swedpower.se/IAHR2004

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