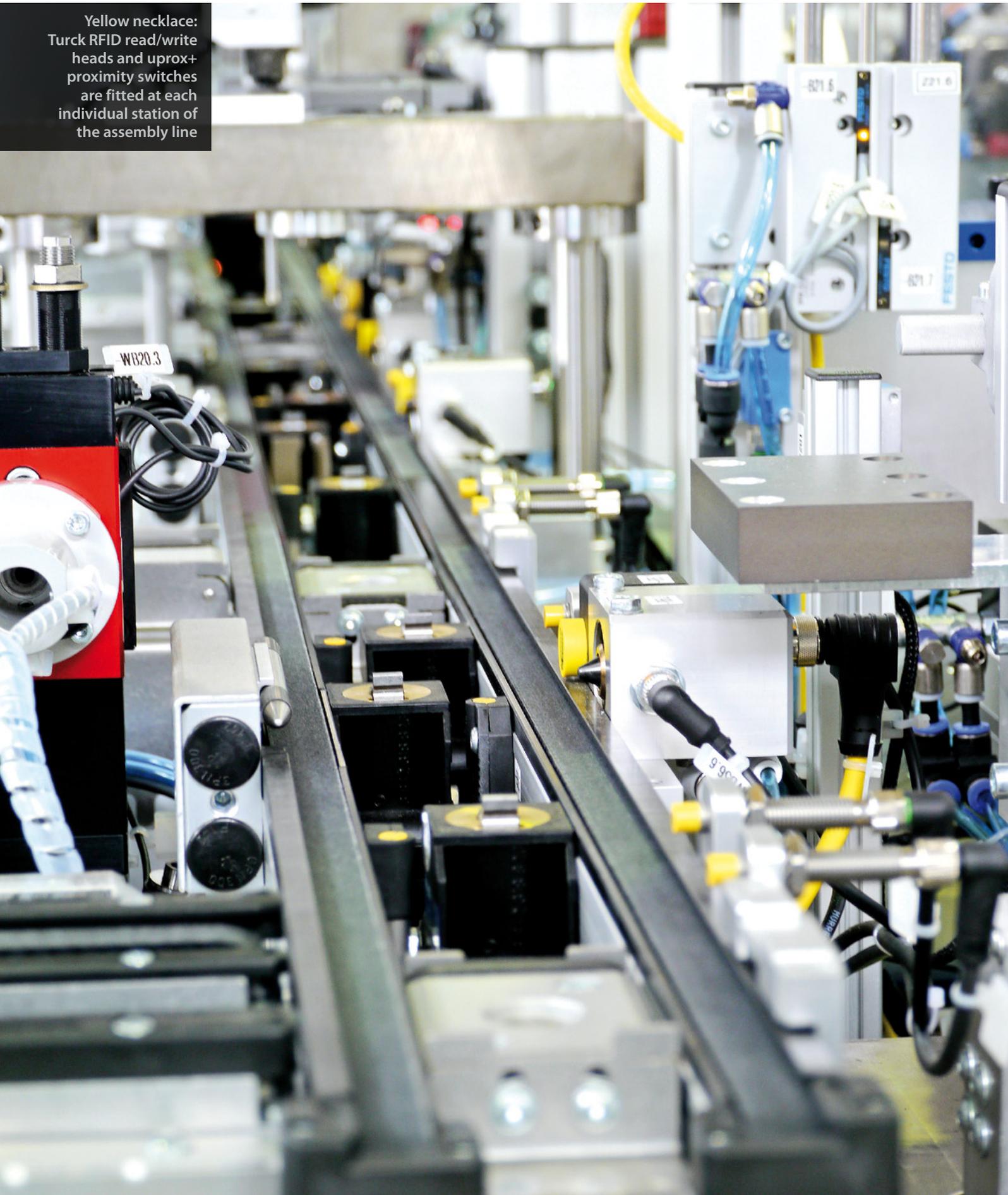


Yellow necklace:
Turck RFID read/write
heads and uprox+
proximity switches
are fitted at each
individual station of
the assembly line



Unique Products on the Conveyor Belt

Sonplas uses Turck's BL ident RFID system and uprox+ sensors in an assembly plant for injector nozzles

Injector nozzles for injection systems basically consist of a nozzle tip, the needle with a spring seat, a spring, sleeve and a type of cover that encloses the entire unit. Mounting them is a complex process since components of each individual injector nozzle are all separate parts. This makes each injector unique. The needle or spring of one nozzle cannot simply be refitted on another nozzle without a loss in quality. Many nozzle components, from the spring seat to the spring, right through to the individual ground needle, have to be measured precisely and matched with each other. The assembly of these unique nozzle products is fully automated on the conveyor belt.

This type of assembly is made possible by special machine builders such as Sonplas GmbH from Straubing. The company specializes in assembly and testing equipment for car parts suppliers. Based in Lower Bavaria they have made a name for themselves in the sector, with machines that assemble or test supplied parts through which fuel later flows in the vehicle. Many international car parts suppliers appreciate this expertise with almost 200 employees with this know-how.

At the end of 2012 Sonplas won the order to design and build two machines for assembling injector nozzles. "The special feature of these machines was the fact that measuring was carried out in front of each assembly station and then the workpiece machined according to this measurement," Sonplas sales manager Hermann Pankofer explains. This is a special challenge for the machine construction. This meant that the spring of the injector was not simply fitted on the needle. The machine firstly measures the force of the spring at a station and then presses the spring seat according to the measuring results. The spring is then placed on the needle and another machine checks the height of the spring at a defined counter force. The height must be measured with a tolerance less than

1 micrometer, since the strength and the seat of the spring later influence the injection action of the injector nozzle in the engine.

Assembly process requires traceability

The complex coordination of measurements and assembly processes requires the relevant measuring data to be tracked and assigned uniquely. "Each component is tracked, not only the injector nozzle in its entirety, but also each individual part itself," says project manager Manuel Lehner. In order to assign the components to a nozzle, they move on the workpiece carrier of the nozzle. The workpiece carrier specially optimized for the plant provides a separate place for each required injector component. RFID readers read the tags that are fitted on each individual workpiece carrier.

For the assembly machines Sonplas looked for an RFID system that can be mounted compactly in the machine. "The problem was not so much the large read/write distances involved but the fact that the tag had to be fitted directly on the aluminum of the workpiece carrier," Lehner describes. The ideal tag could be found in the extensive portfolio of the Turck RFID system: Turck's TW-Q25L12,5-M-B128 tag – not much larger than a thumb nail – meets all the requirements. Eleven TN-M18-H1147 read/write heads in an M18 threaded barrel are fitted in each of the two machines in order to identify the workpiece carriers.

Long switching distance on aluminum

Sonplas looked for inductive sensors as initiators in order to detect the material carriers on the belt and to check the correct position of the workpiece carriers for the tags to be read. This required a compact switch with a long switching distance on aluminum. Only an uprox+ sensor from Turck was ultimately able to meet this set of requirements. Other proximity switches do not manage to guarantee such a large switching on aluminum with the same level of reliability. The four millimeter switching distance of the NI4U-EG08-AP6X used is considerable for a sensor in the M8 housing – and is the same for all metals. Sonplas fitted 56 sensors in each of the



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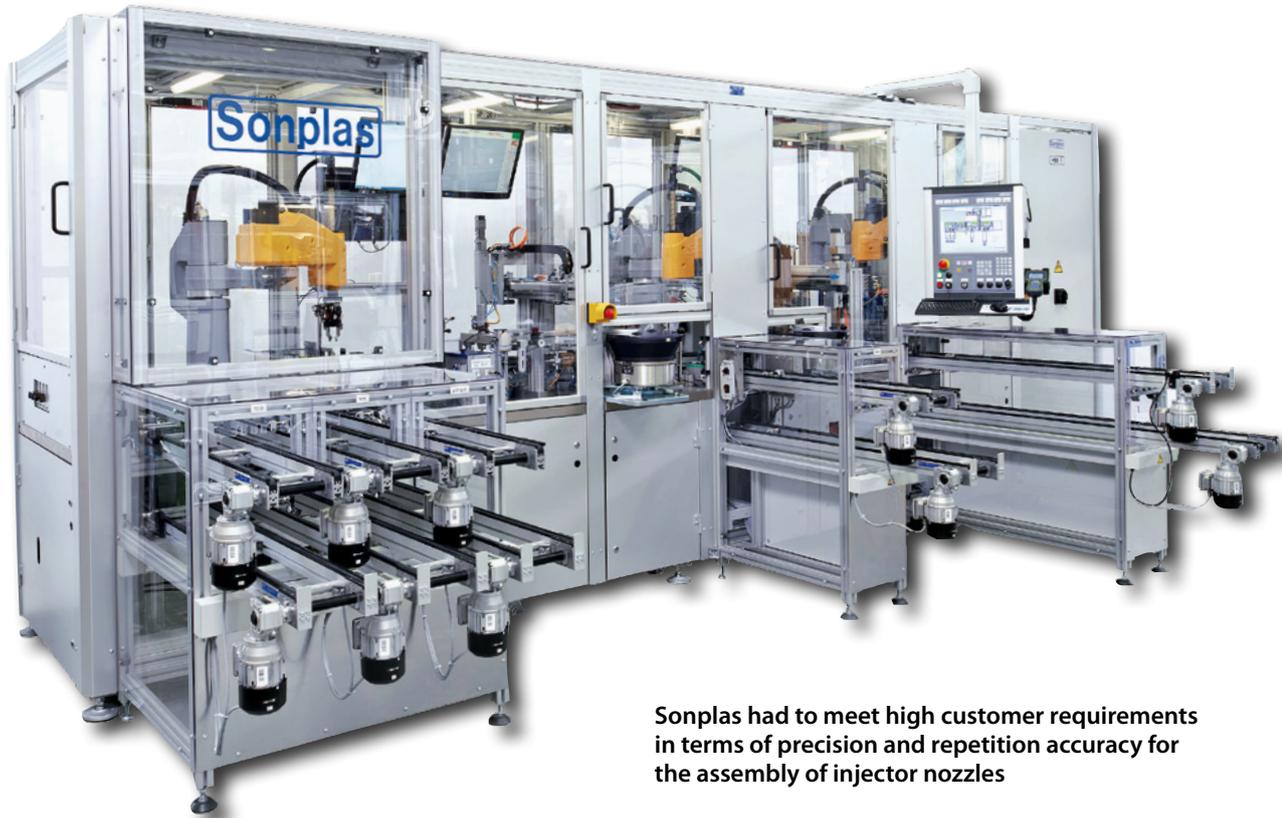
Manuel Lehner,
Sonplas



The tag is fitted directly in the aluminum workpiece carrier

Quick read

Special machine builders Sonplas developed and built two machines for assembling high-precision injector nozzles. To meet customer requirements in terms of precision and repetition accuracy, the individual nozzles and their components must be identified accurately in the process. For this Sonplas uses Turck's BL ident RFID system and uprox+ proximity switches which detect aluminum workpiece carriers on the conveyor belt.



Sonplas had to meet high customer requirements in terms of precision and repetition accuracy for the assembly of injector nozzles

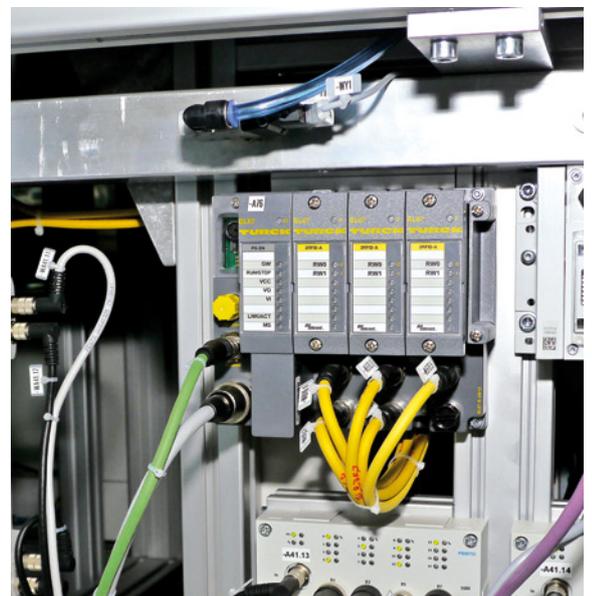
two assembly machines. They detect the workpiece carrier on the conveyor belt, control stop and positioning operations, are used for detecting jams and initiate read/write operations.

“The fact that the Turck sensor detects aluminum so well was a major benefit for us. This saved us having to implement any labor-intensive alternative solutions. The machining of a steel workpiece carrier would have been much more complex.” Sonplas developed the workpiece carriers on the basis of a standard carrier. With a steel design, the weight of the workpiece carriers on the conveyor belt would also have been too high: “With 30 workpiece carriers for each of the two machines this makes a considerable difference,” Lehner says.

The test data at the individual measuring stations is linked with the ID number on the tag via the RFID read/write heads and stored in a database. The data reaches the database of the machine via Profibus using Turck's BL67 gateway. “The challenge with this machine was to maintain a tolerance below one micrometer while coordinating the high-precision measurements and the equally precise assembly operations. This also had to be repeatable in a continuously running production plant. Everything is coordinated here, each cog interlocking with another one,” project manager Lehner sums up the particular requirements of the assembly plant and adds: “Here we must be able to rely on each component installed – and naturally on each sensor – one hundred percent.” ■



The reader reads the tag on the workpiece carrier in order to identify the individual components



The data of the read/write heads reaches the database using Turck's BL67 gateway with RFID modules