A New Era in Interlocking Technology

Communication between interlocking tower and track equipment makes rail travel safe. The inventor Anton Reichlin has been working for years on a new network technology known as Sinet, as well as on a new energy supply system called Sigrid. The latter replaces the point-to-point connections previously used to link control units and the interlocking tower. The benefit of Sinet lies in a ring-like communication network that links all technical equipment along the tracks. Such a network is more reliable and also more cost-effective over the long term than cable and wiring systems, which are expensive to install. Sinet is now being tested under normal operating conditions in Switzerland.

Rail systems equipment and technologies need to be long-lasting. The many thousands of kilometers of rail lines and technical equipment installed in every country require enormous investments that take decades to recoup through actual operations. That's why technologies that have long been standard in other industries take a long time to find their way into the rail sector. However, the time has now come for state-of-the-art network technologies that are common in every office environment to help with the complete modernization of systems for transmitting signals between interlocking computers and element controllers installed along rail tracks. This upgrade of the communication technology will be accompanied by the use of new technologies for supplying energy to the element controllers. In this case as well, the cable-heavy, point-to-point connections will be replaced by bus or ring structures. In addition, the installation of energy buffers along the tracks will enable the use of thinner cables, which will further reduce the amount of copper needed. The inventor Anton Reichlin played a major role in this development. Reichlin, who works for Siemens Infrastructures & Cities at Mobility and Logistics, managed the Sinet (Siemens Interlocking Network) project during the feasibility phase and is now responsible for the Sigrid (Smart Interlocking Grid) project.

Before a rail signal can turn from red to green, a large number of processes that are usually automated need to be carried out along the track segment in question. When a train is approaching, the interlocking system checks to see whether the track segment is actually clear. The necessary track switchings are then made and railroad gates are lowered. Only after all this has been verified by the interlocking system does the signal change from red to green. All of these processes require control units known as element controllers that change, for example, signals or switch tracks into the right positions in line with commands issued by the interlocking system computer. Each element controller is connected via a copper cable to a corresponding technical device on the tracks. Today, communication with signaling and railroad crossing equipment is carried out via ISDN, which limits the permitted distance between the interlocking system computer and the element controllers to six to ten kilometers. If a line is interrupted or command signals are disrupted, the affected signal can no longer be switched or monitored, and the track segment in question will be blocked as a result.

The system described above is set to be replaced by Sinet. More specifically, the ISDN point-to-point connections to the element controllers will make way for a ring-structured network that will enable redundant transfer paths between the interlocking system computers and the element controllers. Additional benefits include central monitoring of the rail network and lower servicing costs. The ring-structured links will assume control of the local connections for the track devices via copper cables on the basis of conventional DSL lines. In other words, when the interlocking components are decentralized, it will be possible to use the actual interlocking functions for larger track segments than was previously the case. Diagnosis, which is gaining in importance, will be possible locally or remotely.

Siemens is currently conducting field tests for Sinet together with its partners. In addition, the first Sinet system began operating in Sevelen, Switzerland, at SBB, in October 2013 on a five-kilometer stretch of a heavily used primary route that was reequipped accordingly. Many rail operators, including Deutsche Bahn AG, have already expressed great interest in the new technology.

Reichlin was the inventor who launched this innovation. “It’s really fantastic to see my work implemented at the end of my career,” says Reichlin, who will be retiring next year. Reichlin studied electrical engineering at ETH Zurich University. Early in his career he focused on medical engineering; later he moved on to assignments involving automation and decentralized control systems in industry. From 1995 to

2005 Reichlin served as a Siemens Switzerland departmental director for the development of electronic interlocking systems. In 2005 he joined the specialist team responsible for developing Sinet/Sigrid. “Whenever I work on a new system, I always look at the equipment on site in order to get a good feeling of what would be a true improvement,” Reichlin explains. He’s now looking forward to doing some traveling with his wife — their two children are long grown up — but he’s also planning numerous private research projects of his own. “I’ve already ordered the software and the 3D printer I need for my tinkering,” he says.