OTTOJUNKER

NEWS

OTTOJUNKER
WE UNDERSTAND METALS

ISSUE 27 // FEBRUARY 2017

Turning of the first sod for manufacturing floorspace expansion

WE UNDERSTAND METALS

Contents

Dear readers,

Already the year is 2017, and industry is engulfed, now as before, in a tangible wave of change. The path towards Industry 4.0 is an evolutionary process. Innovative technologies and current topics such as efficiency improvement and sustainability play a pivotal role in this ongoing evolutionary process.

Consistent with this trend, we once again present you with a line-up of exciting articles in this issue. Learn how our customer, KMD, manages order handling for their hot-dip tinning line and which future steps are imminent.

While our Induction Melting Equipment division can boast the recent shipment of the 1000th medium-frequency coreless induction furnace, the high-grade steel foundry ended 2016 with an excellent order book despite all economic trends and forecasts.

At another level, Industry 4.0 not only shapes industrial requirements but is also impacting the media world. Modern communication methods open up new opportunities, and we shall respond by exploring new routes – with digital issues of our OTTO JUNKER News packed with yet more enlightening and interesting content.

Last but not least, we wish our staff members and business associates a successful year 2017. Please stay healthy, and enjoy reading!

Markus D. Werner
Chairman of the Board
OTTO JUNKER GmbH

IMPRINT

Publisher: OTTO JUNKER GmbH I Jaegerhausstr. 22 I 52152 Simmerath

Editor: Sandra Manthei I Phone: +49 2473 601-233
Photography: OTTO JUNKER Archiv I iStock I Shutterstock
Layout: Marketing & Mediendesign - Nadine Jorde
Publication Intervall: six-monthly

RWTH confers Otto Junker Awards 2016

Last year, once again, four graduates of the Technical University of Aachen (RWTH) were honoured for their outstanding academic performance.

At the award-giving ceremony, the winners received their certificates from the hands of Dr. Ambros Schindler, Director of the Otto Junker Foundation, and Ernst Schmachtenberg, the Rector of RWTH, in recognition of their achievements at the Faculty of Geo Resources and Materials Technology and the Faculty of Electrical Engineering and Information Technology, respectively. Professor Dr.-Ing. Wolfgang Bleck, Chairman of the Otto Junker Foundation Advisory Board, and Werner Stegemann, board member of the Otto Junker Foundation, congratulated the award winners.

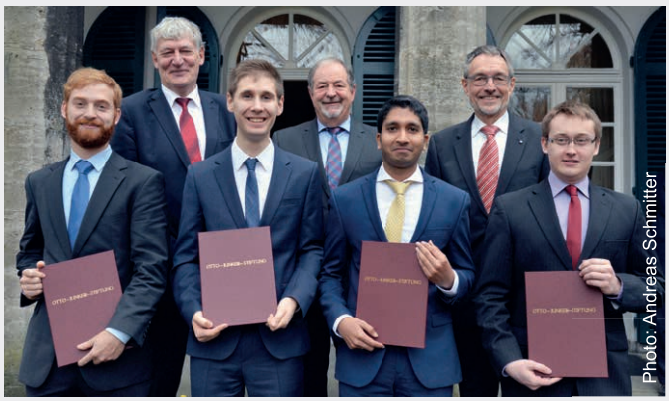


Photo: Andreas Schmitter

About the award winners (from left):
Stephan Prünte *studied materials science with emphasis on engineering materials and nanotechnology.*

Daniel Szepanski, *was enrolled in a programme of electrical engineering, information technology and computer engineering, with emphasis on electrical power engineering.*

Charlie Paul Susai Sakkana Reddy *from Saudi Arabia studied electrical power engineering.*

Pawel Bittner *graduated in materials engineering but, on top of that, enrolled in a second degree program in mathematics last year.*

We congratulate these promising young scientists and wish them success for the future.

Trade fair review 2016

High visitor figures and beneficial talks

In 2016, we once again attended numerous trade fairs and congresses all over the globe.

The year's highlight was ALUMINIUM 2016 in Düsseldorf, an event that brought together leading international specialists, many of whom approached our engineers with very concrete inquiries.

International Engineering Fair 2016
in Brno (Czech Republic)

From 3 – 7 October 2016, our subsidiary company, Junker Industrial Equipment s.r.o., was among the exhibitors at the traditional International Engineering Fair in Brno. This technical trade show takes place annually and ranks among the major industrial fairs in Central Europe.

At our booth, the spotlights were on the production, support and maintenance of induction coils for melting furnaces, the fabrication of steel structures, and our company's assembly and installation capabilities. Preventive interventions and servicing of industrial furnaces were also featured. A further integral part of our presentation was the OTTO JUNKER Group's product range.

We thank all guests for visiting and for their dedication shown before, during and after the events.

For a schedule of trade fairs and conferences we aim to attend in 2017 please refer to page 15.

Erection of a new coilmaking shop at the Lammersdorf site

With the turning of the first sod on August 18, 2016, construction was launched on the two new factory buildings intended to accommodate our re-designed coilmaking operation.

At a cost of € 4.1 million, a modern central production plant is to be erected on an additional surface area of 3,500 sq.m. Moreover, this project sets a clear signal emphasizing our ongoing commitment to the Lammersdorf site.

The aim of this investment is to set up a coilmaking shop aligned with the technological workflow and relying on the most advanced processes and equipment.

It is intended to cut turnaround times and to expand quality assurance activities while centralizing all coil and yoke production work at a single venue.

This will likewise apply to the copper sections and raw materials, as well as to all coil bodies, which will be directly available in the new buildings in the future.

The new facility is designed to accommodate both repair activities and the fabrication of new coils of varying types and sizes. Thus, all coils for coreless induction furnaces, high-power coils, and coils for inductors and billet heaters will be made here. Given the building‘s height of 15 m, even very large coils can be manufactured. The production of yokes has also been integrated into the concept as required by the workflow.

Hence, for a future coil repair project, only preparatory steps such as removing the old ceramic material and burning off the coil insulation will be carried out in the present coilmaking shop. All work causing dust and contamination will thus be kept away from the actual coil fabrication.

The individual technical production steps involved in building a coil are as follows:

- Winding of coil body
- Making the water and power connections
- Pressure-testing of coil
- Coil bandaging and packing
- Impregnating and drying
- Application of ceramic lining (coil coating)
- Installation of the OCP crucible monitoring system
- Application of exterior protection coat
- Yoke fabrication
- Installation of coil body

At present, work is in full progress at both the construction and equipment procurement level with a view to completing by the end of March.

The suitably prepared repair coils will be transferred to the new building via an airlock.

The new building will provide twice the number of coil winding benches we had before. The coil sections stored in the shops will be handled with a modern side-loading forklift truck. This will be followed by automatic feeding of the sections to the winding benches.

Particular care was taken in redesigning the work stations for pressure-testing, applying the ceramic lining, and impregnating and drying the coils. The automatic testing method adopted will help to improve quality assurance.

This reorganization of our coil-making activity is based on our many years of experience as a coil manufacturer on the one hand, and on the results of in-house developments and our cooperation with the Universities of Aachen on the other.

State-of-the-art technology will also be employed in the construction of the buildings, e.g., in terms of energy efficiency. Thus, only 55 % of the heating energy needed by a comparable reference building will be used here.

For scheduling and work sequence planning as well as for production planning and controlling, software from the Microsoft NAV and Project suites will be utilized.

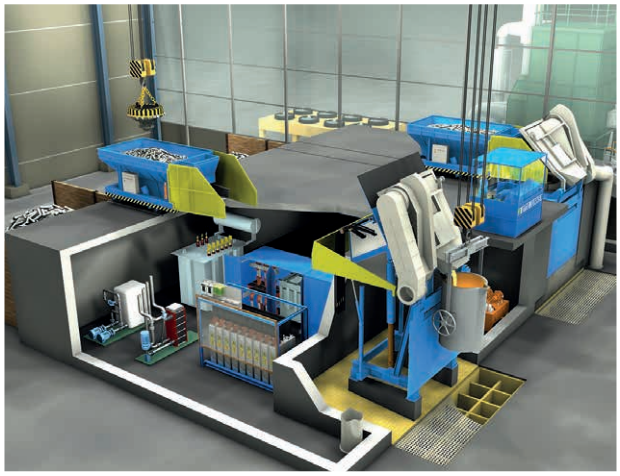
We are convinced that this investment will set new standards in coilmaking, particularly in terms of quality assurance. It is our firm belief that the project will yield substantial benefits both for the customer and for our company.

Focusing on quality assurance and turnaround times.

1000th medium-frequency coreless induction furnace
and development continues

A Polish customer's contract for four medium-frequency coreless (MFT) induction furnaces for melting aluminium materials brought the total of OTTO JUNKER's MFT furnaces shipped to the 1,000 mark.

However, this milestone is only an intermediate figure as our development work continues. Our reference standard is the previous furnace generation, i.e., mains-frequency coreless induction furnaces, of which nearly 2,500 units were manufactured.



In the last 5 years alone, close to 200 MFT furnaces were delivered, mostly to cast iron or steel melting operations. A significant number of these units also went into processing aluminium and copper, as well as into applications handling zinc, silicon, nickel, ferro- and complex alloys. Melting down raw materials is no longer their sole purpose – instead, these furnaces are increasingly used to perform further metallurgical tasks. These involve, e.g., melt refinement and cleaning, or the selective distillation of complex alloys. Undoubtedly, advances in induction furnace technology based on last generation (IGBT) frequency converters have opened up new fields of application and will continue to do so.

Special circuit designs have enabled the implementation of furnace operating regimes optimized in terms of the intensity and patterns of bath movement. At this stage, modern IGBT converter technology has long proven its viability in industrial use and holds out plenty of promise for the future. The power range has been substantially expanded, too, with converter ratings of 8 MW no longer posing a technical or commercial problem today.

Further innovations achieved in recent years include the OCP (Optical Coil Protection) crucible monitoring system, which relies on optical fibre sensors to provide a precise temperature reading with high spatial resolution. The system has demonstrated its dependability and accuracy in a host of application cases. Today, this technical principle is also employed to measure the temperature of other sensitive component assemblies such as the furnace yokes.

Moreover, the energy-saving coil developed a number of years ago has found its way successfully into more than 70 furnace installations. Its power saving potential, which lies in the range of 5 – 9 % depending on the charge material, has been confirmed in day-to-day industrial service. In melting copper alloys, gains of over 30 kWh/t are impressively achieved.

As for Industry 4.0, we are focusing our efforts on the design and expansion of complex process management systems including their interconnection, apart from addressing the use of advanced furnace operating, visualization and remote maintenance devices. The preparation of our equipment for use with a maintenance assistance program is another key activity. Steady investment in manufacturing and our staff's expertise continues to ensure the high quality of our furnace systems.

Heat-treatment lines for alloy wheels

Probably **the world's most efficient** plants of its kind

Each line of an OTTO JUNKER heat-treatment system is built specifically for solution annealing, quenching and artificial ageing of cast aluminium wheels. Energy efficiency, maintenance-friendliness and flexibility are particularly important considerations in developing its design.

Contrary to conventional systems relying on annealing racks, the system has been designed without racks in order to save energy. The parts to be heat-treated are fed into the furnace via a roller table on which they are also aligned, measured and positioned. Once the complete charge has been assembled, it is placed in the furnace by the loading manipulator.

The charge is moved through the furnace by a walking-beam system. This is a further development of the walking beam conveyer used in steel heat-treatment applications which are noted for their particularly exacting demands regarding ruggedness and reliability of the conveyer system. The charge is moved at low speed, making full use of the cycle time, to prevent both damage to the product in its contact area and position shifts. At the exit of the walking beam furnace, the wheels are removed by a manipulator which immerses them into the quench tank. From here the parts are conveyed into the artificial ageing furnace for completion of the heat treatment. At the end of the artificial ageing cycle the wheels are picked up by a manipulator which places them on the exit roller table. From here they are moved to a cooling station for cooling with cold air.

OTTO JUNKER's heat-treatment system for alloy wheels distinguishes itself by its high throughput capacity while maintaining an excellent temperature uniformity across the various furnace zones. This ensures an optimum heat treatment.

Moreover, these lines rely on a specially developed energy saving system. With this system the hot exhaust gas from the solution annealing furnace is passed to the ageing furnace via a so-called „booster", heating the latter to the requisite temperature without requiring any additional burner heat input. This design achieves vast energy savings compared to a system with conventional burner heating in this furnace section.

Its low energy consumption and the unsurpassed quality of the heat-treatment process make OTTO JUNKER's heat treatment system for alloy wheels what is probably the most efficient plant of its kind worldwide.

Investment package

Ensuring improvement of working conditions and ecological performance

The investment package comprises the construction of a new staff amenities building, the installation of new air filters, and the erection of a new water recooling system for the melting operation.

The new staff amenities building is designed to provide new, modern-style changing rooms and sanitary facilities for up to 120 male and 10 female employees working in our foundry and furnace-building operations.

The single-storey building with more than 400 sq.m. of floorspace was erected on the lawn directly in front of one of the foundry shops. Staff can thus access the new building very conveniently.

The new building comprises separate black and white changing rooms, i.e., separate areas for changing and storing workwear and everyday clothes.

Erection of the new social amenities building

An advanced autonomous central heating plant using a gas-fired condensing boiler, an air supply and extraction system with heat recovery capability, and a building execution fully conforming to the Energy Savings Ordinance ensure a low energy consumption. A further step towards this goal is the envisaged future utilization of waste heat from the melting furnace water recooling systems for hot water supply to the showers.

The installation of two air cooler blocks (each consisting of 6 units) will create the prerequisites, on the one hand, for the envisaged expansion of melting capacity over the next few years. On the other hand, it will facilitate the replacement of the existing evaporative cooling tower in the long term.

The solution adopted relies on a system of fully drainable, glycol-free air coolers developed by OTTO JUNKER‘s equipment manufacturing division. The risk of a freeze-up is thus eliminated, and the costs of heating and glycol are avoided.

A cost advantage over the evaporative cooling tower is obtained because the tower‘s high water demand is greatly reduced and the slightly higher electric power consumption of the air coolers does not offset these gains by far.

New dry filter system to remove dust from extracted shop air

The power intake of the air coolers is kept low by allowing the fans of individual units to be switched off when less cooling capacity is needed.

In order to further improve the exhaust air quality from the foundry ventilation system installed a few years ago (see OTTO JUNKER News No. 19), a dry filter type dedusting unit was fitted in the existing exhaust air system. The sole purpose of this unit is to clean the indoor ambient air drawn from the foundry buildings. Air extracted from the workplaces is dedusted by means of separate dry filter systems which ensure that dust concentration is kept below the limits of TA-Luft („Technical Instructions on Air Quality Control“).

As the airflows extracted from the individual shops vary widely over time, the new dry filter dedusting system must be able to respond very flexibly to such fluctuations. This is why the fan motor is provided with a variable-frequency drive unit. This saves energy and avoids an unnecessary strain on the filter system.

At the time of writing, all three projects were nearing completion.

According to a press release by Fritz Winter Eisengießerei GmbH & Co. KG, the company aims to invest more than € 100 million in phase 1 of a new foundry and machining plant to be erected at Franklin, Kentucky in the next few years. Upon completion of the first stage of construction, the new facility will provide a capacity of more than 60,000 tonnes p.a. and employ more than 200 people on a surface area of approx. 25,000 sq.m. Its subsequent expansion is already projected in the company‘s current planning.

For the new grey iron foundry, OTTO JUNKER was awarded the contract to supply a 10-tonne DUOMELT melting installation plus a pouring furnace with an overall capacity of 14.5 tonnes in the first stage.

Fritz Winter Eisengießerei GmbH & Co. KG

New melting and pouring furnaces

for the Franklin, KY (U.S.A.) plant

The melting system will consist of two 10-tonne furnaces powered by a 9,000-kW-DUOMELT-frequency converter.

Melting is to be carried out at a nominal frequency of 250 Hz, but for a fast stir-down of carburizing and alloying agents the system can be switched to 135 Hz. The converter system is of the 12-pulse type and provided with a passive line filter to reduce system perturbation.

The furnaces are equipped with bi-directionally pivotable extractor hoods and controllable dampers. Furthermore, our scope includes an air-to-water cooler, a charging machine, a slag gripper and an emergency power generator.

Crucible monitoring is provided by an OCP system, while an OYTM system (Optical Yokes Temperature Monitoring) will be used to check the yoke temperatures.

Both of these systems comprise optical fibre sensors and guarantee an exact temperature measurement with a high spatial resolution.

The pouring furnace has a total capacity of 14.5 tonnes and a useful capacity of 10 tonnes of iron. With its connected load of 400 kW, it is capable of superheating 5.3 tonnes of molten iron by 100 K (from 1400 to 1500 °C) in one hour.

For control of the pouring process, Fritz Winter relies on the proven „BelyCast“ camera system, a state-of-the-art solution which permits fully automatic, precise pouring even under difficult conditions.

In addition, the pouring furnace is stopper-controlled by the trusted linear actuator. This maintenance-free actuating device provides further enhanced pouring reliability.

For the introduction of fine-grained inoculants, OTTO JUNKER‘s new OPTISTREAM system was adopted. This is the only system available in the marketplace to perform differential weighing for unsurpassed accuracy. In addition, a wire inoculation system made by Heinrich Odermath GmbH will be installed.

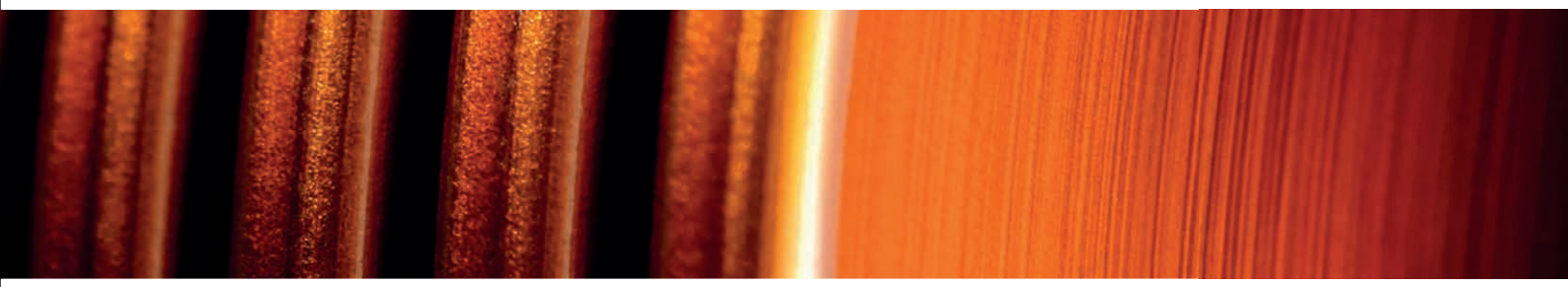
Work on the production of the melting and pouring furnace equipment is currently proceeding at a rapid pace, with on-site installation due to start in the spring of this year.

OTTO JUNKER to supply a copper melting plant to China

High **metal quality** and **efficiency** thanks to the use of **hot-swap crucibles**

OTTO JUNKER GmbH, in cooperation with its Chinese subsidiary, OTTO JUNKER Metallurgical Equipment (Shanghai) Ltd., is to supply the entire melting system for a vertical-type semi-continuous copper caster in China. This was already mentioned in OTTO JUNKER News No. 25.

Here we describe the use of hot-swap crucible assemblies in this project.



Melting is to be provided by two 18-tonne-coreless induction furnaces powered via IGBT-frequency converter systems. One of these melting furnaces runs on a 4,800-kW-IGBT-converter of MONOMELT design, the other one will be fed by a 5,500-kW-IGBT-converter of the DUOMELT type. The DUOMELT-converter system powers the 30-tonne-holding/furnace at the same time.

The finished melt is laundered in batches to the holding and pouring furnace installed between the two melting units. This furnace has a capacity of 30 tonnes and is powered by the 5,500-kW-IGBT-DUOMELT-converter of a melting furnace. This converter configuration assures the user of maximum flexibility.

Once the melt has reached its specified temperature and composition, it is supplied from this furnace to the continuous caster in a controlled manner by means of a precision tilting system.

Another feature worth mentioning is that the project relies on the use of multiple hot-swap crucibles allowing a quick replacement of the crucible still hot in the furnace. Due to the design of the hot-swap system and the use of quick couplings for the water connection, crucible change can be performed in less than 2 hours. As the coil needs to be cooled throughout the handling operations, a cooling system is provided on the crane crossbeam (Fig. 1). For one thing, this technology permits a rapid change of the melting crucible so that melt contamination by absorption of undesirable alloying elements from the lining can be avoided in the case of a changeover to an incompatible alloy. On the other hand, the system decouples ancillary operations from the melting process.

Thus, knocking-out the worn crucible, relining, sintering and even pre-heating are carried out at separate stations, while melting can be continued right away following a hot swap of the crucible assembly. The knock-out stand will be set up outside the melt shop, near the ladle handling area. This location was chosen to avoid excessive dust emissions into the melt shop.

For the other operations, a furnace platform carrying 8 workstations with gas, water and air supply outlets will be fitted near the melting equipment. This is where the crucibles will be relined, sintered and preheated.

In all, the system comprises 8 hot-swap crucible assemblies (4 each for the 18-tonne and the 30-tonne furnace) and two mobile cooling systems.

High metal quality and efficiency attest to the viability of this system which is also suitable for high-output melting of other metals.

Hot-swap crucible assembly with mobile cooling system.

Tinning line at KMD

Tinning line

for copper and copper-alloy strip

Air knife at KMD

Following the successful installation and commissioning of an OTTO JUNKER tin coating line for copper and copper-alloy strip at KMD Precise Copper Strips (Henan) Co. Ltd., the system underwent acceptance by the customer.

The line operates on the hot-dip tinning principle. Strips entering the system are first activated with a special soldering agent before being passed through the molten tin. Once the strip has left the tin pot, the thickness of its coating is adjusted by means of a purpose-developed OTTO JUNKER air-knife system. The strip is then cooled and wound into a coil.

All engineering and construction services for this plant were supplied by OTTO JUNKER GmbH and its Chinese subsidiary.

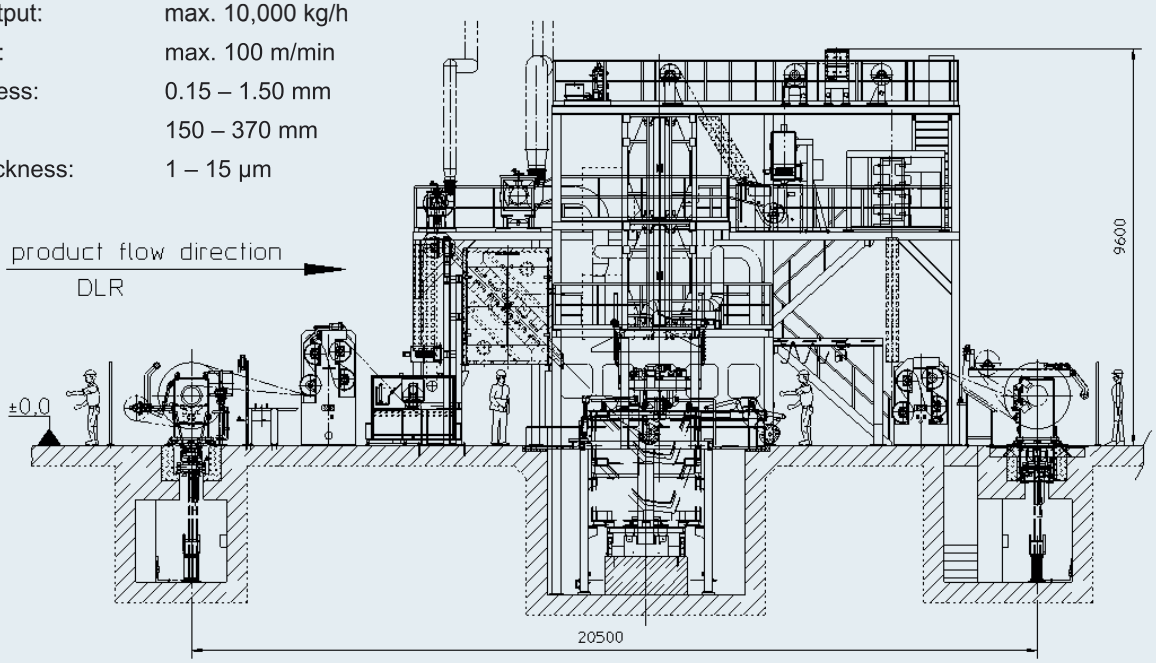
Main engineering criteria lay in the consistent fulfilment of process requirements and in providing optimum equipment accessibility for operation and maintenance purposes.

In developing its proprietary air-knife system with closed-loop controller, OTTO JUNKER took the logical step of creating a capability to build and install strip-tinning lines that require virtually no cross-company interfacing. Another key enabling factor was the intense and constructive collaboration with the customer.

On the strength of OTTO JUNKER‘s many decades of experience in the manufacture of induction-heated foundry equipment, it will be possible to provide an individual tin pot heating system for optimum temperature management in future projects.

Line specification

Coil weight:	max. 6,000 kg
Process output:	max. 10,000 kg/h
Strip speed:	max. 100 m/min
Strip thickness:	0.15 – 1.50 mm
Strip width	150 – 370 mm
Tin coat thickness:	1 – 15 µm



2017 Event dates

Trade fairs and conferences we aim to attend

05 – 09 March	IWCC Technical Seminar	Munich / Germany
24 – 26 April	OTTO JUNKER Academy	Lammersdorf / Germany
25 – 27 April	121st Metalcasting Congress & Cast Expo 2017	Milwaukee, WI / USA
27 – 28 April	Österreichische Gießereitagung 2017	Gurten / Austria
17 – 18 May	Deutscher Gießereitag 2017	Düsseldorf / Germany
05 – 08 June	Metallurgy-Litmash (incl. Tube and Wire Russia)	Moscow / Russia
13 – 16 June	Metal & Metallurgy China	Shanghai / China
25 – 28 June	EMC (European Metallurgical Conference)	Leipzig / Germany
27 – 28 June	ITPS Düsseldorf	Düsseldorf / Germany
19 – 21 July	ALUMINIUM CHINA	Shanghai / China
26 – 29 September	FENAF/CONAF	Sao Paulo / Brazil
16 – 18 October	OTTO JUNKER Academy	Lammersdorf / Germany
26 October	ALUMINIUM USA	Nashville, TN / USA

We are looking forward to your visit.

Dear Reader,

we switch to digital newsletter!

OTTO JUNKER News is a customer magazine designed to keep you abreast of the latest developments in the foundry equipment and mechanical engineering world.

Please note that the automatic postal distribution of our magazine is to be discontinued in the future. Starting with No. 28, we intend to switch to a digital newsletter.

Would you like to suggest a specific subject you would like to see covered in OTTO JUNKER News, or do you prefer to receive a printed issue by post? If so, please contact Sandra Manthei, OTTO JUNKER News editorial office, at this e-mail address: sama@otto-junker.de.

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