Cooling conveyor technology for hot iron ore pellets

As an international supplier of specialist conveying solutions for metallurgical processes in the iron and non-iron industries, AUMUND Fördertechnik GmbH is an established project partner when it comes to handling hot, abrasive and chemically reactive bulk materials. The AUMUND product range with its Pan Conveyors type KZB also includes solutions for handling and discharge of the iron oxide material produced in the agglomeration process of pelletising.

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When planning a pelleting plant, the dimensions of the cooler are a decisive factor in the overall cost of the plant. Even if the cooling capacity is sufficiently calibrated at the time of commissioning, continuous optimisation of the plant can achieve an increase in the temperature of granulate exiting the cooler and therefore an increase in productivity. In some plants a doubling of the planned capacity has been achieved.

As a standard, belt conveyors are used downstream of the cooler. These are rubber belt conveyors originally designed for material temperatures of up to 100°C but they are installed in situations where they have to work with temperatures of 600°C and more. Depending on the plant, pellets are generally transported to a storage yard, a logistics centre, or a port. A metallic plate conveyor is more appropriate than a rubber belt conveyor for both new equipment and for conversions, or capacity expansions.

Hot pellets at temperatures up to 900°C can be transported with pan conveyors from the rotary furnace to the cooler and also onward from the cooler. Additional air cooling for hot pellets where the main cooler provides sufficient cooling is carried out by a special AUMUND designed cooling conveyor suitably equipped with an air flow system, which is also fitted with dedusting equipment at the inlet. *Figure 1* shows the plant at Bahrain Steel Company, with two AUMUND Pan Conveyors type KZB-K for conveying and cooling iron ore pellets at a capacity of up to 1,410tph per conveyor. In the background the steelworks of SULB Bahrain is shown with a MIDREX direct reduction plant and AUMUND Hot DRI Charging.

When production increases and the cooling capacity of existing stationary equipment reaches its limit, the idea of an extended cooling zone with a linear air cooler presents a very interesting, efficient and cost-effective approach for many pellet producers, as compared with other alternatives, which would consume more capital and operating expenditure. For conversions, or capacity increases in pelleting plants, AUMUND solutions replace for example rubber belt conveyors and vibrating feeders *(Figure 2)*.

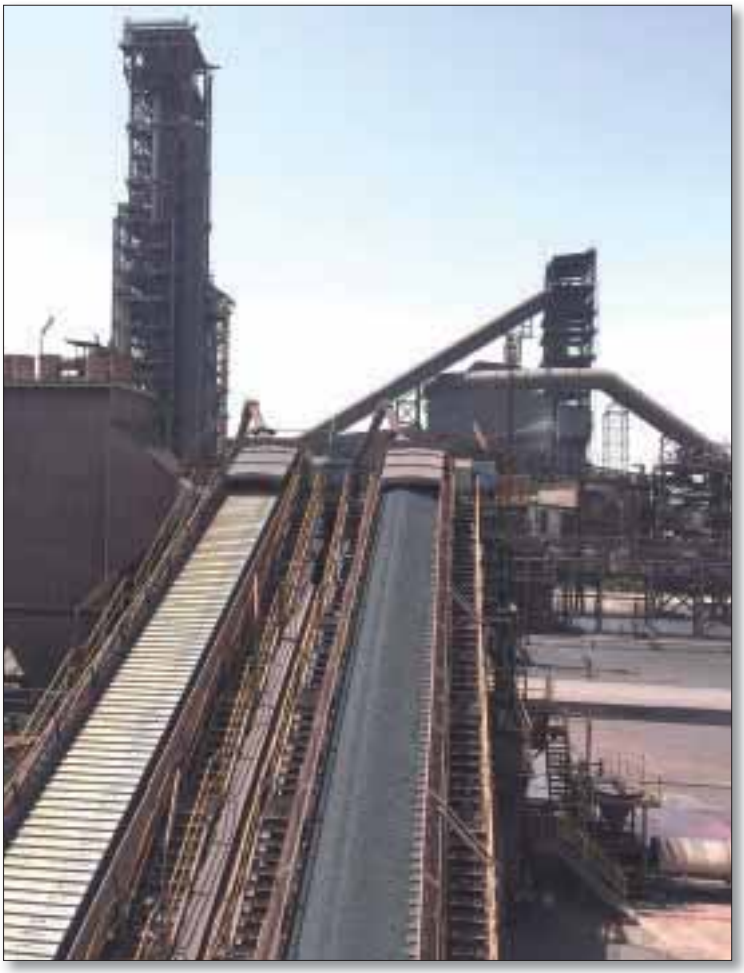

Fig 1 **Pellet conveyors at Bahrain Steel Company**

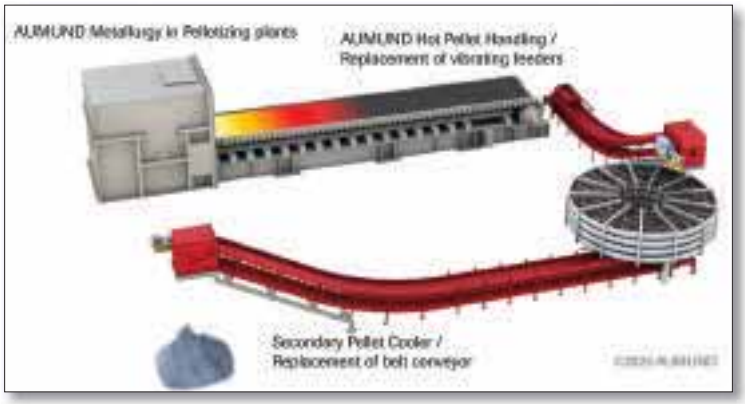

Fig 2 **Replacement of rubber belt conveyors and vibrating feeders**

Fig 3 **CENTREX Pan conveyor system**

Fig 4 **Pan conveyor type KZB-S in a sintering plant**

A special solution in the AUMUND Metallurgy range is the pan conveyor type KZB-KP. KP indicates cooling with perforated conveyor sections. The physical principle is based on forced convection. Negative pressure is generated by a powerful radial blower. Air from underneath the conveyor is sucked in through the perforations of the conveyor sections and flows through the layer of pellets on the conveyor. Heat energy is transmitted from the pellets into the medium of the air flowing through them, and discharged via the exhaust hoods. An appropriate dedusting system follows downstream. This cools the product carefully to below 100 °C, so that it can be transferred to the onward conveying technology without problems, and transported to the stockyard.

AUMUND has received an order for a 100m long KZB-KP for a conversion project to increase the capacity of the existing pelleting plant in an Eastern European steelworks. The conveyor will lengthen the existing cooling line and cool the iron ore pellets. A customer in Tasmania, Australia is also interested in installing the AUMUND KZB-KP solution.

AUMUND has various conveying systems for horizontal, vertical or inclined transportation of bulk materials on offer for materials handling and material cooling in pelleting plants. Applications such as silo and hopper feeding are achieved with bucket elevators and drag chain conveyors. For silo discharge CENTREX® machines are used. Pan conveyors serve to transport and cool iron ore pellets *(Figure 3)*.

In metallurgy the handling of pellets and other hot bulk materials such as DRI, HBI, sinter, coal and coke plays an important role in the process. AUMUND products are used for conveying, loading, unloading, and if necessary for transportation with cooling, or conveying by gas under inert conditions.

In the development of CO_2 reduced production processes in the iron and steel industry, direct reduction has proved its value as an alternative to the classic blast furnace process, by which sinter and coke are used as a charge material. Direct reduction using natural gas produces pig iron from iron ore pellets. Depending on the technology the sponge iron products are either Directly Reduced Iron (DRI), or Hot Briquetted Iron (HBI).

A hot material conveyor feeds the material continuously from the direct reduction plant straight into an EAF, which increases the production rate considerably and saves energy. The AUMUND hot DRI charging transports hot DRI on a bucket apron conveyor under heat-insulated and inert, non-oxidising conditions from the MIDREX direct reduction shaft furnace directly into the EAF of the steel plant. The main advantages of charging hot DRI into the EAF are reduced energy consumption and shorter melting cycle times.

To convey and cool HBI, the patented AUMUND mist cooling process is used. The HBI is sprayed with water mist on an flat plate conveyor and cooled down, for example from 800°C to 100°C, in a way that does not damage the material. This is known as HBI Slow Cooling. AUMUND has its own software to calculate the geometrical design of the cooling conveyor according to the prevailing conditions. As well as length and width, the final temperature can be determined in advance in connection with the conveying speed. A maximum temperature below 100°C is required for the transportation of HBI to its interim storage facility and onwards by ship or rail.

AUMUND sinter conveyors are used for transporting hot sinter at temperatures of up to 1,100°C from the sintering machine to the cooler, and also after the cooler if the material is still too hot for standard belt conveyors. Modern sinter shaft coolers use the heat energy from the hot sinter and are connected by insulated AUMUND sinter conveyors to optimise energy recovery (*Figure 4*).

Conveying equipment is used in coal treatment, for transporting the coke to the coke oven, and in wet quenching. Rotary discharge machines type LOUISE BEW and Rotary Plough Feeders type Besta & Meyer RFX reliably clear the coke from the coke ramp after quenching. Alternatively, the coke can be transported by the hot material conveyor while still hot, directly into coke dry quenching (CDQ). Direct charging of the CDQ is to a large extent continuous, with the advantage that the buffer zones of the CDQ, and therefore the investment costs, can be reduced considerably, and if the CENTREX® Discharge System is used, the building height can be lower.

Charging of the blast furnace can, under the right conditions, be carried out by selected conveyors, which means that for example compact blast furnace plants can be realised, or an existing skip conveyor can be replaced when upgraded. The input materials can then be charged at high temperatures if required. **MS**

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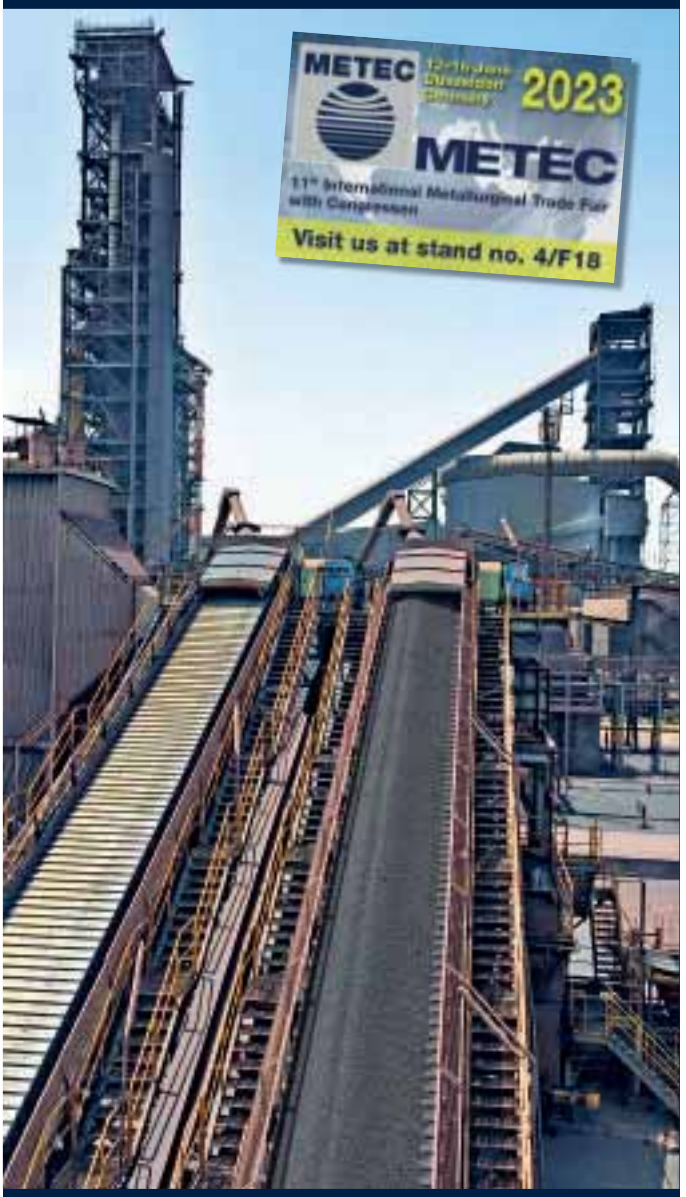
WE CONVEY QUALITY

Pellet Cooling and Transport



- AUMUND Pan Conveyors for cooling and transport of Fe-Pellets
- For hot pellets up to 800 °C
- Designed with special air flow features and dedusting at the inlet

AUMUND

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