

Inductive Sensors –Safe on the Rails

How can a small and unconventional sensor optimise the costs of a large installation? High system availability is just one aspect of many. A Chinese company uses *uprox*[®]+ sensors to monitor the electric traction system of railway vehicles. This example is to show how machine & system engineers as well as system operators are capable of reducing the costs of their technical processes with limited means.

Inductive sensors, which are easy to handle, play a particularly important role in the successful operation of a system and contribute significantly to process optimization. It is important not only to consider the individual component involved but to look at the entire process and its requirements. This is the only approach to gain appropriate insight into the complete costs of the process.

The future calls for a new mechatronic approach, also in this respect. In the final analysis, a large-scale problem solution has much more significance than the sum of the individual standard components used.

Monitoring and control of railcars

The XiNan Trunk Line Electrification Engineering Co. Ltd. in China monitors the overhead contact lines of railway vehicles. Recently, the company, based in the canton of Guang Dong, has started to work with *uprox*[®]+ sensors. The *uprox*[®]+ is ideally suited for this specific monitoring task, i.e. the detection and control of electrically driven railway vehicles. One of the main reasons for this is the novel construction of this sensor type.

It is based on the proven *uprox*[®] principle. However, the receiver and emitter coils are no longer coil windings, but printed onto the circuit board. The high precision of these printed coils clearly improves signal evaluation in the limit ranges.

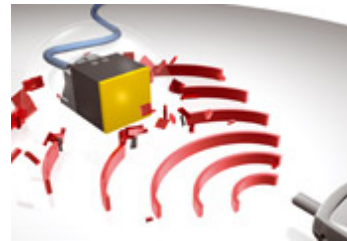
The extraordinary “interior“ of the *uprox*[®]+ sensor as well as the applied novel manufacturing technology are the basis for the highest achievable switching distances. Due to this novel coil technology, these sensors achieve a switching distance that is up to 250 % higher than that of conventional inductive sensors. Of course, no reduction factor has to be taken into account, just like with the predecessor *uprox*[®].

uprox[®]+ sensors are capable of detecting materials such as iron, stainless steel, copper, aluminium and brass at the same high distance and with the highest precision. The non-flush *uprox*[®]+ sensors used in the railway application do not require large metal-free mounting zones. Sensor embedding up to the upper edge of the thread is admissible. The pre-damping effect is automatically compensated via the self-compensation function.

How can the customer actually profit from the technical advantages, such as the very high switching distance, the eliminated reduction factor and the reduced metal-free mounting zones?

Today, only very few sensor types are needed to control the railway vehicles, because *uprox*[®]+ is capable of replacing all other sensors with lower switching distances and complex mounting requirements. Fewer sensor versions, of course, also imply reduced purchase costs. Instead of having to purchase many different versions of inductive sensors in small lot sizes, it is now possible to buy just a few types in accordingly high quantities. This, of course, reduces the average purchase price considerably. A large variety of sensor types is no longer needed, because every standard *uprox*[®]+ sensor optimally meets the requirements of monitoring the electric traction system. The high prices of special sensor versions are old hat. Our customer can already profit from cost reductions in the early purchase stage!

Today, the Chinese company merely needs to store an appropriate quantity of inductive *uprox*[®]+ sensors. Formerly, the many versions required an accordingly high stock space, but due to *uprox*[®]+ the costs associated with large inventories have been eliminated. The very lean inventory programme consists solely of standard types since special sensor versions have become superfluous. And in future, nobody will have to hoard „illegal“ inventories“ in various drawers and shelves. The minimised standard programme is a warrant for no more material shortages and facilitates the daily work of assemblers and mechanics.



Higher operating ranges

The new generation of inductive sensors has an extended operating range, within which reliable detection is ensured. Mounting is simple, quick and problem-free. Non-flush threaded barrel sensors can be embedded up to the edge of the thread and mounted closely next to each other. *uprox*[®]+ sensors pave the way to simple system set-up. Maintenance also poses no problems, quite under the motto: "Things that start in a simple fashion, will not cause any problems in future." The small amount of standard sensor technology is always available and ensures easy and safe replacements. The significantly reduced maintenance and the high operational reliability of *uprox*[®]+ have fully convinced the manufacturer of railway vehicles.

When monitoring overhead contact lines of railway vehicles, EMC is, of course, an essential issue. This application represents a so-called "worst case scenario" – a current-carrying conductor is the target of detection. Very good EMC properties are, in this case, an absolute must. Turck makes no compromises in meeting the high level of EMC needed. The sensors were tested to meet stricter standards and requirements than legally required and offer the highest operational reliability.

In this application, the sensors must always function perfectly despite extreme environmental conditions such as strong solar radiation, snow, hail, storm and rain. Due to the advanced housing and encapsulation technologies, all factor 1 sensors of the new generation pass IP68 testing according to the exacting TURCK company standard. They are thus always optimally protected, despite the harsh environmental conditions. By using *uprox*[®]+, our Chinese customer profits from considerable savings in purchase, system construction, set-up and maintenance. He is capable of reducing his expenses for spare parts and benefits from the outstanding capabilities of this sensor range, which has increased the availability of his systems considerably.

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