



now with
**MASS
HAULAGE**
planning

TiLOS

The linear project management software used worldwide for road, pipeline, transmission line, railway, tunnel and other civil engineering projects.

Use TiLOS to incorporate design details, construction challenges, risk elements and your project schedule into a single view.
Fully integrates with the leading CPM scheduling tools.
The best tool for planning and managing linear projects.

Connecting Schedule and Geometry

Linear projects present unique challenges because the crews and equipment move along the construction right-of-way to perform their work. The work is not performed in a single location as in a typical facility project where control of the site occurs early in the process. Permits, environmental constraints, changing right-of-way conditions, construction related issues and risk elements need to be considered very seriously as they can impact the production process.

Traditional planning systems display their results in bar charts or network diagrams. Neither of these traditional diagrams are able to show a graphical link between the location where the work is performed (the distance axis) and the time when it is executed (the time axis).

This is the strength of TILOS. For BIM, a 3D building model is needed to get a connection between the geometry and the schedule, but two different tools or environments are needed for the model. The time distance diagram in TILOS merges both the geometry and the schedule into one time distance view.



Precise location and quantities simplify the planning process

The work plan is created interactively by drawing the tasks directly on screen. This defines the location, start and end coordinates, the length of the task and sets the quantities for the work tasks.

The link to the work library with pre-defined work rates and resource typical assignments sets the duration of the task.

For planning repetitive work the tasks are simply copied to another location which updates the quantities and the durations for these new tasks. No other calculations are needed. Wizards assist in batch creation of tasks to dramatically reduce the time required to build a precise schedule.

The flexible resource calculation allows the optimization of resource usage. For example, changing the excavator's production rate or assigning multiple haul trucks will up-

Location information is imported into TILOS by XML or by tables through the clipboard. In this example, for each 25 m distance slice, the land height or any quantity between the stations can be displayed. This data can be shown in tabular or graphical format

The mass haulage diagram shows the cumulative quantities in a section. Cut quantities are printed above the zero line and fill quantities below the zero line. The height of the rectangle is determined by the quantity of the cut or fill. The arrows show the transportation of material from one area to the another.

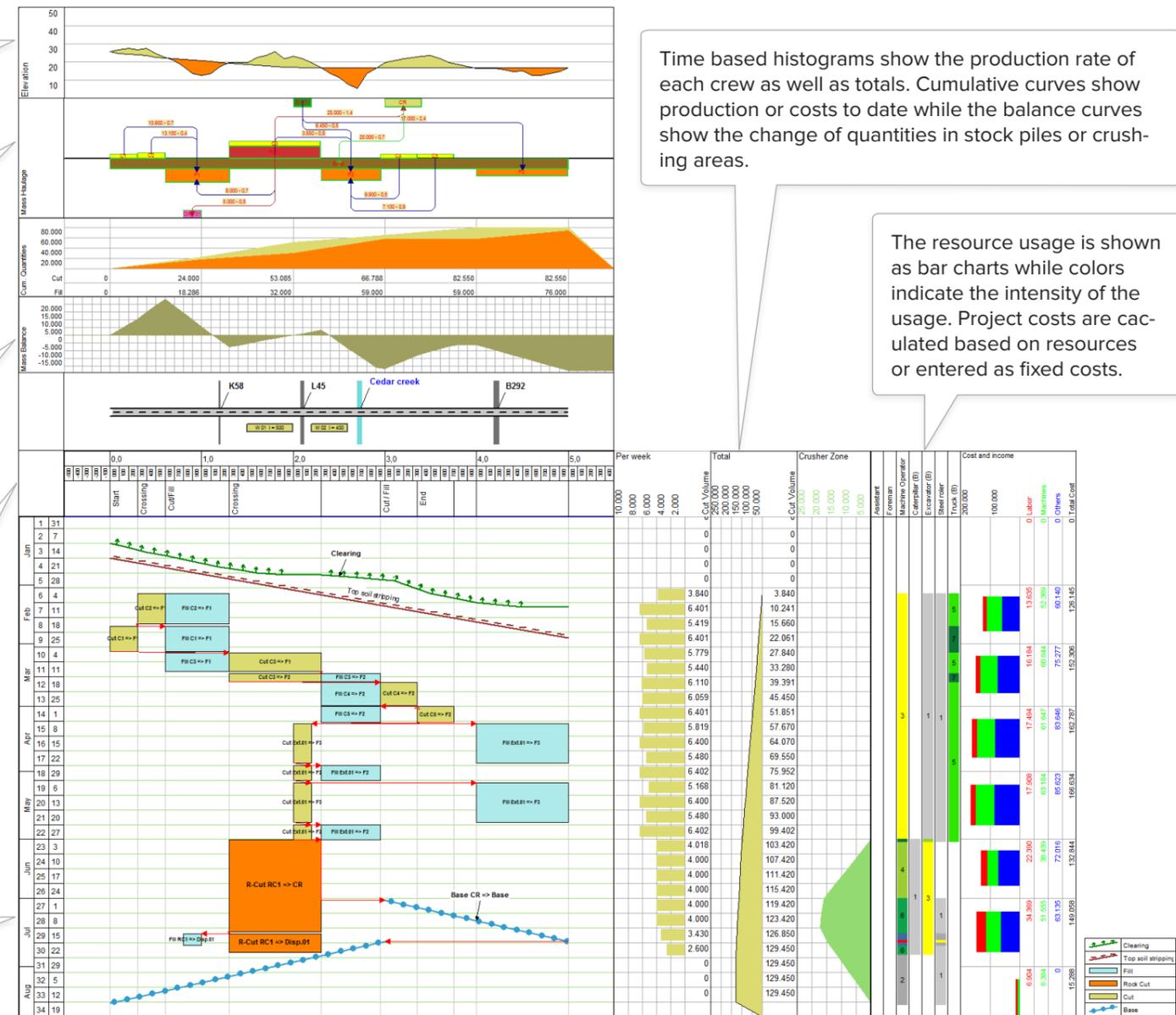
The histograms calculate the cumulative totals along the distance axis and create the mass balance curve. The quantity is balanced between two zero points. This information is key to optimizing the transportation on the site.

Further ribbons show drawings from the project as imported pictures. They can also be drawn directly in TILOS using the symbol library. User defined distance scales show any important project information along the distance axis.

These features enables the user to build the plan with any information to support the planning and execution of the project. All constraints are visible on the

The schedule is represented as a time distance diagram using lines, curves and shapes to represent different types of activities.

TILOS is a full critical path model enhanced by special functions controlling the distance between the tasks to avoid clashes.



Time based histograms show the production rate of each crew as well as totals. Cumulative curves show production or costs to date while the balance curves show the change of quantities in stock piles or crusher areas.

The resource usage is shown as bar charts while colors indicate the intensity of the usage. Project costs are calculated based on resources or entered as fixed costs.

From planning to execution

Site layout : Define the project window in time and location. The rulers showing time and distance information are automatically updated as you build your plan (this saves a lot of planning time in comparison to planning in CAD or Excel). Define the calendars and the working time.

Import location data and quantities: Import any site information into TILOS from Excel or other design software. This site information could include crossings, districts, camps, restricted areas, elevation, quantities. Once these are imported they can be graphed as histograms or presented in scale ribbons.

Mass haulage plan: Drawing lines between the mass areas defines the flow of material and sets the transport volumes for calculating the haulage costs (m3km). The haulage plan can also be imported if it was already prepared in another system.

Task Planning: A wizard will automatically create the cut and fill tasks based on the haulage lines created in the mass haulage plan. These tasks are automatically linked to set the sequence of the execution.

Baseline : Prior to execution, a baseline is typically created to freeze the plan against which progress is reported. Alternatively, it is possible to copy the planning data for later evaluation in what-if scenarios.

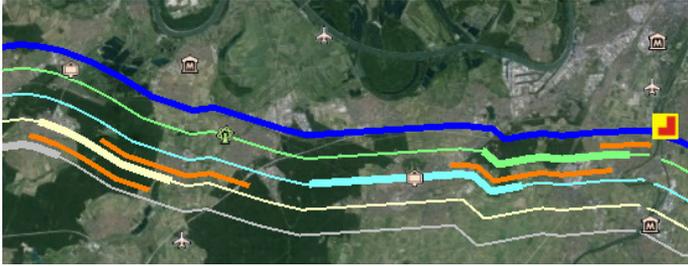
Execution plan: The time distance diagram delivers all the data needed for the daily work planning. The daily quantities for each task can be exported by XML and imported to any site data recording system or to Excel. This supports a parallel recording of actual data using database or Excel based tables.

Recording actuals: Actuals can be recorded manually at the task level. Automated recording from each piece of equipment need to be processed to allow an import (e.g. all hauls for a day to a certain area go to 1 planning task).

Importing actual progress: The progress is imported to TILOS progress segments as micro tasks. The scheduler sees at one glance in which period which progress has been made. After approval this can be applied and the remaining construction process can be calculated and updated.

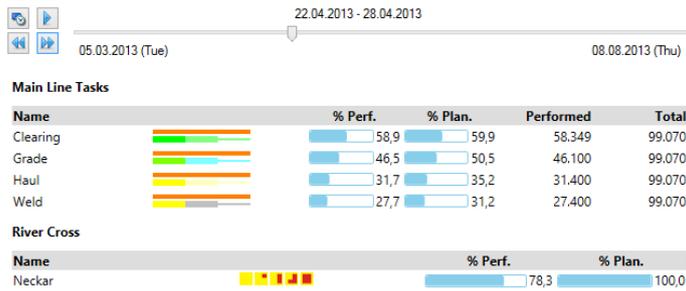
Map and Schedule in a single view

In infrastructure projects, the crews move along the distance axis while executing the work. TILOS ProgressMap simulates the movement of these crews in a map view and shows their planned and actual position on each date.



In the example above, the planned work for a pipeline project is shown for the week of 24-28 April 2013. The thick orange line shows the baseline - where the crews should have worked according to the initial plan. The thinner lines show where the crews have to perform their work and the thick line shows the location planned for this week.

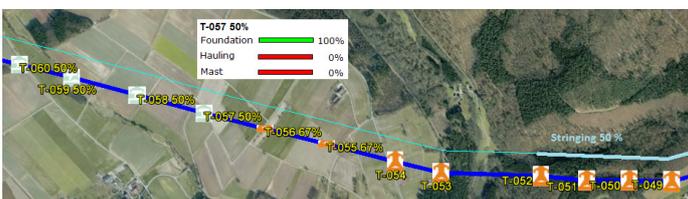
The yellow symbol shows that the river drill is progressed by 75 %. Non-linear progress is shown by changing symbols related to the progress state.



By moving the time slider forward or backwards, the status is updated on the map view. The legend presents the overall status for the current project.

The option "Show Actuals" shows the current as-built situation, which sections have been completed and what % of the project is finished.

Each progress period can be exported as a KMZ file which can be emailed or stored in the intranet or internet. These files can be viewed with your preferred mapping software such as Google Earth, Argis Explorer, ArcInfo or others. This easily allows the interactive progress view to be embedded in your design software.



The connection works without having to create complex 3D models but rather is based on simple geometry: paths, placemarks and polygons that can easily be created with GIS systems. This information can be exchanged using standard KMZ/KML files or by Excel.

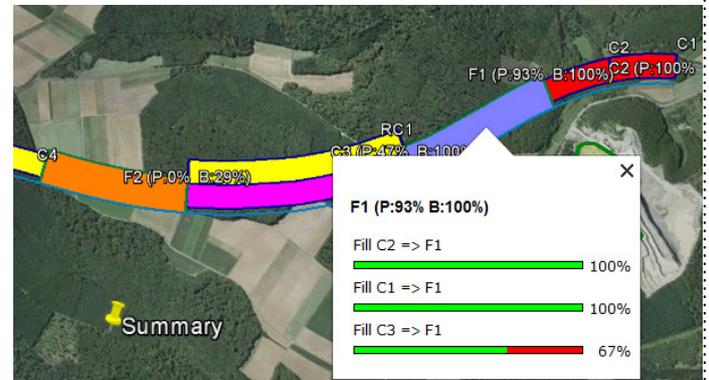
The path represents the right of way along which the work is executed. Each path point also has a station value which allows the activities to be mapped to the path. Each crew can be displayed as a parallel line in a different color showing the current work position.

The polygons represent an area of non linear work (i.e., bridge, pumpstation, etc). They are defined either as a point cloud or as a section of the main path. Polygon progress is shown in different user defined colors to represent the execution state.

The symbols represent non linear work at different points. Changing symbols represent the progress state. Multiple planning tasks can be merged the same symbol to display overall progress.

The connection is made based on display sets. This defines which colors and symbols are used, and a filter which determines which activities should be visualized. The filters are project independent and can be reused on similar projects.

Five steps are required to generate a map view from your project:



TILOS ProgressMap can be used during any project stage. In the pre-execution phase it is an effective collaborative tool to present how the project will be performed using the natural map view instead of technical charts. During construction, it shows the as-built situation as well as next steps. This is an ideal method for non construction people to communicate the plan in a simple way.

Very little effort is needed to generate these extra views. The results can be easily exchanged and viewed and explored without any technical knowledge.