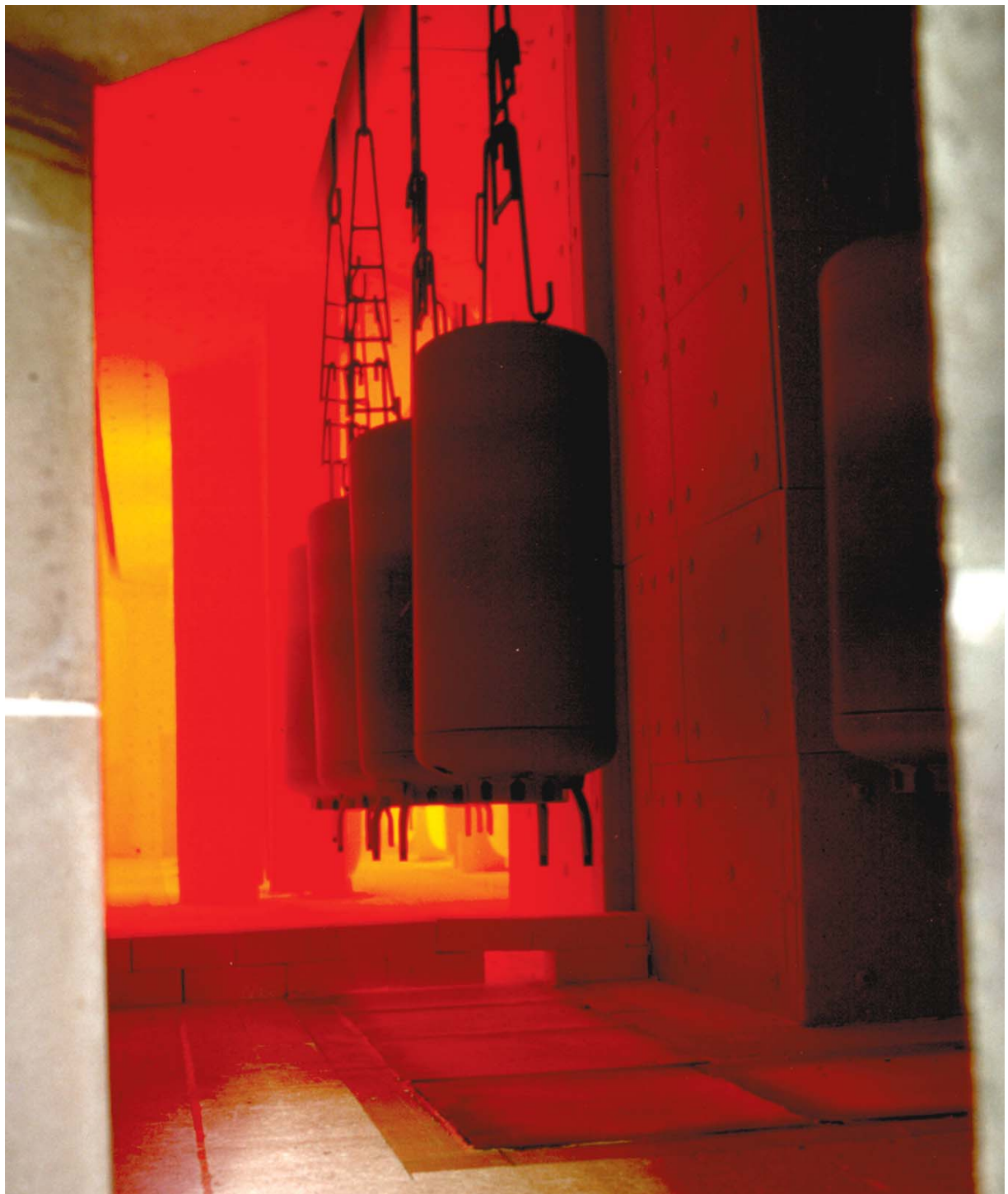


EISENMANN

**Boiler Enameling in China
with German Know-How**



Enameling plants from Germany contribute to providing hot water in a growing number of Chinese households at any time.

With quantum leaps, the People's Republic of China is attempting to leave inflexible structures behind and establish itself as an economic world power. The line adopted has led to a virtually unequaled economic growth and considerably enhanced the living standard of the approx. 1.2 billion inhabitants.

In many areas, however, there is still quite a backlog demand, for example in the area of living comfort. Hot tap water is not yet a matter of course but is esteemed by more and more Chinese people. For this reason, easily installable hot water tanks (generally referred to as boilers) in household sizes are among the customer goods that are in great demand. Alone 4 boiler enameling plants supplied by EISENMANN have an annual capacity of 2.4 million boilers in total.

China also Goes for Experience

First contacts were made via friendly German companies with subsidiaries in China. These contacts could be intensified through numerous personal visits on site. The EISENMANN office that was newly established in Shanghai supported the efforts. Access to the market was also simplified by the fact that Eisenmann's program includes all the enameling processes with practical relevance plus furnace, conveyor and handling systems, i.e. EISENMANN can objectively counsel on the best process for each individual cases. In addition, EISENMANN has vast experience as a general contractor and could also present a list of references with all the well-known German boiler manufacturers.



Fig. 1: Shot blasting plant for boiler pretreatment

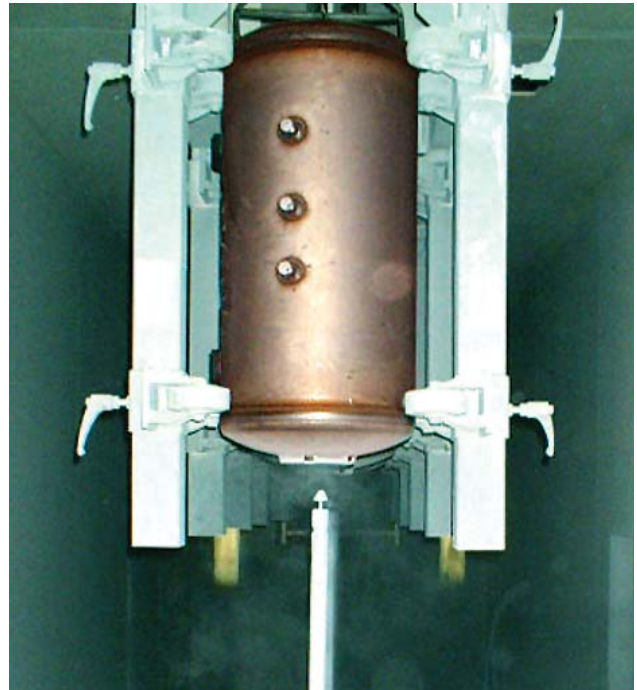


Fig. 2: Boiler interior coating with powder enamel through guns mounted on lances

The first Chinese company in this sector to become a customer was the largest manufacturer of household appliances situated in the north of China, who has a installed capacity of 144 boilers/h in his plant. Not quite a year later, customer no. 2 in Canton in the south ordered an enameling plant for 75 boilers/h to complement his job site enameling plant by his own manufacturing program. Shortly after, an absolute newcomer in the north of China became customer no. 3. This customer extended his original production of plastic profiles to the production of cooling units and hot water tanks. For reasons of flexibility, he was supplied with two separate enameling plants with capacities for 144 and 86 boilers/h.

Powder Enameling for Electro-Boilers

Apart from the different capacities, the requirements for all installation were identical: Small electric boilers with diameters of approx. 400 mm and heights up to approx. 1200 mm were to be provided with a high-quality interior coating as cost-efficiently as possible. (The boiler bodies will be insulated and clad later on, for this reason, only the "interior values" were of importance in this case.)

Due to the workpiece geometry (hollow body without internals with a sufficiently large opening for introducing lances) and the planned large-series production in three-shift mode, EISENMANN recommended powder enameling as the most favorable solution in all three cases. Comparable to powder

coating, this procedure can easily be automated and is thus especially economical. In this case however, solvent-free processes esteemed in the paint coating field cannot be quoted as a special advantage. The anorganic enameling material is equally environmentally friendly in the case of wet or powder application and exhaust air containing noxious substances will not be generated in any case.

Fully-Automatic Process

Generally, the operation of the four powder enameling lines in terms of process engineering are identical. Due to the different capacities and space conditions, there are slight differences that will not be detailed in this context.

The core of the problem solution is always a flexible Power& Free conveyor system, equipped with hardcoded car trains, rotary hangers and a comfortable PLC control. The fully-automatic process will be started following manual loading of the pressure-tested raw boilers and enabling by the PLC controller.

The shot blasting plant is the first treatment station (Fig. 1). Due to the welding seams on the boilers, shot blasting was selected as the pretreatment process. Another technically feasible solution using wet chemical methods incl. pickling



Fig. 4: Entry into the high-temperature furnace

was not considered to prevent the generation of waste water right from the start. In many areas of China, the proper disposal of waste water is still a problem due to the lack of municipal clarification plants.

The powder coating is applied in booths featuring lances equipped with plug-on guns (Fig. 2). These move into the boilers from below through the opening and coat the inside with a layer of enamel.



Fig. 3: Power&Free transport of the coated boilers to enamel firing at approx. 850 °C

The next step is the firing of the powder enamel at approx. 850 °C (Fig. 3). The furnace in proven EISENMANN modular design is subdivided into 4 control zones and equipped with radiant tubes and Rekumat® burners that are characterized by a very high degree of efficiency due to combustion air preheating: The PLC facilitates flexible assignment of the burners to the individual control zones so that the temperature curve can be exactly adjusted to the different workpiece sizes (Fig. 4).

The furnace conveyor system concept already developed 10 years ago and well-approved in practice is still worth mentioning. Its special characteristic is that it can work without special hangers and chains and above all, without manual rehanging efforts while transporting the workpieces through the high-temperature furnace. When transferring the coated boilers into the furnace, an additional shoe plate conveyor is brought to action. It takes over the loaded hangers from the Power&Free chain circle and at the same time completely seals the conveyor opening in the furnace towards the top. Takeover from and transfer back to the Power&Free conveyor system is completely automated so that a continuous material flow from loading of the raw boilers to unloading of the finished boilers is ensured.

Will Wet Enamel Be Used More Frequently in the Future

Up to now, approx. 95 % of the hot water tanks produced in China were electrically heated. In this case, however, a certain trend reversal is becoming apparent. Electric energy is considered expensive even in China. For this reason, boilers powered with gas or solar energy will be gaining significance.

However, due to their internals, these two boiler types are not necessarily appropriate for "powder". From experience with respective reference plants, Eisenmann rather recommends the classical wet enameling method for workpieces of this kind.

Like the application of the powder enamel to the inside surfaces of the boiler, inside coating with enamel slip can also be completely automated. This can be achieved, e.g. using lances that enter the boilers rotating in a slanted position. Alternatively, tumbling machines are used that



Fig. 5: Brisk interest of the trade visitors at the surface engineering trade fair in Guangzhou/China

are especially easy to adapt to varying boiler types. The last problem solution of this kind was implemented for a Spanish manufacturer of hot water boilers.

Substantial Interest in German Technology

Without doubt, China will be a highly interesting, albeit difficult future market. Contacts to the automotive market segment are mostly established via the European joint venture partners of the automotive manufacturers. Access to the general industry branches is easiest through local presence. In this way, numerous conversations could be conducted with highly interested expert visitors at the EISENMANN stand at the Surface Engineering Trade Fair in Guangzhou / South China (visited by approx. 2 millions of Chinese people) in November 2004 (Fig.5).

Admittedly, the sales managers of the metal coating, wood and plastics as well as special process engineering fields that attended this trade fair agreed that only technically superior plants had a real chance on the Chinese market. Examples are wheel coating plants, coating plants for plastic bumpers or enameling plants, all equipped with state-of-the-art control technology and tailored workpiece conveying systems.

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