

Plastic energy chains for harsh environments

In the Eschweiler waste incineration plant, igus replaced the existing trailing cables with an energy chain that was developed for heavy-duty use in harsh environments. The installation of the chain at the 70-metre long crane runway placed high demands on logistics and coordination during the incineration line operation.

Festoon system or energy chain? This question arises whenever industrial cranes are used under unfavourable environmental conditions. The conventional choice was often the festoon system, which was also installed in 1996 when the Weisweiler waste incineration plant began operations. It is still one of the most modern incinerators in Germany and disposes of the waste from the districts of Aachen and Düren as well as the city of Aachen. It operates in a public-private partnership by the public AWA Entsorgung GmbH and the RWE subsidiary, Entsorgungsgesellschaft Niederrhein GmbH.

The plant is designed for a throughput of 360,000 tonnes per year. It has three incineration lines, which are fed from a central bunker. The charging of the furnace is undertaken by two cranes that travel on a common 70-metre long crane runway and have a span width of 25 metres.

High wear due to unfavourable environmental conditions

When the trailing cable of the festoon system was replaced in 2010, contact with igus GmbH was established by chance; Wolfgang Krebs, head of electrical and control systems division of RWE Power AG, which operates the adjacent coal-fired power plant, and who is also in charge of the electrical equipment of the incinerator stated, "we were not hundred percent satisfied with the trailing cables, because the wear due to the highly abrasive dust was still noticeable. As the bending occurred always at the same predetermined breaking points, we lost some cores. Moreover, the cleaning of such cables is difficult to impossible."

Initial scepticism about the plastic chain

The energy chain specialists from igus were given the opportunity to present their roller chain of the type "rol e-chain". However, a scepticism still remained about the plastic material in those responsible for the incinerator. Wolfgang Krebs: "Our energy supply system is extremely stressed, because the cranes work around the clock without a break

with very high dynamics." Even the fluctuating humidity that prevails in the bunker makes great demands on any plastic that is used there - not to mention the heavy dirt load".

The energy chain specialists from igus, managed to overcome this scepticism among other things. because of a joint visit to another waste incineration plant, where such a chain has been in operation for nearly nine years under similar adverse conditions; those responsible for the Weisweiler incinerator opted for the conversion.

Two major challenges

There remained two challenges. The first: The replacement must take place during operation of the incineration lines; so there could only be brief interruptions, in which the cranes do not charge the furnaces. The second: Since the manufacturer of the cranes had ceased operations, the documentation was incomplete and had to be re-incorporated.

Creating a new e-technology plan

This task alone took approximately two months to complete. Matthias Gebauer, sales engineer at the igus GmbH: "Our engineers have determined what task the respective cables shall perform, and based on that a current e-technology plan is created." At the same time, preparations for the conversion to change from flat to round cables were made. The extensiveness of this task is demonstrated by the fact that igus has merged the three terminal boxes for the transfer of cables to the energy chain into one unit.

The engineers at the incinerator had expressed a desire to reuse the mountings for the energy supply. This requirement was fulfilled by igus through a "tailor-made" structure; and the moving end arm for the energy supply of the trolley was adjusted individually.

At this late point, the igus engineering team is in demand. In our in-house design department, customised solutions that are precisely designed to meet and adapt to the requirements of the customer are developed.

The mounting of the trough in which the energy chain moves proves to be simple. For this, you could use the suspension of the drag chain as a mounting bracket. After the igus engineers had built a framework over the entire length of the crane runway on which they could work, they worked in three shifts for a fortnight to install the energy chain. This was followed by two days for the commissioning, in which each single cable and the control system were tested according to the requirements of the VDE (association of German electrical engineers).

The rol e-chain: Developed for heavy-duty applications

The energy chain has been in operation for more than a year and has proved to be the best. This is due to the fact that it is a chain that was specifically developed for heavy-duty use in harsh conditions.

One distinctive feature that you will notice at first sight: The "rol e-chain" moves on rollers and doesn't glide as usual. This creates the condition in which it handles long travels and high speeds using low drive power. Additional design features include the encapsulated stainless steel roller version and the high tensile stability of the chain. The torsional stiffness of the "rol e-chain" is also very high. The entire structure is designed in such a way that a high degree of wear resistance is ensured even under unfavourable conditions. For example, the rolling resistance is consistently low even with heavy dirt accumulation.

Rigid or floating moving end?

Prior to the installation, the question about the best-suited moving end type was also clarified. Sales consultant Holger Guhlich, statedr: "The incinerator engineers initially preferred a floating moving end, because the crane runway is not 100% straight. We then measured the track and found that the track accuracy is still sufficient and no additional wear and tear is to be expected, if we slightly adapt the trough. Therefore, we could use a simply constructed rigid moving end." In addition, the stainless steel rollers also have a certain amount of clearance, so that they can compensate for inaccuracies.

Complex positioning under unfavourable conditions

The rol e-chain systems were installed not only on the crane runway, but also on the 25-metre-wide crane girder. The appropriate troughs belong to the igus standard range, but were manufactured in V4A stainless steel to account for the harsh environmental conditions.

In addition to energy and conventional signals, the energy chain also carries Ethernet data (they transmit image data from cameras to the concerned operator station) and Profibus signals, which are processed by the PLC. The actual values that tacho generators of the cable winches deliver to the trolley are also of great importance. Wolfgang Krebs: "We use rugged clamshell bucket grabs that do not require energy on the gripper itself, but are operated by two winches on the trolley. The crane control must know the exact position of the two winches to initiate the opening and closing operations as specified by the crane operator."

Planned with foresight

igus has provided at the centre of the chain division one empty chamber equipped with a draw wire. This enables additional cables, if needed, to be pulled in without much effort. A provision for maintenance has also been made, which will be rendered by the igus service under a maintenance contract. Wolfgang Krebs: "In general, the energy chain on the crane runway is much more accessible than the trailing cable. We have stretched a safety rope, onto which personnel can latch themselves. Thus we can carry out maintenance without requiring an additional platform." Furthermore, the elimination of the trailing cable makes extra space for the travel path on the crane runway, so that the whole crane maintenance becomes easier.

Captions:



Image FA2212-01: Incinerator plant, Weisweiler GmbH & Co. KG

The Weisweiler incinerator near Aachen is one of the most modern waste incineration plants in Germany.



Image FA2212-02: igus GmbH, Cologne

Easy connection: The existing components could be used as holders for the energy chain.



Image FA2212-03: igus GmbH, Cologne

Demanding: The conversion took place during operation of the incinerator.



Image FA2212-04: igus GmbH, Cologne

Rolling instead of gliding: The "rol e-chain" roller chain was developed for long service life under adverse environmental conditions, including abrasive dust.



Image FA2212-05: igus GmbH, Cologne

Even in a severely contaminated environment, the rolling resistance of the "rol e-chain" is consistently low.



Image FA2212-06: Incinerator plant, Weisweiler GmbH & Co. KG

Picture of the waste bunker from the control station. Dust, dirt and environmental conditions are a tough challenge for every component.



Image FA2212-07: igus GmbH, Cologne

Wolfgang Krebs, head of the electrical and control systems of the RWE Power AG (centre) is responsible for the energy chain conversion project at the Eschweiler incinerator. Left in the picture igus sales consultant Holger Guhlich, to the right igus industry manager Matthias Gebauer.