

Optimism in times of crisis

200 companies took part in this year's survey of the international solar thermal industry. The signals are set for growth. Manufacturers are expecting a significant downturn in the established markets this year, however, although the financial crisis has not slowed down the factory expansions of the European heating industry.



The solar thermal industry is being optimistic even in the current global financial crisis. “The global solar thermal market shows a good increase, below the expectations but still satisfying,” sums up Marco Guartini, Solar Thermal Product Manager at the Italian Ariston Thermo Group, assessing the mood in the sector. And yet the difficult worldwide economic situation has not left the sector unaffected. Some companies have lowered their sales forecasts for this year significantly, for example GreenOneTec in Austria. The world’s largest flat plate collector manufacturer now only aims to manufacture 0.72 million m² (-20 %) collector area this year, after a record year in 2008 of 0.9 million. Sales and Marketing Manager Alexander Eichwalder says the main reasons lie in the uncertain market development in Europe and in “adjusting deliveries to the sluggish payment behaviour of customers in southern Europe.”

Vincent McClean, Head of the collector manufacturer Aquasol in Barbados, finds clear words for the effects of the crisis: “Several of our large supply contracts from last year have been cancelled now that the house-building market has completely collapsed,” he

explains. His figures fell from 4,800 m² in 2007 to 1,200 m² last year. The Aquasol manufacturing plant on the neighbouring island of Trinidad has already been shut down.

These are uncertain times, which make forecasting difficult, and thus several manufacturers have decided not to put in a figure for the planned total production volume for this year. For example, Sun Master in Austria: “We don’t want to provide a forecast for 2009 because we so far also haven’t received any reliable statements for the 4th quarter from our customers,” said Head of Sales Karin Ebner in September of this year.

Please find further comments on the market situation on page 78.

Table 1 on page 54 shows how rightly or wrongly manufacturers estimated market developments for last year when asked in the autumn of 2008. The forecast growth for 2008 made in last year’s survey is shown against the really achieved growth as stated in this year’s survey. The solar thermal industry registered peak growth last year in Germany (125 %), Spain (42 %) and Austria (42 %).

Thermosiphonic systems in Mexico: although the production volume of the Mexican manufacturers rose by a hefty 24 % in 2008 over the previous year, this was still significantly below the forecast of 53 %.

Source: GTZ, photo: Marco Lemus





Flat plate collector manufacture in India. The Emmvee production plant opened in summer this year.

Photo: Emmvee

It can be clearly seen that the industry forecasts in established solar thermal markets such as Brazil, Israel, Greece and Austria are more reliable. The Austrian manufacturers forecast 51 % in the autumn of 2008 and still managed to get 42 %. The Greeks were looking for 40 % and achieved 37 %.

Manufacturers in dynamically growing markets such as Italy, Mexico, Spain and Poland clearly laid too high with their euphoric expectations. Retrospectively, the genuinely achieved growth was much low-

er. This was the case for the Mexicans (planned 53 %, achieved 24 %) and the Spanish (planned 67 %, achieved 42 %).

The Indian manufacturers also tended to overestimate things (planned 59 %, achieved 17 %). The market there has been falling behind its potential for years, but this hasn't stopped companies from once again forecasting a high growth of 62 % for the current year in this year's survey.

The expectations of US American companies for

Country	Forecast 2008		Actual values 2008			Forecast 2009	
	Forecast growth for 2008 (as of Sep. 2008)	Number of companies considered in 2008	Actual growth in 2008 (as of Sep. 2009)	Number of companies considered in 2009	Deviation from the forecast	Forecast growth for 2009 compared to 2008	Number of companies considered
Germany	84 %	11	125 %	7	↑	0 %	12
Spain	67 %	11	42 %	4	↓	28 %	6
Austria	51 %	9	42 %	9	↓	25 %	9
Poland	59 %	6	38 %	5	↓	7 %	5
Greece	40 %	13	37 %	13	→	12 %	12
Mexico	53 %	3	24 %	4	↓	15 %	5
Turkey	30 %	6	18 %	4	↓	19 %	7
India	59 %	16	17 %	11	↓	62 %	15
USA	17 %	5	14 %	5	→	-2 %	6
Brazil	22 %	7	16 %	7	↓	19 %	7
Israel	18 %	4	10 %	4	↓	6 %	4

Table 1: Forecast and reality: the forecasts made in September 2008 concerning the growth in production volumes (see S&WE 6/2008, page 66) are set against the actually achieved growth as determined retrospectively by this year's survey. In the right-hand columns the average growth expected for the current year by the manufacturers in each country is given. The countries are listed in order of the highest growth rates of the home industry in 2008. The company GreenOneTec in Austria has not been considered. The figures from S&WE 6/2008 for the USA have been corrected downwards, as incorrect figures for the manufacturer AET from Florida had been used. The figures obtained for China this year were so far removed from those of the previous year that they could not be compared directly. China is therefore not included here.

Source (all data in this article): Market survey Solrico/S&WE September/October 2009

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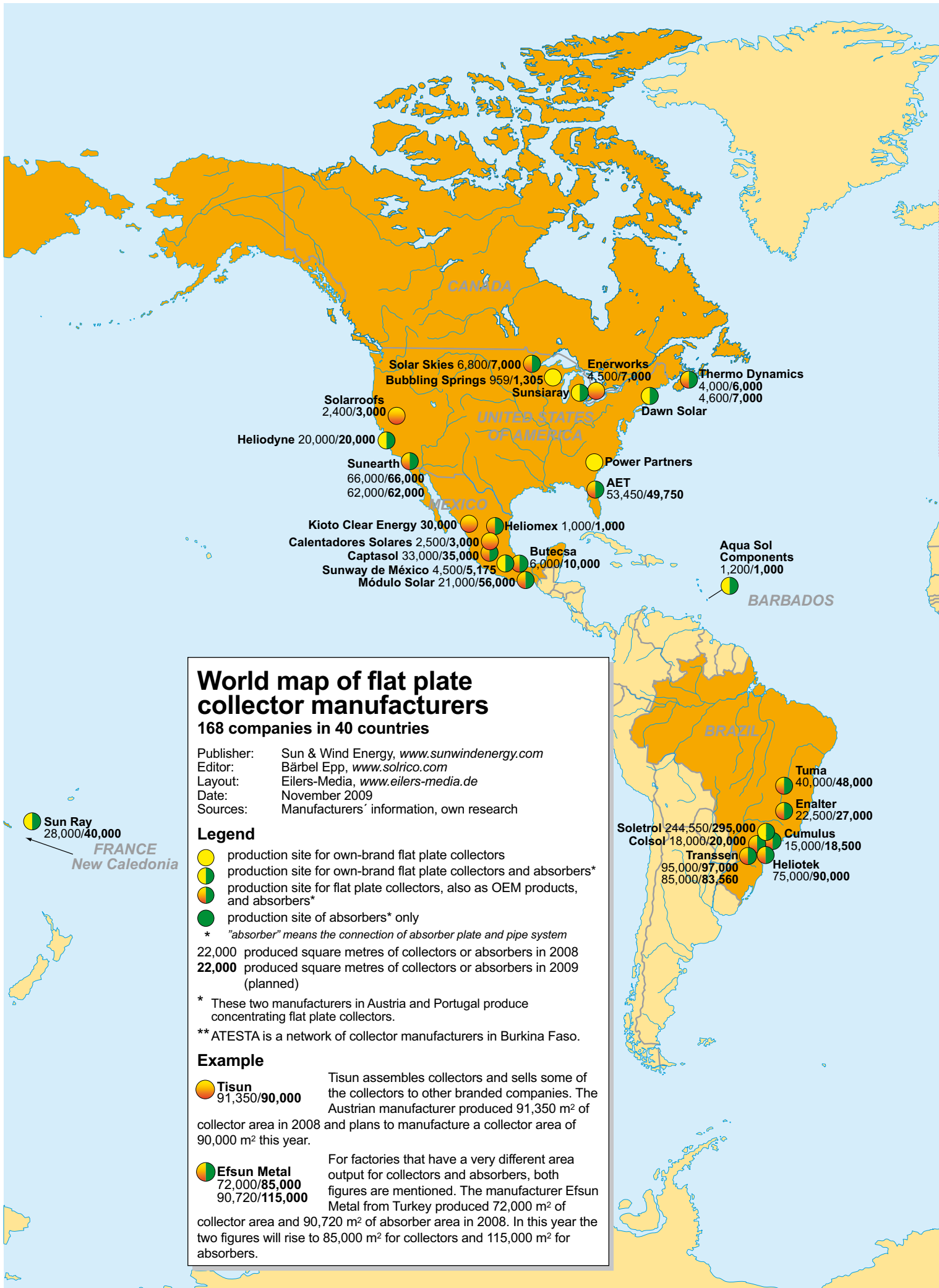
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World map of flat plate collector manufacturers
168 companies in 40 countries

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Sources: Manufacturers' information, own research

Solar Skies 6,800/7,000
Bubbling Springs 959/1,305
Sunsiaray 4,500/7,000
Enerworks 4,500/7,000
Thermo Dynamics 4,000/6,000
Dawn Solar 4,600/7,000
Solarroofs 2,400/3,000
Heliodyne 20,000/20,000
Sunearth 66,000/66,000
62,000/62,000
Power Partners
AET 53,450/49,750
Kioto Clear Energy 30,000
Heliomex 1,000/1,000
Calentadores Solares 2,500/3,000
Captasol 33,000/35,000
Sunway de México 4,500/5,175
Módulo Solar 21,000/56,000
Butecsa 6,000/10,000
Aqua Sol Components 1,200/1,000
BARBADOS
BRAZIL
Tuma 40,000/48,000
Enalter 22,500/27,000
Cumulus 15,000/18,500
Soletrol 244,550/295,000
Colsol 18,000/20,000
Transsen 95,000/97,000
85,000/83,560
Heliotek 75,000/90,000



World map of flat plate collector manufacturers

168 companies in 40 countries

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Legend

- production site for own-brand flat plate collectors
- production site for own-brand flat plate collectors and absorbers*
- production site for flat plate collectors, also as OEM products, and absorbers*
- production site of absorbers* only

* "absorber" means the connection of absorber plate and pipe system

22,000 produced square metres of collectors or absorbers in 2008
22,000 produced square metres of collectors or absorbers in 2009 (planned)

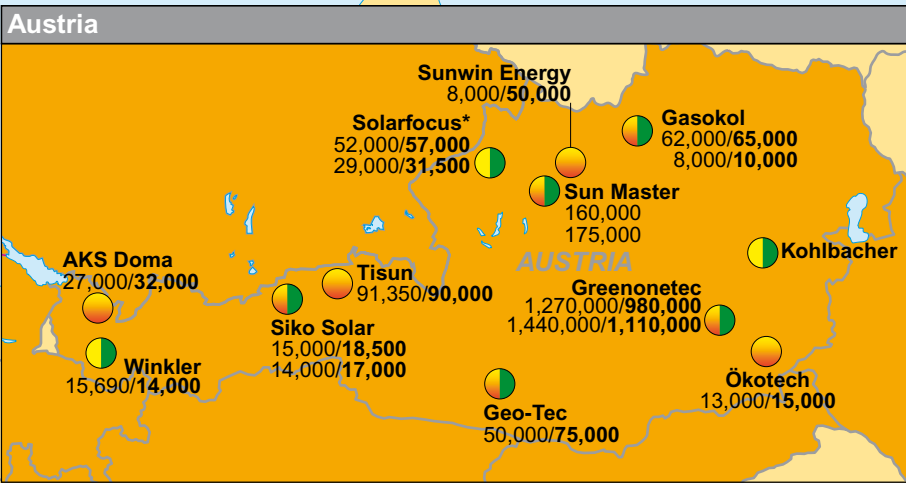
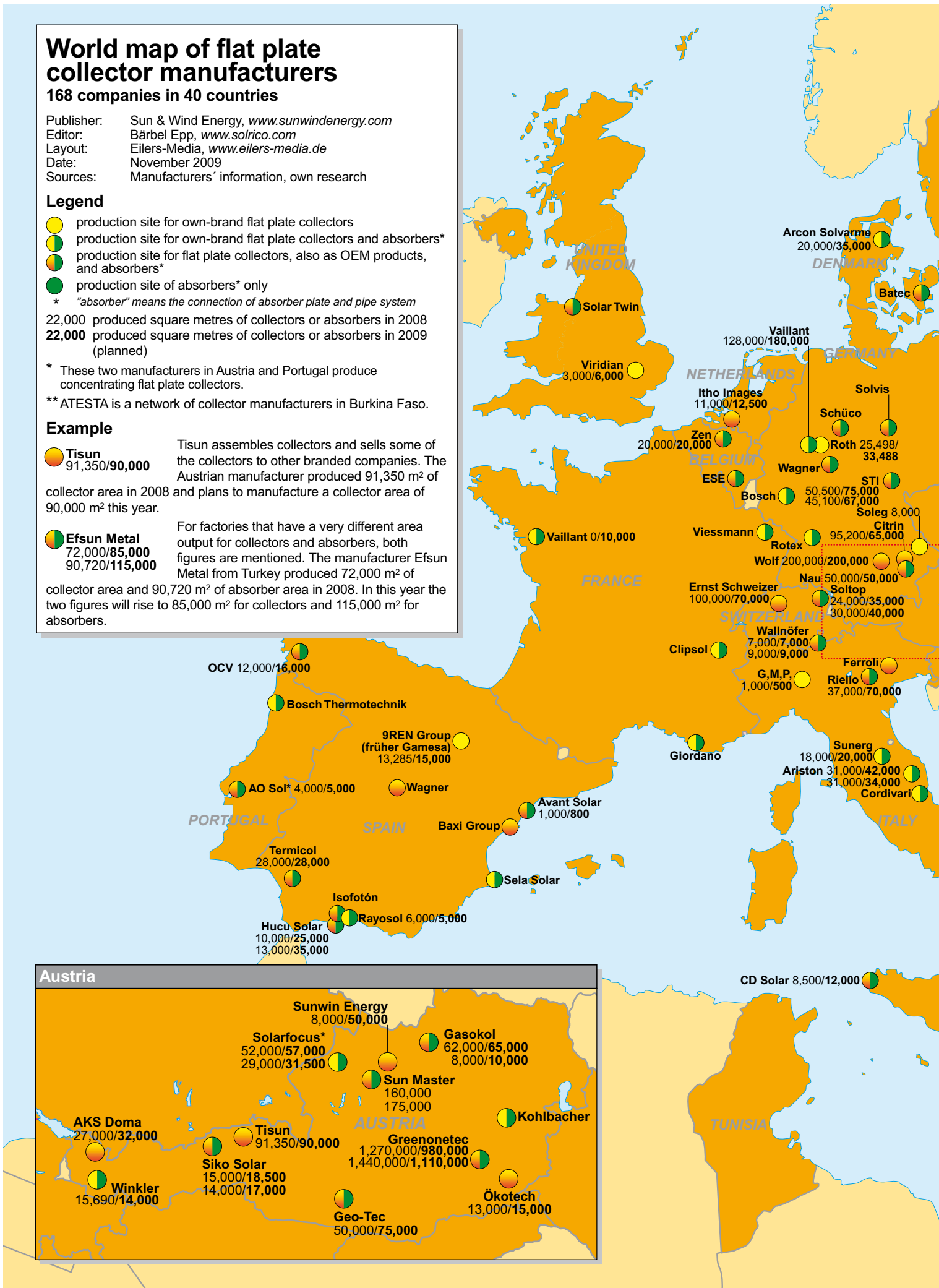
* These two manufacturers in Austria and Portugal produce concentrating flat plate collectors.

** ATESTA is a network of collector manufacturers in Burkina Faso.

Example

Tisun
 91,350/90,000
 Tisun assembles collectors and sells some of the collectors to other branded companies. The Austrian manufacturer produced 91,350 m² of collector area in 2008 and plans to manufacture a collector area of 90,000 m² this year.

Efsun Metal
 72,000/85,000
 90,720/115,000
 For factories that have a very different area output for collectors and absorbers, both figures are mentioned. The manufacturer Efsun Metal from Turkey produced 72,000 m² of collector area and 90,720 m² of absorber area in 2008. In this year the two figures will rise to 85,000 m² for collectors and 115,000 m² for absorbers.





Ranking of flat plate collector manufacturers

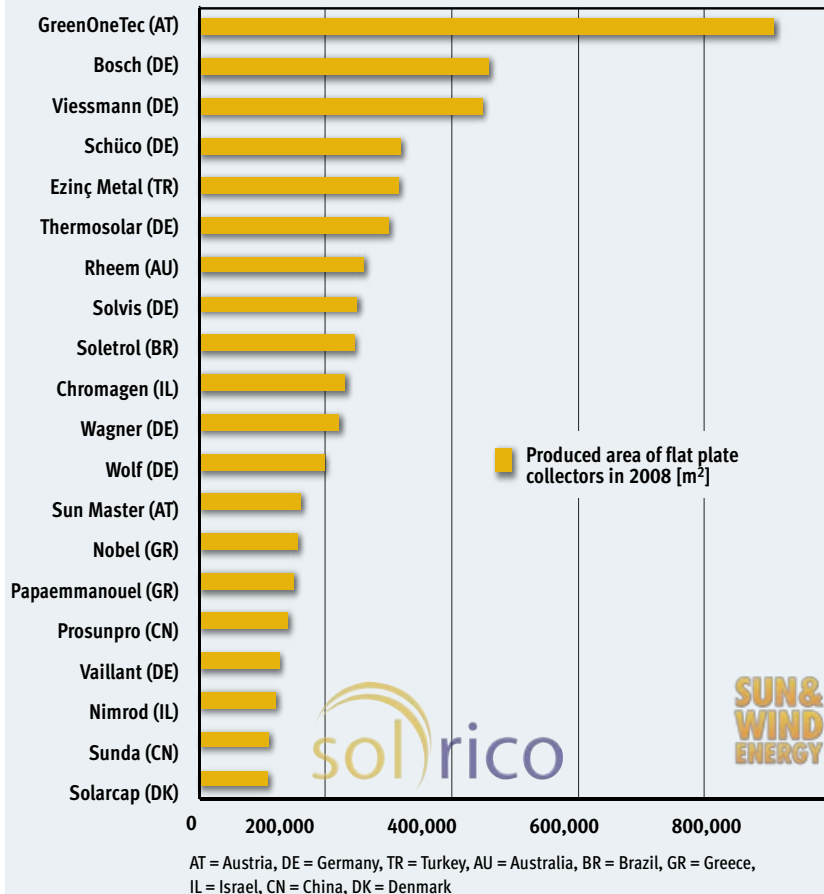


Fig. 1: Germany dominates the 2008 ranking of the largest flat plate collector manufacturers in the world. Sunda and Eraslan have retrospectively adjusted their production figures downwards in this year's questionnaire and the latter no longer makes the top 20. For Solarcap, only the production from its three subsidiaries Heliodyne, Emmvee and Arcon have been pooled together. GreenOneTec adjusted their production figures shortly before the editorial deadline. Hence its figures on the world map on page 58/59 are not correct. The Austrian manufacturer produced 0.9 million m² of collector area and 1.1 million m² of absorber area in 2008.

Velux training centre in Sonneborn shows solar technology inside (show room) and outside (roof integrated solar panels of the type CLI).

Photo: Stefan Müller/Velux

2009 are considerably more restrained. They grew by 14 % last year, but anticipated a small decrease of 2 % this year. The Polish companies are also taking the crisis seriously and have forecast 7 % growth this year over 38 % last year. The lowest forecast was made by the Germans, with 0 % growth over last year, although 2008 did break all records with 2.1 million m² of newly installed collector area. The relatively good

expectation of 25 % growth made by companies in Austria mainly falls on several fast-growing companies which are putting a lot of effort into exports.

The heating industry is building new production facilities

168 flat plate collector manufacturers from 40 countries and 50 vacuum tube collector manufacturers from 16 countries took part in this year's survey. As the survey has now been carried out for the third time and should therefore have become established among the companies, filling in the questionnaire was a prerequisite for all companies this year for appearing on the world map. Over 30 manufacturers of flat plate collectors and 5 of vacuum tubes are thus not represented on this year's map.

The series of new factory construction has not been broken, although its speed has slowed. In 2009 the world maps of the solar thermal industry show only six new sites for factories. Last year the survey determined 28 new company locations, although this covered the two years of 2007 and 2008. China is not included in these two statistics, as the number of manufacturers (3,000) is too high for such a detailed analysis to be made.

So, what are the six new factories from this year?

- The Italian company Ferroli has already been manufacturing its flat plate collectors since January in a factory at Alano di Piave, north of Venice.
- The German heating company Bosch Thermotechnik started up a flat plate collector assembly line near Shanghai, China, in the summer.
- The Austrian company Kioto Clear Energy AG has also started up an assembly plant for solar collectors, in this case in El Salto, Mexico, in July.
- The British Baxi Group is currently building an assembly plant for flat plate collectors at Fabrigas, Spain, which is planned to go into operation in December.
- The Danish company Velux has already been selling solar thermal systems since 1999 and has now moved into in-house production at the Hungarian Velux site at Fertöd.
- The German heating supplier Vaillant started up the only production site among the new factories for collectors and absorbers in Nantes, France, in September this year.



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The most popular sales markets in 2008: Germany, Italy and Spain

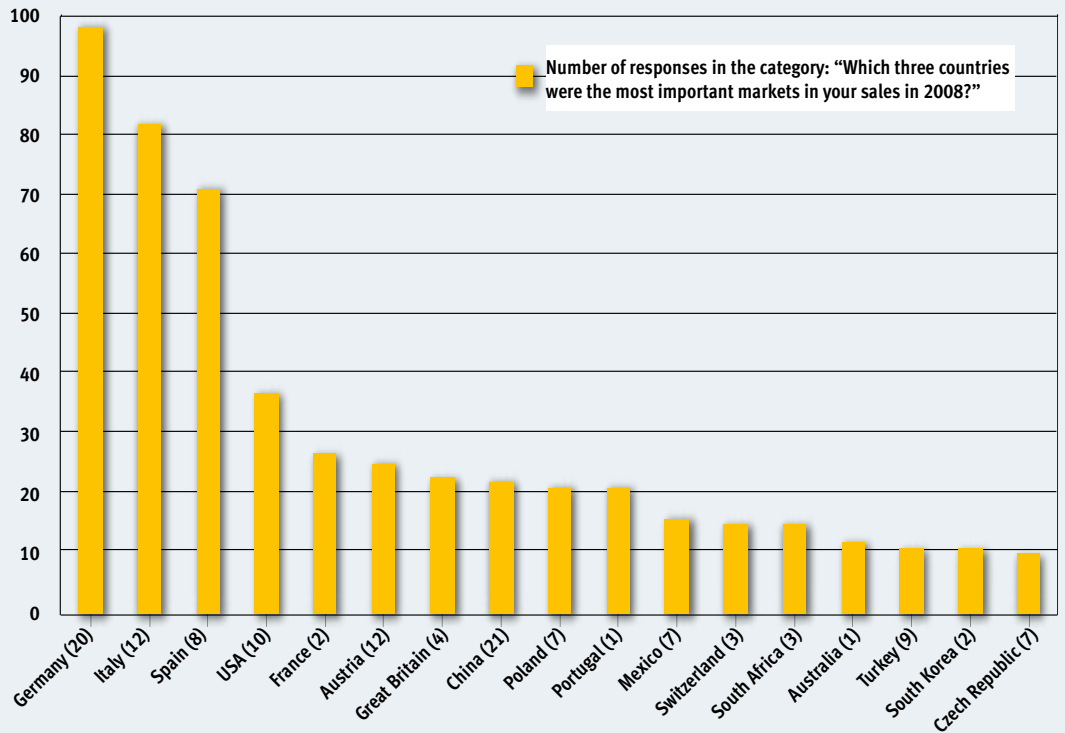


Fig. 2: The most popular sales markets in 2008 in order of the number of responses. Only those countries which received more than ten ticks in total are listed. In brackets behind the countries is the number of manufacturers which have their headquarters in that country. 200 questionnaires were evaluated.

The globalisation of the solar thermal industry

For Bosch, Kioto, Baxi and Vaillant, the new plants are at secondary locations. Globalisation is thus also taking place within the solar thermal industry. Any company wishing to serve international markets ideally makes use of assembly plants in other countries, or even other continents. All the European players in the heating industry are following this strategy:

Bosch Thermotechnik has the broadest setup, with solar technology plants in Portugal, Germany and China. At the end of June the Baxi Group inaugurated a new manufacturing unit in Turkey for the group member Baymak with a capacity of 375,000 m² (see S&WE 8/2009, p. 12) and will be running a factory in Spain as of the end of the year. The Italian Ariston Thermo Group manufactures in Italy and India. Only Viessmann currently still concentrates its flat plate collector manufacture at one plant, namely at Falquemont, France. The



In September Vaillant opened its new production plant for collectors in Nantes, France.

Photo: Vaillant

company is involved in a joint venture in China called Eurocon for its tube collector manufacture, which is situated near Beijing. The financial crisis has thus not slowed down the expansion of manufacturing capacities within the European heating industry.

Especially Bosch Thermotechnik made a big leap last year and now holds 2nd place in the ranking of the 20 largest collector manufacturers and is almost at the same level as Viessmann (fig. 1). German companies dominate the ranking with eight placings. Apart from this, the companies are fairly evenly spread around the globe: 2 each in Austria, Greece, China and Israel, and one each in Turkey, Brazil, Australia and Denmark.

Outside the heating industry, especially the Danish holding Solarcap has bought up a global network of production capacity, with factories in India (Emmvee), the USA (Heliodyne) and Denmark (Arcon). Just considering these three sites, the holding secured the final place in this year's ranking.

GreenOneTec, the largest flat plate collector manufacturer in the world, belongs jointly to Solarcap and Kioto Energy AG, which has already taken the step to becoming a global manufacturer with its factory in Mexico. As GreenOneTec cannot clearly be put together with one of these two "global players", it has been listed separately in the ranking.

Broadly based Chinese manufacturers

The Chinese solar thermal industry may not have set up any factories abroad, but the top five companies do have several factories for the enormous home market (see figure 2a and 2b on page 72). Here, the results are as follows:

By far the largest solar thermal manufacturer in China – and worldwide – is the Linuo Group. Linuo New Material, a subsidiary of the Linuo Group responsible for the production of glass tubes and vacuum tubes, runs four glassworks in the provinces Zhangqiu, Henan, Shandong and Jiangsu. A fifth factory in Zhangqiu, which also belongs to the Linuo Group, is



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a joint venture with Baoguang, and is thus included in the world map under this name. Apart from the factory in Zhangqiu, a further two large vacuum tube factories belong to the Linuo Group in Jinan and Shenxian, Shandong Province.

Himin Solar Company owns three factories for module assembly, as well as a further four for manufacturing double-glazed vacuum tubes, all of which are situated in Dezhou, Shandong, where company founder Ming Huang wishes to set up a solar valley. Himin manufactured over 2 million m² of collector area there last year. It is planned that the most important pre-suppliers will also move to the solar industrial park. The supplier for the single-glazed glass tubes, the company Yaohui, already owns a factory there which supplies exclusively to Himin. The glass production line is directly linked to the automated tube lines of the Ming Huang empire.

Sangle Solar Energy has four different factories for collector assembly as well as three factories for coating and evacuating glass tubes in the provinces Zhejiang, Hunan, Jaingsu and Shanxi. According to its own statements, the company produced 98 % of the vacuum tubes in-house, for the 1.7 million m² of collector area which it produced in 2008.

Tsinghua Solar Systems has two sites. The main factory is in Beijing and a second factory for the final assembly is in Zhumadian in the province of Henan.

Sunrain Solar Water Heater Manufacture is focussed on the coastal city of Lianyungang in Shandong, and has since last year been expanding production there with a second factory next to the main one. However, for the 1,445 million m² of collector area which it produced in 2008, Sunrain did not have enough capacity to produce all the vacuum tubes in-house. Sales Manager David Liu confirmed that exported tubes and collectors are all produced in-house, however.



	Number of "yes" answers	Percentage share
Do you manufacture solar storage tanks?	102	51 %
Do you supply thermosiphonic systems?	127	64 %
Do you supply drainback systems?	63	32 %
Do you provide complete thermal systems, including a pump group?	144	72 %
Do you carry out installation for your customers?	98	49 %
Do you provide your customers with financing for large solar thermal systems?	55	28 %

Table 2: The manufacturers busily ticked "yes" when it came to the spectrum of additional services. 200 questionnaires were evaluated. A tick in more than one box was permitted.

Only Huayang Solar Energy still makes do with just one factory according to the survey. In 2008, vacuum tubes and collector modules with an area of 1.4 million m² were manufactured in Yangzhou, in Jiangsu Province.

Takeovers are enabling expansion

While the new factory locations can clearly be seen on the world map, the subject of takeovers and share acquisition, i.e. a consolidation of the collector market, lies more in the shadows. But there is a fair amount of news on this front too:

- The US American investment company First Reserve Corporation took over the Spanish company Gamesa Solar in August 2009. Spokesperson Antonella Pellegrini confirmed that solar collectors will continue to be produced within the newly founded company 9REN España, but did not wish to talk about volumes.



Velux is one of the few companies that increased their production capacities in 2008.

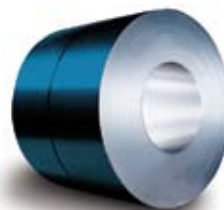
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“The slowdown has forced us to increase our efforts”

Solar thermal businessmen from Spain: Julio Castro (right) and Angel Martínez founded the collector manufacturer Termicol Energía Solar, S.L. eight years ago and invest even in times of crisis.



S&WE: You have just invested € 1.5 million to extend your collector factory near Sevilla.

Was it the right decision in times of a dwindling solar thermal market in Spain?

Martínez: The decision to invest was made not only by looking at the Spanish market, but at our international expansion as well. When we outlined our strategic plans for 2007, no one could have imagined the depth of the crisis we are now suffering from. We had continuous annual growth rates over 30 % and in September 2006, the national government approved the building law, so the expectations were very high. The slowdown has forced us to increase our efforts in going international a bit earlier than planned, but the investments were necessary anyhow. We began selling in Portugal and will enter other national markets in 2010, in order to compensate for the shrinking market in Spain.

S&WE: How did you invest the money and what were the objectives of your investment?

Castro: We invested almost € 1 million in a new building complex, which includes a warehouse, offices, production facilities, as well as an R&D laboratory. The rest was used to buy machinery – for both the manufacturing line for absorbers and the assembly line for collectors. All in all, we had three objectives: an increase in both capacity and productivity and improvements in quality – and we reached all of them. Our production capacity has increased from 45,000 m² in 2007 to 160,000 m² in 2009 and we are in the process of obtaining the Solar Keymark certification.

S&WE: According to the Spanish industry association ASIT, market volume will decrease by twenty to thirty percent this year. You want to again reach the quantity of square meters

produced last year! What are the success factors of your sales strategy?

Martínez: By the end of September 2009, our production and sales figures were four percent higher than the year before, and we expect to improve on that growth rate within the next months. Although two years ago our forecasts were much higher, we are aware of the current situation and are pretty satisfied with our results. We have managed this because we manufacture a wide range of quality collectors and kits at competitive prices, and we focus on serving our clients. We made a commercial strategy based on distributors all over the country and have maintained and respected our close relationship even in times of crisis. We have also increased our OEM sales, a strategy we want to reinforce primarily in other countries.

The interview was conducted by Bärbel Epp.

- The Swedish investment company Earthsun Technology bought up the long-standing company Sunstrip in May this year, a company which has manufactured absorbers and developed coating technologies since 1979. The company is now trading under the name S-Solar and according to Company Head Klas Ståhl intends to strongly expand its activities. The step into collector manufacture has already been made and further products are to follow.
- Since 1st October 2008 the former German company Rotex Heating Systems GmbH has been a 100 % subsidiary of the Japanese stock company Daikin Industries Ltd, with 36,000 employees worldwide.
- In the same year, the German Monier Group GmbH took on a majority share in the Brazilian collector manufacturer Heliotek.

- Back in 2007, the Austrian collector manufacturer Gasokol took up 51 % of the Czech absorber specialist T.W.I. Spol.
- And in 2006, the Slovenian automobile supplier Hidria Inženiring bought up the company IMP Klimat, which had been producing collectors in the capital Ljubljana since 1980. After the takeover, Hidria set up a renewable sources of energy business unit at the former IMP Klimat site.

There are certainly advantages to acquiring a financially strong “mother company” through participation or by being taken over. In many cases there is a powerful initial investment and production capacities for expanding in the market are thus created. Rotex is a good example of this. The company inaugurated a semi-automated production line for collectors

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at its Güglingen plant in Germany in May, which enables a cycle time of 18 minutes. In three-shift operation this equates to 100,000 collectors a year. Since the Irish Kingspan Group took over the vacuum tube collector manufacturer Thermomax in 2007, investment has been strong. A new modern factory in Portadown, Northern Ireland, has three times the manufacturing capacity of the two previously existing factories in Bangor and Blackwood combined, claims Gerard Whelan, Head of Kingspan Renewables. It is to be inaugurated before the end of the year. The Indian collector manufacturer Emmvee Solar Systems built a completely new factory, with an enamelling line for storage tanks and a collector production line at a cost of € 15 million for the buildings and machinery after being taken over by the Danish holding Solarcap.

Flat plate collectors and tubes: manufacturers are doing both

Ever-more collector manufacturers are following two paths simultaneously, i.e. they are supplementing their existing flat plate collector production with a line for vacuum tube assembly or vice versa. The manufacturers in Poland were the first to take up this trend. Already last year, the overview contained five home companies supplying both technologies. Taking up the trend now is India. This year's map of the vacuum tube industry already shows 8 companies which claim to buy vacuum tubes from China and then assemble them to collectors in India. Last year it was only two, including Borosil Glass Works, an Indian company which moved into glass tube manufacture for solar technology in 2007, and which meanwhile covers the whole value chain right up to finished solar systems.

At the same time, several Chinese manufacturers are also showing an interest in the flat plate collector technology which prevails in Europe and the USA. In 2008, Sunrain Solar Water Heater Manufacture was the first of the large suppliers to start

SMEThermal 2010: the first international conference on the subject of "Automation in the solar thermal industry"

SunWin has it, Vaillant has it, Sun Master and Roth have it too: ever-more collector manufacturers are having turnkey production lines for collectors and/or absorbers built for them by a general contractor. What needs to be considered when planning such a production line? Which production steps are to be automated? And which preparation steps should you integrate into the line? These and many more questions will be answered at the international conference SMEThermal on 4th March 2010 in Berlin. This is the first time that a conference will be looking exclusively at the subject of automation and process optimisation for the manufacture of the key components of solar thermal systems, namely the collector and storage tanks.

This one-day event is being organised by Solarpraxis AG in cooperation with SUN & WIND ENERGY. Raffaele Piria, Senior Consultant at Eclareon, and Bärbel Epp, Head of Solrico, are responsible for the conference programme.

Conference programme: www.sunwindenergy.com (Events)
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Collector manufacturing line at SunWin in Austria

Photo: SunWin

manufacturing flat plate collectors, although the 5,000 m² planned for production this year is still insignificant compared to the 2.3 million m² planned for vacuum tube collectors this year. Its competitors from the leading group, Himin Solar Company, Linuo Paradigma, Tsinghua Solar Systems, Sangle Solar Energy and Huayang Solar Energy (see figure 2a on page 72), still answered the question of whether they currently had any flat plate collector manufacture

with a clear 'no' this year, however. The number of manufacturers producing both technologies has now risen to 18, as opposed to 14 from the previous year.

Exceptions prove the rule, of course, and thus the French company Giordano also gets a mention. It has pulled out of vacuum tube collector manufacture this year and now only produces flat plate collectors at its two sites in Aubagne (France) and Grombalia (Tunisia).

The three most popular sales markets in 2008 were, as in the previous year, Germany, Italy and Spain (see figure 2). The USA has moved up from 8th place in last year's survey to 4th place now. The international solar thermal industry has been attracting attention in the last few years with an annual growth of approx. 50%. The manufacturers are less optimistic for this year, however. The six manufacturers which provided figures for both years are expecting a decrease of 2%.

Mexico has made a significant jump forwards. While for 2007 only the five home manufacturers ticked Mexico as a main sales market, the figure has now risen to 16 responses. Switzerland is also being taken more seriously; 15 companies responded that it was one of the top three sales markets in 2008. In the previous year the number was below 5 and the country wasn't shown on the chart at all. If you only look at the questionnaires filled in by the few Chinese companies which are currently exporting, then Germany also comes top (5 responses), followed by the USA (4) and France, Australia and Korea, with 3 responses each.



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Broad spectrum of services

Manufacturers of flat plate and vacuum tube collectors provide the market with a wide product spectrum. This is the conclusion from the part of the questionnaire dealing with "additional services". Table 2 (see page 65) sums up the results. The percentages are remarkably high, maybe as a cheated "yes" doesn't really hurt on paper. The question was asked for the first time this year and surveys in the future will determine whether the number of suppliers of drainback systems, or providers of financing models, is really so high.

The number of original equipment manufacturers (OEM) also seems to have risen. This year 132 of the 200 companies stated that they manufactured OEM collectors for other suppliers (66%). Last year it was 98 companies out of 185 (52%). In this, the share of OEM manufacturers in this year's survey among the vacuum tube manufacturers (70%) was considerably higher than among flat plate collector manufacturers (60%).

Worldwide survey of flat plate collector manufacturers: China remains a factor of uncertainty

For this year's survey over 300 flat plate manufacturers around the world were sent questionnaires: 168 answered. Their factory sites, their production volumes in 2008 and their forecast volumes for this year – insofar as they provided figures – are shown on the world map of flat plate collector manufacturers on pages 56 to 59. It was a prerequisite for all companies this year to fill in the questionnaire in order to be included on the map.

The annual repetition of this survey is paying off. A number of companies with sometimes very exaggerated production volumes and forecasts from last year have now reported significantly lower figures. Hopefully, the number of "black sheep" which bandy about unserious forecasts will fall from year to year. Additionally, the English questionnaire was also translated into several other languages (Chinese, Spanish, Czech and Turkish), in order to minimise misunderstandings while filling them in.

A large factor of uncertainty is created by the Chinese market. According to Prof. Zhiqiang Yin from Tsinghua University, 7% of the solar collector area sold there consists of flat plate collectors. With an estimated market volume in 2008 of 30 million m², this would be 2.1 million m² of collector area. The market research for the world map of the solar thermal industry cannot confirm this figure. Despite intensive efforts, no significant number of larger flat plate collector manufacturers could be found in China and surveyed. Moreover, the company Fivestar, for example – so far taken as being the largest manufacturer of flat plate collectors – has this year admitted that the production volume of 200,000 m² that they had previously reported was false. The genuine area probably does not even reach half this figure. The companies listed produced 420,000 m² of flat plate collectors in 2008. The question thus remains of where in China and by whom 2.1 million m² of flat plate collectors are supposed to have been manufactured.

Bärbel Epp

The Internet addresses of all the companies shown on the world map can be found at
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