Solar thermal energy for enameling plants and production processes

EISENMANN & Ritter XL Solar - A green alliance for sustainable production

In the 21st century, mankind's management of the planet must change from today's predominant regime of consumption to a regime of sustainability. This change is all-embracing and without alternatives: like all other sectors of our globalized economy, the industrial production of goods will undergo far-reaching transformations. And because energy affects every single sector, its generation and use will be transformed even more fundamentally. From all that we know today, it will no longer be possible to produce energy from fossil and nuclear sources by the end of this century.

This change of regime is not a process for the far-distant future: it is already well under way. Its driving forces are clearly evident in the automotive industry and will soon also affect other sectors of industry, including the enameling industry.

Inexorably rising energy prices in the medium term, increasingly more stringent statutory requirements and framework conditions (CO_2 reduction, emissions trading) and above all the consumer's ever louder calls for "green products from green production" present a growing challenge for the manufacturers of enameled goods, as well as for the suppliers of enameling plants.

In the majority of cases, such as in the manufacture of household appliances, surface treatment accounts for 70% of the total energy required by the entire production process. The potential for saving energy is consequently immense here. However, there are economic limits to the optimizations made in recent years to reduce the amount of energy required for such processes. The logical next step and simultaneously ideal answer to the challenges mentioned above is to use renewables to cover the remaining energy requirements.

Efficient complete solutions integrating solar thermal energy into the production process are now possible thanks to the strategic partnership set up in 2011 between the plant manufacturing specialist EISENMANN AG and Ritter XL Solar GmbH. In this way, consumption of fossil fuels for energy-intensive processes, such as enameling, can be cut considerably by using solar thermal energy systems.

Figure 1 (Pretreatment / spray tunnel)

Figure 2 (Pretreatment / drying)

Mega-trends of the 21st century

Very different industries with production processes requiring high energy inputs are experiencing growing pressure to take action as a result of the mega-trends of the 21st century. The development and realization of energy-efficient production processes is increasingly becoming a factor of fundamental importance for success.

Energy prices will continue to rise significantly as the shortage of such fossil fuels as oil, gas and coal continues to grow while energy consumption increases steadily in emerging markets, such as China, Brazil and India.

The use of renewable energy sources, on the other hand, makes industry less dependent on the future development of energy prices, provides for security in planning and allows cost savings to be realized in production.

The cost of production will increase considerably, not only due to rising energy prices, but also and above all on account of the far-reaching CO2 requirements specified by the Kyoto Protocol and the European Emissions Act. Using energy from the sun in the form of solar thermal energy reduces not only the consumption of conventional energy sources, but also the amount of CO2 emitted – and hence the need for CO2 certificates. This helps to cut production costs and protects the environment.

The debate raging in all industrialized nations over the greenhouse effect, climate change and the action needed to reduce negative impacts on the environment has brought about a change in awareness among manufacturers and consumers alike.

The logical conclusion resulting from this change is sustainable economic management and compliance with "green footprint" principles. The solar thermal energy solution offered by EISENMANN and Ritter XL Solar can contribute significantly to the realization of "green factories".

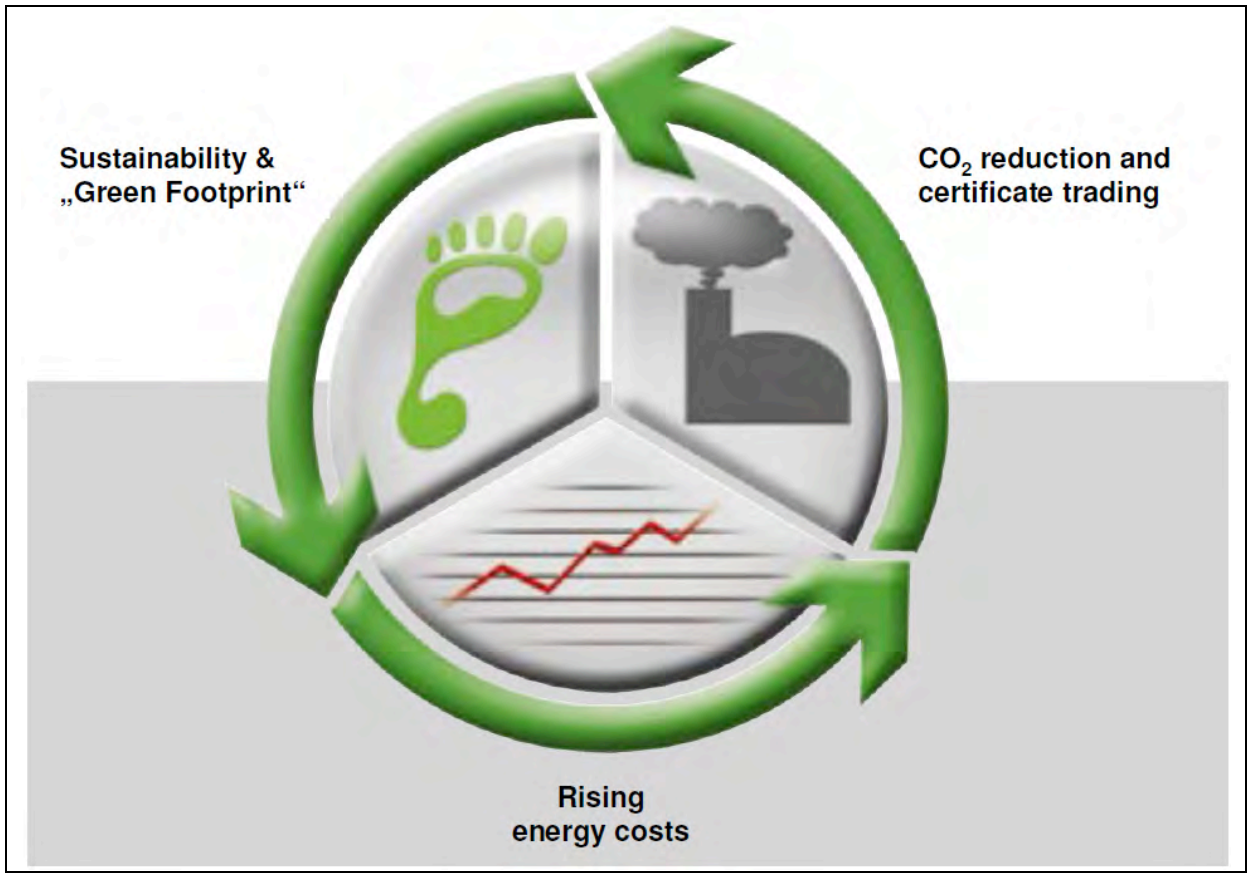


Figure 3

Sustainability requirements

Many branches of industry have long ago realized that plausible communication of a "green" product is only possible if it includes "green production".

Modern consumers eager to know how and where their food is produced are merely harbingers of a comprehensive, socially motivated consumer demand for information on the origin of raw materials and the sustainable nature of the processes by which all consumer durables are produced.

As a result of this awareness, many companies throughout the world have already developed broadly based sustainability strategies focusing on the plausible communication of ecological competence to their customers.

A look at the sustainability reports published by different companies shows that reducing emissions, saving energy and using efficient, alternative energy sources are not only points of importance for the customer, but also highly relevant for all production processes and products.

To date, this has primarily resulted in the development of "green footprint" products (e.g. motor vehicles with electro-mobility) despite the considerable potential still to be exploited for low-pollutant, energy-saving processes in production!

The cooperation between EISENMANN and Ritter XL Solar will make it possible to significantly cut the demand for fossil fuels in energy-intensive processes, such as surface treatment in the automotive industry, by using solar thermal energy (as illustrated in Figure 4).

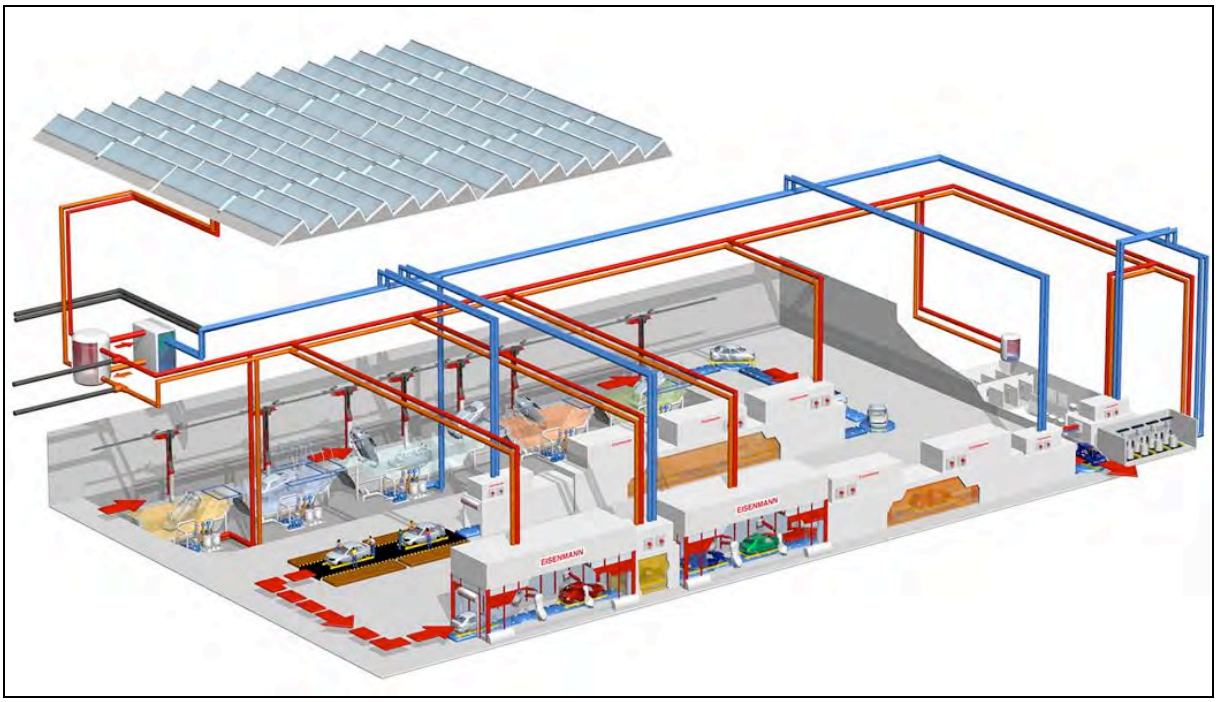


Figure 4

EISENMANN

is a leading international system supplier for surface finishing technology, material flow automation, environmental and thermal process engineering. More than 2,500 employees develop new technologies and plants for production, assembly and distribution. Engineers, technicians and specialists from a whole variety of branches plan, design and build state-of-the-art systems, including the operation and maintenance of complete plants.

Cooperation between EISENMANN and Ritter XL Solar

Like EISENMANN, Ritter XL Solar is an internationally operating company with extensive specialist know-how.

In this partnership, EISENMANN is responsible for integrating the solar thermal energy concepts into the plant engineering, for the marketing and commercial handling, as well as for the piping, and is your contact.

Ritter XL Solar specializes in large solar thermal energy plants with vacuum tube collectors and is responsible for engineering the collector array, as well as for production and delivery of the modules.

The technology underlying the XL solar plant was developed by the Ritter Group in 2006 on the basis of the AquaSystem first developed in 1986. This technology makes it possible to build collector arrays of almost any size and to integrate them into new or existing heat systems.

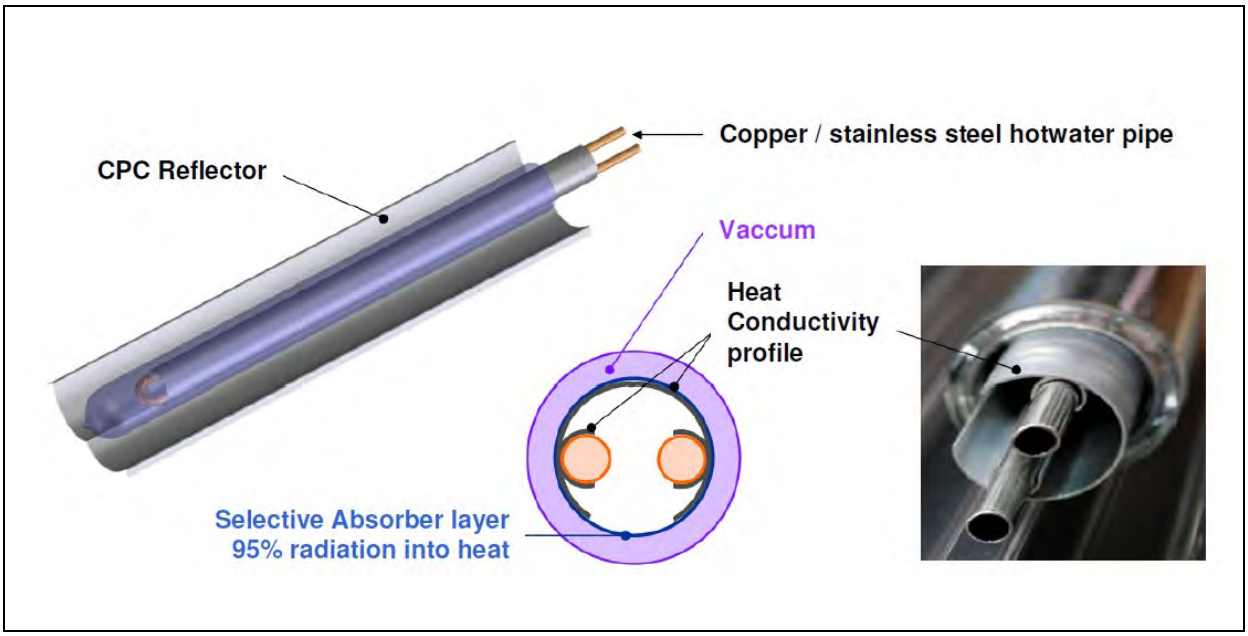
The Ritter Group's technology consequently leads the world market for solar thermal energy plants with process temperatures up to 120 °C! Well over 150 XL solar plants with areas ranging from 30 to 3,400 m² have already been installed, including some of the largest vacuum tube collector plants in the world.

Figure 5 (Reference)

Figure 6 (Reference)

Mechanical design and function of vacuum tube technology

The mechanical design of the vacuum tube collectors (Fig. 7) is extremely functional. The double-walled vacuum tube contains a heat pipe with heat transfer profile which is heated by solar irradiation. The CPC reflector additionally focuses the sun's rays on the pipe.



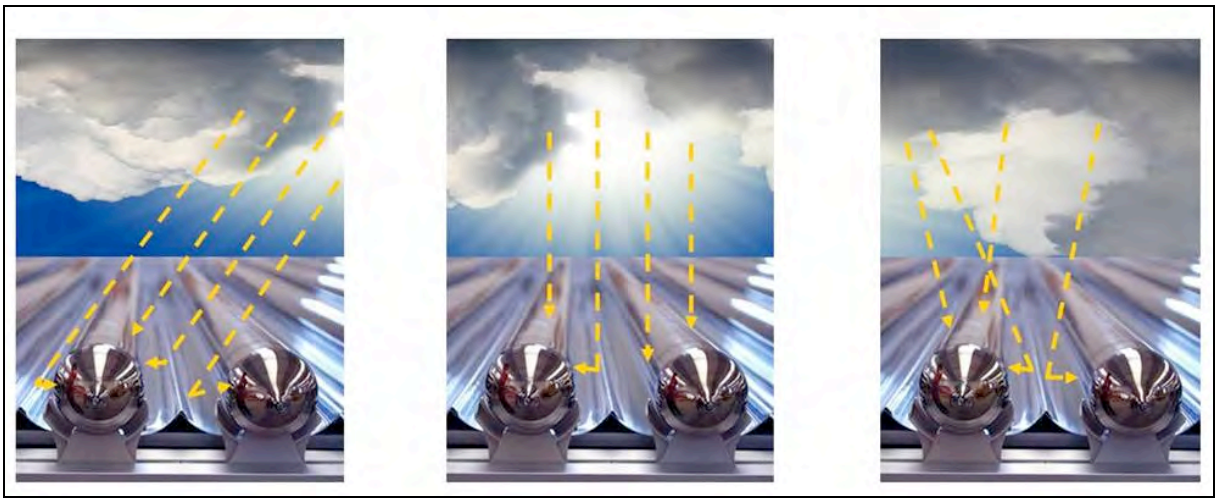


Figure 7 (top: vacuum tube collector, bottom: CPC reflector)

Even in weak or diffuse sunlight, the service temperature is consequently still between 70 and 120 °C. This evacuated glass tube is shockproof and can even withstand hailstorms. What's more, it is easily replaced if damaged, as the water only flows through the heat pipe (copper or stainless steel) without coming into direct contact with the evacuated glass tube.

Expensive chemical anti-freeze is not needed for this type of collector, thus also making a heat exchanger unnecessary.

A high utilization factor is additionally assured by the very good ratio of heat absorbed in the collector to heat output in the production process.

Compared to conventional flat collectors, vacuum tube collectors are extremely compact and occupy less installation space. They also achieve a much higher temperature difference with the same output.

This system is unbeatable when it comes to sustainably producing energy for coating processes.

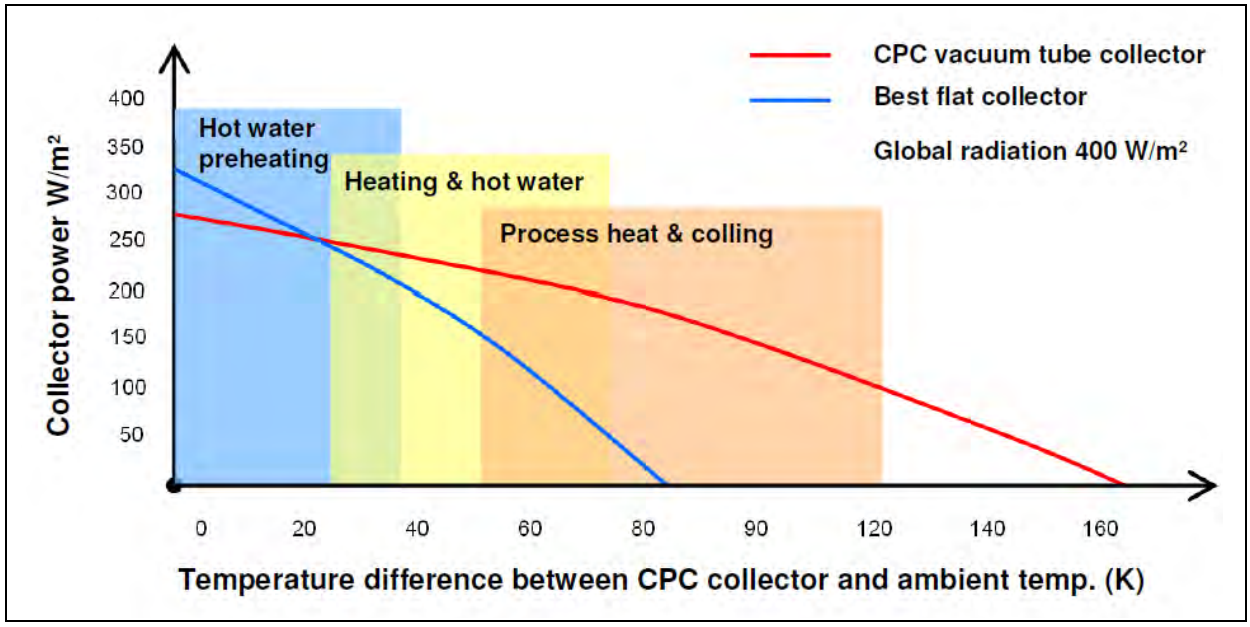


Figure 8