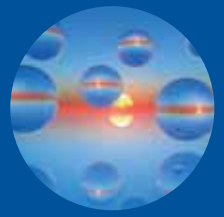
Case History

archimede solarenergy



ANGELANTONI GROUP MORE THAN YOU THINK

ACS

Archimede Solar Energy Case History

Tunnel ovens for thermal treatment

Continuing in its mission to enrich its range of products through a constant research and development activity, Angelantoni Industrie has increased its contribution in the Renewable Energies sector with the production of tunnel ovens for the annealing treatment and coating of receiver tubes for thermodynamic solar plants.

For this purpose, equipment for performing temperature tests up to 650°C on specimens, with programmable heating/cooling ramps, was created first. This made it possible to identify the best thermal cycle to use for the tubes in the tunnel oven treatment cycle, in order to guarantee their best performance and reliability.

On the basis of the data collected, two types of tunnel ovens were then developed:

- "**GMS**" for the treatment of the glass/metal joints
- "**AR**" for anti-reflective coating treatment

"GMS" tunnel oven

The main characteristics of Angelantoni tunnel ovens are their modularity and flexibility, which enable them to be configured in various lengths, thus making them adaptable to the necessary production capacities. The modules making up the tunnel measure one meter in length each, with an internal useful area 700 mm wide and 320 mm high. Each module has its own forced ventilation heating unit and temperature control and adjustment, permitting the utmost flexibility in choosing and producing the desired thermal profiles.

This oven is used to anneal the glass/metal joints (GMS) made of pieces of borosilicate glass tube with metal rings welded onto them. The advancement speed of the GMS conveyor belt can be regulated to obtain the most suitable thermal cycle for the desired profile. The tunnel oven consists of an entry module heated to approximately annealing temperature, with the GMS loaded manually in two rows directly onto the conveyor belt.

Tunnel oven "GMS"

To reduce heat loss to a minimum, entry into the ovens is achieved through two doors which are opened and closed automatically. Immediately after the entry module, there are a series of heat-adjustable (in the 100÷600°C range) modules, as many as are necessary for the creation of the desired thermal profile and production capacity.

The next-to-last module, equipped with a cooling unit, consists of a forced ventilation air/water exchange battery for cooling the outcoming GMS to a temperature of 50°C or lower. The last exit module has a buffer for the manual removal of the treated GMS.

"AR" tunnel oven

This oven was designed for anti-reflective coating treatment on borosilicate glass jackets of solar receiving tubes. Similar to the "GMS" oven in concept, it is characterized by the advancement of the belt which is not continuous, but step by step, and by the fact that it is suitable for inclusion in a totally automated production line.

This oven, also, may be configured in various lengths to adapt it to the desired production capacities and thermal profile. Each module is one meter long and has an internal useful area measuring 4,000 mm in width and 400 mm in height. Precisely due to its considerable width, the forced air heating system adopted guarantees a great uniformity of temperature on the surfaces along the entire length

of the glass jackets being treated.
The conveyor belt is equipped with cradle supports in which the glass jackets to be treated are held. The supports have plates made of a special ceramic material on which the glass jackets rest; the contact surfaces are linear in order to leave the fewest possible traces on the antireflective coating. The "AR" tunnel oven is thus made up of an entry module, which interfaces at the entry with the automatic loader of the glass jackets arriving from the AR film deposition process, and of subsequent modules heated to temperatures which can be adjusted within the 100÷600°C range, as many as are necessary for the creation of the desired thermal profile.
The next-to-last module, with a cooling unit, consists of a forced ventilation air/water exchange battery for cooling the outcoming glass jackets to a temperature of 50°C or lower. The last exit module has two removal positions for the treated glass jackets, which may be removed either automatically by the mechanical unloader, or manually if necessary. In both ovens the various process and safety protection functions are managed by a PLC and local control panel.
Remote management is also possible via PC using the Winkratos software developed by Angelantoni, known for its advanced functional characteristics and user-friendly interface.

CONCLUSION

Both ovens have been designed to guarantee a reliability enabling them to function continuously around the clock, with minimal interruptions for preventive maintenance.
For this purpose, components with a high MTBF were selected, and combined in a system layout that maintains their reliability level.

APPLICATION

In addition to the sector of receiver tubes for thermodynamic solar plants, these Angelantoni ovens can be used in photovoltaic panel production lines and, more in general, for thermal treatments on mechanical devices and any other devices that require programmed thermal profiles.

ANGELANTONI TEST TECHNOLOGIES - Environmental Test Chambers ACS

Since 1952 and under the ACS brand, Angelantoni Industrie has introduced worldwide environmental test chambers for all types of tests on materials, components, and finished products.
The ACS brand has always been associated with vast experience and flexibility in customized solutions and undisputed expertise in technologies, gained also through close cooperation with research institutions, universities, and industrial partners.

Tunnel oven "AR"

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ACS

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