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SCHAEFFLER TECHNOLOGIES GMBH & CO. KG, HERZOGENAURACH

Train Support System with Generator Sensor Bearings for Rail Traffic

Schaeffler Group Receives CNA “Intelligence for Transportation and Logistics” Innovation Award

- Concept for improved logistics and safety in mass transit and main-line rail traffic
- Intelligent Generator Sensor Bearing from the Schaeffler Group developed into on-board unit
- Mechatronic rolling bearing solutions enhance productivity and reliability

The Schaeffler Group has received this year’s “Intelligence for Transportation and Logistics” innovation award, given away by the Center for Transportation & Logistics Neuer Adler e. V. (CNA). This prize recognizes the company’s sophisticated Train Support System, based on the Generator Sensor Bearing. It was presented during a ceremony in Herzogenaurach, where Schaeffler Group Owner Maria-Elisabeth Schaeffler welcomed about 70 guests from politics, business, science and the media. She called the award an outstanding example of the Schaeffler Group’s strength in innovation that opened up new opportunities for a wide range of industrial segments. “The Generator Sensor Bearing will provide excellent opportunities for the Schaeffler Group and a partner company to offer system solutions that make rail traffic in Germany, Europe and perhaps even worldwide more cost-effective and secure,” said Mrs. Schaeffler.

The First Mayor of the city of Herzogenaurach, Dr. German Hacker, emphasized in his citation the Schaeffler Group’s long-term commitment and high investment in research and development. He said that the Generator Sensor Bearing marked an important step in bringing together mechanics, micromechanics, sensors, electronics and software. “The mute, rolling railway wagon is a thing of the past. Thanks to the Generator Sensor Bearing it will become an intelligent, communicating, safe and highly efficient logistic module,” he continued, summing up the potential of the Train Support System in rail traffic.

From rolling bearing to on-board unit

The Train Support System is based on an FAG axlebox bearing from the Schaeffler Group that can be used with an integrated Generator Sensor Bearing (GSB) as a self-sufficient energy source, for example in freight wagons. Schaeffler engineers developed the system electronics and software and integrated them in the GSB, thus forming an on-board unit. In combination with an information management system, line operators and railway companies are able to achieve increased track safety and optimize their logistics. To this end, a wide range of different signals are recorded in the GSB and transmitted to a

central computer via GPS. The evaluated data are the basis for the use of railway supervision systems as well as online time-table generation, routing, process and risk analysis, localization, length of retention and the related check of chargeable track sections.

Comparable with a dynamo, the Generator Sensor Bearing induces electric power via the rotational movement of permanent magnets located on the wheel axle. This power has a typical wattage of approx. 100W at a nominal voltage of 24V. Thus there is an independent, self-sufficient energy source available which, via an electric storage unit, enables additional functions, such as the automatic opening of doors or the detection of switches and sensors. For the Train Support System, the Schaeffler Group has now refined the GSB with a sophisticated electronic system into a so-called on-board unit and connected it with a higher-level information management system. So the signals are not only recorded and processed in the bearing, but are also transmitted via GPS satellite technology.

In the past, it was not possible to realize such on-board units, particularly in freight trains. Information and data supply, preferably using satellite technology, works only with an independent and self-sufficient energy supply system. "This is now available thanks to Schaeffler's development of the Generator Sensor Bearing. Communication messaging via satellite opens up new possibilities for optimized logistics in freight haulage, and also for enhanced safety in transportation," says Bernd Gombert, Head of Mechatronic Systems at Schaeffler. The sensors integrated in the bearing not only record data regarding the condition of the axlebox bearing itself, such as wear or excessive heat. They also determine and monitor characteristics such as mileage, speeds, temperatures, noise, etc., which enables conclusions to be drawn about the condition of wheels, bogies and even rail tracks. This means that even the condition of butt joints and switches in the rail network can be monitored. The evaluation of the data recorded in the bearing also enables the monitoring and optimization of the entire traffic and goods flows as well as wagon availability control, location tracking and the calculation of track utilization costs, taking into account the loads, number of axles, time and distance.

"The great innovation for transportation and logistics is achieved through the combination of self-sufficient energy generation in the Generator Sensor Bearing and the sensor data with the respective on-board units and the higher-level information and control system. This makes the Train Support System a groundbreaking solution for railway traffic in terms of safety and communication as well as transportation and logistics management," emphasizes Simone Purbs, Head of the Schaeffler Group's Railway Sector Management. The Train Support System is an important step on the road towards a railway guidance system. For example, there are plans for it to be integrated in the European Train Control System (ETCS) designed for European rail traffic. Initial tests are currently being

conducted with Finnish Rail. In addition to GPS data collection, in other words the localization of individual freight wagons, the entire logistics chain is examined here. Transported goods are tracked via satellite and this knowledge of their current whereabouts enables the optimized utilization of routes and containers or freight wagons.

Mechatronics gaining increasing importance

Mechatronics is becoming more and more important for the development of innovative rolling bearing solutions. It enables enhanced functionality and thus leads to further increases in productivity, economic efficiency and reliability of machines. Schaeffler Group Industrial's newly developed rolling bearings with integrated sensors and integrated or neighboring energy supply enable novel solutions for numerous industrial segments, including but not limited to rail vehicles, machine tools and e-bikes.

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Signals are recorded in the Generator Sensor Bearing (GSB) and transmitted to a central computer via GPS. The evaluated data are the basis for the use of railway supervision systems as well as online timetable generation, routing, process and risk analysis or localization.

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