



Sika at Work

Hydroelectric Dam Dafnozouara - Sanidi in Acheloos River, Greece



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Owner : TERNA ENERGY
Contractor: TERNA SA
Start / Completion of Project: 3Q 2008 / 3Q 2010
Specifiers: 50% TERNA & 50% IDRETME
Consultants: TERNA SA

Project Description

The hydroelectric project Dafnozouara-Sanidi is situated between the municipalities of Etoloakarnania and Evrytania, right on the main stream of Acheloos river (Aspropotamos). It produces approximately 40 GWh per year, while the installed power capacity is 8.50 MW (2 x 4.25 MW). The power station's maximum discharge capacity is 80 m³/s (40 m³/s per unit).

The project is unique from many aspects. Firstly, because it is the first small hydroelectric project in Greece constructed on the main route of a river of the size of Acheloos and secondly due to the environmental parameters that had to be taken into account during its design phase. These parameters had to include two big flash gates for sediment flashing, fish ladder, small boat pass and automatically overturned fuse gates without human intervention. On the crest of the dam-spillway, nine gradually overturned fuse gates are located, with a total width of 60m and 3.5m height, mostly in order to increase the flood protection, even in the case of the maximum designed flood. These fuse gates will protect at the same time the historical bridge of Avlaki, ensuring at the same time the controlled overflow of the flood from the left river bed side, right across the power station, the tailrace channel and the sediment flashing channel.

Project Demands

The demands of the project were various and extended to all the phases of the project, namely concrete production, waterproofing, sealing & bonding, injections, flooring, concrete repair & protection.

Concrete Production

The concrete for the whole construction (spillways and buildings) had to be C20/25 reinforced. The concrete would be produced on site, using natural aggregates and cement type I 42.5, having as main demands:

- High initial and final strengths
- Reduced W/C ratio (0.50 – 0.55)
- Slump S3 during concreting
- Good pumpability

The concrete production did not concern only conventional types, but also special ones, such as underwater concrete, concrete with rapid strength development and concrete with very high flowability.

Total concrete quantity: 50.000 m³

Sika Solution

For the vast majority of the C20/25 concrete, Sika proposed the new generation superplasticizer **Sika® Viscocrete® 300**. Its incorporation in the mix, ensured the production of a cohesive mix, with the demanded slump maintenance and the requested high pumpability at the same time. **Sika® Viscocrete® 300** maintained the W/C ratio to the required level of 0.50 up to maximum 0.55. Part of the mix for some elements also contained polypropylene fibers **Sika® Fibres** that contributed to the reduction of the cracks.



The underwater concrete was produced using the special admixture **Sikacrete® UCS**, which contributes to the production of a cohesive mix and reduces dramatically the wash-off the concrete. The concrete that demanded rapid strength development was produced with the combination of the superplasticizer **Sika® Viscocrete® 300** and the hardening accelerator **SikaRapid®-2**, while the concrete with the extremely high flowability was produced with **Sika® Viscocrete® 4000**.

Concrete Repair & Protection

As in all projects, the application field of concrete repair was also here of crucial importance. The demands for repair included:

- Repair mortars
- Cement mortars for non-shrinking fillings
- Surface leveling mortar
- Pore sealer with good final surface, ready for painting

In general, many areas of the project had to be protected, using products that could offer:

- Protection with high resistance to weathering, alkalis & ageing
- Water repellency

Total protected concrete surface: ~ 8.000 m²

Sika Solution

The repair issues were treated with various products from Sika's mortar series, as each time the contractor had to deal with another demand. Therefore, the high thickness repairs were dealt with the one component ready to use mortars **SikaRep®**, while in the cases where

there was a demand for absolutely smooth final surface, ready for painting we used **SikaRep® Cosmetic**.

Regarding the protection of the concrete elements, the system **Sikagard® 680 S** and **Sikagard® 700 S** was proposed. Both products are certified according to EN1504-2 (Surface Protection Products).

Waterproofing

The main part of the project that demanded waterproofing was the spillways. For this part, the demands were:

- The use of a cement base mortar, with resistance to negative pressure
- Sealing of the construction joints
- Use of waterbars

Total length of waterproof joints: 220 m

The nature of the project and the depth of the construction time necessitated the use of injection for crack fillings. These cracks were induced by natural deterioration, due to the nature of the project and the water presence.

Apart from the special demands of the project, there were also many parts that required conventional treatment. These included sealing in floor joints, construction & metal joints, epoxy floors in the warehouse, the control room and the production station, anchoring of the rebars and reinforcement of steel bolts and admixtures for slurries and renders.



Sika Solution

The waterproofing demands of such a project were various and included waterproofing mortars, waterbars, asphaltic emulsions and special jointing systems. All needs were satisfied using products from Sika's product range. When problems regarding leakages arised, Sika's injection systems could solve the problems of such a demanding project.

All in all, Sika managed to cover all the needs that came up during the construction and in the working phases of this special project.

Sika Products

Concrete Production

Product	Description	Quantities (tn)
Sika® Viscocrete® 300	New generation superplasticizer	87.57
Sika® Viscocrete® 4000	High performance superplasticizer	1
SikaRapid®-2	Hardening accelerator	1.25
Sikacrete® UCS	Special admixture for underwater concreting	0.21
Sika®-Fibres	Polypropylene fibers	0.192

Concrete Repair

Product	Description	Quantities
SikaRep® Cosmetic	Repair mortar	4.623 kg
SikaGrout® 312	Cementitious grout	975 kg

Concrete Protection

Product	Description	Quantities
Sikagard® 680 S	Protective coating for concrete	1790 kg
Sikagard® 700 S	Water repellent impregnation	820 lt
Sikagard® 907 W	Pore sealer and surfacial stabilizer	100 kg

Joint Sealing

Product	Description	Quantities
Sika® Backing Rod	Backing Rod for joints	930 m
Sika® Primer 3	Primer for polyurethane sealants	13 lt
Sikaflex® Construction	Polyurethane sealant	320 sausages 600 ml
Sikaflex® PRO 3 WF	Polyurethane sealant for floor joints	20 sausages 600 ml
Sikaflex® 11 FC	Polyurethane adhesive sealant	80 sausages 600 ml

Waterproofing

Product	Description	Quantities
SikaTop® Seal 107 SH	Waterproofing cementitious slurry	250 kg
Sika® Monoseal®-101	Waterproofing cementitious mortar with high resistance to negative pressure	1125 kg
Igolatex®	Asphaltic emulsion	75 kg
Sika® Waterbars O-25 L	PVC Waterbars	210 m
SikaSwell® S-2	Swellable sealant	5 sausages 600 ml
SikaSwell® P-Profiles	Swellable joint sealing profiles	100 m

Flooring

Product	Description	Quantities
Sikafloor® 156	2 component epoxy primer, leveling mortar and mortar screed	25 kg
Sikafloor® 2530 W	2 component water based epoxy resin	30 kg
Purigo® I	Stabilizer and surface hardener	100 kg

Injections

Product	Description	Quantities
Sikadur®-52	Low viscosity injectable resin	29 kg
SikaGrout® -LSR	Low shrinkage cementitious injectable mortar	420 kg
Injection nipples	Injection nipples	10 pieces
Bulk plunger new kit low	Equipment for injection	1 piece
Sika® Thinner C	Thinner	3 lt

Anchoring

Product	Description	Quantities
Sika® Anchorfix-3+	2-component, high performance epoxy anchoring adhesive	480 cartridges 400 ml
Sikadur® B-Mixer Gun	Application gun	2 pieces

Mortar Production

Product	Description	Quantities
Sika® Latex	Mortar admixture	620 kg
SikaMix® Plus	Mortar plasticizing admixture	200 kg
Sika® 1	Waterproofing admixture for mortars	20 kg
Sika® 4	Admixture for mortar set acceleration	40 kg

