New developments and further optimization from extrutec

extrutec: solutions for increasing energy efficiency

extrutec GmbH from Moos has developed from being a product supplier to the aluminium extrusion industry into an integrated solution provider for various sectors and different metals thanks to the continuous development of its core competences heating, heat treatment and targeted cooling.

Despite the ongoing Corona crisis, extrutec is maintaining its positive course of recent years. The company has been working on various new developments, which were presented live to numerous clients in Iserlohn in mid-November 2021. The company will also be present at ALUMINIUM 2022 and will unveil new developments and further optimization there.

A particular focus of every new development is on increasing energy efficiency even further. extrutec sees itself as having the responsibility to contribute to the decarbonization of industry by providing innovative systems.

The Eco Heating Process (EHP) – a holistic heating process with maximum energy efficiency

The first step in the EHP is to feed aluminium logs from the log magazine into the new extrutec Eco Shower Unit (ESU). There, the logs are preheated from room temperature to temperatures of up to 90°C by laminar wetting of the entire log surface with warm water. The ESU uses the residual heat from the exhaust gases of the gas-fired furnace downstream of the preheating zone to produce the hot water required using an air-water heat exchanger developed in-house. The ESU has its own closed-loop water circuit consisting of a tank, a circulation pump, a self-cleaning filter and an integrated softening system.

The water level is regulated by a float switch and water losses due to evaporation (approximately 2 l/h) are replenished automatically. The entire system, including the roller conveyor which serves as the base frame, is made of corrosion-resistant material (mainly stainless steel). In systems where only gas-fired convective heating is used, it is also possible to utilize the heat generated for the ESU, thereby further increasing the efficiency to up to 88 per cent and reducing emissions accordingly.

After preheating in the ESU, the aluminium logs then enter the high-convection preheating zone of the gas furnace. Here, they are exposed to flue gases from those zones of the furnace that are heated directly by gas and heated to 200°C. In a subsequent step, the logs are heated to approximately 400°C in the gas furnace. A precise, linear temperature gradient up to the top temperature, such as 480°C, is then obtained using an induction module (patent-protected) that is located directly in line between the gas furnace and the hot saw in order to optimise the extrusion process.

With this energy-optimized heating process, extrutec is responding to the general market demand for the most energy-efficient product possible. In addition, the company wants to make its contribution to conserving resources and combating climate change. The Eco Heating Process will therefore be optimized further in future and innovative technologies will be added.

One can assume that the efficiency of a system such as the one described above, comprising an ESU, a gas-heated preheating furnace with a preheating zone and a downstream, in-line, induction-type, final heating system, will be approximately 74 per cent.

Power Focus Technology – the latest development of extrutec's induction furnace

extrutec's Power Focus TechnologyTM ensures that power is supplied to each heating zone individually in accordance with the necessary process-related temperature gradient. The top zone of a taper furnace always requires more power than the bottom zone of the billet because of the higher temperature at the top of the billet. This results in greatly differing degrees of utilization in the respective heating zones. Power Focus TechnologyTM takes the heating requirement into account in order to equalise the energy utilization of the IGBT converter. It thus leads to a lower connected load, especially in the case of a so-called taper furnace, which is always linked to a preheating system.

This means that the energy supply is utilized to a high degree and at the same time the peak load in the power supply is smoothed out. In a typical application for a throughput of four to five tonnes in an eight- or nine-inch furnace line, a system with Power Focus Technology requires approximately 25 per cent less connected load without affecting the heating throughput in hybrid operation with a billet preheater. The energy distribution can thus be optimized, which in turn leads to lower basic losses and thus to better resource utilization.

New 8-inch extrutec in-line furnace unit (patented) with a hot saw for logs and a billet manipulator

Photos: extrutec

Detailed view of a new 8-inch hot saw for logs with billet cross transfer

Alpha Flex Technology – patented solution for closing the alpha gap during every cooling cycle

The Alpha Flex Technology is a technical extension of the existing profile cooling system from extrutec. In future, the axially rotatable nozzle will consist of a two-chamber aluminium extruded profile.

Solid jet nozzles will still be used in the large chamber to achieve an extremely high α value of at least 7000 W/m²K for the most intensive water cooling (typical nozzle size V=6L/min at 7 bar).

In future, extrutec will also be closing the previously very large gap between the α values for air and water cooling – the so-called 'α gap' – via soft cooling using the patented Alpha Flex Technology, with α values of 500 W/m²K to 1500W/m²K (typical nozzle size V=1.3L/min at 7 bar). Here, water nozzles with an extremely low flow rate are used in the small chamber of the double profile to produce a fine cone of spray. These are brought into position by simply rotating the dual-chamber profile axially by 180° and can also be rotated by +/-20°, of course, to adapt to asymmetrical profile geometries. Depending on the application, the cooling intensity of the Alpha Flex Technology can be adjusted to values smaller than 500 W/m²K or larger than 1000 W/m²K by selecting a different nozzle size.

The following heat transfer coefficients can be achieved for the individual variants:

- water quench (solid jet nozzles): α value at least 7000 W/m²K
- soft cooling using Alpha Flex Technology (new patent): α values from 500 W/m²K to 500W/m²K depending on the nozzle size
- intensive air cooling (at an air velocity of 50 m/s): α value up to 200 W/m²K.

www.extrutec-gmbh.de

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Dennis Roß (Verlagsleitung) Gögginger Straße 105a
86199 Augsburg
Tel. +49(0)821 319880-34
Fax +49(0)821 319880-80
ross@schluetersche.de

Birgit Schaper-Dworschak
(Anzeigenleitung)
Tel. +49(0)821 319880-33
birgit.schaper@schluetersche.de

Stephan Knauer
Tel. +49(0)821 319880-19
stephan.knauer@schluetersche.de

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