The Greek Solar Thermal Market and Industrial Applications

Overview of the market situation

Costas Travasaros,
Greek Solar Industry Association
Solar thermal capacity per capita in operation at the end of 2009, in KWth, per 1000 inhabitants, in Europe (source: ESTIF)
Products in Greece

- Solar water heater - Thermosyphon systems 95%
  Private customers

- Central pump systems
  Mainly professional customers
  - Hot water for hotels, industries, hospitals, etc
  - Process hot water
  - Solar cooling

- Technologies
  - Closed loop, electric back up (95%)
  - Selective surface
  - Flat plate, compact, roof mounted, heat pipe, vacuum tubes
Thermosyphon systems in Greece

Average system

- 2.4 m²
- 150 l
- single family
- yield to user: 1200 kWh/year
Advantages of the product

- Low price (1000 €/2,4 m² -150 l system)
- Easy to install (No special training for installers)
- Low maintenance (no control, pump etc.)
- Good quality (long experience)
Energy production from EBHE members solar collectors, installed in Greece and exported, at the end of 2010, in MWth (source: EBHE)
Supporting framework

- National Center for Scientific Research “DEMOKRITOS” (Testing facilities, technical support)
- Center for Renewable Energy Sources - CRES (Studies, Marketing, Conferences etc.)
- EU Funding for Demonstration and Research Projects
The conventional source of water heating is electricity, with higher costs than fuel oil or gas, leading to shorter payback periods for solar systems.

Most houses have a flat roof, enabling the easy installation of an inexpensive thermosiphon water heater.

Favourable climatic conditions.

State support during the start-up phase of solar thermal.

Involvement of dedicated individuals at the early stages of solar thermal.
Likovrissi Solar Village

435 households
1200 inhabitants
1005 m² of solar collectors
601 MWh/year of energy savings
Solar systems for process heat in Greece

- **Food industry** (dairy products, tinned fruits and vegetables, cold cut and process meat factories, pastry and cake confectioneries, olive oil refineries)

- **Agriculture** (solar drying, horticulture-nursery greenhouses, slaughterhouses, meat processing, livestock landings)

- **Textiles** (tanneries, leather treatment, cloth refineries, textile treatment workshops)

- **Chemical industry** (cosmetics, detergents, wax, pharmaceuticals)

- **Beverage industry** (wineries, liquor and wine distilleries, breweries, fruit juices and soft drinks)
• 4.100.000 m² Collector area in operation
• 2.255.000 MWh Energy production
• 2.255.000 t CO₂ avoided emissions
Achaia Clauss S.A

• Year of installation: 1993
• Type: Winery
• Needs: 1000m³/day, 60–75 °C, 3,000 l storage
• System: 308 m² FPC

Other info: GSR contract, operation for 6 years yielding a mean performance of 300 kWh/year/m²
Alegro S.A.

• Year of installation: 1993
• Type: Clothing industry
• Needs: 0.7m³/day, 40–90 °C and steam, 1500 l storage
• System: 55 m² FPC

Other info: The system is still operational
Alpino S.A.

- Year of installation: 2000
- Type: Diary
- Needs: 40 m³/day steam
- System: 324 m² + 252 m² FPC for pre-heating the water entering to the steam boilers, 25,000 l storage

Other info: GSR contract
Kastrinogiannis

• Year of installation: 1993
• Type: Textile industry
• Needs: 10m³/day steam
• System: 180 m² FPC for pre-heating the water entering to the steam boilers, 10,000 l storage

Other info: Still operational
Kozani Greenhouses S.A.

• Year of installation: 1994
• Type: Greenhouses
• Needs: depending on the outdoor conditions
• System: 80 m² FPC, 4,400 l storage

Other info: Still operational
Mandrekas S.A.

- Year of installation: 1993
- Type: Dairy
- Needs: 15m³/day steam
- System: 170 m² FPC, 2,000 l storage

Other info: Still operational
Mevgal S.A.

- Year of installation: 2000
- Type: Dairy
- Needs: 150m³/day
- System 1: 216 m² FPC + 111 m² CPC, 5,000 l storage
- System 2: 398 m² FPC, 5,000 l storage

Other info: Still operational, TPF Contract
Plektemboriki S.A.

- Year of installation: 1999
- Type: Textile
- Needs: 90°C hot water
- System: 50 m² FPC, 2,000 l storage

Other info: Still operational
SARANTIS S.A.

- Year of installation: 1999
- Type: Cosmetics industry
- Needs: 70-75°C hot water for the two adsorption chillers, for AC needs
- System: 2664 m² FPC, 2,000 l storage, only for the start-up

Other info: Still operational, 50% funding by National Operational Program
Tripou-Katsouri S.A.

- Year of installation: 1993
- Type: Tannery
- Needs: 15 m³, 40-90 °C hot water
- System: 308 m² FPC, 13,500 l storage

Other info: The system operated for 4 years
Suggested measures

- Financial incentives
- Implementation of industrial energy standards in the form of a Presidential Ordinance
- Enforcement of a mandatory share of RES to the total houses have a flat roof, enabling the easy installation of an inexpensive thermosiphon water heater.
- Favorable legislative framework to allow easy integration of solar system