

Solar Water Heater in China

Li Hua,
programme advisor, SenterNovem, the Netherlands.
Fax: +31 46 452 8260
e-mail: l.hua@senternovem.nl

China has been the world's biggest producer and user of solar water heating for many years, and the industry broke new records in 2003. Production of new collectors reached 12 million m², on top of an annual growth rate of 27% in installed area over the previous five years. And yet, in spite of these achievements, the industry will still face challenges if it is to make a greater impact in a market where electric and gas heaters still dominate.

MARKET DEVELOPMENT

China's solar water heater business was initially developed in smaller towns and villages during the 1980s and 1990s. Focusing mainly on industrial households, it provided the most economical and convenient energy services for those towns which lacked the energy services and fuels for water heating. From the 1990s onwards, the energy supply in China has gradually diversified. Today, natural gas, electricity and solar thermal systems are all used for water heating in cities, and solar thermal, coal and traditional biomass in rural areas.

The solar water heater still lags behind its competitors in urban domestic water heating, namely the natural gas boiler and the electric water heater, even though the solar option is the most economical for hot water supply. A gas heater that heats 6–8 litres of water per minute or an electric heater rated at 4–9 kW both cost around RMB 1000–1500 (US\$120–180). This price compares with that for a typical solar system - 2 m² of collectors and 180 litres of water storage - which also serves the needs of a three- or four-person family. Solar water heaters are most popular in the provinces of Jiangsu, Zhejiang, Shandong and Yunnan, where most of the manufacturers are located, but they have been gradually gaining popularity in medium and large cities, such as Kunming, Shanghai and Tianjin.

Big growth, big targets

Annual growth in the solar water heater market in China was about 27% between 1998 and 2002, on average, in terms of square metres installed. By the end of 2003, the cumulative installed area was 52 million m² (see Figure 1). If this rapid rate of growth continues, the industry should not face any problems meeting the goals of the '10th Five Year Plan (2001–2005) of China New Sustainable Energy Industry Development'. The Chinese Government set a national target for 65 million m² of cumulative solar collector area by 2005, while there is a further target for 230 million m² by 2015.

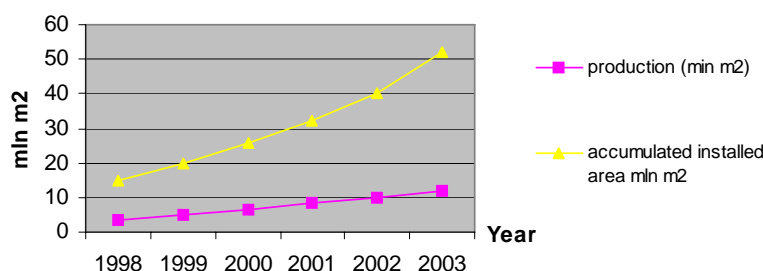


Figure 1. Market development 1998 - 2003

Product development

Solar collectors in China are usually one of three types: flat plate, vacuum tube or combined storage. The vacuum tube is currently the most popular type of collector in China. In 1996, the flat-plate collector was still dominant, with a market share of about 70%. However, the market for vacuum-tube collectors grew so quickly from 1999 that it soon took the lead, with an 85% share in 2002 (see Figure

2). About 80% of the solar water heaters in China use natural circulation (thermosyphon) systems with vacuum-tube or flat-plate collectors.

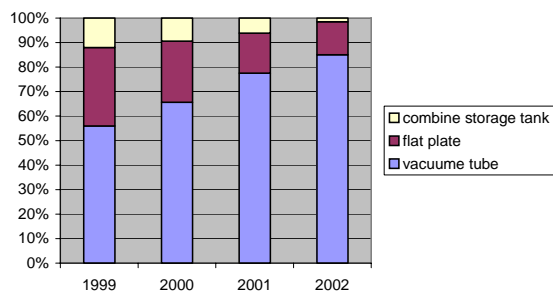


Figure 2. Product segment 1999 – 2002
Sources: China Solar Water Heater Industry Development Report, NDRC, 2003

Price range

Chinese solar water heaters are the most competitively priced in the world. In 2002, 70% of solar water heaters were sold at prices less than RMB 1500 (\$180). The heaters typically comprise 2 m² of vacuum-tube collectors, a 180-litre storage tank and an open circulation system, and simply provide hot water. Most of the systems in this price range were sold in the warmer regions, such as Jiangsu, Zhejiang and Yunnan.

A further 26% of the products were sold between RMB 2200–3000 (\$270–360). Those systems provide a better level of comfort, and can be used in the relatively cold regions. Top-quality systems, with 4–6 m² of collectors, forced circulation and a back-up electrical auxiliary system, could cost RMB 10,000–15,000 (\$1200–1800).

THE SHIFTING MARKET

Real estate: a real opportunity

The real estate boom in China represents a major opportunity for the solar water heater industry. In 2001, 976 million m² of building area was constructed nationwide, with the construction industry accounting for 6.7% of the nation's GDP.¹ Assuming that each 50 m² of building allows 1 m² of solar collector area to be fitted, then about 40 million m² of collectors could potentially have been installed on buildings constructed in 2001. Therefore, the potential for building integration of solar water heaters in China is larger than anywhere else in the world. However, the Chinese solar water heating industry – the largest in the world – still faces the challenge of convincing urban planners and real estate developers that they should adopt solar water heaters for new buildings. The public also has an influence on the market; for instance, when houses without solar water heating were constructed in Kunming, they were not attractive to buyers due to the high energy costs in the area, and so further new buildings in the city incorporated solar systems.

So there are two main challenges for the industry. Firstly, city planners, architects, real estate developers, builders and property owners all need to be aware that system integration is an available option, as they should be involved in any work that takes place. Secondly, the technology needs to be demonstrably reliable, and satisfy the needs of both property developers and owners. What can be done to interest these key participants, and reassure them of product quality?

To address these issues, a large number of Chinese solar water heater manufacturers are currently working with real estate developers, architects and energy engineers. Together, they are developing a large-scale project for collective solar water heating systems for high-rise buildings and new residential districts. At present, these count for about 20% of total annual turnover on the Chinese solar thermal market, though it is much more cost-effective to sell such collective systems than it is to sell ones for individual users, the traditional customer base. The latter still count for about 80% of the total annual turnover, but it is anticipated that large-scale water heating and collective systems will be a dynamic market.

Technology improvement

Before obtaining solar water heaters, customers frequently have had no access to hot water at all – but once they do, they would like to have a 24-hour-a-day hot water supply. And when they are satisfied with their supply, they are often keen to heat their homes in the winter and cool them in the summer.

The technology for this is used in a number of European countries, but solar water heaters in China mainly use natural circulation systems, which means they cannot be directly used for space heating or cooling. To satisfy the needs of these customers, the Chinese industry faces both technical and non-technical problems.

A number of manufacturers, often working together with universities, are developing suitable new products and technologies. The three areas of development are:

- developing systems for industry, and for heating and cooling applications
- improving productivity and efficiency by automating production
- developing systems suitable for building integration.

Support for this development is taking the form of several programmes, both national and international.

SUPPORT AND STANDARDS

Government action, international assistance

Three national test centres for solar thermal heaters have been established in Beijing, Wuhan and Kunming, and will be in operation before the end of the year. These were established through the 'Accelerating China Renewable Energy Commercialization' programme, run by the Chinese Government with the UN Development Programme and Global Environmental Facility (UNDP/GEF). China has also taken an interest in the development of the European Solar Keymark system, and under the UNDP/GEF programme, a national certification centre has been set up in Beijing, though this will run on a voluntary basis.

Meanwhile, under the 'Improvement and Expansion of Solar Water Heating Technology in China' programme, a set of technology standards and building codes has been promulgated, as has a guidebook and design model for integrating solar water heaters into buildings. This programme is being run by the Chinese Government, together with the United Nations Fund for International Partnerships (UNFIP).

With the growing interest in aesthetic, building-integrated solar water heaters, 100,000 m² floor area of demonstration buildings has been constructed in Beijing, Shanghai, Yunnan, Anhui, Shandong and Tianjin under the UNFIP programme in the last two years. These projects have shown how heater manufacturers, city planners, real estate developers, architects and builders can co-operate effectively in the integration of solar water heaters into buildings.

New standards

Since 1991, a number of standards relating to solar water heaters have been developed. These consist of two basic standards, four test standards, three product standards and one industry standard. Six further standards have been in force since 2002:

- one test standard:
 - GB/T 18708 – 2002, Test methods for thermal performance of domestic solar water heating system
- two product standards:
 - GB/T 19141 – 2003, Specification of domestic solar water heating systems
 - GB/T 18713 – 2002, Solar water heating systems - design, installation and engineering acceptance
- three industry standards:
 - NY/T 513 – 2002, Electric auxiliary thermal source for domestic solar water heaters
 - NY/T 514 – 2002, Storage water tank for domestic solar water heaters

– NY/T 651 – 2002, Specification for installation, operation and maintenance of domestic solar water heating systems.

MARKET ENVIRONMENT

The solar water heater industry employed 200,000 people in 2002, had an annual turnover of RMB 11 billion (\$1.3 billion), and an export value of \$10 million. The top eight manufacturers each have an annual turnover of more than RMB 100 million (\$12 million): Himin, Tsinghua Yang Guang, Linuo Paradigma, Tianpu, Hua Yang, Mei Da, Sunpu and Five Star. However, solar water heater sales are less than a tenth of the entire domestic heating market.

Although coal and traditional biomass still play a role in rural areas, the three main technologies – gas, electric and solar – together account for 71.2% of the household water heating market. Gas heaters make up more than half of this proportion (57.4%), electric heaters just under a third (31.3%), and solar water heaters the remainder (11.2%). The electric heater market grew by 36% annually between 1999 and 2002, and the gas heater market by 7%. The reason for the high growth rate for electric heaters is the increased availability and reliability of electricity supply in both urban and rural areas. With current growth in the solar water heater market, it is estimated that cumulative solar collector installation area will be 230 million m² by 2015. Solar collectors currently offset 13 million tonnes of CO₂ emissions, but with the increase in installed area, they would offset 58 million tonnes by 2015.

OUTLOOK

The solar water heater market will definitely continue to grow. Growth will be driven by the boom of the real estate market, the economic benefits of the technology and increased environmental awareness, as well as the improved reliability of systems and aesthetic awareness of the stakeholders – the suppliers, architects and real estate developers.

Meeting the high demands of customers is not proving easy, but conversely, applications such as combisystems, cooling facilities and industrial systems have not yet been popularized in China. If manufacturers can develop reliable products in this market segment at a competitive price, the industry will continue to set – and break – new records.