VISIONS AND TRENDS IN TRAIN DETECTION

Wheel Detection Forum 2015
Review, statements, outlook

Visions & Trends
Frauscher takes a look ahead

Expansion of Sensor Production
Doubling capacities at HQ
Great success: Wheel Detection Forum 2015

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Exhibitions & Conferences in 2016
Dear reader,

Always moving forward, accepting new challenges and pursuing your goals with determination – these are important building blocks for developing innovative strength and economic success. Looking back on 2015, it was precisely this attitude that defined our company in a positive manner and guaranteed stable growth.

The third Wheel Detection Forum was found to be a great success and was a perfect example of this philosophy. 2015 marked a milestone in the history of this event. More than 200 participants from 34 countries made it clear that the WDF has become an established industry event. International signaling experts, rail operators, system integrators and renowned axle counting manufacturers discussed requirements, ideas and visions for the future of train tracking, wheel detection and associated applications.

In addition to basic information on current technologies for fail-safe and non fail-safe systems on the track, innovations and technological visions play a role that are becoming increasingly critical for modern needs. It is interesting that some innovative rail operators are passionate advocates and are making clear demands on the industry.

For Frauscher, it is exactly this exchange of ideas and synergy that creates a solid basis for further development of existing technologies. The acceleration of technical possibilities and the developments in the rail market suggest that in the future, manufacturer-operator collaboration will be the only way of organizing rail traffic around the globe more efficiently, and above all in a safer manner.

For Frauscher, this means working as closely as possible with our customers in order to learn and understand market requirements first-hand. By opening new branch offices in the USA and in Australia, Frauscher has succeeded in convincing industry thought-leaders and customers on the ground of our ideas in two new markets. Possible application fields for modern axle counting technologies have been debated and specifications have been defined in line with local conditions through numerous discussions. Impressive results have been obtained through this strategy, for example in India where, following the completion of the Mumbai Urban Transport Project, the next large project is already on the starting blocks. With the recently opened expanded area for sensor production at our main site in Austria, Frauscher is ideally equipped to meet rising demand from abroad.

While we are looking back, we are always considering the future and hoping to provide some insights in a thoughtful and practical way. I hope you enjoy reading this issue!

Michael Thiel
Wheel Detection Forum 2015: Discussing

From September 30 to October 2, 204 railway experts from 34 countries participated in the third Wheel Detection Forum in Vienna to discuss visions and trends in train detection. The audience’s general attitude was enthusiastic during the event: most of the world’s leading operators, wheel sensor manufacturers and system integrators were notably impressed by the international reputation of the Wheel Detection Forum, as well as the professional organization and high quality of the lectures.

A comprehensive program for an international audience

On Wednesday, four keynote presentations given by speakers from Switzerland, Turkey, Australia and Germany introduced all participants to this year’s forum motto and stimulated the discussion on future trends in train detection.

In his presentation, Max Schubert stated that Deutsche Bahn is convinced of the opportunities from the widespread application of Distributed Acoustic Sensing within the railway industry in the future. This was a point of great interest to all and fueled the debate throughout the entire event. A networking evening framed the start of WDF 2015, and attendees took the opportunity to discuss recent projects, new technological approaches and more.

Thursday was filled with 13 diverse presentations by international speakers on four panels, each followed by an interactive podium discussion. The four panels were: High Availability, Communication over open Networks, Level Crossing Solutions and Wheel Sensor Applications.

Michael Thiel, CEO of Frauscher Sensor Technology, summed up the key points of the lectures and discussions in his concluding speech. In particular, he outlined the importance of international views and cooperation when it comes to development and future-oriented research in the railway industry.

Michael Thiel, CEO, Frauscher Sensor Technology

“We have to share our experiences from different perspectives, including from the standpoints of all markets and all stakeholders – operators, system integrators, consultants, railway authorities as well as sensor and axle counter manufacturers. This is the only way to develop the next level of train control systems. This is what makes the Wheel Detection Forum, its topics and outcomes unique and so important. There are numerous conferences all over the globe, that discuss signaling on a more general level – ETCS, ERTMS, PTC etc. – but none of these events focuses directly on the requirements, conditions and challenges of track.”
the future of train detection

Panel 1: High availability
Ensuring the maximum uptime of signaling systems is becoming more and more important today. On Wednesday, Lars Dietrich stressed the significance of high reliability, especially in sensitive areas such as the Gotthard Tunnel. The point was soon reiterated in the first presentation on Thursday by Sanjay Singh of MRVC who underlined the impact of failures on lines with tight headways. He agreed that intelligent fault-tolerant functions such as Counting Head Control or Supervisor Track Sections provide interesting options to increase availability without needing to duplicate outdoor equipment. Phil Blacker of Atkins described some examples in his presentation and expressed his conviction that such functions will be used more frequently in the future.

Panel 2: Communication over open networks
Communication over software interfaces and open networks is becoming more and more apparent in the rail industry. Neil Popplewell from Rail Control Systems Australia Pty Ltd predicted that this trend will continue and small signaling systems will also adopt this innovation. All those who spoke at this panel agreed that although the expense and effort of initially implementing a protocol cannot be neglected, any disadvantages in terms of initial outlay and maintenance are outweighed by the savings potential.

Panel 3: Level crossing solutions
Although basic requirements for Level Crossing Solutions are the same all over the globe, the details differ from operator to operator. Therefore, presenters on this panel had to consider a wide range of design options in their discussions. One commonality that was recognized was the fact that communication over open networks may have significant positive impacts on level crossing systems, and particularly on the connection of the activation points. Another important topic that was discussed here was how independent level crossing systems could be connected.

Panel 4: Wheel sensor applications
Modern inductive wheel sensors can be used in a wide range of railway applications. The discussion revealed that the system integrators’ and operators’ main interests primarily focus on ensuring the high accuracy of generated data based on traversing, wheel center detection or speed measurement, as well as maximum availability of the sensors.
## Voices from the WDF 2015

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<tr>
<th>Name</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Hark Braren</td>
<td>BNSF Railway</td>
<td>United States</td>
<td>&quot;I find this forum very valuable in terms of benchmarking my counterparts in the field in terms of how they apply wheel counting technology to improve the performance of the systems they manage.&quot;</td>
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<tr>
<td>Max Schubert</td>
<td>DB Netz AG</td>
<td>Germany</td>
<td>&quot;Thanks to this platform, we have the opportunity to connect with people from the railway business all over the world, to gain an insight into their railways and perspectives and to network with companies as well, which is fantastic and very interesting.&quot;</td>
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<td>Phil Blacker</td>
<td>Atkins Global</td>
<td>United Kingdom</td>
<td>&quot;The WDF is an important event: it brings together both system operators and system integrators for a general discussion on wheel detection and the problems affecting modern railways. It covers a wide variety of topics that together challenge people to generate ideas that they in turn can discuss as well as to share approaches and technologies with each other.&quot;</td>
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<tr>
<td>Sanjay Singh</td>
<td>Mumbai Railway Vikas Corporation Ltd. (MRVC)</td>
<td>India</td>
<td>&quot;The WDF is a very good forum for exchanging our experiences; various practices are being followed by a variety of railways and companies. And it helps us to grasp new technology that can help us to improve our system back at home.&quot;</td>
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<tr>
<td>Stewart Rendell</td>
<td>John Holland Rail Pty Ltd</td>
<td>Australia</td>
<td>&quot;It's been a very interesting couple of days listening to people describe problems that are very similar to the ones that we have at home. And it's been a great opportunity to speak to other people with similar problems as well as with completely different problems from all around the world, so it's been a very good event.&quot;</td>
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<td>Vennie Dyavanapalli</td>
<td>Loram Maintenance of Way Inc.</td>
<td>United States</td>
<td>&quot;For me, this forum has been one of the most interesting events because it takes a very small topic and really sheds a lot of light on it, because I don’t think that wheel detectors get enough attention from a diverse range of perspective at other venues.&quot;</td>
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A common touchstone for global railway experts
As an international railway event, I believe that the Wheel Detection Forum continuously aims to develop integration within the railway industry and enable continuing evolution of train detection by bringing together experts from various fields and countries.” The third forum exceeded expectations by presenting exciting lectures, attended by an international field of participants, and presented with professionally organized programs and diverse conference events. Having set an attendance record with the 2015 conference, the Wheel Detection Forum in 2017 can now be seen as an up-and-coming landmark event where global railway experts can meet and discuss.

Visit our website to find comprehensive reviews, picture galleries and all the presentations from past Wheel Detection Forum events. Click “Stay up to date!” to register to receive regular updates about the event and to make sure that you do not miss any news about the WDF 2017.

www.wheeldetectionforum.com

The gala evening at the Vienna Technical Museum was a memorable event for all participants
International participants seized the chance to interact
New technologies and solutions were discussed during the breaks

Save the date:
4th Wheel Detection Forum | October, 4–6 2017
Vienna, Austria

Speakers who want to contribute to the next Wheel Detection Forum are invited to submit their papers starting in September 2016. Presentations can again be expected to live up to the motto “Visions and Trends in Train Detection”. Proposals may focus on train tracking solutions, open communication, security and any additional subjects of interest to railway experts. To submit a paper, please contact Mr Christian Pucher (christian.pucher@frauscher.com) or send an e-mail with an abstract (max. 400 words) and a short biographical sketch to marketing@frauscher.com.

Important dates
September, 1 –December, 20 2016
Abstracts, Bios, Open window to submit papers for WDF
February 2017
Confirmation of presentations
April 2017
Short Papers due for review Deadline for author biography
August 2017
PowerPoint Presentations due for review
4–6 October 2017
Wheel Detection Forum 2017
Outlook: New solutions

The task of developing the most innovative and future-proof equipment for modern railway systems requires more than being aware of the latest technologies and available options. With many years of experience, Frauscher knows that it’s even more important to listen to customers about what they really need and what they are planning to do. Learning from the market and matching requirements using tailored solutions is a concept that sounds simple; however, Frauscher depends on a solid base of continuous research and development from the real-world for this. Our philosophy is the key to Frauscher delivering solutions for safe and smooth railway operations around the globe. Taking account of what he learned at last year’s Wheel Detection Forum, Martin Rosenberger,Product Management Director at Frauscher, describes the challenges and opportunities that come with this approach.

Facing the challenges

"In my experience, all of the parties involved in establishing modern signaling systems on railways are confronted with similar challenges: optimizing lifecycle cost efficiency (especially when it comes to installation and maintenance), guaranteeing precision, and following standardization best practices, regulations and more.

Thus, the main goals are also the same: reduction of complexity and effort, increased efficiency and capacities, optimization of energy consumption, easy exchange of information between various systems as well as support of interoperability and increased availability.

As a global technology leader for inductive wheel sensors, wheel detection systems and axle counters, we know about these factors. We must consider them as much as any operator or system integrator using our equipment. Therefore, it is crucial for us to talk to our customers regularly in order to understand their needs and challenges. This helps us to advance existing or develop new solutions and allows us to focus on visions and trends."

To make it easy

"Comprehensive experience and a history of collaboration supports us in optimizing our systems for special requirements and conditions. As our products are modular and flexible, we profit from international projects by developing new individual solutions wherever needed. Step by step this process influences our whole portfolio. Though some very specific customizations focus on single projects or markets, others become new standards throughout the railway industry.

From our point of view, this approach holds great potential for sustainable global innovations. These can ease the handling of
complex requirements such as information and data management, cross-systems diagnostics, system configuration, monitoring and alarm functions, preventative maintenance tools and more. Some of our solutions for these requirements will be presented at this year’s InnoTrans in Berlin.

Outlook on new technologies
We have also been carrying out research on various alternative technologies to inductive sensor technology over the last few years. “As part of this, we have tested strain gages and fiber optic sensors using technologies such as fiber bragg grating. We have performed several tests and trials about the proof of concept, reliability and safety standards. As none of these technologies even came close to attaining the level of safety and reliability of inductive sensors, we have not been convinced by any of these concepts so far.

Due to the fact that Distributed Acoustic Sensing (DAS) offers a wide range of possibilities and cost savings potential for many applications, we will now look more closely at this technology. DAS technology has been used in other industries up to now, but there are some major challenges regarding its usage in the railway environment that have not yet been resolved. The fact that railway operators, such as Deutsche Bahn, RZD or the US railroads, are showing interest in using this technology motivates us to continue our research in this field.

Appropriate tests and developments of prototypes have been much more comprehensively described in research carried out in the past about other concepts due to the complexity of this technology. With the goal of using DAS at SIL4 level for train detection, we expect the research process to take a long time – and it is unclear whether it will ultimately be successful. However, at the InnoTrans 2016 we will be able to present the progress of our research and development activities and that of the trials we have carried out as well as information about possible and available applications."
More room for innovative manufacturing processes

With the expansion of sensor manufacturing at its main site in St. Marienkirchen, Austria, Frauscher is ideally equipped to satisfy growing demand from international rail markets. The expansion was carried out alongside an upgrade in capacity and also required an optimization of workstations, which resulted in a reduction of throughput times and faster implementation of measures to ensure high product quality.

Wide-ranging measures and optimized processes

The goal of expanding the manufacturing area went far beyond merely creating additional space, reports Gerald Buchinger, Production Director of Frauscher Sensor Technology: “The new production area that we have created measures approximately 500 m². Together with other measures, additional machines and the improved material flow form the foundations for expanding our manufacturing capacity in the area of sensor production. The aim is to be able to increase the annual output from 17,000 to almost 30,000 sensors. In addition to the detailed planning of numerous technical innovations, it was also a challenge to maintain operations during the construction periods. Once the construction and installation work was completed, the new processes were implemented and ideas for optimizing processes and working conditions were put into practice.”

Automation of the casting lines

Constantly-increasing production figures and different casting methods for various sensor types were the reason behind the expansion and optimization of the casting lines. With an additional vacuum casting line, the capacities and associated processes have been optimized through extensive automation, while it has also been possible to reduce set-up times significantly. Following removal of the components from the vacuum chambers, chemical vapors that are released are suctioned off via special tunnels, which greatly helps maintain good working conditions.

New curing ovens

Two new curing ovens are available for further processing of the cast sensors. With each
production batch, programmable temperature profiles ensure high product quality and detailed process documentation. The vapors in the curing ovens are also suctioned off before the components are removed from the drying chambers.

**Extensive tests in modern temperature test cells**

In the next step, the sensors are subjected to extensive functional tests in special temperature test cells. The parameters of the test methods used here comply with the general safety criteria and may be adapted using innovative mechanisms where required. The new production hall houses six of these cells and has space for two more.

**Extension of ESD protection zones**

At Frauscher, all production areas are subdivided into specially-marked safety zones that can only be entered while wearing special clothing in order to protect the installed components from electrostatic discharge. With the expansion of the production area, it was decided to completely cordon off the whole area and only allow access with ESD protective clothing from now on. In order to make this measure possible, the entire floor of the premises was manufactured from conductive material and all entrances were fitted with access controls in front of the sliding glass doors.

**New engineering room for the whole production area**

Alongside the cascades of the temperature test cells, the newly constructed two-story engineering room contains major components for the building services systems and for the existing and expanded parts of sensor production as well as for board production, which has recently been optimized.

The room has its own ventilation system that ensure the ventilation of all production areas. In order to ensure the additional reduction of electrostatic discharges in the dry air, particularly during the winter, a separate humidification system has been installed. Devices that emit high levels of noise, such as the vacuum pumps for the casting lines, are also housed in the engineering room.

**Optimized storage logistics**

All chemicals that are used for coating or casting are housed in a chemical storage area that has also been enlarged. This area is equipped with shelving with inclined shelves and with a raceway system that guarantees "first in, first out" removal.
Frauscher is not just responding to the increasing diversification of requirements for optimization measures and an increase in capacity in the area of sensor production. The production of components for the indoor equipment of axle counters and wheel detection systems is also adapted to new requirements on an ongoing basis. For example, an in-house conformal coating system was recently integrated into the production process.

Looking beyond the rails

When components worthy of protection in the field of signaling technology are mentioned, the focus is generally on outdoor equipment. Sensors have to function in extremely unfavorable conditions and redundant designs are often used on sensitive track sections in order to increase the availability of the system. Intelligent functions to increase fault tolerance, such as supervisor track sections or counting head control, are also used to deal with faults outdoors. These have been shown to be responsible for the majority of the system errors that occur.

However, in view of the conditions that vary greatly between countries, the trend towards decentralized architectures and the high degree of receptiveness for specific requirements, Frauscher has realized at an early stage that it is not just outdoor equipment components that require special protection. Even in air-conditioned interlocking buildings, there are unpredictable factors that may influence the sensitive electronics of the evaluation boards. For example, it has been proven that even a spider walking across a circuit board can cause minor restrictions in function.

Ultimately, if the fixed interlocking building is replaced by decentralized cubicles in adverse environmental conditions, it becomes indispensable to protect the board components in an adequate manner. Frauscher gained this experience from its expansion in various climatic zones, including Kazakhstan, India, Australia and Latin America. Moisture, extreme temperatures and contamination were no longer considerations just for outdoor equipment. This also had to be taken into account to a certain extent with regard to the sensitive electronics in the indoor equipment.

Finding and optimizing solutions

Frauscher responded to these requirements with a high-quality standard solution that significantly increased the availability of the electronics: Conformal coating. In this process, a wafer-thin coating is applied to the fully-assembled circuit boards in order to protect them. In the past, this work step was carried out by a partner company in Austria. However, due to rising demand and increasingly tight production cycles that are currently restricted to five days in the systems production area, capacity limits were quickly reached using this arrangement. "Developing problem awareness, analyzing problems in a targeted manner and solving them plays a decisive role at Frauscher, both in areas such as research and development as well as in production. Tackling a challenge does not end with finding a solution. We respond to new trends and requirements in a flexible manner – and are ready to adapt resulting processes to current demand", explains Gerald Buchinger.

The conformal coating production step has now been taken on by employees in house, with the aid of the new system. The system is state-of-the-art. The connected curing oven guarantees a gentle drying procedure and enables the immediate resumption of production.
Eddy-Current Brake Compatibility: Lessons learned

The Eddy-Current Brake Compatibility (ECUC) research project, which is part of the European Commission’s 7th Framework Program, investigated the thermal, mechanical and electromagnetic interactions of eddy-current brake systems with railway infrastructure, namely the track and the trackside signaling equipment. Selected operators and manufacturers worked together in order to plan and test these interactions, develop new designs, and propose operational guidelines.

Project goals
The motivation behind this project was to clarify how ECBs affect technical equipment under various operational conditions and how these impacts can be handled. As an international technology leader for inductive sensor technology in the railway industry, Frauscher participated in this project by developing specific test models and procedures which were used to derive recommendations for OEM.

Cooperation as a key factor
It was confirmed that ECB-based factors influencing signaling systems, trains and tracks not only have to be considered by system integrators and OEM, but also by operators. These mechanisms were simulated using specially constructed software models and finite element analysis. Additionally, using a specially configured ICE train, running tests were conducted to obtain measurement data regarding rail temperature and magnetic interference. This data allowed the identification of, brake intervals, total braking time, brake force and more, as areas for optimization which could lead to the significantly increased efficiency of train operation. Moreover, the data were harnessed to validate the simulation models to allow virtual testing of scenarios not included in the running tests.

This shows that close cooperation between OEM, system integrator and operators can contribute significantly to the optimization of project design regarding the interoperability of ECB and the railway environment.

Innovative tools for new developments
For Frauscher, the successful contribution to the ECUC project has confirmed the company’s philosophy regarding research alliances and its products. The special tools that have been compiled during the project will be used to further develop the portfolio:

- Development of new measuring methods (besides inductive sensor technology)
- Advancement of existing technology, e.g., simulated tests of specific detection limits under individual conditions
- Simulation of sensors under unusual operating conditions

Frauscher’s main task was to develop detailed test models
All relevant metallic parts were considered in the models
The influence of the wheel on electromagnetic fields can be visualized

Validation field tests were conducted in Germany

Gavin Lancaster, Research & Development, Frauscher Sensor Technology

“The ECUC project was a very impressive and exciting topic to work on. For us at Frauscher it offered double benefits: On the one hand, we profited from the results regarding the influences of eddy-current brakes on the components of signaling systems. On the other hand, the specially developed tools and simulation models will increase and broaden opportunities to develop and advance new and existing products.”
Frauscher India: Setting and achieving milestones

Since its founding in 2013, Frauscher India has intensively pursued business development in railway markets throughout Asia. Having carried out a variety of projects focused on metro lines, the company has now won a contract to pursue a project with Indian Railways (East Coast Railways). This expands the activities of Frauscher India from metro lines to the field of main lines.

First project with Indian Railways
In the first mainline project for Frauscher India, tracks will be equipped with the ACS2000 Axle Counting System and RSR 180 Wheel Sensors. Services provided by Frauscher include project design, manufacturing and supply of products as well as supervision of installation work. Seeing this as an initial opportunity, Frauscher India will continue to establish and deepen its cooperation with Indian Railways.

Delhi Metro Line 8 through Nippon Signal
In a CBTC system, as a fall back arrangement axle counters are used as a track vacancy detection system to locate the train in case of failure of primary radio communication. In order to facilitate this requirement, Nippon has chosen the RDSO approved ACS2000. The contract awarded to the company involves installations at 25 metro stations and the Kalindi Kunj Depot of DMRC Line-8.

The project was carried out by means of cooperation between the Austrian and Indian facilities; in which, designs were delivered by Frauscher India and axle counter materials were imported from Frauscher Austria. The cabinets were wired and tested at the Frauscher factory in Mysore. The Factory Acceptance Test (FAT) was performed by a team of representatives from RDSO/DMRC and Nippon. Subsequently, material was delivered to the DMRC Depot at Kalindi Kunj, Delhi in December 2015. A trail installation of Frauscher Axle Counters was done at this Depot and on a main line in January 2016. Complete installation of the axle counting system will follow soon.

Kochi Metro through Alstom
Kochi Metro is a major rapid transit system project. It extends across 16 miles of metro line from Aluva to Petta, including 23 stations. The signaling contractor Alstom Transportation India Limited, has chosen Frauscher India as a partner to supply the Axle Counter ACS2000 for this project.

The equipment will be supplied and dispatched directly from the manufacturing facility in Mysore. The design and wiring of the cabinets is being developed at the Frauscher Design Office in Bangalore. The FAT is scheduled to be conducted in March 2016 by representatives from KMRCL/DMRC & Alstom.
achieving milestones

Projects throughout Asia

With offices in Delhi, Bangladesh and Malaysia, the subsidiary in Bangalore is also responsible for active sales and support throughout the Asian railway market.

Kyan Sit Thar Project, Myanmar

Hitachi Asia, Singapore, has awarded Frauscher the contract to supply axle counter systems to level crossings at Kyan Sit Thar for the Yangon to Pyuntaza section of Myanmar Railways. With a view to improving rail safety and contributing to the modernization, upgrading and diversification of the transportation infrastructure in Myanmar, Frauscher has proposed a multiple detection point solution using the ACS2000 Frauscher Axle Counting System for this level crossing project. Thus, Hitachi Asia awarded Frauscher Sensor Technology India the contract for the design, manufacture and supply of the ACS2000, which will be integrated into their level crossing control equipment.

Subang Jaya Skypark Project, Malaysia

In its role as signaling contractor, Ansaldo STS has awarded Frauscher the contract to supply axle counters for the Skypark Project in Malaysia. The scope of work involves 20 detection points to monitor the block section between Subang Jaya and Skypark stations, using the company’s latest generation of axle counters, the Frauscher Advanced Counter FAdC. After a successfully completed trial Frauscher received type approval for the FAdC to install axle counters at further KTMB undertakings.

The axle counter will be integrated into an existing signaling system which will monitor the newly constructed electrified double-track line between Subang Jaya KTMB Station and the new station at Skypark Terminal.
Mumbai Urban Transport Project: A huge Frauscher footprint in India

Over 6 million commuters each day, increasing passenger traffic as well as train frequencies and limited availability of tracks along with floods, heavy rains and an uncontrolled environment. These factors describe the challenging conditions for Mumbai Railway Vikas Corporation’s (MRVC) Mumbai Urban Transport Project (MUTP).

Railway sections in this project had formerly been equipped with track circuits for track vacancy detection. As this application is one of the most essential in this area, a decision was made to carry out a technological switch to increase safety and availability, particularly during the monsoon season. Therefore, the system needed to be upgraded to a modern axle counter technology as an additional train detection system.

Project scope
The year 2009 saw the installation of the first detection points and track sections of the project in Mumbai. As part of MUTP Phase II, which was awarded to Frauscher, MRVC planned to procure multi-section digital axle counter (MSDAC) systems while carrying out DC - AC conversion work.

Requirements
The project requirements included the use of modern axle counters with two reset options – PC based reset and conventional reset box based reset. Frauscher provided system design, delivery, installation, testing and commissioning of the axle counter system. With a train passing over the tracks every minute, it was also a challenging task to upgrade the system without affecting day-to-day train schedules and commuters.

Solution
The solution is based on a combination of the ACS2000 Frauscher Axle Counting System and RSR180 Wheel Sensor. The axle counter was first installed and tested on six track sections at Kanjurmarg station. Following the successful trial, the system was granted project-specific approval from the Research Designs & Standards Organization (RDSO). The equipment for the first station, Parel, was delivered ready for installation in May 2012.

Benefits
Since the axle counters were installed at Mumbai, the system has proven to work efficiently under extreme conditions – such as during flooding and excessively hot temperatures – and given existing dense train traffic. The concept for sensor installation on the track without drilling and the requirement for no trackside electronics have also proven to be advantageous.

Status of the project
Axle counters have improved the performance of Mumbai’s railway system as signal incidences due to track vacancy detection have fallen to almost zero. The Mumbai Division of Central Railway’s data shows that there has been a 66% reduction in track vacancy detection system failures and 32% improvement in suburban train punctuality due to signaling and telecoms factors with respect to overall performance. Having completed all installations, Frauscher is currently providing its customer with an Annual Repair Contract (ARC) to last for the next three years.

Key details of the project are:
- Section: Chhatrapati Shivaji Terminus (CST) Mumbai to Thane, Kalyan, Raoli and Jogeshwari stations
- Total Number of stations: 19
- Total number of detection points: 1584
- Number track sections: 1199

Wheel sensors work highly reliable even under water
huge Frauscher footprint in India

Meeting challenges and requirements
Every market is unique, and any new product has its own challenges in finding a suitable application. At first glance, some issues may seem insurmountable. But after careful analysis and appropriate adaptions, products can be modified to fit the purpose. This high flexibility and the philosophy of staying open minded make Frauscher a reliable global partner in the rail industry.

“We certainly had to face some issues during the installation phase, but all of them were solved in close cooperation with Frauscher experts. This underlines their customer focus once again: Global know-how, fast responses due to a high level of flexibility and innovative capacities enable the creation of individual solutions for specific requirements which operate perfectly when implemented in the system”, says Sanjay Singh, General Manager of Signal & Telecom, MRVC.

Rail specific claw
Having the clear objective of installing wheel sensors in a more flexible and cost-effective manner, Frauscher pioneered its patented rail claw through which wheel sensors can be easily mounted on track without the need for rail drilling. The easy deployment of rail sensors in such a busy area provided a clear advantage. Due to a high level of vibrations and shocks of up to 1000 g, these claws had to be redesigned to suit the Indian railway environment as per the RDSO requirements. This included a customization of the claw plates to fit the rail profiles as well as a modification to avoid damage to bolts caused by huge vibrations. In order to develop a satisfying solution, several tests were made at the laboratory in Austria. A range of prototypes was tested using a special pneumatic hammer to simulate real conditions. Finally a solution to make the claws more stable was found. The performance of these newly developed claw plates and bolts has been monitored regularly, and the failure rate has been reduced to zero.

Counting Head Control enables the non-detection of push trolleys

Push trolleys
The ACS2000 has a unique and patented technology called Counting Head Control, which is of significant importance for the Indian railways. Thanks to this technology, detection of push trolleys and a number of other influences can be suppressed and only train axles (more than two axles) are considered and counted. This helps to increase the availability of track sections by reducing the number of resets.

Track lead junction box
The IP 65 certified Track Lead Junction Box (TLJB) is used for connecting the wheel sensor cable to the underground quad cable that connects to axle counter indoor electronics. Typically, each wheel sensor requires one track lead junction box. Their design was also adapted as per Indian railway requirements. The customization included a provision for a lock and key option to prevent any external interference with the wiring.

Strain relief clamp
This product has been especially developed to meet Indian rail conditions. It helps to prevent strain on the sensor cables and to avoid damage to the cable. Around 1000 of these clamps have been installed at MRVC sites.

Shocks of up to 1000 g have been simulated in the laboratory

Counting Head Control enables the non-detection of push trolleys
Frauscher growing strong

The North American railroad industry is unlike any other in the world. It faces its own unique challenges and, therefore, requires its own unique solutions. That’s why Frauscher extended its reach and established a new North American branch specifically to help the industry face these challenges through education through a problem-solution approach. Frauscher North America’s mission is to help railroads generate more information with less effort with the ultimate goal of making railroading safer and more efficient.

Frauscher North America gives a memorable performance at RSSI 2015 Exhibition
Frauscher North America participated at RSSI 2015 in Minneapolis for the first time from October 4th–7th. Industry leaders and media representatives were highly impressed with Frauscher’s performance at the exhibition. At the Frauscher stand, attendees were introduced to the Frauscher FAdC Advanced Counter and the new RSR110 Wheel Sensor Family. They also had the chance to learn more about how these modern products can facilitate the implementation of a wide range of railroad applications for North American requirements.

Frauscher USA at RSSI 2015

Location and office capabilities for Frauscher Sensor Technology USA Inc.
Frauscher’s new subsidiary in North America is based out of Princeton, New Jersey, in the prestigious Carnegie Center office park. Its offices are situated in 300 Carnegie Center in almost 3000 square feet of office space, which will be complimented by a staging area and room for comprehensive customer training. Currently, the Frauscher US team consists of five employees and provides a full array of services in areas of sales, product management, engineering, supply chain management, marketing and administration.

The team of Frauscher Sensor Technology USA Inc. is fully available to address your concerns

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Vivek Caroli, Managing Director, Frauscher Sensor Technology USA Inc.
“We have a strong strategy and a great vision. As a next step, Frauscher strives to make the North American market as well informed and as confident in its inductive sensor technology solutions as other global marketplaces, including Europe, Latin America, Asia and Australia. Having learned more about the needs and specifications of the market from the technological point of view, we discovered a couple of unique requirements and applications for which we will develop and augment our existing product line. Each of these applications requires a different approach.”
in North America

New Frauscher Wheel sensor family

The increasing interest in high-quality wheel sensors with an open interface in the North American and further railway markets has been the moving force behind the development of the new RSR110. Due to the excellent performance and high demand for the RSR110 on the international market, Frauscher has developed a whole sensor family based on the RSR110 model to better equip the unique needs of the North American industry.

The RSR110 002 is equipped with only one sensor system and can thereby be integrated very easily into existing systems. It provides a customized solution for applications where only a traversing axle can be detected. The Wheel Sensor Signal Converter WSC, eases the basic evaluation of the analogue sensor signal. It supports both system integrators and operators in planning and operating new systems when implementing various applications using the RSR110 Wheel Sensor Family.

Reliable and precise triggering of trackside equipment

The RSR110 Wheel Sensor Family enables the accurate triggering of track side equipment, such as the AEI card reader, vision monitoring, hot box detection, wheel flat detection, lubricators or warning systems.

So far, more than ten companies have installed the RSR110 for triggering systems and applications, either in full commercial operation or on a trial basis. The feedback from the market has been very positive. The open interface of the sensor significantly facilitates implementation and interoperates seamlessly with individually developed evaluation boards and PLCs. Furthermore, the operators emphasize the benefits from the option to generate absolutely accurate measurement information about train speed, direction and wheel diameter when triggering train inspection systems.

The signal of the RSR110 can be evaluated flexibly as per to individual requirements
Frauscher North America: Increasing efficiency at Baltimore Staging Yard

The Baltimore North Avenue Yard is a staging yard where trains are parked and maintained. A manual system allows train engineers to stop at both entries and switch tracks to determine their route. This process is tedious and time consuming. To automate the functionality and modernize the yard, the first task was to use the latest technology for reliable and precise train detection. Together with M.C. Dean as a system integrator, MTA Maryland went for the Frauscher axle counter FAdCi.

Stuart C. Forth II, Systems Engineer at M.C. Dean, reports: “Frauscher performed the project planning, configuration file creation and board rack layout. The trial was a great benefit for both – M.C. Dean as system integrator and the client itself. It was wonderful to see the axle counter in person, to be able to touch and examine the components and to ask questions to Frauscher staff before ordering. The trial allowed us to influence the design early enough to make modifications. This led to an important decision that we made during this phase: our original intent was to use relay interfaces from axle counter to PLC for track section occupancy. Discussions during the trial made us go for the Frauscher Safe Ethernet FSE and the additional features available in it! The extensive use of the FSE simulator during the design phase to validate the interface between the axle counter and the PLC was guided by quick responses from the Frauscher staff.”

Having seen the equipment in use also enabled M.C. Dean and MTA to accelerate installation and start up time significantly. The field adjustments of the wheel sensors were quickly carried out through the rail claws. The pairing of the sensors to the AEB was also quickly done, as no special tools were needed.

Benefits identified by the system integrator:

• Counting of the rail cars stored in the yard is the immediate answer to capacity questions and train building operations
• Reduced risk of trailing switches since they are now remotely thrown and locked based on route selected by operator
• Event logging and alarming
• Wayside equipment that is easy to install and durable
  - Quick mounting and adjustment of sensors
  - Small, flexible cable to signal house
  - No electronics near the track

Operator: MTA Maryland  
Partner: M.C. Dean  
Scope of Supply: Delivery of components, Trial System  
Scope of Project: 31 counting heads  
Axle Counter: FAdCi  
Wheel Sensor: RSR180
Frauscher CIS: Level crossing solutions

Several projects in the CIS region have shown that level crossing solutions are highly applicable to this market. Frauscher Sensor Technology is represented by an office in Astana, where tailored solutions for appropriate applications are designed in direct cooperation with interested customers.

Operation trials
Together with EBE Solutions and Kazcentrelektroprovod, Kazakhstan Frauscher CIS has yet to implement two level crossing pilot projects for the national railway company of Kazakhstan, Kazakhstan Temir Zholy on the railway section between Astana and Almaty. In order to detect approaching trains and automatically control the protection system, Frauscher Wheel Sensors RSR180 are used in combination with Evaluation Boards AEB and the Frauscher Advanced Counter FAdC.

The flexible Frauscher Safe Ethernet, FSE, standard is used as an efficient software interface to the ISIS-LC system. This system is currently being run in two trials: the first project was requested in February 2014 and its trial run started at the end of 2014. The second level crossing followed in mid-2015.

“A great deal of interest in the whole region”
In addition to the extreme temperature in winter time, one of the big challenges of these projects was operating the special equipment from Kazakh and Russian manufacturers. This involved, on the one hand, the so-called PASh, an automatic level crossing barrier, and on the other hand, a level crossing blocking device, which is designed to prevent unauthorized vehicle entry if the crossing is closed. Based on global experience and ongoing developments, our equipment was capable of meeting these requirements perfectly. Of course these activities have gained high interest across the entire region. Therefore, the next step from our point of view is to work on an accreditation of the ISIS-LC system in combination with Frauscher components for the Russian market”, says Uwe Günther, Managing Director, Representative office of Frauscher Sensor Technology, Kazakhstan.

Uwe Günther,
Managing Director,
Representative office of Frauscher Sensor Technology, Kazakhstan
Frauscher Poland

Within the Polish railway industry, Frauscher Poland has been the first to recognize the benefits of using axle counters in the existing Eac, Eac95 and Eap relay block line systems. Due to significant changes compared to the prior usage of track circuits, it was necessary to obtain approval from the responsible Polish authority, UTK.

Three approvals, which allowed Frauscher to equip Poland’s most important railways with its Axle Counting System ACS2000, have been obtained. Installation has been carried out, for example, on the following lines:

- E20 Line Paris – Moscow (approx. 50 miles)
- CMK Line Warsaw – Katowice High Speed Line (approx. 124 miles)

Experience-based development: CBL2010

Having learned about local requirements, Frauscher Poland participated in the development of the fully computerized CBL2010 block line system, which was led by their partner Sig-Mont. This cooperation enabled a solution, which makes it possible to connect the block line system to the ACS2000 via a digital software interface.

2013 saw the first railway line equipped with CBL2010. One year later three more systems followed on a track length of 62 miles. Positive experiences and further developments have gained increasing interest from the Polish railway market. Therefore in 2015 Frauscher and Sig-Mont were able to install the ACS2000 together with CBL2010 in four more places over approximately 124 miles of track on major Polish railway lines.

Updating the established ACS2000

Today a large proportion of railway throughout Poland uses the ACS2000. To provide new and existing customers with optimum service and products, Frauscher is currently making progress to obtain the approval for an update of this tried and tested axle counter. This next generation of the ACS2000 will make it possible to speed up commissioning, installation and maintenance by providing automated processes related to these tasks.
Frauscher Brasil: Conducting business at NT Expo 2015

The 18th NT Expo “Business on Rail” took place from November 3rd–5th, 2015 in São Paulo. The team from Frauscher Sensor Technology Brasil Ltda. seized the opportunity to present the latest technologies from Frauscher to an international audience. Attendees were attracted by the wide range of capabilities that the Frauscher Advanced Counter FAdC offers by providing information for a wide range of applications. Many of them took advantage of the opportunity to discuss individual requirements, such as the prevention of vandalism or the transmission of data from decentralized infrastructure to centralized locations, directly with Frauscher experts in attendance. No questions about the FAdC’s properties, such as about its modularity, flexible interfaces and the ability to implement customized software protocols or use the Frauscher Safe Ethernet FSE protocol, were left unanswered.

“We know that Latin American railway markets are highly interested in finding, testing and installing new safe, reliable and highly available components for train detection. Frauscher supports these approaches with individual trials and training activities, which give customers the opportunity to gain hands-on experience regarding the benefits of using modern axle counters for making railway operations safer and more efficient. The NT Expo 2015 provided a great opportunity to communicate these opportunities to our customers – and we gained great feedback on that.” Maicon Ferrari, Managing Director, Frauscher Sensor Technology Brasil Ltda.

Apart from its software interface and flexible configuration capabilities, the FAdC enables maximum uptime of the signaling system by using intelligent fault tolerant functions: Supervisor Track Sections and Counting Head Control. These are implemented in the axle counter and do not affect the safety level at any time when in use.

“We have already introduced these approaches to our customers in the UK and are looking forward to demonstrating the benefits of their use in operation. The FAdC definitely represents the next step in modernizing railways throughout Great Britain, as it provides a broad portfolio of individual capabilities to optimize railway operations on mainlines and in industrial environments, such as yards and even on urban lines”, says Elaine Baker, who has been Managing Director of Frauscher UK Ltd. since June 2015.

Frauscher UK: Introducing new technologies to the market

Having introduced beneficial solutions for increased system availability to the world-wide railway industry, Frauscher UK has attracted interest in its technology in Great Britain as well. Frauscher UK is now preparing to obtain approvals for its next generation axle counter, the Frauscher Advanced Counter FAdC.

Frauscher Advanced Counter FAdC
Frauscher training programs

Individual training programs are a way of communicating essential expertise about Frauscher products. Given correct installation and relevant basic knowledge of the functionalities and operation of the system, a minimal level of maintenance is guaranteed. In addition, this ensures the high level of availability of the products.

Relevant workshops are also held at a variety of locations, either at the customer’s premises or even at the Frauscher company headquarters, where we have a modern, large-scale training center that can accommodate up to 30 people. All the Frauscher components are available in installations there to provide a “hands-on” experience.

Get more information and reserve your place at a training program: training@frauscher.com

Exhibitions & Conferences in 2016

In 2016, Frauscher Sensor Technology will be represented at a range of international exhibitions and conferences. We are looking forward to welcoming you at one of these events.

- EurasiaRail | Istanbul, TUR
  - March 3–5, 2016
- Short Line & Regional conference (ASLRRA)
  - National Harbor, US
  - April 3–6, 2016
- Rail Solutions Asia | Kuala Lumpur, MY
  - May 11–13, 2016
- RSSI C&S Exhibition | Grapevine, US
  - June, 28–30 2016
- AREMA | Orlando, US
  - August 28–31, 2016

Frauscher at InnoTrans 2016

InnoTrans | Berlin, DE
- September 20–23, 2016
- Under the motto “Track more with less”
  - www.frauscher.com/innotrans

Save the date:
Frauscher Stand Party
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