

Solar energy without a flicker



Located near Guadix, Spain, "Andasol 1" is currently the largest thermosolar plant in the world. Its parabolic trough collectors cover 510,000 square metres and, when the plant is connected to the grid in mid 2008, will generate 50 Megawatts, sufficient to provide electricity for up to 50,000 homes.

Thermosolar plants based on parabolic trough collectors basically operate in the same way as conventional thermo-electric power stations, except that the steam turbines are driven 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. This type of thermosolar plant combines excellent ecology features and the greatest solar energy efficiency achieved to date.

then assembled. Later they are mounted on the pillars and connected to the oil flow circuit.

To achieve high level thermal efficiency, each 12 metre long, 6 metre wide, collector must be mounted with great precision. Vibrations caused by the wind, or changes in temperature, present a great challenge for fastening technologies.

During the technological planning phase, lockbolts and collars clearly

provided the best performance compared with other methods. The great clamp load provided by lockbolts and collars remains constant throughout the life of the assembly. The danger of the joint coming loose, as could happen if screws were used, is removed with this system, thanks to the permanently swaged lock between the collar and the bolt.

An additional advantage is the speed with which lockbolts and locking collars can be installed.

This process is also based entirely on the installation system and

cannot be influenced by the worker, eliminating the potential for errors by assembly personnel.

8mm, 13mm and 25mm diameter 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", explains Avdel's general manager, Martin Kunz. "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 install the bolts was also supplied by Avdel. In the case of ø13 and



ø25mm 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 ø8mm 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 ensuring uninterrupted assembly of the collectors.

Since February 2007 and simultaneously to Andasol 1, civil preparation work is being carried out on a second similar thermosolar plant of the same type (Andasol 2) developed by Solar Millennium. 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. At Guadix Andasol 3 is already in its planning stages.



The Andasol plant will use 'Skal-ET' collectors, which, compared to other technologies installed to date in this type of plant, are efficient and easy to manufacture. A fundamental design innovation is the use of a new "Torque Box" open framework that not only reduces weight but also, importantly, provides resistance to torsion and bending, preserving exceptional levels of accuracy even under strong wind conditions.

The Andasol thermoelectric plant's solar field measures 1,500 by 1,300 metres – 195 hectares. A total of 7,488 collectors have to be installed on site. Prefabricated galvanised steel parts, mirrors and pipes are supplied in containers, unloaded, temporarily stored and