

Tunnel Manager MWD

Technical specification



Tunnel Manager MWD (Measurement While Drilling) is a support software for planning, administration and evaluation of the drilling operation in mining and tunnelling projects.

Introduction

The Atlas Copco drifting and tunnelling Boomer rigs with computer control are not only an efficient piece of equipment for drilling, but are also capable of utilising planning data for navigation and positioning of the holes to be drilled, and of continuously and automatically collecting drilling data while drilling.

Tunnel Manager MWD is the third step in a family of computer software to be used at the work site office for planning, administration and evaluation of the drilling operations in tunnelling and mining projects. Tunnel Manager MWD is particularly designed for evaluating and characterizing the rock properties based on drilling data.

Tunnel Manager Pro complies with the IREDES standard.

Features

» **Tunnel Manager MWD consists of functions for:**

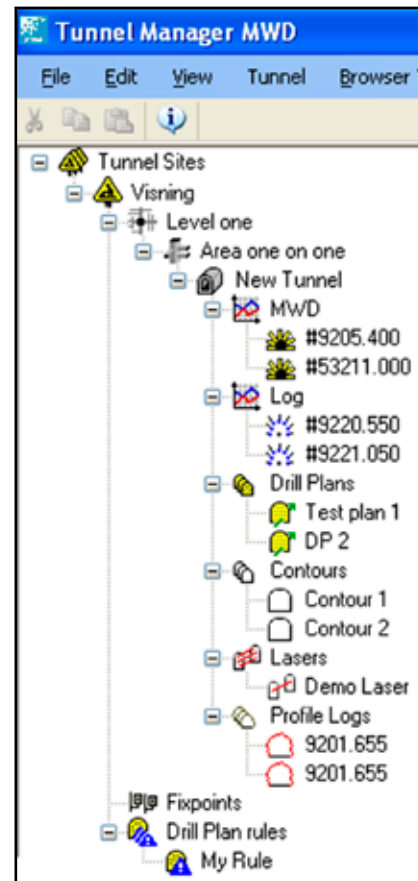
- Designing the tunnel alignment
- Designing the laser line
- Handling fixpoints for navigation
- Designing the contours and drill plans for the tunnel
- Generating drill plans
- Easy transfer of data to and from the drill rig
- Evaluating drilling results from logged data
- Evaluating and characterizing the rock hardness and fracturing based on drilled MWD data
- Generating hard copy reports

Program structure

» Planning and production data are stored in a defined tree structure:

The topmost level of the structure is the (*work*) site. As an option intermediate structures can be defined as *levels* and *areas*. These structures are especially designed to adapt Tunnel Manager MWD for use in mines. A site can comprise of one or several *tunnels*, each defined by a tunnel line, mostly operated from one office and by the same drill rigs. The tunnel line is defined in the *tunnel line table* where the tunnel location is specified by section numbers and x, y, z coordinates for the direction of the final tunnel. In the database structure each tunnel line have nodes for different *laser lines*, *drill plans* and *contours*, that will be used for the excavation of different sections of the tunnel. Fixpoints and drill plan rules are stored directly under the worksite.

The tunnel also have nodes for *log data* from the excavation that can be analysed and presented to improve drilling quality and rock mass characterization.



Tree structure in Tunnel Manager MWD.

Functions

» Designing the tunnel alignment

The tunnel line shows the alignment of the tunnel on a national or local grid and is created from the base data of the project. The details are presented either as a table or as a graph. In table form the alignment is shown as a collection of x, y and z coordinates together with the camber of the tunnel floor for different sections. Contours and several drill plans can be linked to the tunnel sections. Coordinates max $\pm 9\ 999\ 999.000$.

» Designing the laser line

The tunnel alignment laser is defined with its' start and end point coordinates.

» Handling fixpoints

The fixpoints (reference points) for the work site can be imported or typed into Tunnel Manager MWD for navigation of the drill rig.

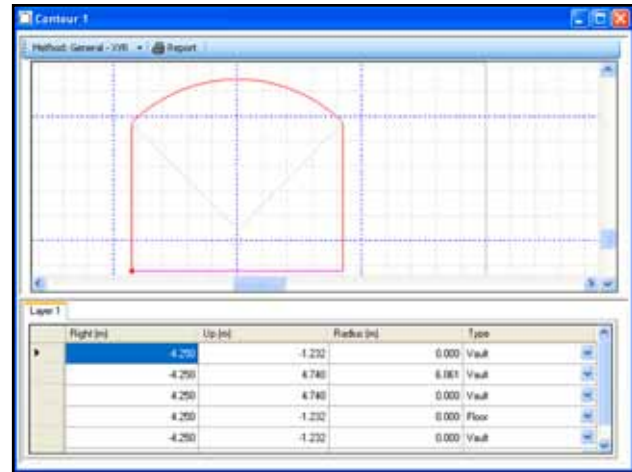
Section	X - North	Y - East	Z - Height	Camber	Contour	Drill Plan	Bolt Plan	Inj. Plan
0.000	13290.412	72691.219	40.958	0.000	Contour 1	DP 2		
5.000	13294.703	72688.652	40.327	0.000	Contour 1	DP 2		
10.000	13298.994	72686.086	39.696	0.000	Contour 1	DP 2		
15.000	13303.285	72683.519	39.065	0.000	Contour 1	DP 2		
20.000	13307.576	72680.952	38.435	0.000	Contour 1	DP 2		
25.000	13311.867	72678.385	37.804	0.000	Contour 1	DP 2		
27.407	13313.932	72677.150	37.500	0.000	Contour 1	DP 2		
30.000	13316.158	72675.819	37.500	0.000	Contour 1	DP 2		
35.000	13320.449	72673.252	37.500	0.000	Contour 1	DP 2		
39.407	13324.231	72670.990	37.500	0.000	Contour 1	DP 2		
40.000	13324.739	72670.685	37.506	0.000	Contour 1	DP 2		
45.000	13329.030	72668.118	37.559	0.000	Contour 1	DP 2		
50.000	13333.321	72665.552	37.612	0.000	Contour 1	DP 2		

Tunnel alignment shown as a table.

Functions

» Designing the contours

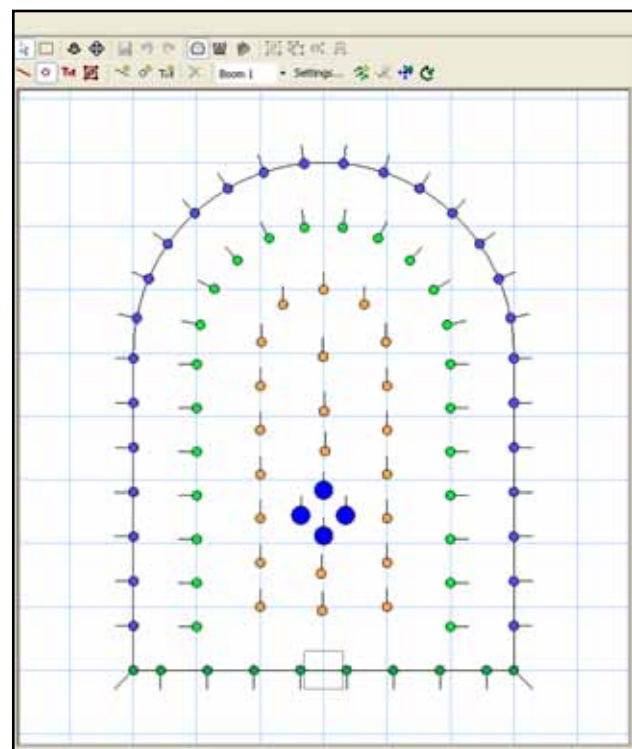
The designed contour of the tunnel can be imported or defined in Tunnel Manager MWD. Contours can then be used as a basis for scanning with the Tunnel Profiler and for drill plan design.



Contour of a tunnel.

» Designing the drill plan

Drill plans are created graphically in an interactive part of Tunnel Manager MWD. Each hole is given its specific attributes such as position, look-out, length and type. If the drill rig is equipped with ABC Total, Tunnel Manager MWD can be used to define the drilling sequence of the holes. The maximum number of holes is 500.



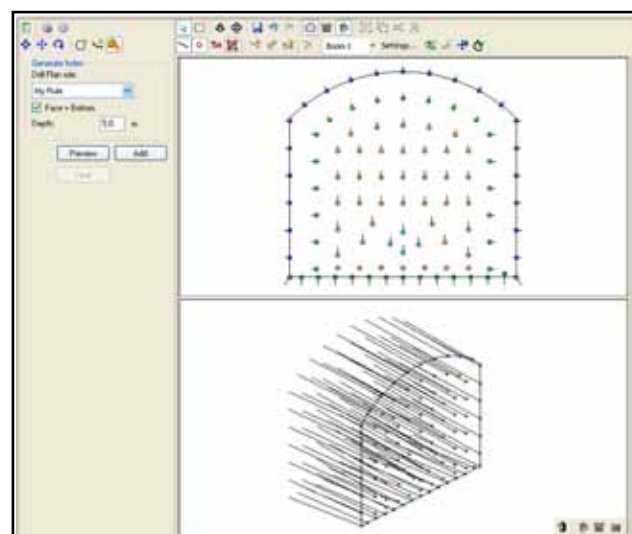
Drill plan designed in Tunnel Manager MWD.

» Drill Plan Generator

Tunnel Manager MWD also has a function for generating the holes in a drill plan. With this function it is easier and quicker for the designer to design a drill plan.

» Transfer of data to and from the rig

Planning data can easily be transferred to the specific drill rig by a simple function. Data files to and from the drill rigs use the IREDES standard format.



Drill plan generated in Drill Plan Generator.

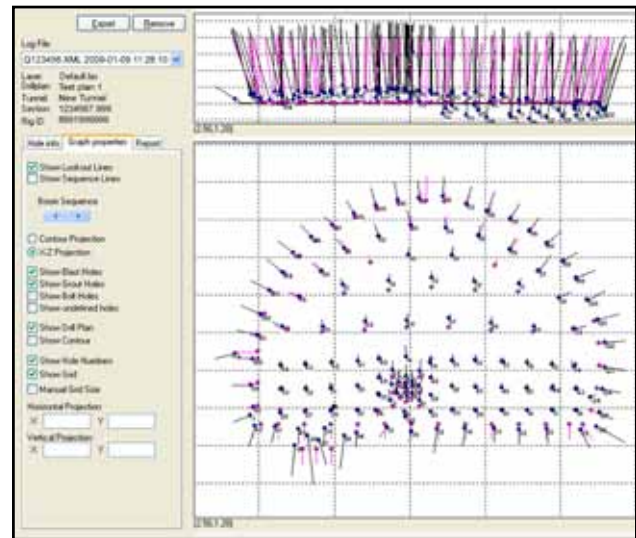
Functions

» Evaluating drilling results

Data recorded during drilling is transferred back to the office computer. Tunnel Manager MWD can then be used to analyse the actual results and compare them with the planned data. Logged data can cover drilled holes, MWD (Measurement While Drilling) data from the holes and scan results from the Tunnel Profiler.

» Generating reports

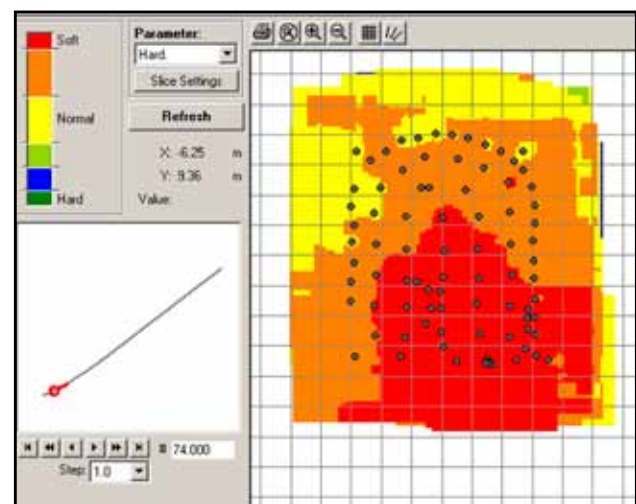
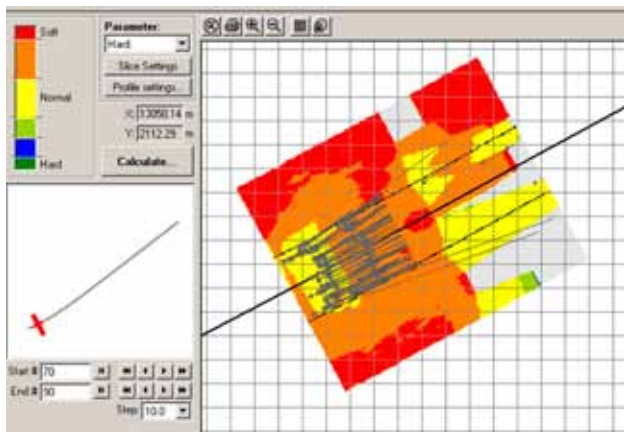
The result of the drilling can be produced as a Microsoft Word document for printing.



Round report.

» Evaluating and characterizing rock hardness and fracturing

Based on MWD data collected during drilling, Tunnel Manager MWD can evaluate indices for rock hardness and rock fracturing. With Tunnel Manager MWD a geologist can correlate the evaluated hardness and fracturing with the actual field observations. Evaluated data can be presented as tunnel slicing or tunnel mapping.



Evaluated data presented as tunnel map (left) and tunnel slice (above).

System requirements

The Tunnel Manager MWD software is designed to be used together with the computerized Boomer drill rigs with RCS (Rig Control System) and equipped with the optional function ABC (Advanced Boom Control) Regular or Total.

» To use the Tunnel Manager MWD software you will need:

- Tunnel Manager MWD installation CD
- Tunnel Manager MWD hardware key for the parallel or USB port of the computer

- IBM PC-compatible computer with Pentium-type processor, 1 GHz or higher recommended
- Parallel port or a USB port on the computer
- 512 MB RAM memory minimum, > 1 GB recommended
- Disc space of 100 MB required plus additional disc space for the stored drill plans as well as round, profiler and MWD logs
- Microsoft Windows XP Professional (Windows Vista is not supported)
- Microsoft Word 97 and Microsoft Excel 97 or later installed on the computer
- Mouse with at least two buttons
- Colour display
- Printer
- PC-card reader or USB reader, depending of type of drill rig, for transferring data to and from the drill rigs