



OTTO JUNKER

Publication

Heat treatment with
Otto Junker

Focus on core competences
and technology

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In its 'thermo-process equipment' business sector Otto Junker has adopted a new strategy: the sites of participations by Germany's Otto Junker GmbH in various metallurgical plant engineering companies – such as Thermcon in the Netherlands, IUT in Sweden and Elhaus and Induga in Germany and Switzerland – have been closed and the know-how, together with important staff members, brought together at Otto Junker's main location in Lammersdorf. With this slimmed-down structure Otto Junker presents itself as a technology company focused on its core competences in the aluminium sector. "Here in Lammersdorf we have unique possibilities for developing new heat treatment and melting technologies which should ensure long-term growth for the company", explains Hans Rinnhofer, for the past two years CEO of Otto Junker. And he adds: "We regard ourselves as a company with its origins in industrial furnace engineering, which during the more than 85 years of its existence has accumulated extensive expertise in the field of thermal process technology and melting, and which derives its competitive advantages from an understanding of process technology." The company, then, regards itself as a plant engineering group with core competences in industrial furnace technology and project management. In addition, at its main location Otto Junker operates a stainless steel foundry of its own. "We can offer complete casthouses, but we also co-operate with partner firms that can cover special fields, as for example continuous casting machines for rolling slabs or extrusion billets", says Rinnhofer. Similarly, besides melting and casting furnaces Otto Junker also supplies heat technology equipment such as heating and heat treatment furnaces for semis, castings and forged components, as well as the associated loading and unloading equipment. The Technology Centre in Lammersdorf does not only have staff specialized in the field of heat treatment. In a laboratory for induction melting furnaces and a technical unit for heat processes new ideas are investigated for their feasibility in 1:1 practical tests, and optimized. "Not many industrial furnace manufacturers have the possibility to carry out development work on the industrial scale and, for example, to compare mathematical models with physical reality so that we can present our customers with concrete results", says Rinnhofer. Another major asset of the location is its proximity to the Rhine-Westphalia Technical University (RWTH) in Aachen. 'Proximity' does not just refer to the barely 30 kilometers between Lammersdorf and Aachen. The founder, Dr. E. h. Otto Junker (1900 to 1982), being without issue, endowed a foundation while he was still alive, in 1970, whose sole purpose is to promote RWTH in the technical fields of metallurgy and electro-technology in the context of research projects. The Otto Junker Foundation is today one of the major private benefactors of this renowned university. That fact has resulted in an extremely fruitful co-operation with the relevant faculties of RWTH, which is reflected on the one hand in industry-related requests to the institute for practical problem solutions and on the other hand in continual feedback of new engineering competence to Otto Junker. By focusing on its core





competences the company managed, even when the economic crisis was beginning, to acquire technologically demanding contracts which helped to cushion the impact of the worldwide down-turn of orders last year and provide continuity with the now recovering trade situation. Whereas China and South America brought the company some interesting projects in the sector of copper plants, the aluminium sector benefited from technically demanding orders from other economic areas. As an example, increasing the throughput of an existing pusher furnace at a major French can stock manufacturer can be mentioned. This will be done not by the usual lengthening of the furnace zone, but by a unit for the selective cooling of the rolling slabs. This frees up the furnace several hours earlier for the next heating operation, while the selectively controlled cooling to rolling temperature of the slabs previously heated to the homogenization temperature takes place in external cooling and equalization chambers. "We were able to derive the necessary technology for surface cooling and subsequent recuperation from the core temperature from our many years of experience in the construction of plate-quenching units, in a customer-convincing way", reports Bernd Deimann, sales manager Heat Treatment Equipment for Light Metals. A noted foil rolling mill in southern Europe is soon to receive from Otto Junker two large foil annealing furnaces, which on a worldwide view will have comparatively the lowest energy consumption. The furnaces are designed for all types of foil products and for coils. In this case too Otto Junker is using a further development from its Technology Centre: to operate the furnaces optimally in terms of time and energy, a mathematical model connected online to the furnace control system calculates the thermal status of the coils and the furnaces. Using the calculated parameters the furnaces are operated optimally, resulting in shorter annealing cycles and lower energy consumption values. A highly effective heat exchanger preheats the flushing air to remove its vaporized rolling oil content, and this too reduces the energy consumption substantially. The variety of Otto Junker technologies available for use is also shown in another current contract. A leading Italian manufacturer of vehicle components has awarded the company a contract for a large tempering unit for automobile components at its new plant in the Czech Republic. The equipment comprises a solution annealing furnace, a water-quench and the ageing furnace, complete with rack loading and removal. In this case Otto Junker is building on experience gained by the company in earlier tempering plants supplied to VW Braunschweig and KSM Hildesheim.

Energy-optimized pusher furnaces – a new development by Otto Junker

An example of the company's innovative potential is the concept, for which a patent application has been filed, of a particularly energy-efficient pusher furnace – SLE (Side Loaded Energysaving) Pusher Furnace – for heating and Homogenising rolling slabs before they are hot-rolled. Previous designs by various suppliers have one thing in common: large doors with a door area, depending on the application, of up to 30 m² on the loading and unloading sides, enabling the rolling slabs, positioned upright, to be pushed transversely to their long axis. According to measurements by Otto Junker the resulting energy losses (door losses) amount to three to six percent of the useful energy, depending on the furnace, the slab dimensions and the process conditions. Besides these losses the furnace atmosphere is





also affected by the continual opening and closing of the doors. Even slotted nozzles with aerodynamic sealing on the ends of the furnace do not give any lasting improvement. Otto Junker's approach for a solution is very simple in principle. The slabs are no longer pushed into the furnace from the end, but from the side. The area of the door aperture is then no longer defined by the width and length of the slabs, but by their width and thickness. Thus, with the customary slab sizes the door aperture shrinks to around a tenth of its previous area. Door losses are reduced to the same extent, so that the saving corresponds to around two to three percent of the energy consumption of the furnace. The in-furnace procedures are unchanged, but temperature control in the loading and unloading areas is better because of the less disturbed air circulation. Besides the improved energy efficiency there is also a slight throughput increase compared with a conventional furnace configuration. The company's ideas for improving the economy of pusher furnaces go even further: despite the use of highly efficient burners the exhaust gas losses of pusher furnaces are still appreciably high. Preheating the slabs in a separate preheat chamber heated by the additional use of the pusher furnace exhaust gases can drastically reduce the exhaust gas losses. In this connection Otto Junker cites the following example calculation: the total energy (gas and electrical energy) used in a classical pusher furnace is around 194 kWh/t of aluminium. With preheating, the corresponding value under otherwise like conditions is reduced to 162 kWh/t. If a large enough slab preheat chamber is used, then despite an increased consumption of electrical energy the preheating cuts the total energy consumption by more than 16 percent. Different furnaces and slab dimensions will cause these values to vary in accordance with the changed boundary conditions.

Stainless steel foundry benefits from trade recovery

Besides thermal process equipment, in whose turnover aluminium accounts for a share of around 50 percent on average, Otto Junker has two further business sectors: the design of induction melting units, and a stainless steel foundry. Induction melting units are used in the aluminium industry in the anode rodding shop and for melting down machining swarf and chips. In the latter case the advantage compared with conventional furnaces is that due to the melt flow pattern, the chips are quickly drawn down under the bath surface. Since owing to their large surface area aluminium swarf and chips tend to undergo severe oxidation during conventional melting, the greater the machining waste fraction produced by a company the greater is the economic benefit from an induction furnace in the sense of material and energy efficiency. At present, Otto Junker is also very pleased with its highly specialized stainless steel foundry, which is benefiting from the worldwide trade recovery. This is backed by a high level of specialization, which besides the production of castings also includes high-precision mechanical machining of the castings. The company's specializations include machine beds for precision machine-tools for the production of microchips. Thanks to excellent co-operation with a leading machine manufacturer, the company anticipates a lasting position in this market segment.

