

Valid data on wear

ipf solution optimizes preventive maintenance

Infrared thermometers from ipf are particularly suitable for reliable, contactless temperature measurement of materials and objects with very high heat radiation. Properties that convinced Ecobat Resources Braubach to use such a solution in battery recycling at a rotary furnace for lead smelting in order to obtain valid data on furnace wear.

Ecobat, based in Texas (USA), is a global leader in the production of lead, lead alloys and the recycling of lead batteries. Production is complemented by a lead recycling system that enables 99 percent of the metal to be recovered and reused. The company's network comprises 11 smelters in the USA and Europe, including in Germany with Ecobat Resources Braubach GmbH in Braubach, around 30 kilometers south of Koblenz.

"With more than 100 employees, we recycle lead-acid batteries from a wide variety of vehicles. We also recycle the plastic from the old batteries, which is then reused by the automotive industry for specific vehicle exterior parts. The raw lead obtained at our plant is sent in the form of cast lead blocks to our sister plant in Freiberg in Saxony, where it is further processed for later use in the chemical or battery industry, for example," explains Clemens Schaab, Head of Electrical Maintenance at Ecobat Resources Braubach GmbH.

Regular measurement of the shell temperature

The lead is smelted in large rotary furnaces, which are lined with fireclay bricks on the inside and are subject to wear during furnace operation, meaning that they have to be repaired after a certain period of operation. Some time ago, the company began to regularly measure the temperatures on the steel casing of the kiln in the hope that this would provide more concrete information on the status of the brick lining and thus the wear of the rotary kiln. The head of electrical maintenance gives an example: "The furnace is filled every four hours, whereby the cold lead gradually takes on temperature with an initially low flame. However, if the temperature on the furnace shell also rises sharply during this time and does not de-energize significantly after the furnace is emptied, this is an indicator that the thickness of the brick lining is decreasing, causing its insulation to deteriorate towards the outside. The temperature inside the oven is increasingly transferred to the outer shell, which effectively reflects the reaction taking place inside the oven."

No exactly repeatable results

Previously, temperature measurements were taken once per shift using a handheld device. Ideally, the measurement data should be recorded in precisely defined areas of the furnace shell and always in the same operating phases of the furnace.

However, manual measurement is always accompanied by possible inaccuracies, as Clemens Schaab knows: "During measurements by different employees, it is not always possible to ensure that the temperatures are measured at the same points and at approximately the same distance from the furnace shell. In addition, it is imperative that the time of measurement is accurate in relation to a previously defined operational state of the furnace in order to be able to compare the measurement data and thus recognize a trend in the temperature curves. Although the corresponding measuring times were recorded, the respective operational states of the furnace were not always taken into account at this time."

Measurements under demanding operating conditions

At the suggestion of an employee, those responsible for maintenance at Ecobat Resources Braubach therefore decided to carry out the temperature measurements continuously in order to obtain more reliable data at all times. Clemens Schaab explains: "The solution had to enable trouble-free and continuous temperature measurements in an area of application with high levels of dust and dirt and, above all, high ambient temperatures. The electronics required for this also had to be installed at a sufficient distance from the interrogation point due to the high radiant heat."

Emissivity as a material-specific constant

In view of these specific requirements, an application specialist from ipf finally recommended an infrared (IR) thermometer - and for several good reasons.

One of the most common tasks of infrared sensors is to determine the surface temperature of hard-to-reach or moving objects, especially if they have a high level of heat radiation.

The technology makes use of the fact that every body emits a certain amount of infrared radiation depending on its temperature, the intensity of which changes accordingly when the temperature changes. Since in this case the intensity of the infrared heat radiation emitted by the furnace jacket depends not only on its temperature, but also on its specific radiation properties, the emissivity of ipf's IR thermometers is set as a material-dependent constant before start-up to ensure the exact mode of operation of the solution.



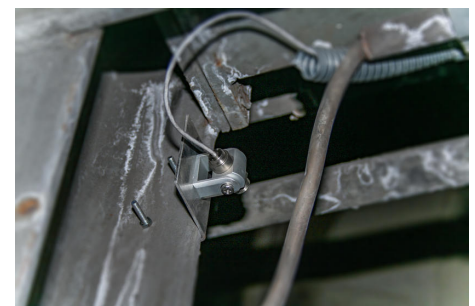
The measuring head of the **OI98C558** can be used at ambient temperatures of up to +180°C. The system solution including evaluation unit is particularly suitable for contactless temperature measurement of objects with high heat radiation. (all images: ipf electronic gmbh)



The two evaluation units are located in a thermally less critical area in a separate housing on the rotary kiln.

IR thermometers from ipf are two-part systems consisting essentially of an infrared measuring head and an evaluation unit. For the application at Ecobat Resources Braubach, the **OI98C558** is used as a system solution that can be parameterized via free software. The evaluation unit is equipped via a switching output and a freely selectable analog output (0...10V/0...20mA/0...5V/4...20mA) and can be optionally expanded with numerous interfaces.

The robust infrared measuring head is one of the smallest in the world and is designed for ambient temperatures up to +180°C without cooling. The system from ipf with a particularly wide measuring range of -40°C to +900°C determines the infrared radiation emitted by the furnace shell in a contactless and therefore completely wear-free manner and calculates its surface temperature on this basis.

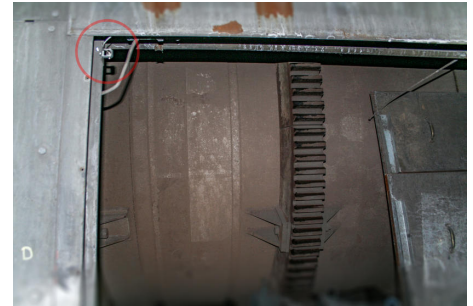


For mounting and easy alignment of the measuring heads, the bracket **AY98C075** was used, which can be easily adjusted in two axes.

Trouble-free use in harsh environments

Continuous measurements of the jacket temperature are taken at the front and rear of the rotary kiln. For this purpose, two infrared measuring heads are mounted at a distance of around 1000 mm from the sheath. The evaluation unit of the measuring heads, on the other hand, is located in a separate housing in a thermally less critical area of the furnace.

The ipf solution has been in use for several months in the hot environment of the rotary kiln and has been working without any problems ever since. The initial results of the continuous temperature measurement and the resulting benefits for preventive maintenance of the kiln are very promising.



Two infrared measuring heads were installed at a distance of around 1000mm from the kiln shell in the front and rear areas of the rotary kiln for continuous temperature measurement.

Lots of potential for optimized processes

"Thanks to the seamless measurement and recording, we are now able to track the temperatures of the kiln shell at certain operational states at any time without the need for an employee to be on site. We are extremely satisfied with the entire project as it has shown a clear correlation between the temperature trend on the kiln shell and the wear of the rotary kiln, enabling us to better assess its status," says Clemens Schaab. For Maxym Boboshko, Operations Manager Lead Division, this also offers a wide range of opportunities for optimizing preventive maintenance: "We can now always react in good time and plan the necessary processes for repairing the rotary kiln even better, e.g. with regard to the lead times for just-in-time delivery of the kiln bricks or prompt notification of the external company for the corresponding repair work in the rotary kiln, to name just two examples."