

Master of all he surveys

For more than a decade, Manfred Messing has headed-up tunnel guidance and surveying instrumentation company VMT. He talks to George Demetri

Describe your career and current position.

Having completed my studies at the Fachhochschule Karlsruhe as an engineer in surveying and mapping in 1986, I became involved in several of the tunnelling parts of the ICE railway line from Mannheim to Stuttgart, Germany.

Following this I worked as the survey manager on a power plant project in Munich. Between 1991 and 1993, I worked on the Great Belt project in Denmark as survey manager.

Following the project's completion, I established my own one-man survey company – I always wanted to have the flexibility of working for myself and reaping the rewards of my own efforts. I have an entrepreneurial spirit and wished to create a dynamic company dedicated to the innovation surrounding underground surveying.

Since 1994 and a fortuitous meeting with Martin Herrenknecht, I have been the managing director of Germany-based VMT GmbH, which has grown from a one-man operation to one employing over 180 people.

How did you get into tunnelling guidance systems?

When working on the Storebaelt project, I was the surveyor responsible for the guidance systems being used on all four of the project's TBMs. This gave me a thorough background to the requirements of a guidance system from a users' perspective and enabled me to develop a system that fulfilled all of these requirements. Having developed the first systems, I have always welcomed input from on-site users on ways to improve our systems.

What are the applications for your guidance systems?

A VMT guidance system for TBMs continuously shows the machine operator the position of the TBM in respect to the designed tunnel axis (DTA). This information is refreshed approximately every ten seconds by a full machine position and orientation determination, thus giving almost real-time information.

The guidance system is easy to maintain and can normally be operated by non-surveyors with the occasional overview of the site surveyor. It also comes with the optional 'ring management programme', which provides optional ring positioning and orientation for the actual drive executed by the TBM.



Manfred Messing

Alongside the basic guidance systems, we have developed a number of additional features to enhance the automated input of various parameters needed for the ring measurement programme, such as automatic and semi-automatic tail-skin clearance measurement.

In pipejacking, our speciality is in precise navigation of long distance or curved drives where multiple curves and distances of well over 1,000m are now commonplace. Again, we have developed a number of ancillary services to support these types of drive.

For more conventional tunnelling projects, where partial face extraction machines are used, we have now produced guidance systems for profile control using roadheaders and positioning systems for rockbolting machines.

In addition to the excellent quality of our products, we pride ourselves in the services we

provide as well as in our provision of solutions to problems that our customers experience on and around their projects.

What projects are you currently working on and where are your main markets globally?

We are currently working on a comprehensive software information system that provides full data collection, processing and correlation of all data available on and around a tunnelling project. This will enable information to be used more effectively in the decision-making process.

Geographically, China, Spain and Australia are currently our busiest areas. In Australia, this is mainly due to the introduction of our roadheader Guidance System being used on major highway projects. There will also be a concentration of roadheader projects in Russia, especially in Sochi, where preparation for the

winter Olympics in 2014 is well underway.

Another market focus is the area of geomonitoring. Since a substantial amount of VMT's know-how is based on data acquisition and handling of all kinds of sensors, VMT is able to provide comprehensive sensor systems for monitoring above-ground movement in order to give a holistic picture of the entire TBM drive.

How has VMT been affected by the global downturn?

VMT has lost some geomonitoring projects since these are mainly non-infrastructure projects which are dependent on the general economic situation. However, in the next year or two we expect significant growth based on infrastructure as nearly all advanced economies have set-out vast infrastructure construction programmes.

How did the partnership with Herrenknecht come about and what does it involve?

I first met Martin Herrenknecht in 1994, when he asked me to develop a guidance system that would be both reliable and technically accurate. He wanted to employ me, but as I had just set up my own office and had my mind set on working for myself, we agreed to establish a 50-50 limited company.

Since the beginning of 2009, however, Herrenknecht has taken a majority holding. With the exception of some reporting requirements, there has been no difference at all in the working co-operation that has always existed since the start of VMT. VMT is an independent company and still provides full responsibility for its products to the market.

“We have been researching ways of utilising indoor GPS for use in the underground environment”

How does this partnership affect your ability to do business with other manufacturers of TBMs and roadheaders?

As I stated previously, VMT is an independent company and will supply to every customer. What counts for the industry is quality and reliability.

I believe that when you look at the size of VMT, there is nothing else comparable. We have the potential to cope with the large upcoming projects. We offer both service and the highest technical standards throughout the world, and given our ongoing education programme, we also have the necessary personnel capacity.

What effect have guidance systems had on the installation of segmental tunnel linings (and on tunnelling generally)?

Although it usually takes around two years to construct a tunnel, the typical design life can be 100 years or more. By providing a guidance system to keep the tunnelling machine as close as practical to the designed alignment and incorporating a programme for the best fit of each ring in relation to the available space, the quality of the ring build and its structural integrity is enhanced and able to fulfil its design requirements.

Outline the non-tunnelling applications into which VMT is supplying its expertise.

VMT has major capability in metrology [the study of measurement] applications. We have a wide range of sophisticated instrumentation and experienced metrology engineers, which enable us to make precision measurements in the sub-millimetre range.

With our expertise in metrology, we are a very well-known and appreciated service and solution provider on the market.

VMT is also the representative of Spatial Analyser metrology software from NewRiverKinematics (www.kinematics.com) in Europe. This software is a very flexible and powerful tool in the metrology market. Another collaborative agreement is with US-based Brunson Instruments (www.brunson.us), which supplies optical tooling for the metrology industry. This completes our range in this market segment.

Have you made any recent acquisitions?

Yes. In addition to establishing regional offices in China and Australia, we have now established a Russian subsidiary. We expect a lot of business for VMT products and services in the Commonwealth of Independent States (CIS).

Also, we have established another subsidiary company – VMT Process Technology – which enables us to provide products for automation and process technology. Now we are able to provide measuring solutions as a service as well as the integration of the measuring process within the production facility.

Where is your main R&D focus at present?

Since we started, VMT has always been dealing with various kinds of software products. Some time ago, we decided to harmonize our software platforms and to achieve this, we had to develop a complete new software structure and architecture – what we call TUNIS (Tunnelling and Underground Integrated Software Structure).

On this platform, which is based on a large database, we will be able to interact with all other databases – from any software involved in the tunnelling process. Also, VMT is developing and completing geomonitoring abilities.

The navigational usefulness of satellites has not yet been harnessed deep underground, for obvious reasons. Do you see technology developing that can in any way allow this?

For some time now, we have been researching and developing ways of utilising a product called indoor GPS (iGPS) for use in the underground environment. This is based on a number of transmitters and receivers similar to the standard GPS system. Currently, iGPS is used in aviation assembly and we have had some encouraging results in underground trials that we have carried out. It is still early days but we will keep you informed of our progress.

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Do you see the need to set up total stations periodically as a tunnel progresses as something that can be obviated by developing technology?

Surveying is an ongoing process with checking and re-checking continuing throughout the entire tunnelling process – even if a new technology is developed the very nature of the work will need Total Stations to be setup for surveying purposes even if they are no longer necessary for navigating the tunnelling machine.

Nevertheless, we have worked on a continuous guidance system. In the end, it would be far too expensive because the back-up gantries and the machine design would need to be modified.

We cannot see any greater advantage in this technology at the moment. But we are monitoring technological advances and will be prepared if something significant evolves.

What in your mind has been the greatest tunnelling innovation of recent years?

No typical innovation has been especially made for tunnelling. It is a synergy effect. All engineers with common sense will eventually reach the same conclusions.

Using standard technology, the task is to create tunnel-worthy applications out of that. Since the start of VMT, we have always used the automated features of survey instruments as well as applying all the IT features that are available.

All of this influences tunnelling technology as well. I would say that the application of technology from other fields is the greatest innovation of recent years.