RAILWAY SYSTEMS

RAILWAY SOLUTIONS FOR THE MIDDLE EAST

www.voestalpine.com/railway-systems

voestalpine
ONE STEP AHEAD.

Tailored solutions for critical environments

voestalpine VAE and voestalpine Schienen are the leading companies in the fields of turnout systems and rails.

The voestalpine VAE group, a wholly owned subsidiary of voestalpine AG and headquartered in Austria, is the global market leader for railway turnout solutions, innovative drive, detecting, locking-systems, monitoring equipment for rolling stock as well as fixed infrastructure assets and a variety of related services complement the product portfolio.

Furthermore, voestalpine VAE is a provider of train control & signaling solutions and turnkey railway systems for private/industrial clients (i.e. marshalling yards, railway infrastructures for ports or industrial facilities).

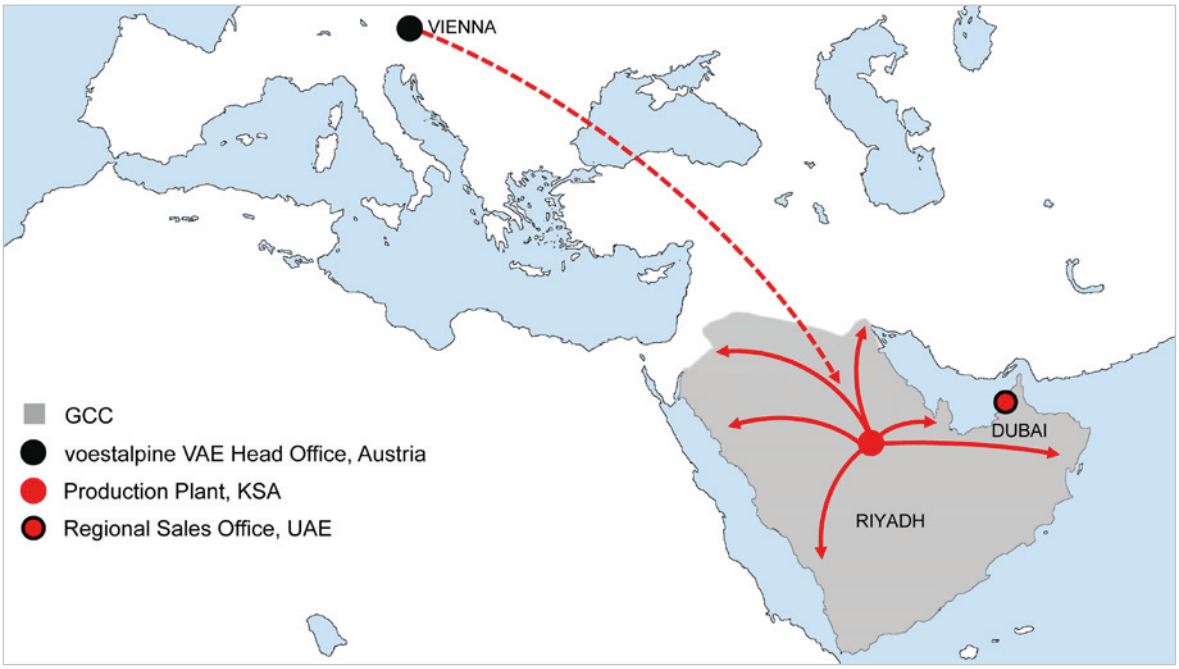
Numerous well-known references for High Speed, Heavy Haul, Industrial Railways and Urban Traffic applications from all over the world outline the comprehensive competence and long history of voestalpine VAE, the unchallenged number 1 in the industry sector.

As European market leader and innovation pioneer with a worldwide reputation, voestalpine has played a decisive role in the development of modern railway rails. Building on this competence advantage we exclusively produce rail products of the highest quality and launch new problem solutions on an ongoing basis in the markets.

For this purpose we combine leading edge technology with decades of experience and comprehensive system competence, thus offering our customers worldwide an outstanding benefit package.
In particular heat-treated premium rails, a speciality of voestalpine Schienen, generate sustainable and measurable customer benefit by a significant increase of the track performance, while the life-cycle costs are considerably reduced, is at the core of all our activities.

More information is available on page 4.

With a well-established organization in the GCC countries*, a production plant in Saudi Arabia and Sales Office in Dubai, UAE, and extensive experience, voestalpine VAE and voestalpine Schienen are your first-class local partners in the Middle East railway market.
*GCC - Gulf Cooperation Council

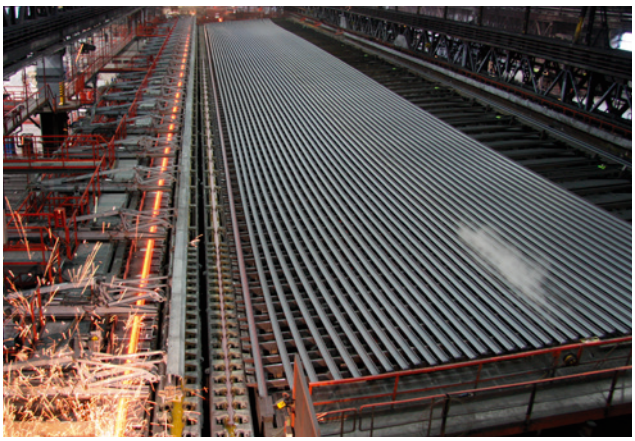


- Turnout and permanent way system solutions of highest quality standards for high speed, heavy haul and standard traffic systems such as metros, light rail and tramway systems.
- Compliant with all track/turnout geometries, international standards and permanent way types (UIC, AREMA with different gauges, radii, fastening systems, for ballast or slab track systems).
- Fully encapsulated, sealed and water- & dust-tight turnout and permanent way components designed for the prevailing harsh environmental and desert conditions of the Middle East region.

We specialize in offering and providing all-encompassing "one-stop-shop" solutions for turnouts, such as

- Early stage design and engineering support
- Manufacturing and supply of turnouts, turnout and permanent way components
- Production of complete turnouts in voestalpine TSSA's local production facilities in Saudi Arabia
- Just-in-time delivery of fully assembled turnouts to construction/installation sites
- On-site installation of turnouts and turnout components on a just-in-time basis
- Commissioning services and supervision services of site installation works
- Inspection & maintenance services for all turnouts and turnout components
- Training of local maintenance and operation staff
- Remote diagnostic and technical support by means of fixed infrastructure asset and rolling stock diagnostic systems
- Rail surface and manganese crossing repair welding support

WORLD MARKET LEADER AS YOUR LOCAL PARTNER



PREMIUM RAILS BY VOESTALPINE SCHIENEN

voestalpine Schienen GmbH, a sister company of voestalpine VAE GmbH, is the European rail market leader and a global player with activities in Europe, the MENA region, the Americas, Russia, South East Asia, the Far East and Australia. Total annual rail output amounts to more than 600.000 tons, i.e. if welded together in one string, would cover a linear distance from our plant in Austria to destinations as far away as Cape Town, Vancouver or Seoul. Heat treated premium rails account for a share of more than 50%, with growing tendency.

OUR POSITIONING: PERFORMANCE UP – COST DOWN WITH HEAT-TREATED PREMIUM RAILS

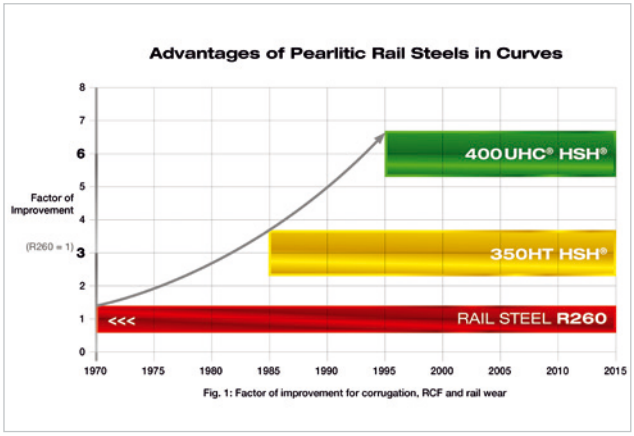


Fig. 1: Factor of improvement for corrugation, RCF and rail wear

As innovation pioneer with a worldwide reputation, voestalpine Schienen combines leading edge technology with decades of experience and comprehensive system competence.

Our own patented HSH® (Head Special Hardened) technology is a large-scale high-precision process which allows us to produce heat-treated rails of a consistently topmost quality in sync with the rolling cycle. Not only that we can heat-treat practically any, even most complex rail profile. We also have developed specific solutions for each rail traffic mode, thus offering our customers an outstanding benefit package:

- **Decisively higher resistance to wear and other rail damage, resulting in a multiplication of rail service life as compared with standard grade steels**
- **Superior track performance is combined with significantly less maintenance needs, thus increasing the capacity while reducing the lifecycle-cost considerably**

Therefore, rails from voestalpine Schienen are a first choice whatever the application is: high speed, heavy haul, mixed traffic or urban rail.

OUR TECHNOLOGIES AND FACILITIES: HIGH-TECH FOR HIGH PERFORMANCE

Our dedicated rail rolling mill in Austria is considered as the global industry benchmark. All key aggregates of the value added chain, the adjacent BOF compact steel plant, the rolling line, the heat treatment facility down to the test center and the rail finishing/dispatch area have been newly invested in the past few years.

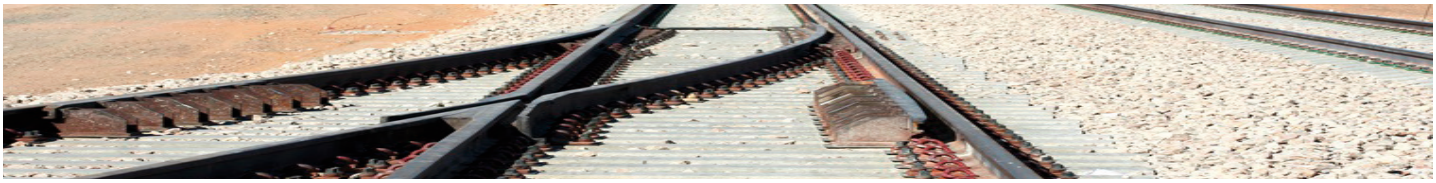
Our Rail Technology Center is a powerhouse of applied rail R&D which networks with customers and scientific institutions around the globe. Thus we are able to launch new problem solutions in the markets on an ongoing basis. Beyond that we offer comprehensive premium advice for rails, their application and all related technical issues.

OUR MARKET POSITION IN THE GCC-COUNTRIES: DRIVING YOUR SUCCESS BY INNOVATION

Our association with the region started already a century ago when we supplied the rails for the Hejaz railway. Today, voestalpine is one of the leading rail suppliers with a supply volume of about 100.000 tons over the last years, including standard and heat-treated premium steel grades for various railway projects in the Kingdom of Saudi Arabia and the United Arab Emirates, including the North-South Railway, the Etihad Rail network and even tramway projects in Doha, Qatar and in Dubai.

HSH® HEAT-TREATED PREMIUM RAILS: CUSTOMER BENEFIT IS OUR TRADEMARK.

voestalpine TSSA



TURNOUT TURNKEY SERVICE SOLUTIONS LOCALLY PROVIDED SERVICES IN THE GCC REGION

With many years of experience in the Middle East region voestalpine VAE decided in 2010 to found a local production facility in the heart of the Arabian Peninsula, so to suit the growing demand of the emerging railway market in this region.
With the establishment of the production facility of voestalpine TSSA in Riyadh, Saudi Arabia, voestalpine VAE GmbH expanded its global network of over 42 production facilities also to the Middle East region.
With the focus on state-of-the art railway technology and highest production qualities, voestalpine as a brand is renowned for on a global level, voestalpine TSSA is bringing this to the GCC railway market.

PRODUCTION PLANT - RIYADH, KSA

With the establishment of production facilities in Riyadh (KSA) vaTSSA is setting new standards for high quality productions in the GCC.

EXPERIENCED WORKFORCE

With vaTSSA's experienced local workforce vaTSSA can guarantee top quality productions and local installation & maintenance services on short notice.

TRANSPORT & LOGISTICS SOLUTIONS

Due to vaTSSA's capability to deliver pre-assembled turnouts by road or rail directly to installation site the highest factory quality is guaranteed on delivery.

JUST-IN-TIME DELIVERIES

Just-in-time deliveries of pre-assembled turnouts to installation site provide massive cost reductions - as on-site storage & assembly facilities are obsolete.

TURNOUT INSTALLATION SUPERVISION

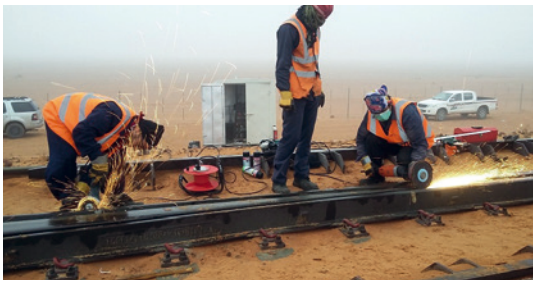
To ensure the full quality within the supply chain, vaTSSA is providing installation supervision services performed by local, experienced and trained installation teams.

ENGINEERING SERVICES

To suit all customers requirements vaTSSA is providing a wide range of engineering services, such as supervision or test & commissioning services.

MAINTENANCE

To guarantee maximum product life-times and a full system availability, vaTSSA is providing general and long-time maintenance services as required.



TRAINING

Training of Maintenance & Operation Staff, thus to ensure a correct and proper handling, operation and maintenance of all voestalpine components.

REFERENCES:

Riyadh Metro, Haramain High Speed Line (KSA), Saudi Railways Organization (SRO), Saudi Railway Company (SAR), ARAMCO's Depots at Sulphur Handling Facilities (KSA), etc.

voestalpine SIGNALING

The voestalpine SIGNALING group is an international technology leader and offers innovative point operating, locking and monitoring equipment, signaling solutions, diagnostic systems for fixed assets and rolling stock, as well as a comprehensive range of services.

Sand, dust, heat and wind require special considerations when it comes to building a railway line in desert areas as they prevail in e.g. the MENA region. Regional peculiarities must be taken into account when designing equipment for the use in challenging environments. Therefore, we have precisely analysed various desert conditions scientifically and adapted its turnout technology accordingly. Tests in compliance with MIL-STD 810 F, ASTM D 968-05 and adapted test methods according to DIN 52348 have resulted in sophisticated designs which provide top functionality of our turnout systems. existing sleepers. Each detector half consists of a fixed and a moveable part and monitors the position of the closed and the open switch blade. Each detector detects a tongue rail in both end positions, so there is a double control of the turnout.

ECOSTAR – a compact electro-hydraulic point machine – serves to switch rail turnouts independently from types or gauges with an external lock. It is made up of an electro-hydraulic point operating unit, a detection module for monitoring the final positions of the tongues, which also locks the tongue detectors, and connections to an external lock and the interlocking system.

- Developed and registered according to CENELEC 50126, SIL 4
- For switch assemblies and movable crossings
- Trailable and non-trailable variants available
- Works with different supply voltages and signaling requirements
- Available as IP67 system (sand and dust proof)
- Guarantees highest availability and reliability

SPHEROLOCK® NG – a fully encapsulated and externally lubricant-/grease-free locking system as a specific desert solution, since sealed, water- & dust-tight.

- Fully sealed & encapsulated components
- Water- & dust-tight designs
- Externally lubricant-/grease-free
- EXTENDED Inspection Intervals
- EXTENDED Maintenance Intervals

EPD 4.0 – the new End Position Detector 4.0 (4th generation end position detector) serves to monitor the position of the tongue rails and will be mounted outside of the track on existing sleepers. Each detector half consists of a fixed and a moveable part and monitors the position of the closed and the open switch blade. Each detector detects a tongue rail in both end positions, so there is a double control of the turnout.

- Applicable for all gauges and vignol rail profiles
- Protection class up to IP67
- Machine tamping possible
- Easy inspection and maintenance

REFERENCES:

Transnet, TCDD, ANESRIF, ARTC, Rail Corp, Rio Tinto, Queensland Rail, Metro Tunis, Korean Railways, KVB Germany, OBB, Vienna Metro, MAV, PKP Poland, Attiko Metro, etc.

voestalpine SIGNALING

voestalpine SIGNALING offers innovative products and systems for public transport as well as for heavy rail applications and industrial railways. The products have been established in the past years within the GCC Region and our customers prefer the high quality of our products and their capabilities to withstand harsh environmental conditions.

UNISTAR HR SWITCH MACHINE

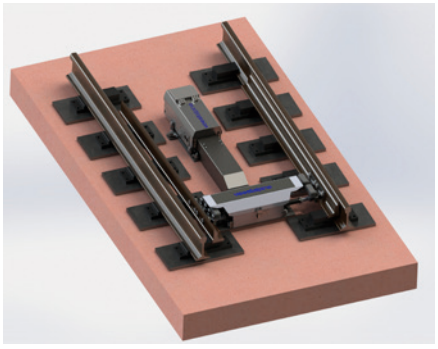
UNISTAR HR stands for the latest generation of integrated point setting and locking systems. Compact modules allow for unrestricted arrangement in the track. The system can be installed on top of a concrete sleeper and allows for fully automated tamping.
Such installation includes all benefits of a hollow bearer installation like e.g. perfect track balance, however, comes with further advantages, as the concrete sleeper provides a more stable position in the ballast and cannot fill up with sand. Points as well as swingnose frogs can be equipped with always the same module for single or multiple setting levels. The switch machine is available with up to four setting levels linked by one hydraulic unit.
Only one interface to the interlocking system is needed. As an alternative the UNISTAR HR is also available as electro mechanic version. The UNISTAR HR EM, equipped with a strong, clutch less torque motor. The high flexibility of the system introduces further advantages on site, the low profile with less than 175 mm allows for direct fixation of the system on concrete slab and without the need of space and/or niches beside the tracks.

UNISTAR HR, Etihad Rail, Abu Dhabi

UNISTAR HR EM, SRO, Riyadh

TECHNICAL DATA UNISTAR HR

- Safety Level: SIL4 according to DIN EN 50126, 50128 and 50129
- MTBF >500.000h
- MTTR : <20min
- Environmental conditions: Temperature -40 to +80C°, Solar Radiation tested with 1120W/m^2
- Standard configuration: Humidity up to 95%
- Degree of Protection: IP67
- Weight - electro-hydraulic drive: DLD unit approx. 80kg, Motor unit approx. 50kg
- Weight - electro-mechanic drive: DLD unit with integrated motor approx. 75kg
- Throw Time: 1-5 sec
- Throw Force: up to 17000 N, adjustable
- Motor Voltages: 24-750V AC or DC
- Switch Point Opening: 60-163 mm, adjustable
- Locking System: Lock integrated prism lock, trailable or non-trailable
- Fixation to Track: concrete or hollow sleeper, stock rail fixation, sleeper fixation
- Interfaces to Trackworks: all types of turnouts, with or without tongue connecting rod



UNISTAR HR, Riyadh Metro, Doha Metro

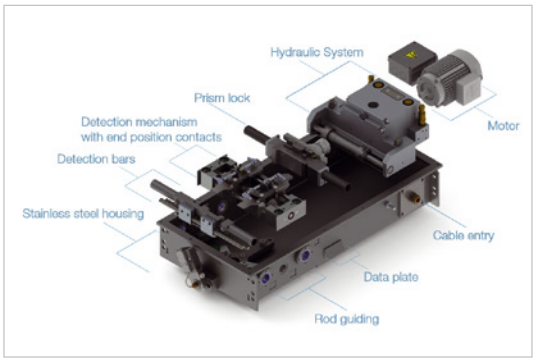
REFERENCES - UNISTAR FAMILY OF SWITCH MACHINES:

Saudi Railway Organization, Etihad Rail Stage-1, Al Sufouh Tram, Riyadh Metro, IZBAN – Turkey, RET Rotterdam, RATB Bucharest, BLT Baselland Transport, Basel Metro, GMPTE Manchester, TCDD – Gebze-Köseköy, Berliner Verkehrsbetriebe GmbH (BVG), RATP Paris, Chicago Transit Authority – USA, ProRail – Netherlands, ATM Milano – Italy, etc.

voestalpine SIGNALING

UNISTAR CSV 24 SWITCH MACHINE

The low profile of UNISTAR CSV 24's stainless steel box together with its outer dimensions of only 920 x 450 x 180 mm (36 x 17.75 x 7 inches) is housing all mechanic and electric hydraulic modules in compact design. Beside the universal use for both, grooved rail and T-rail turnouts, its low height also allows for using the system in embedded conductor rail solutions. The fully modular design is clearly arranged and makes retrofits easy.



TECHNICAL DATA UNISTAR CSV 24

- Safety Level: SIL4 according to DIN EN 50129
- MTBF >500.000h
- MTTR : <15min
- Environmental conditions: Temperature -40 to +80C°
- Standard configuration: Humidity up to 95%
- Degree of Protection: IP67
- Weight - electro-hydraulic drive: approx. 195kg without fixation elements
- Throw Time: 1-5 sec
- Throw Force: up to 9000 N, adjustable
- Motor Voltages: 24-750V AC or DC
- Switch Point Opening: 34-120 mm, adjustable
- Locking System: Lock integrated prism lock. trailable or non-trailable
- Fixation to Track: earth box, stock rail fixation, sleeper fixation
- Interfaces to Trackworks: all types of turnouts, with or without tongue connecting rods

UNISTAR CSV 24, Al Sufouh Tram, Dubai

SIGNALING SOLUTIONS FOR YARDS AND DEPOTS

The Unilock EOW, combined with the TCS VISIO Software, stands for a state-of-the-art signaling and train control system of local electrically operated turnouts for railway yards, depots and industrial railway infrastructures of any size.

This system, approved and certified according to CENELEC SIL 3 provides a high security level for - compared to conventional applications for locally operated turnouts – furthermore, it is also used on several passenger lines. The system includes extensive monitoring systems for the OCC. For local operated turnout control system a power supply solution via solar panels is also available.

The SIL 4 certified PLC and software allows an adjusting of the system to any site requirements and conditions in a flexible manner. The entire system components, incl. the route setting boards of stainless steel, signals and vandalism safe push buttons are all designed for operation under e.g. harsh environmental desert conditions – representing the ultimate system solution for the Middle East and providing an outstanding safety level.

SRO Depot, Riyadh

TCS 300 - Solar Powered

REFERENCES - YARDS AND DEPOTS:

Saudi Railway Organization, Port of Stuttgart, IZBAN – Turkey, RET Rotterdam, Rheinbahn AG, Stadtbahn Saar, RATB Bucharest, BLT Baselland Transport, Basel Metro, BSAG Bremen, GMPTE Manchester, etc.

voestalpine SIGNALING

Hazard Alert & Diagnostic Systems: The voestalpine SIGNALING group is a global leader in providing wayside diagnostic and monitoring technologies that focus on safety and efficiency. With our range of products you will be assured of constant and precise monitoring of both your network and your trains that contribute in turn to high levels of safety and greater customer satisfaction. With PHOENIX^{MDS}, our new modular structure of railway diagnostic and rolling stock monitoring technologies, we offer a wide range of functions that have been designed to provide accurate data even in harsh desert environments.

PHOENIX^{MDS} HBD/HWD – Compatible with all types of rolling stock PHOENIX^{MDS} HBD/HWD Hot Box and Hot Wheel Detection functions identify and alert operators to excessively high temperatures of passing trains. With references from Europe's fastest railways HBD/HWD scanners accurately capture temperatures up to a speed of 500km/h using 8 beams with infra-red technology for a wide detection area. The desert option works at temperatures as high as 70°C and is equipped with a new generation of cover to withstand the harsh desert environment.

PHOENIX^{MDS} ECM – Environmental Condition Monitoring delivers accurate data and alarms in case of hazardous weather conditions such as sandstorms and high winds. Through both a sand particle detector and wind sensor PHOENIX^{MDS} ECM provides accurate real time alerts directly to your railway control center enabling speed reductions and safety measures to be communicated and implemented before a derailment occurs. Made with high quality components its robust construction has been proven in the world's harshest environments.

PHOENIX^{MDS} WIM/WDD – Using high accuracy fibre optic sensors PHOENIX^{MDS} WIM/WDD Weighing in Motion and Wheel Defect Detection functions offer reliable, continuous and cost effective management of locomotive and wagon wheels up to a speed of 500km/h. Twelve sensors attached to the rail without drilling measure the impact forces, wheel defects and weights of passing trains. Each wheel defect and the weight of each train is analyzed and transmitted in real time to the train control center where operators can react to alarms, and assess the defect before damage is caused to vital infrastructure.

PHOENIX^{MDS} DED – The function PHOENIX^{MDS} DED Dragging Equipment Detection monitors the undercarriage of passing trains for dragged parts using accelerometers. Just as with our other Wayside Monitoring technologies customers have the benefit of real time alerts sent directly to the control center that enable immediate action to be taken, preventing further damage to the train and track structure.

PHOENIX^{CMS} – voestalpine SIGNALING's Central Management Software PHOENIX^{CMS} is an innovative and high capacity software solution with intuitive applications for the daily diagnosis and management of assets. It handles various equipment, protocols, data and processes in real time and displays them in a user friendly format to the customer. With a customizable interface and the potential to handle and interpret data from 3rd party systems and devices all within a single system.

REFERENCES:

Saudi Railway Organization, Saudi Railway Company, Iranian Railways, Transnet, ARTC, QR National, Rail Corp, Rio Tinto, Deutsche Bahn, ADIF, Network Rail, RFI, BNSF, Union Pacific Railroad, OBB, SBB, SNTF, etc.

voestalpine SIGNALING

voestalpine SIGNALING provide diagnostic systems for fixed infrastructure, assisting rail operators to implement smarter maintenance practices and prevent asset failures.
Key parameters reflecting asset performance are measured to identify deteriorating condition and issue automated alerts allowing scheduled maintenance before a failure occurs.

MONITORING SOLUTIONS:

A versatile range of field hardware and software systems offer an end to end solution to monitor the condition of a broad range of vital rail assets, maximising availability and reducing maintenance costs:

- Points & Switch Machines
- Track Circuits
- Level Crossings & Signaling
- Power & Cable
- Track & Rail health

POINTS CONDITION MONITORING:

Specialist algorithms are used to warn when normal operating characteristics are exceeded.
Proven in operational use with leading railways to reduce point failures.

TRACK CIRCUIT MONITORING:

Detect deterioration in track circuit performance before failure. Solutions for AC, DC, High Voltage and Audio Frequency systems.

LEVEL CROSSING & SIGNALING MONITORING:

Event recording for relay interlockings and electronic systems such as SSI and Westrace.
Level Crossing event logging, integrated condition monitoring and automated testing.

POWER & CABLE MONITORING:

Any installation can be easily expanded to include monitoring of critical signaling power supplies, Earth Leakage & detection of cable theft.
Power faults can be investigated and rectified before asset performance is affected.

TRACK & RAIL HEALTH:

voestalpine SIGNALING Whiteley flexible architecture allows monitoring to extend beyond the signaling domain to track/rail health measurements such as ground water/rainfall, track movement and rail temperature.

REFERENCES:

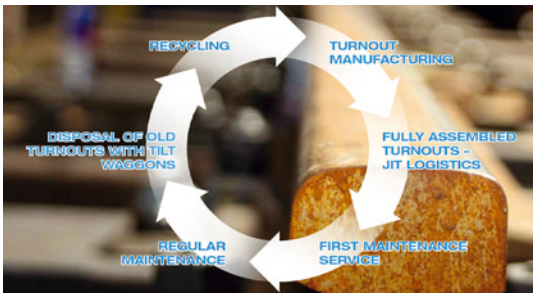
Network Rail, CTRL, Rail Corp, QR, Aurizon, RioTinto, Metro Trains Melbourne, MTR Hong Kong, TCDD, Deutsche Bahn, OBB, Vienna Metro, SBB, BLS Alp Transit, ADIF, Korean Railways, HSL Zuid, Taiwan High Speed Rail, MAV Jernbanedrift etc.

Holistic servicing

TURNOUT SERVICE

Targeted and planned servicing is an indispensable necessity for the achievement of desired levels of track availability and reliability. Regular grinding of all rail in track, including in turnouts, is a fundamental component of a holistic service strategy. The objective of track and turnout rail machining is to keep the consequences of rail damage as low as possible for the overall system and to thus minimise operating costs.
As a holistic turnout system provider, voestalpine VAE offers the network operator cost-optimised and environment-friendly rail service and repair options including rail grinding or machining; the clear objective being to economically extend the life of the turnout

- First maintenance action for turnouts
- Initial survey and recommendation support
- Regular grinding service
- Correction of track gauge, check-rail gauge and flange groove
- Bending of tongue rails in the switch device
- Repair welding (crossing, tongue rail area, running rails)
- Cleaning from sand / Lowering ballast level in turnout area
- Geometrical check: gauge, general condition, expendable parts
- Ultrasonic testing
- Supervision on site and commissioning



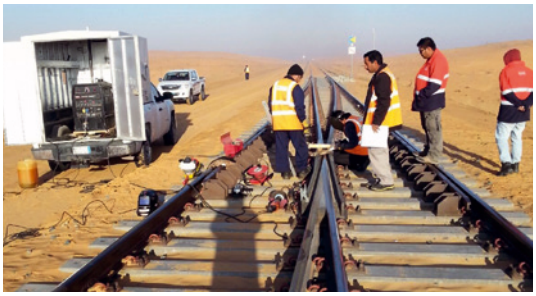
Life Cycle Management of turnouts

TURNOUT SERVICE PACKAGES

In order to ensure reliability and efficiency of all system components, we offer the following service packages following turnout installation:

A - Initial Survey & Recommendation Report

- Complete inspection and survey of turnouts
- Provision of turnout condition report
- Recommendations on spare part concept
- Recommendations on maintenance and repair



B - First Turnout Services

- Turnout condition check: geometry, rail components, fastening material, base plates, locking device
- Maintenance by grinding: switch device, crossing
- Adjustment of the track in the crossing area
- Final inspection, commissioning, reporting

C - General repair work

- Bending of rail / switch rails, adjustment of locking device
- Heavy repair grinding of material flow breakages or splits
- Repair welding (build-up welding, including final grinding)
- Final inspection, commissioning, reporting

voestalpine VAE GmbH
Regional office GCC

Sales office:
P.O. Box 262840, Jebel Ali Free Zone,
South Zone # 3, Showroom No. S3A2SR04
Dubai, United Arab Emirates
T. +971 (0)4 8870 704-208
F. +971 (0)4 8870 705

voestalpine TSSA
Turnout Production Plant

Head office:
Malaz, 2509 Nori Street, 6747
Riyadh 12836, Saudi Arabia
T. + 966 115 119 799

Turnouts Factory:
2nd Industrial Zone, New Kharj Road, Exit 13
Riyadh, Saudi Arabia

Mr. Hartwig Lankow
Regional Sales Manager GCC
M. +971 (0) 50 100 5441
Email: hartwig.lankow@voestalpine.com

voestalpine Schienen GmbH
Kerpelystraße 199
8700 Leoben/Donawitz
Austria

Mr. Reinfried Pichler
Vice President Sales
T. +43/50304/26-4417
F. +43/50304/66-4990
M. +43/664/836 38 06
Email: reinfried.pichler@voestalpine.com

voestalpine VAE GmbH
www.voestalpine.com/vae
www.voestalpine.com/middleeast

voestalpine Schienen GmbH
www.voestalpine.com/schienen

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