SIEMENS

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Enhanced availability due to optimized service

High track mileages, economic pressure and minimal operating reserves: today's rail vehicles have to deliver optimum performance. Every malfunction or breakdown causes delays, leading to loss of revenue, damage to an operator's corporate image and operational bottlenecks. Under certain circumstances contractual penalties or fare refunds may be incurred if defined punctuality figures are not achieved. All this explains why the servicing and maintenance of rail vehicles and the infrastructure that supports them is growing in significance all the time. Today's demands call for near-100% availability of trains and locomotives. In the event of malfunctions a rapid response is called for, and ideally such faults should be prevented before they occur.

Siemens' service concepts

Increasingly, rail operators transfer responsibility for servicing and maintenance to the vehicle manufacturer. For this reason the provision of new vehicles is frequently linked to long-term maintenance contracts, in some cases lasting until the end of the systems' planned lifetime. When it comes to the single-source delivery of trains, infrastructure and service, Siemens occupies a leading position in the rail industry. Siemens Mobility Services supports customers in more than 50 countries.

Taking in everything from testing and commissioning at the Siemens Test and Validation Center in Wegberg-Wildenrath (North Rhine-Westphalia), predictive and corrective maintenance coupled with spare parts provision, right through to repairs and the extension of operating lives by means of vehicle modernization, Siemens is at its customers' disposal on a round-the-clock basis. They can thus rely on better-than-99% availability. With regard to the Velaro E highspeed train in Spain, delays lasting

longer than 10 minutes caused by technical issues occur statistically speaking only every 1.5 million kilometers.

Data-based maintenance management

Siemens focuses on status-based and predictive maintenance based on data analysis, remote monitoring and decision support. Using sensors, monitoring devices or cameras, data relating to the current status of a train is collected, analyzed and evaluated by means of a diagnostic system. This enables fault detection and prognosis to take place, with the results then being processed in the Siemens Rail Support Center. Here, experts are on hand on a 24-hour, 365-day basis, to set out maintenance work instructions for workshop personnel in the depot, to deploy their own mobile engineers or coordinate the logistics for the requisite spare parts. With the aid of this type of fault diagnosis, the imminent maintenance work is already planned in before the train arrives in the depot. The empirical values captured in this way are fed back into an intelligent system design process, so that sample analyses can be factored into other service projects.

Augmented Reality

The technical innovations used in data-based maintenance management include augmented reality, involving the computer-aided enhancement of the way reality is perceived. Additional information is presented by superimposing and overlaying virtual objects in the form of videos, images, texts, infographics etc. Here, real and virtual objects appear in three-dimensional relationship to each other, thus enabling real-time interactivity. The service engineers can thus call up this information on their smartphone or tablet on site, optimizing both specific and everyday workflows, and performing them more rapidly. Standardized processes also contribute to quality assurance, while paperless documentation of the maintenance process is more efficient. Bearing in mind that engineers performing maintenance on rail vehicles have to deal with as many as 200 inter-networked control devices from different manufacturers, augmented reality offers them comprehensive support.

3D-printing methods for Siemens spare parts

The innovative 3D-printing method, also known as additive manufacturing, was developed for the purposes of spare parts management. Workpieces of almost every shape or geometry are produced using a 3D model or with the aid of another electronic data source. The advantages are obvious. Even small batch production and

customer-specific solutions can be handled economically and without problems. In this way it is also possible to remanufacture parts which are no longer available off the shelf. In addition, 3D-printing methods bring shorter delivery times and reduce the need for costly stockpiling. Siemens can demonstrate wide-reaching expertise in both fields, augmented reality and 3D printing, and has a reputation as a leading innovator in the sector.

Today, the global market for rail vehicles stands at 162 billion euros, of which, according to transportation consultants SCI Verkehr, more than half – amounting to 82 billion euros (52%) – is taken up by the servicing and maintenance of vehicles and the rail infrastructure. This area, also known as after-sales service in the vehicle industry, is growing just as quickly as the market for new vehicles. Over the coming years SCI Verkehr is anticipating a growth rate of 3.4% and thus an increase to around 190 billion euros by 2018. Vehicle maintenance has developed into an important business field – a fact acknowledged by operators and manufacturers alike.

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All information about the Siemens presentation at the UITP 2015 can be found at
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