MANAGE Process

SDS
Modular Production and Logistics Management System

Modules | Functions | Advantages

VMT

SDS | Modular Production and Logistics Management System

The experience that VMT has gained for 25 years of worldwide tunnel projects has been integrated into the development of this modular production and logistics management system.

With its SDS.Production, SDS.Storage and SDS.TBM modules, the system comprehensively controls, monitors and documents all the major processes within the production and storage of segments and captures their position and installation data in the tunnel. SDS thus guarantees plannable, efficient, transparent handling on site. The system can be adjusted as required so that the customer's specifications and guidelines are followed and implemented in all stages in the process.

SDS is far more than a documentation system – as an integrated solution, it manages and accompanies the life-cycle of the segments from the production stage to the tunnel. In this, SDS ensures compliance with quality and documentation standards combined with optimum use of resources, excludes risks, avoids errors and reduces costs. All areas of the tunnel site are linked to an intelligent, efficient workflow network, thanks to SDS.

Benefits

- Requirement-focused production planning according to the advance of the TBM
- Compliance with defined quality standards and documentation requirements for production and storage
- Traceability and transparency of all segment-related data and information – at any time, at different locations (production hall, production office, crane, outside area, TBM)
- Optimal planning and use of storage capacities
- Attractive human resources savings potential compared with traditional production documentation processes
- Reduction in error potential and therefore error rate in production
- Avoidance of wrong deliveries of segments to the TBM
- Considerable expansion potential of the core system through relevant interfaces

"Through SDS, the error rate is zero. Mistakes caused by 'the human factor' are discovered early on through feasibility controls and can be overcome with little effort. A wrong delivery to the TBM, for example, costs a great deal of money because of the need to replace rings and the associated downtimes, and yet it still happens time and again. At the Koralm Tunnel KAT 2, we have so far not had a single wrong delivery, thanks to using IRIS.tunnel and SDS. The reduction in the number of staff needed over the total term of the project covers the costs of the system completely.
In my opinion, the error avoidance and computer-guided logistics delivered by SDS enables the process to run really smoothly on the building site."

Andreas Lange (*Segment Production Manager at ARGE Koralm Tunnel KAT 2)*

SDS.Production

The SDS.Production module supports production planning and ensures compliance with defined quality and documentation standards. SDS manages both stationary and carousel production.

SDS.Production | Features

For identification, each segment is provided with a barcode label/RFID tag with its own individual dataset, in which information such as the reinforcement used, tools, concrete composition and geometry of the segment etc. are recorded using scanners and interfaces. Alongside this documentation function, every work stage and all the components are specified and monitored by the system → production errors are avoided.
Damage caused to a segment can be recorded, photographed and classified in the database using scanners → the delivery of faulty segments is prevented.
At the press of a button, the software can also prepare all sorts of evaluations and reports which can be used by the people responsible as an important basis for discussions and decisions.

Module characteristics

- SDS-Stationary for stationary production
- SDS-Carousel for carousel production

Options

- Temperature sensors for the curing chamber
- Quality control through 3D measurement using the supplementary LIS product
- Synthetic label/RFID tag for long-term identification of segments after installation

Interfaces

- Communication with an ERP system (e.g. SAP)
- Interface to the concrete mixer for part-automation of concrete ordering
- Interface to existing heat sensor technology
- Interface to data management system, Herrenknecht.Connected – a joint system solution from VMT and Herrenknecht

SDS.Production | Benefits

- Reduction in repair, reject and removal costs: through monitoring and direct feedback, SDS can prevent errors before they happen (wrong reinforcement in the mould, wrong concrete mix, etc.)
- Easier and faster training of new employees: SDS sets out defined stages on the hand-held scanner and takes users through all work stages
- Time is saved by part-automation of the documentation: the system creates absolute transparency about the state of the production process at all times
- Facts-based reporting to the client: thanks to evaluations in seconds and complete, seamless site documentation

SDS.Storage

The SDS.Storage module manages and organises storage as well as store-in and store-out processes. Thanks to its modular functions, various production and site storage systems – including partly or fully automated systems – can be supported.

SDS.Storage | Features

Clearly defined storage and stacking rules make incorrect deliveries impossible and save storage space. There is no need for redistribution, which considerably reduces the risk to employees and damage to the segments – and also cuts staffing costs. When the segments are removed from storage, SDS checks compliance with curing times along with freedom from damage and automatically generates the delivery note.

Module characteristics

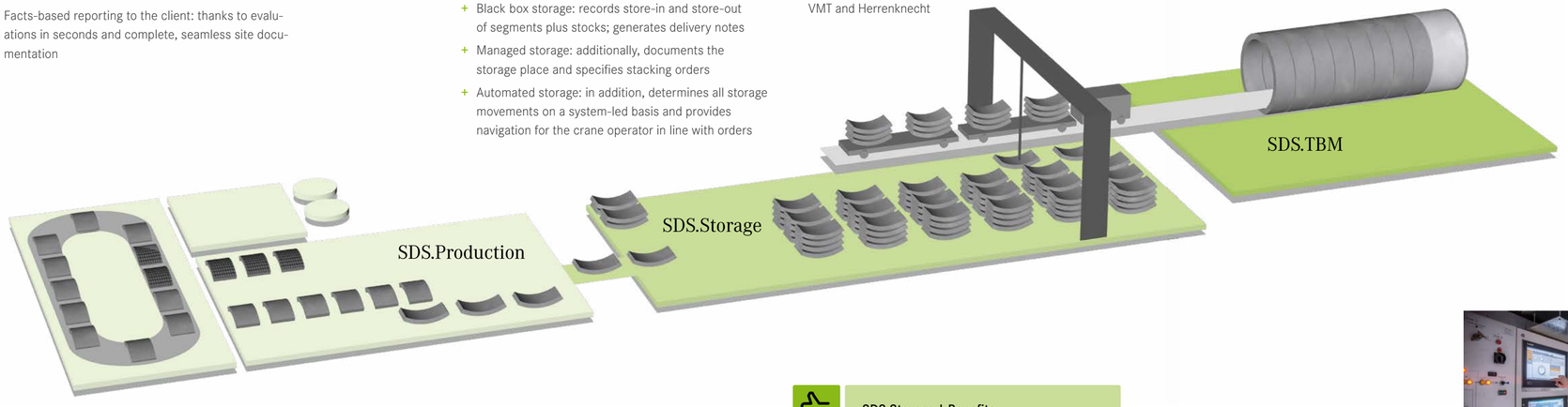
- Production storage
  - + Black box storage: records store-in and store-out of segments plus stocks; generates delivery notes
  - + Managed storage: additionally, documents the storage place and specifies stacking orders
  - + Automated storage: in addition, determines all storage movements on a system-led basis and provides navigation for the crane operator in line with orders
- Site storage
  - + If the production location is some distance from the site, temporary storage is needed on site. This site storage can generally be managed as a black box storage.

Options

- Additional storage area to expand storage space
- Crane navigation for gantry cranes

Interfaces

- Interface to an existing crane navigation system
- Interface to data management system, Herrenknecht.Connected – a joint system solution from VMT and Herrenknecht



SDS.Storage | Benefits

- Less storage space/staff required, plus shorter loading and delivery times through optimised storage rules
- Transparency of storage stocks avoids over-production and costly production restarts
- SDS.Storage ensures availability of segments and thus avoids interruptions in tunnel driving
- Permanent inventory overview cuts inventory costs

SDS.TBM

The SDS.TBM module captures the position and installation data during ring construction in real time. Thanks to the interface with VMT's TUnIS Ring Sequencing, orders in the storage can be triggered directly from the TBM. All data come together in the SDS database promptly.

SDS.TBM | Features

Capturing, documenting and archiving the precise position and installation data of each segment simplifies and speeds up error diagnosis if there is any damage in the tunnel.
The ring order is forwarded from the TBM straight to the crane operator as an instruction to store-out. Finally, the TUnIS interface ensures that both the availability of the various ring types and the current order and delivery status are displayed at the TBM.

Module characteristics

- Number of TBM modules required depends on the number of TBMs

Options

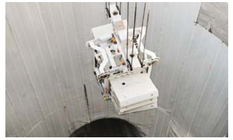
- Offline damage recording for tunnel acceptance

Interfaces

- Interface to the TBM's TUnIS Ring Sequencing
- Interface to data management system, Herrenknecht.Connected – a joint system solution from VMT and Herrenknecht

SDS.TBM | Benefits

- The installation location of any segment can be traced at any time
- Smooth advance of TBM thanks to automatic, error-free segment ordering by the TUnIS Interface
- The interface ensures that design requirements and other conditions that define the ring sequences can be precisely implemented
- No more expensive, time-consuming risks during delivery and installation



View SDS product film: sds.vmt-gmbh.de

SDS.Onsite

SDS.Onsite is a stand-alone solution for the tunnel construction site. It manages and documents all segment movements and processes during its jobsite acceptance, storage, transport into the tunnel as well as its final installation at the TBM.

Features

With each arriving segment, either the existing barcode is scanned or a new label printed. Each work step is documented using mobile devices. External production data can be handed over to SDS via CSV import. After the final installation, the system provides a lifetime quality record for each individual segment.

Interfaces

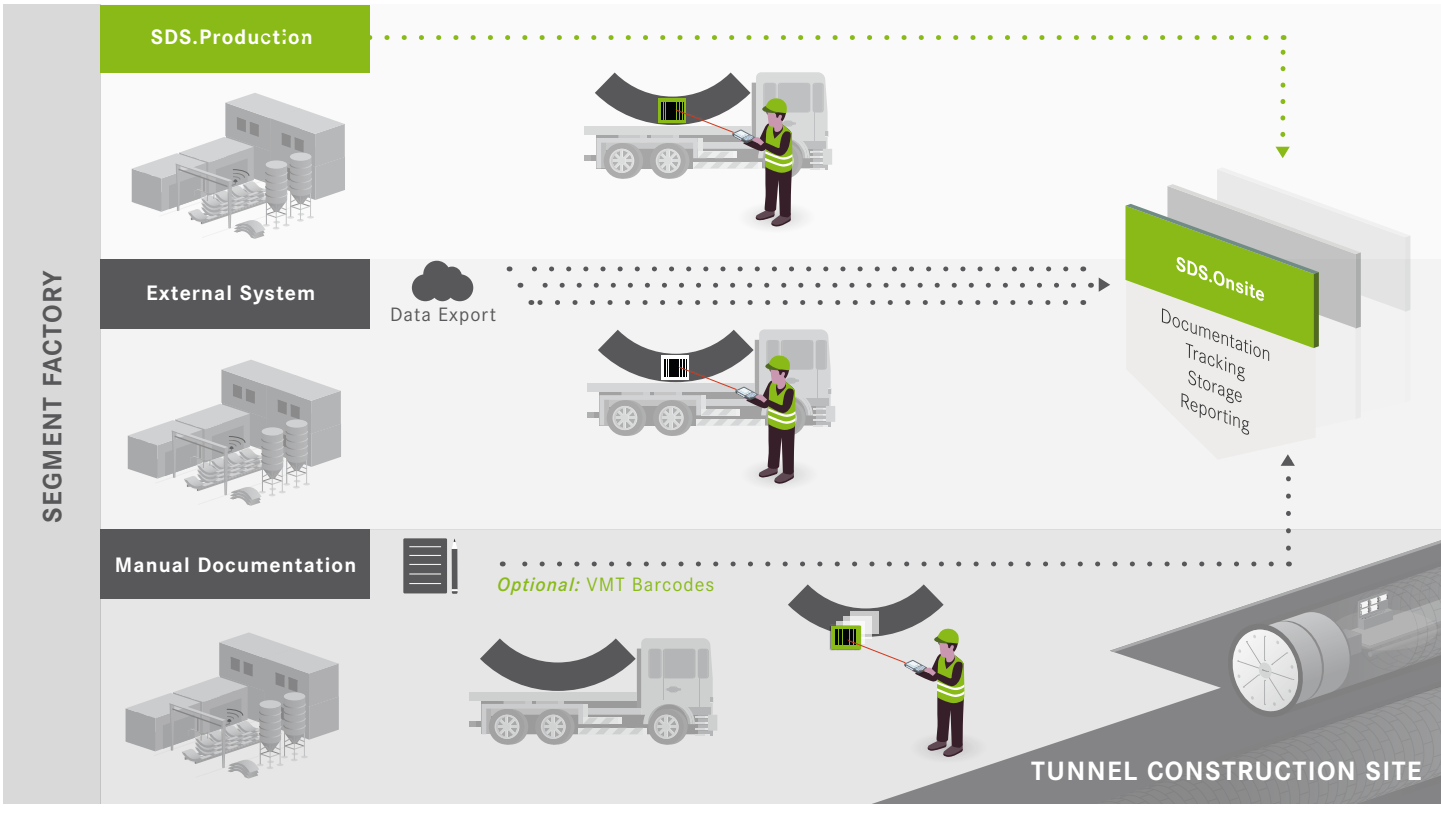
- Visualisation of data in data management system, Herrenknecht.Connected – a joint system solution from VMT and Herrenknecht
- Interface to VMT Navigation System for automatic ring ordering corresponding to tunnel alignment

Ultimate Flexibility

SDS.Onsite can be linked to any other segment management system or generate its own barcodes to assure unique identifiability. Therefore, it can be scheduled independently from the precaster at an early stage or together with the TBM.

Benefits

- Integration of available production data from any segment data system
- Full transparency of storage inventory at any time
- Maximum exploitation of storage capacities
- Seamless documentation of damages and damage handling including damage classification and picture function
- Avoidance of wrong deliveries to the TBM (damaged segments or segments not in line with the planned ring design)
- Provision of lifetime quality records for each segment
- Guarantee of conformity with your clients' documentation standards
- Fast and reliable error diagnosis in cases of tunnel damage.



LIS | Laser Tracker Industrial Measurement System

LIS is a supplementary product that supports quality management by SDS. Both moulds and segments can be measured with sub-millimetre precision and their geometry checked (distances, angles and torsion). The integrated reporting system forwards the measurement logs to SDS and provides information as to whether the required tolerances have been observed.

Features

LIS checks the 3D geometry of the segments and moulds directly on site to determine their basic geometry and installation parts. The measurement technology is fast and highly precise, yet extremely easy to handle. Measurements, calculations and an analysis of the results can be carried out within about 20 to 40 minutes. Evaluations can be adapted for specific customers and the results provided in any format required.

Range of services

- Purchase or rental with corresponding training
- Measurement service by VMT engineers on site (equipment included)

Options

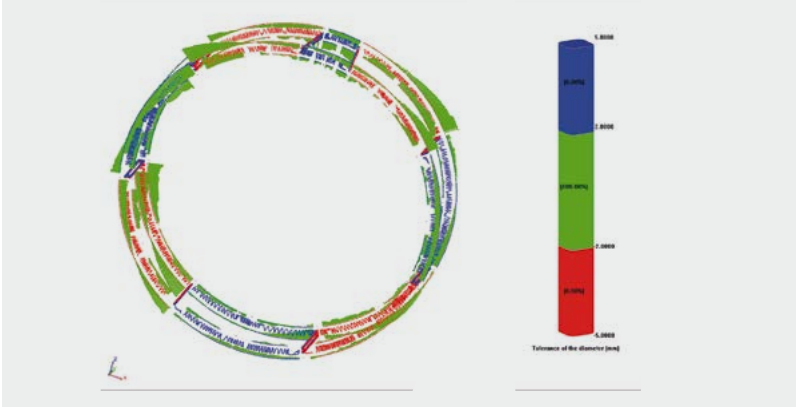
- Virtual ring construction after segment measurement (replaces physical test and master ring construction)

Interfaces

- SDS data server

Benefits

- **Time-saving** due to optimised, partially-automated measurement routines and evaluations
- **Simple handling** (no specialist required)
- Virtual test ring construction **saves time, costs, space and personnel**



References

Australia | Sydney
North West Rail Link

Project start	May 2014
Tunnel length	2 × 15,000 m
Diameter	6,000 mm
Segments	100,000
Modules	SDS-Carousel | SDS.STORAGE.Managed SDS.Depot | SDS.TBM

"... Not only did the SDS system offer an effective way of removing human errors and human functions from the production and delivery operation, it also met a requirement from the client where certain data needed to be submitted throughout the process..."

Jeremy Glasgow, Project Manager of the Kellyville Precast Facility

Qatar | Doha
Metro Gold Line

Project start	January 2015
Tunnel length	6 × 6,000 m
Diameter	7,000 mm
Segments	154,000
Modules	SDS-Stationary | SDS.STORAGE.BlackBox LIS

Austria | Graz
Koralm Tunnel – KAT 2

Project start	September 2012
Tunnel length	17,000 m & 15,000 m
Diameter	9,930 mm
Segments	120,000 incl. base elements
Modules	SDS-Carousel | SDS.STORAGE.Automated SDS.TBM | LIS

"The reduction in the number of staff needed over the total term of the project covers the costs of the system completely."

Andreas Lange, Segment Production Manager at ARGE Koralm Tunnel KAT 2

Project	Country	Application	Start
Kühtai HEPP Erweiterung Beleitung Kühtai - Fernau	Austria	Power	2021
Delhi Meerut	India	Railway	2021
Gotthard Straßentunnel 2.Röhre – Pilot Süd	Switzerland	Road	2021
Gigerwald	Switzerland	Dam	2021
Changi Airport New Termninal Connector	Singapore	Railway	2021
London High Speed2	UK	Railway	2021
Koralmbahn Gleistragplatten	Austria	Railway	2020
Brisbane Cross River Rail	Australia	Railway	2020
Bangalore Metro Phase 2	India	Metro	2019
Silicon Valley Clean Water	USA	Water	2019
York Potash Mine	UK	Transport	2019
Dubai Deep Tunnel Water System	UAE	Water	2019
Hinkley Nuclear Power Plant	UK	Water	2018
Suez Canal Road Tunnel	Egypt	Road	2018
Paris Meudon	France	Water	2018
London Thames Tideway Central	UK	Water	2018
London Thames Tideway East	UK	Water	2018
Kemano T2 Upstream	Canada	Water	2018
Paris Metro Line 15 Sud	France	Metro	2018
Sydney Metro City & Southwest	Australia	Metro	2018
Brenner Base Tunnel Mauls	Italy	Railway	2018
Semmering Base Tunnel	Austria	Railway	2017
Majes-Siguas Irrigation II	Peru	other	2017
NBS Ulm-Wendlingen Albvorlandtunnel	Germany	Railway	2017
Port Said Suez Canal Tunnel	Egypt	Road	2017
Galleria Santa Lucia / Barberino	Italy	Road	2016
Doha Metro Green Line Slab Track	Qatar	Metro	2016
Ismailia Suez Canal Tunnels	Egypt	Road	2016
Saint Martin la Porte	France	Railway	2015
Prutz Gemeinschaftskraftwerk Inn - GKI	Austria	Power	2015
Riyadh Metro Line	Saudi Arabia	Metro	2015
Doha Metro Gold Line	Qatar	Metro	2014
NBS Wendlingen-Ulm, Albaufstieg (Boßler)	Germany	Railway	2014

VMT | Your partner in tunnel building

Navigation and supplementary systems Large Diameter Tunnelling

Navigation systems Microtunnelling

Deformation monitoring system

Modular production and logistics management system

Process data management

Industrial measurement solutions

VMT with its measurement systems and services has been a leading provider in tunnelling and industrial measurement for more than 25 years. About 2,400 successful projects document the capability and innovation of the VMT product portfolio in the areas of navigation technology, production and logistics management, deformation and process monitoring, and data management.

VMT considers itself as competent, reliable partner for customers and contracting company in each phase of a project.

The personal advice, the active support and the full commitment of all VMT employees – whether on-site project engineer or IT developer in the office – have top priority in the company philosophy and are proven every day.

Locations on 4 continents guarantee short paths, local support and independence from national borders and time zones.

VMT Germany | Headquarters
t +49 7251 9699 0
info@vmt-gmbh.de
www.vmt-gmbh.de

VMT China | t +86 21 50750276 | info@vmt-china.com | www.vmt-china.com
VMT Australia | t +61 1300 553 905 | info@vmt-tg.com.au
VMT USA | t +1 253 447 2399 | info@vmt-us.com
VMT Singapore | t +65 659 057 19 | info@vmt-singapore.com
VMT India | t +91 987 129 22 00 | info@vmt-india.com
VMT Spain | t +34 91 359 8008 | info@vmt-spain.com

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