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wcolshorn@acument.com**PRESS RELEASE****Avdel fastening technology for the largest thermosolar plant in the world**

WELWYN GARDEN CITY (UK) – 3 April 2008 - "Andasol 1", currently the largest thermosolar plant in the world, can be found In Andalusia, southern Spain, near Guadix (province of Granada). This thermosolar plant uses parabolic trough collectors covering a huge expanse of 510,000 m². When the thermosolar plant, which will generate 50 Megawatts, is connected to the national grid in mid 2008, it will provide electricity for up to 50,000 homes, i.e., 200,000 people.



Thermosolar plants based on parabolic trough collectors basically operate as conventional thermo-electric power stations. The only difference is that the steam turbines are not driven by the combustion of fossil fuels but by solar energy. The thermal power of the sun is used to heat a synthetic energy vector, such as oil, to a temperature of 400 °C. The oil then generates steam in a heat exchange unit, which drives the thermosolar plant's turbine. Thermosolar plants that use parabolic trough collectors combine excellent ecology features and the greatest solar energy efficiency achieved to date.

The Andasol plant will use so-called Skai-ET collectors, which, when compared with other technologies installed to date in this type of plant, are efficient and easy to manufacture. A fundamental innovation in the design of the collector is the use of a new "Torque Box" open framework that not only leads to weight reduction but, above all, provides resistance to torsion and bending, preserving exceptional levels of accuracy even under strong wind conditions.

Installing the solar field

The Andasol thermoelectric plant's solar field measures 1500 x 1300 metres (195 ha.). A total of 7,488 collectors have to be installed *on site*. The prefabricated galvanised steel parts, mirrors and pipes are supplied in containers, unloaded, temporarily stored and then assembled. They are later mounted on the pillars, connected to the oil flow circuit and made operational.

In order to achieve high level thermal efficiency, these 12 m. long and approximately 6 m. wide collectors must be mounted with great precision.

Vibrations caused by the wind, or changes in the temperature, present a great challenge for fastening technologies. During the technological planning phase, lockbolts and collars clearly provided the best performance if compared with other methods. The great clamp load that lockbolts and collars provide remains constant throughout the life of the assembly. The danger of the joint coming loose, as could happen if screws were used, can be dismissed with this system thanks to the permanently swaged lock between the collar and the bolt.

Another additional advantage is the speed with which these lockbolts and locking collars can be installed. This process is only based on the installation system and cannot be altered or influenced by the worker. Consequently, assembly errors made by assembly personnel are not possible.



Diameters of 8 mm, 13 mm and 25 mm Avdelok[®] lockbolts and collars are being used. In all, about 3.4 million fastening elements are being used to assemble the system. "On the Andasol project, we are mainly using Avdelok[®] bolts with large diameter heads and large flanged head collars", declared Avdel's General Manager, Martin Kunz. Furthermore: "Due to the large contact surface, specific superficial pressure is reduced and a uniform distribution of the clamping load is achieved."

The equipment used to place the bolts was also supplied by Avdel. In the case of $\varnothing 13$ and $\varnothing 25$ mm bolts, 16 hydraulic tools, driven by 10 HAT electro-hydraulic power units, are used. For the assembly of the collectors, hand tools are connected to the power units by 10 metre long hydraulic hoses. Special nose equipment and machines have been developed to access all parts of the joints. The $\varnothing 8$ mm Avdelok[®] bolts are installed using four 7267 type hydro-pneumatic units.



Avdel engineers have worked in co-operation with the customer from the planning stages. The design of the joints, the development of the fastening equipment and the training of the assembly staff were all part of the technical services offered. During the construction phase, Avdel also provided logistics support for its customers by scheduling requirements as construction work progressed. This ensured the continuous assembly of the collectors.

Since February 2007 and simultaneously to Andasol 1, prior civil work is being performed on a second similar thermosolar plant of the same type (Andasol 2) developed by Solar Millenium.

This project will be connected to the grid after an approximate two year building phase. At the same time as Andasol 2 is being built, work will commence on the first plant of this type in Extremadura, using Senertrough collectors.

Going back to Guadix, a third plant (Andasol 3) is already in its planning stages.

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