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CHANGE OF DIRECTION: The freshly excavated gravel is transferred to a long stationary haulway.

Emergency pull-wire switch passes test in gravel plant

At a gravel plant in Vennebeck, gravel freshly extracted from the River Weser has to travel a considerable distance on conveyor belts from the floating-grab excavator to the processing and grading machinery. The responsible persons at the gravel plant are currently testing a new series of emergency pull-wire switches.

For some it is a place for rest and recuperation – for Rhein-Umschlag it is a place for excavating high-quality gravel. In Porta Westfalica, the River Weser passes through the 200 m deep "Westphalian Gap" between the Wiehen Hills and the Weser Hills before flowing unhindered through the North German Plain to the North Sea. Directly ahead of the Westphalian Gap, the Weser makes a significant bend – enclosing an extensive and inviting area which features multiple lakes and attractive walks.

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WET CUT: The gravel is dredged from a depth of more than 20 m using a floating-grab excavator.

These lakes have a total surface area of around 90 hectares and are the consequence of gravel extraction. Weser gravel, rich in sandstone and quartz deposited here during the Ice Age, has been in demand for a long time. One of its characteristics is very good processability as a raw material for concrete because it is not particularly reactive. It is also popular with landscape gardeners because it is more colourful than, for example, Rhine gravel: brown and grey with white inclusions and striking colourations; each particle is individual.

One of the lakes within the bend of the Weser is currently being excavated. The operator of this gravel plant is the Rhein-Umschlag Group, founded in 1924. It is a medium-sized company which is privately owned and runs five locations in Lower Saxony and North Rhine-Westphalia, some with partners. Together they extract around 1.5 metric tonnes of sand and gravel per year. The Group additionally owns sea and inland berths in five different ports. They are mainly used to handle and store bulk goods, such as raw construction materials and animal feed. Rhein-Umschlag also plays an active role in the trading of building materials and in inland water transportation – including a container line for the hinterland of the major seaports.

From the darkest depths to daylight with a floating excavator

At this gravel plant, located within the bend of the Weser and visible from the Emperor William Monument, the gravel is extracted using a floating-grab excavator. The grab has a capacity of 3.8 m^3 and dredges deep under the water. Nils Rexroth, plant manager of this and two additional Rhein-Umschlag sites (Schinna/Stolzenau and Estorf/Landesbergen) explains: "The gravel layer here is abundant. We excavate the raw material from a depth of over 20 m." In addition, the gravel here tends to be fine: the gravel plant supplies four different particle sizes to DIN EN 12620 ("Aggregates for concrete"), the coarsest being a 16/32 mm fraction.

THE PLANT is designed for a throughput of up to 220 t/h. A load-dependent control system ensures energy-efficient grading.

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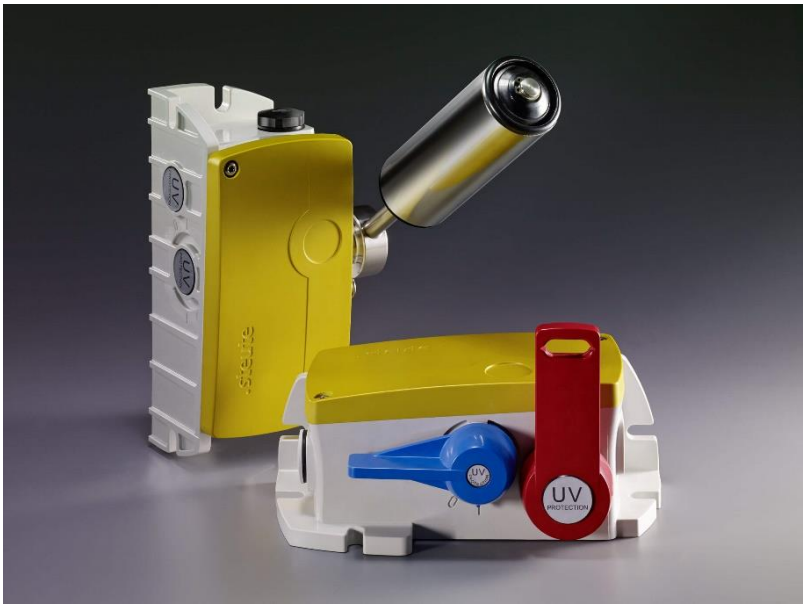

MORE COLOURFUL THAN WESER GRAVEL: The ZS 92 S emergency pull-wire switch with a Thermoset enclosure for heavy-duty applications (front); and the belt alignment switch version (back).

The excavator driver first unloads the grab contents onto a scalper above a collecting funnel. From here the pre-screen is filled with material.

From the pre-screen, the material moves onto dry land via a modular conveyor belt system, arriving at the loading point for the stationary haulway. The latter then transports the gravel via another conveyor system over several hundred metres to the next screen. Here oversized particles are once again separated before the material is brought to the raw gravel tip. Nils Rexroth: "The raw gravel tip decouples the two central production steps of extraction and processing or grading. This buffer is very important for smooth production, for example during maintenance work on individual pieces of equipment."

Grading system with load-dependent control

The grading and processing plant is designed for a throughput of up to 220 t/h. The responsible persons at Rhein-Umschlag attach great importance to state-of-the-art technology and efficient plant operation, shown for example by their investment in load-dependent grading control. Nils Rexroth: "This control system has been retrofitted. It adapts the operation mode of the plant, and thus also the power consumption, to the scale of the gravel. If it contains a great deal of sand, the performance or throughput is shifted towards finer grading. If the material contains many coarser particles, the opposite happens." Power consumption was, of course, compared using the 'before and after' principle. The result: "The efficiency gain is larger than we had expected. The control system will soon pay for itself."

Current modernisation project: personal safety along conveyor belts

Regarding safety at its gravel plants, Rhein-Umschlag always welcomes suggestions for improvement. In line with the current stipulations, all conveyor belts are safeguarded with emergency pull-wire switches which can prevent the worst from happening in a hazardous situation: one pull of the wire, and the belt stops.

In agreement with Nils Rexroth, specialist company steute has installed a brand new emergency pull-wire switch for test purposes along the central conveyor belt from the shoreside loading point towards the processing plant. The ZS 92 KST switch from the steute "Extreme" range has been developed especially for use in heavy-duty applications, including the extraction industry. This is clear not only from its size and obviously robust design, but also from its enclosure material: not only the ZS 92 KST enclosure, but also its two levers are made of Thermoset. Only the enclosure screws and their screw sleeves are

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NILS REXROTH, plant manager at the Vennebeck gravel plant (r.) talks to Rainer Lumme, Product Manager Extreme at steute.

made of stainless steel. The new emergency pull-wire switch is thus considerably more corrosion-resistant than the already available ZS 92 versions featuring die-cast aluminium enclosures with multiple coatings (passivation, primer, powder coating).

The mounting dimensions are compatible with those of other commercially available emergency pull-wire switches, simplifying the retrofitting of existing conveyor systems with this new series – as has occurred at Rhein-Umschlag. Using the same connection diagram, mounting is possible from the bottom of the switch or from the back.

Low release force and travel for emergency stops

One advantage from the standpoint of the user is the low release force and travel necessary to actuate the emergency stop function. This simplifies operation of the safety switch, while making it reliably compliant with all relevant international standards, e.g. for electrical emergency stop devices with a mechanical latching function. This means that the latest variant of the ZS 92 with its robust plastic housing is also ideally suited for all bulk goods transportation and processing applications. Internal tests by the manufacturers have already clearly shown this, and now first tests in practice are proving it: observed by Rhein-Umschlag and steute, the Thermoset pull-wire switch has passed its first crucial test at the Vennebeck gravel plant.

The ZS 92 is also available as a belt alignment switch. In this version, the very simple set-up in 5° steps of the switching points for pre-warning and switch-off (from 5° to 35° for two switching inserts) increases its flexibility in practice. In Vennebeck there is no need for this switch type, however. Nils Rexroth: "If the bulk goods are deposited in the centre of the belt – and we guarantee that they are – then there is no misalignment."

Focus on optimisation and maintenance

Load-dependent control of the plant, as well as the willingness to test these pull-wire switches, demonstrate how Rhein-Umschlag is continually working to optimise its plants – with the long-term goal of always guaranteeing efficient and safe operation. From the point of view of the responsible persons, maintenance is also an important contributing factor, as is staff commitment. Nils Rexroth: "When you have good employees who always keep an eye on the plant and feel responsible for it, then components can last for a very long time."

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