

WORK REPORT

Customer : UTE Andasol III

End User : Marquesado Solar

Industry : Energy Generation

EPC: MAN Solar Millennium
Duro Felguera s.a. energía

Location : Aldeire Granada, Spain

Project : Restoring grout on
footings of a HTF tank

Equipment: 31WTE22 BB001 VESSEL
400 m³

Work Period: February 2015



Work Report | UTE Andasol III; Restoring grout on footings of a HTF tank

The Andasol concentrated solar power station was the first Parabolic Trough power plant in Europe.

Consists of 3 projects;

Andasol-I (completed 2008)

Andasol-II (completed 2009)

Andasol-III (completed 2011)



Andasol Solar Power Station (File 12-05-08 AS1.JPG Wikimedia Commons).

Andasol has a thermal storage system which absorbs part of the heat produced in the solar field during the day. This heat is then stored in a molten salts on two HTF tanks (*Heat Transfer Fluid tanks*).



Andasol-III power plant generate approximately 175 GWh/yr and the total cost of building it was estimated to €315 million.

The HTF tanks continuously move slightly due to a contraction-dilatation cycle, originated by its temperature changes, along with great changes in the HTF level which combined, exert considerable loads in the footings.



Significant failure in the anchoring+insulation system in the sliding saddle.

The anchoring+insulation system used for the moving supports is thoroughly deteriorated. The insulation part was designed and built using two different materials, two insulation plates and one cement grout which add up to approximately 110mm in thickness.



Alphatec worker chipping-out the damaged cement grout. (Alphatec® Epoxy Grout.)

The expansion of the tanks is approximately 2 cm on each side and, adding its contraction, it can have roughly 4 cm of possible movement on each footing.



M64 anchor bolts cleaned.

Assuming a friction coefficient for a steel-steel interface $\mu=0,7$ (usual values in between 0,5 y 0,8) and a net weight of $P= 170$ tonnes, then $\tau= Fr/A= P \cdot \mu/A = 0,35\text{MPa}$.

This calculation doesn't bring into account the effect of *stress-*

-concentrators such as sharp corners or defective surfaces.

Any good cementitious grout upholds a shear stress resistance within the adhesion surface of 1.75 MPa, supposed ideal conditions (which slightly differ from in as built conditions). This shear forces, together with a laminated disposition installed without any bonding agent and the loose anchor bolts, was enough to induce a progressive cracking on the isolating material.

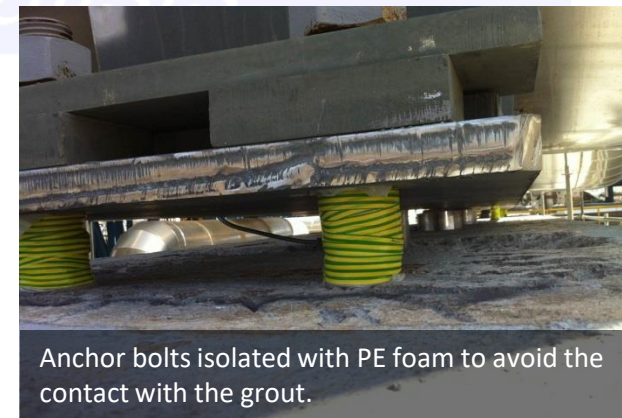


Alphapad[®] sized D2 holding the HTF tank.



Checking the saddle to its proper height.

The steel plate and the isolation layers moved conjointly. This fact added dynamic friction to the crack party, degrading further and faster the isolating material.



Anchor bolts isolated with PE foam to avoid the contact with the grout.

The repairs (for both tanks working on parallel and for all the footings: six in total) were carried out to restore the integrity of the interface between the grout and the sliding plates, situated beneath the footings.



All surfaces that will be in contact with the resin were prepared.

Using pneumatic chippers, we got rid of enough material from underneath the sliding plate to be able to place the first Alphapad® sized D2.



All corners sufficiently rounded and Alphatec® 800 Epoxy Grout poured (on green).

The quantity of material removed was sufficient to ensure a proper levelled surface with healthy concrete, and not enough to change in any way the position of the saddle.



Checking the hardness on our Alphatec® 800 Epoxy Grout once cured.



All saddle plates were adjusted to have as much contact with the footings as possible.

Finishing of all grouted areas was revised to avoid sharp edges and After taking off the pressure on the Alphapads®, the whole of the tank weight rested on the epoxy grout.

A LIFETIME EXPERIENCE

Since 1977 we have been repairing foundations, installing new machinery, aligning, and regrouting all kinds of **Reciprocating** and **Rotating Machinery**.

Noise and vibration indicate issues that can affect a machine's reliability, such as imbalanced parts, and can even cause machines to fail through their own damaging effects.

As the only epoxy grout manufacturer with its own engineering and contracting arm, **Alphatec Engineering** is uniquely placed to give you the best combination of products and services, together with our commitment to quality reflected with our ISO 9001 certification.

GROUTING SPECIALISTS

In **Alphatec Engineering** we have different procedure of repairing critical machinery foundations, and the best technique of application of our polymer products.

Our main products are epoxy resin based grouts with inert fillers for stiffness and heat resistance, which we use to repair cracked or damaged foundations and to install new machinery following the **OEM** and **API RP 686** recommendations.



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- Giles Goldsbro, Founder & Managing Director

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