ALUMINUM
SENSOR SOLUTIONS FOR THE ALUMINUM INDUSTRY

SICK
Sensor Intelligence.

TASKS IN THE ALUMINUM INDUSTRY

In the end, the quality has to be right. To achieve this, some critical details need to be observed. Monitoring the flow and dosing of bulk materials optimizes the throughput and reduces maintenance times. This also includes the correct positioning and alignment of semi-finished and finished products on roller tables and the optimal distance between finished products in order to avoid damage and compromising quality. Flexible processes and interactions between humans and machines require safety technology. The regulations for emission monitoring and data transmission to the authorities are becoming increasingly stricter; this also applies to the aluminum industry. SICK delivers sensor solutions for almost every application so that reliable aluminum products are delivered.

➜ www.sick.com/Metal_and_Steel

Material flow optimization

2D LiDAR sensors and flow sensors measure volume flow on conveyor belts. Level sensors monitor the contents of silos and material discharge hoppers. Encoders and sensors for detection control the dosing processes. Even material management benefits from sensor technology from SICK: production efficiency increases.

Emission monitoring

Measurement systems either check to see if emission standards are reached and complied with or only report limit violations. Operators in aluminum mills trust the expertise of SICK when choosing appropriate solutions for gas flow and dust concentration measurement as well as gas analysis.

Security and protection

It is not just the protection of people that is important. Equally important is the protection of the plant and its machines from damage and loss. SICK offers solutions for collision protection, access control in risk zones and accident prevention within and outside of the production building.

Quality control

The product quality must be consistently ensured in the production chain. Solutions from SICK ensure that the required quality level of finished products is achieved – from measuring sheet thickness to checking the ingot dimensions, from profiling and adjustment to warpage detection.
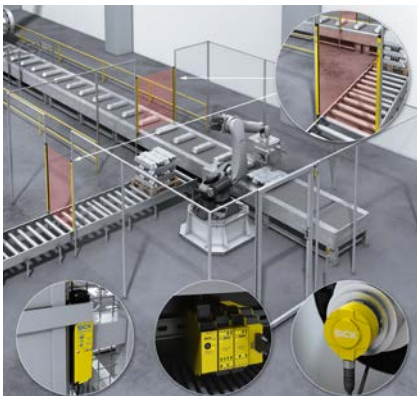
INGOT CASTING SYSTEM
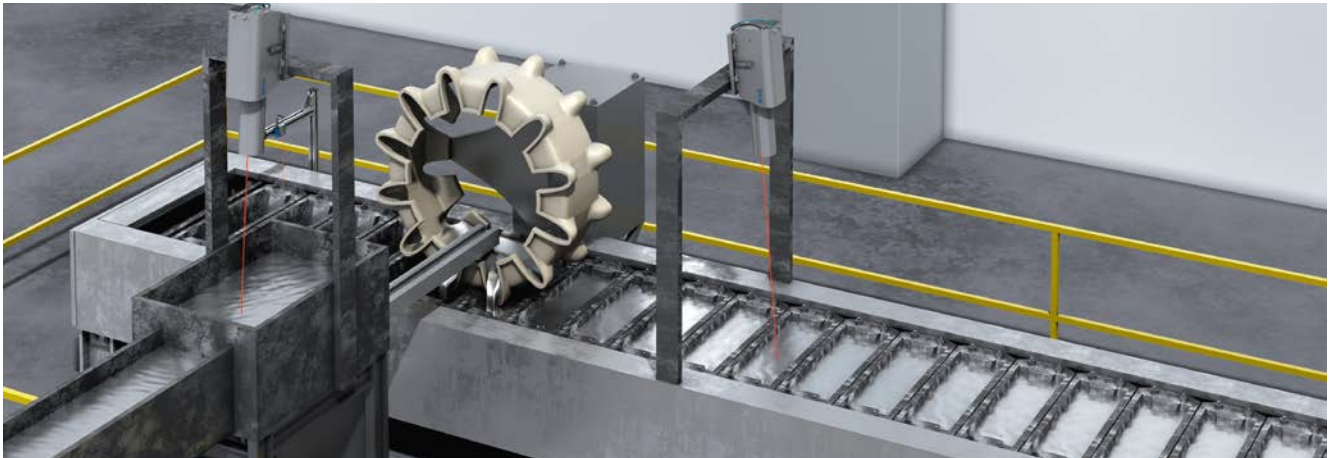
Level measurement in distribution units and casting molds

Perfect ingots are only possible when the casting mold is correctly filled and sufficient liquid aluminum is available. The DT1000 long range distance sensor precisely measures the level of the fluid aluminum in the distribution unit upstream of the casting wheel as well as in the casting molds downstream from the casting process. This works with liquid aluminum despite its reflective surface and temperatures of more than 600 °C. The measurement ensures that there is always sufficient aluminum available and every mold can be uniformly filled. The sensor immediately detects deviations from the target values.

- Dx1000 long range distance sensor

➜ www.sick.com/Dx1000

Access control and protection of casting systems

A casting system for aluminum ingots has various dangerous parts, such as the moving casting wheel, moving conveyor belts, automated grippers and robot stackers. There is also danger posed by liquid metal and hot surfaces. That is why the access points to such system parts must be monitored and guarded if necessary. The Safe Interlocking safety system ensures that access to the specific system parts is only possible during downtimes.

- Safe Interlocking safety system

➜ www.sick.com/
Safe_Interlocking

## Ejection and presence monitoring of ingots

The ejection of ingots from the casting mold must be monitored. It is important to know where individual ingots are located on the casting belt in order to prepare downstream processes, such as the gripping and stacking of ingots. Additionally, the exact shape of each ingot must be recorded for quality control of the casting process. The Ranger3 streaming camera generates the shape and dimension of every ingot as 3D data. The data can be compared with the target values in an external image processing device. This enables deviations to be detected and countermeasures to be initiated.

- Ranger3 3D vision sensor

➜ www.sick.com/Ranger3

RAW MATERIAL MANAGEMENT
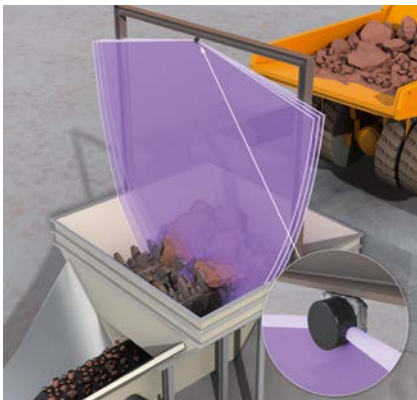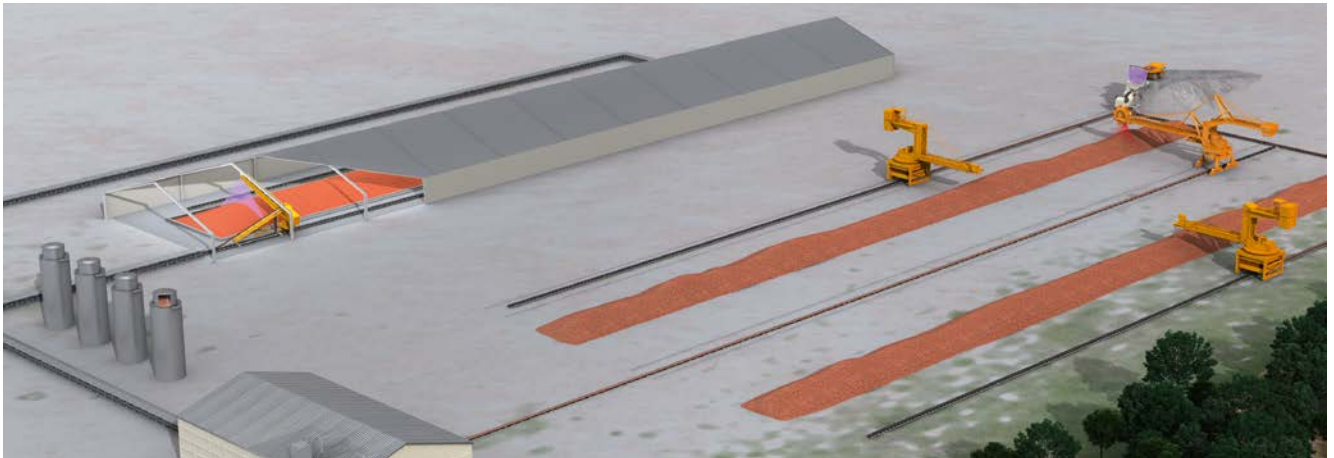
Overfill protection at the crusher

During unloading, monitoring the crusher and continually measuring the raw material flow are important in order to fill the crusher correctly. The 3D-LiDAR-Sensor MRS1000 sensor monitors and measures whether the crusher is efficiently loaded. If this is not the case, the sensor delivers data which enables optimization of the process. The MRS1000 monitors operation without making contact. If the crusher is overfilled, or if oversized stones are detected, the sensor immediately sends a warning so that material transportation can be stopped.

- MRS1000 3D LiDAR sensor

➜ www.sick.com/MRS1000

Protection of wheel loaders and bulldozers

Wheel loaders and bulldozers can collide with other vehicles when reversing. Embankments, stockpiles or silos also pose a considerable collision risk. When loading and unloading, wheel loaders are constantly moving forward and backward, while the main attention of the operator is focused on the bucket. The MINESIC100 WPS is a highly precise driver assistance system that monitors the critical zones within the rear section of the vehicle. The system sends a warning signal when there is a risk of collision and provides assistance to the driver during difficult maneuvers.

- MINESIC100 WPS driver assistance system

➜ www.sick.com/MINESIC100_WPS
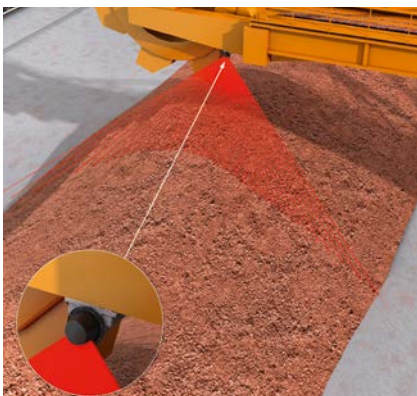
Measuring the raw material tip

The LD-LRS 2D LiDAR sensor enables reliable material detection and distance measurement. For example, mounted on a moveable gantry crane, the sensor collects data about the contour and volume of raw material heaps and makes this data available. This information helps optimize the handling of bulk materials and storage capacities can be depleted in an efficient manner. Based on the distance between the crane and the heap, the LD-LRS calculates the minimum dump height, preventing individual heap areas from being overfilled. The sensor also ensures collision protection, which prevents the need for repairs.

- LD-LRS 2D LiDAR sensor

➜ www.sick.com/LD-LRS

ANODE MANAGEMENT
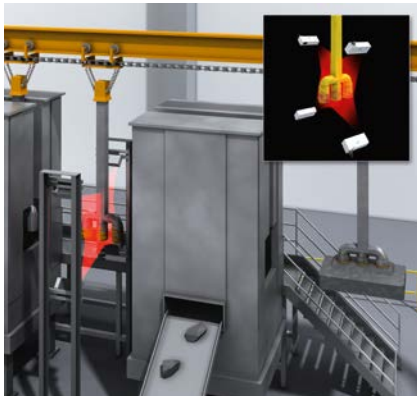
Inspection of cleaning quality

In anode production, the supports for mounting fresh anodes are reused. To do so, the residues of the old anode as well as the cast iron used as "adhesive" must be completely removed. First, the remaining pre-cleaned carbon is broken off the support so that only the cast iron parts remain on the support. The Ruler streaming camera provides data enabling image analysis of the support. Furthermore the data is used to check whether the carbon has been completely removed and the cleaning was performed properly. The data of several cameras can be combined in order to generate a point cloud view of the support.

- Ruler 3D vision sensor

➜ www.sick.com/Ruler

Tilt angle detection on the injection molding machine

When joining the anode block and support, liquid cast iron is used as an "adhesive". The cast iron is poured out of a pot into the space between the support and the anode block using a tilting structure. To do so, one must know the precise position of the tilting device. The TMS/TMM88 inclination sensor exactly measures the angle of the tilting structure. Measurement is achieved in one or two dimensions. This measurement also makes it possible to identify a deviation from the lateral axis. An aluminum housing with fully encapsulated electronics makes the sensor resistant to rough ambient conditions.

- TMS/TMM88 inclination sensor

➜ www.sick.com/
TMS_TMM88

## Positioning of the injection molding machine

The tilting device and pot for the liquid cast iron must be driven back from the overhead track for the anodes for inspection, refilling and exchanging of the pot. Then, the tilting device and pot must be moved to the track to start casting. One must know the exact travel position of the tilting device and pot to correctly execute the refilling and casting processes. The OLM200 linear measurement sensor perfectly fulfills these tasks: detection of bar codes on measuring strips which are attached to rails allows for accuracy of up to 0.1 mm.

- OLM200 linear measurement sensor

➜ www.sick.com/OLM200

ALUMINUM PRODUCTION
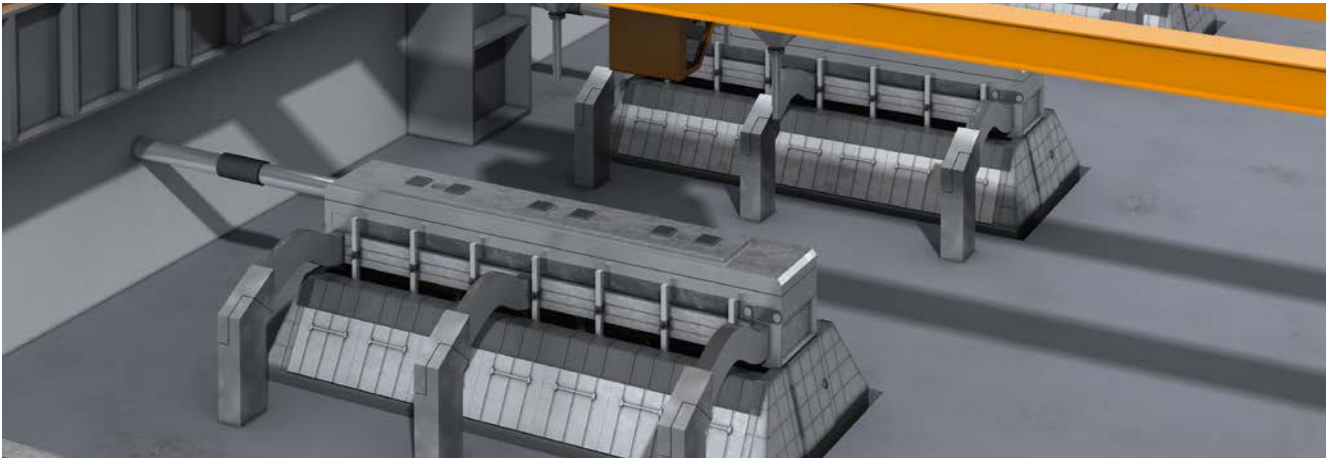
Positioning of the crust breaker

In the electrolysis cell, a firm crust builds on the fluid aluminum and the cryolite. A crust breaker mechanically breaks the crust so that aluminum, carbon and fluoride can be filled regularly. To ensure that the crust is broken, the MAX48 linear encoder installed in the cylinder monitors the distance traveled. The encoder is characterized by its very high accuracy at operating temperatures of up to 105 °C for the electronics and up to 95 °C for the operating medium (oil) and its very good EMC properties.

- MAX48 linear encoder

➜ www.sick.com/MAX48

Monitoring conveyor belt operation

The Bulkscan® flow sensor is ideally suited for the throughput measurement of bulk materials on conveyor belts. The Bulkscan® continuously determines the volume of aluminum slag or chips on conveyor belts. The system operator therefore has a constant overview of the volume transported into its systems. Proper volume data can reliably prevent overfilled plants. The multi-echo technology of the sensor makes reliable operation possible, even with tough conditions at the measurement point, such as dust, steam or rain.

- Bulkscan® flow sensor

➜ www.sick.com/Bulkscan

Protecting the furnace

Furnaces often contain rotating furnace vessels or kilns. Since the systems are of great size, the parts moving against one another are also very large. The drive capacities are also considerable. There is a risk of accidents when persons approach the furnaces. The Safe Interlocking safety system ensures that persons can only access hazardous areas when the system is really at a standstill. A combination of safe sensors, e.g. safety locking functions, encoders or inductive sensors with a safe control ensure proper system standstill.

- Safe Interlocking safety system

➜ www.sick.com/
Safe_Interlocking

PROCESS AND EMISSION MONITORING

Gas analysis in the exhaust gas line in order to control and optimize processes in drying ovens

Aluminum chips are created in the further processing of semi-finished products and can be contaminated. That is why the chips must be treated thermally and dried before being melted. This creates poisonous gases which are destroyed during post-combustion. The complete combustion of these gases and compliance with the emission limits is monitored by emission limit measurement technology. The combination of MKAS, SIDOR and suitable sampling technology ensures that the thermal process can be completely monitored at all times.
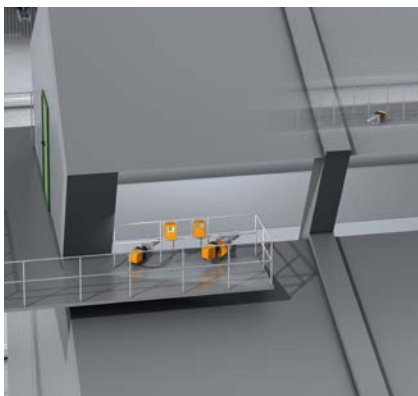
- SIDOR and MKAS gas analyzers

→ www.sick.com/MKAS

→ www.sick.com/SIDOR

Diffuse emissions from the electrolysis hall

Electrolysis furnaces are used during the production of primary aluminum. Several furnaces are located next to one another in an electrolysis hall. Due to the continuous consumption of the anode material, it is necessary to continuously change the anodes. This releases hydrogen fluoride (HF). The dust in the electrolysis hall partly escapes together with the HF gas through ridge turrets which ventilate the hall. The detection and monitoring of these diffused emissions is becoming increasingly important. The DUSTHUNDER T200 reliably measures dusty emissions over long measuring distances.

- DUSTHUNTER T200 transmittance dust measuring device

→ www.sick.com/DUSTHUNTER_T200

Monitoring the dust content in drying ovens

The atmosphere in drying ovens in strip coating plants contains large amounts of flammable gases. That is why it is important to know whether an explosive quantitiy is created. Direct measurement and monitoring of the oxygen content in the furnace with the TRANSIC Extractive provides important information for this purpose. Assembled on a mounting plate, it can be easily installed near the outer wall of the oven and is suitable even for rough conditions due to its rugged design. Gas extraction works with nitrogen as a fuel gas for the injector pump, whereby no danger exists for the oxygen injection process.

- TRANSIC Extractive process gas analysis system

→ www.sick.com/TRANSIC_Extractive

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,800 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

Comprehensive services round out the offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

That is "Sensor Intelligence."

Worldwide presence:

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Hong Kong, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations ➜ **www.sick.com**

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