

TURN MESH MODELS INTO SOPHISTICATED SURFACE MODELS.



Rapid Surface
Creation

Using Rapid Surface Creation, even novice CAD users will be able to create surface models out of mesh models (STL, for example) and channel them on into downstream production development and manufacturing processes. What's special about the surfaces: They are of design quality. Which means that they are ready for immediate implementation e.g. in product design loops or die manufacturing design processes.

With the Tebis RSC module, we have bridged the gap between approximated mesh models consisting of hundreds of thousands, often millions, of triangles and the mathematically precise world of polynomial surfaces. With RSC, Tebis CAD technology now supports the entire panoply of possible surface descriptions that regularly turn up in the course of many design and engineering processes.

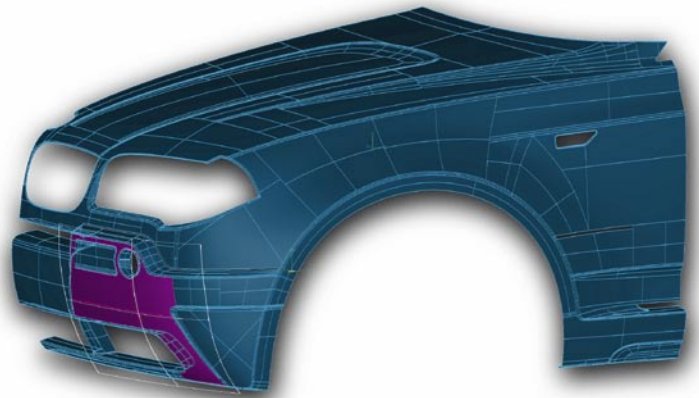
Increased efficiency in product design and draw die manufacturing

Tebis RSC is ideally suited for areas whose processes contain iteration loops, such as in product design and draw die manufacturing. In both industries, you approach the final result by running through multiple loops. Over and over, you have to make copies of physically existing surfaces, optimize and modify the images in the CAD surface world and finally transport them back into reality via milling technology and rapid prototyping methods. By using Tebis software you can reduce the number of times you have to run through this cycle.

Designer acceptance as a quality criterion

The most important aspect of the surfaces generated with Tebis is the low level of effort required to achieve design quality. To be accepted and used by designers, surface models must have the same structural setup as surfaces created the old-fashioned way, using sections and boundaries. Trimmed surfaces, known as faces, are considered indispensable here. That is why Tebis RSC generates

both untrimmed surfaces with four boundary curves and trimmed surfaces with any boundary and any number of islands. All adjoining surface elements have tangential transitions. The BREP technology also adheres to the most exacting tolerance specifications when dealing with gaps. That was the important prerequisite for enabling users to be able to subsequently extend, round, bend and do any other modifications to the surface areas generated.

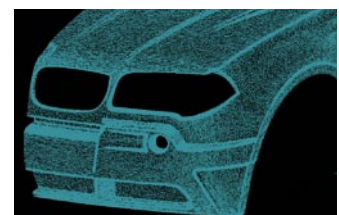
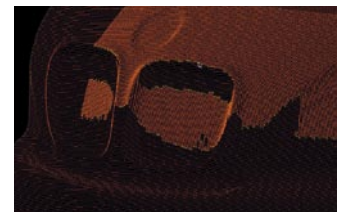


Surface descriptions supported by Tebis

Scan data created by mechanical and optical digitalization can be imported into Tebis in various native formats, cleaned, filtered, smoothed and trimmed (“Digitized Data Processing” CAD module).

Mesh data created by triangulation or imported through the STL interface can now be modified, smoothed, modelled and enhanced with polynomial surfaces in Tebis (“Digitized Data Processing” CAD module). You can also copy mesh data over from prior simulation systems, e.g. to run drawing simulations for sheet metal-working dies.

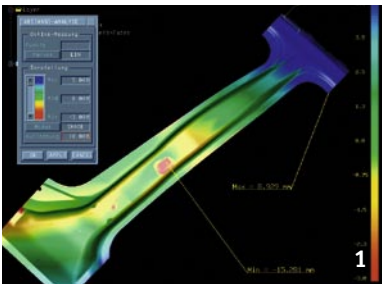
You can use Tebis **surface functions** to process surface data any way you like (“Surface Design” and “Advanced Surface Design” CAD modules) and copy them over into other CAD systems (geometry interfaces for Catia, UG, ProE, VDAFS, IGES).



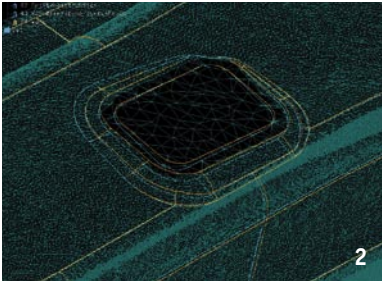
With the RSC software you can transform mesh data into surface data.

And conversely, Tebis transforms surface models into mesh models, e.g. for rapid prototyping.

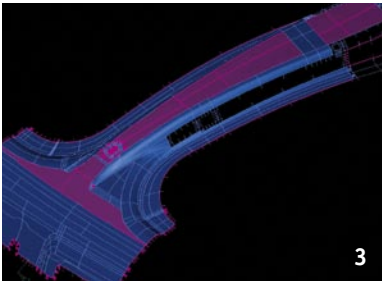
Application example from the die manufacturing industry



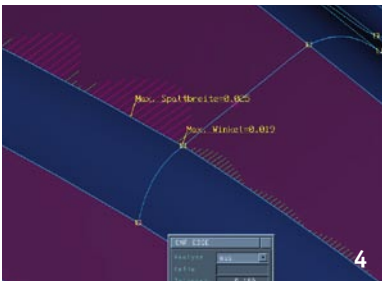
Deviation made visible between the digitalized surface and the original surface design. In the right connection area it exceeds 5 mm; in the lower left it is between 3 and 5 mm (blue areas). The red areas indicate holes.



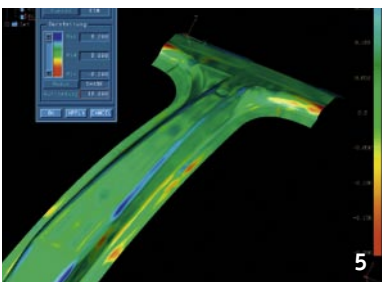
The no up-to-date wire grid from the original surface design (blue) is copied fully automatically onto the digitalized surface (yellow).



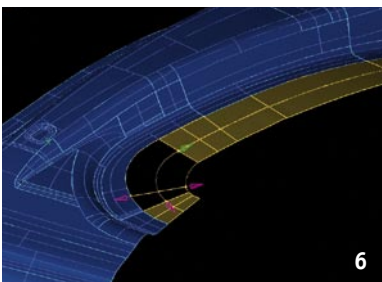
The user uses the wire grid to decide where to have the system fully automatically create trimmed surfaces (violet) and where rectangular surfaces (blue) will suffice. This ensures that the surface model will be modifiable later on down the line.



The individual areas generated can be analyzed for various criteria, such as e.g. gap width and angle.

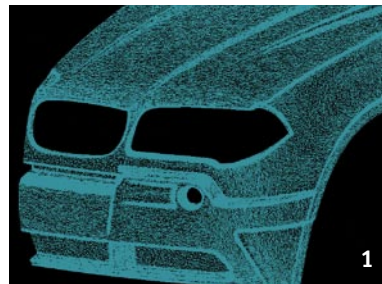


In the offset analysis, the system exaggerates the distance differences to display the generated surfaces' deviations from the digitalized mesh model data.

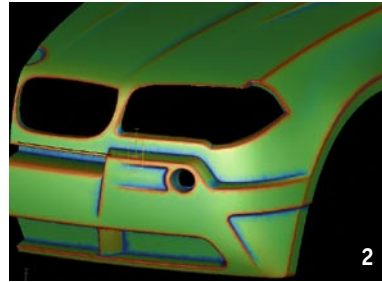


Thanks to their design quality, you can reprocess the surfaces any way you like, e.g. by dragging on an arrow to lengthen them.

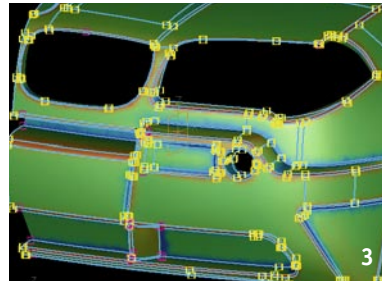
Application example from product design



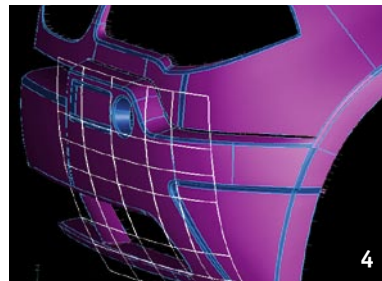
The optimized mesh model of the front of the vehicle consists of around 500 000 triangles and describes an area of 2.222 m2.



The mesh model's curvature display gives users important information when creating the wire grid.



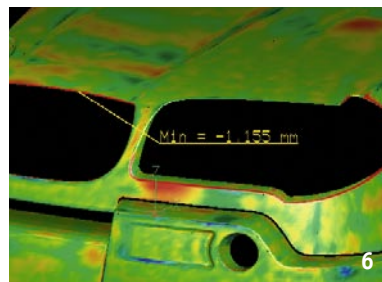
The edges of the wire grid are created in part automatically by evaluating the curvatures and in part using the graphic interface with the aid of the drawing functions.



The system calculates the surfaces fully automatically. Where necessary for later design usage, users can have the system calculate trimmed surfaces (violet). The associated untrimmed base surfaces will be available for further design purposes (white area).



The system uses zebra shading to display reflection behavior, thus making visible the quality within the individual surfaces and in the transitions to the adjoining surfaces.



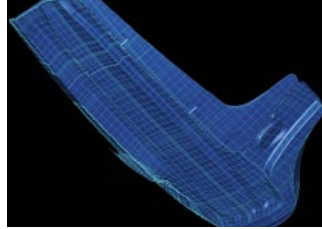
The offset analysis uses color codes to show the distances between the generated surfaces and the fundamental mesh data.

Wire grid as a prerequisite for automatic surface generation

The RSC user's primary task is giving the component its necessary grid structure with as little work as possible. RSC will provide users with several options to choose from, depending on the task at hand:

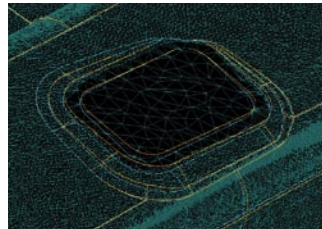
■ Automated functions

project regular grid structures onto the component. Tebis calculates automatically surfaces of constant curvature (C2 constancy). Use this technique when time is the most crucial factor and the structure of the surfaces is of secondary importance.

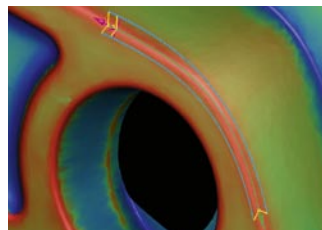


■ Update functions

are used when you already have a structured surface model but its real-life counterpart has been modified manually. In this case, the system will project the individual boundaries of the existing surface model onto the digitalized mesh model and then optimize them.

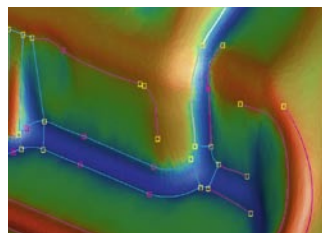


■ **Intelligent semi-automated functions** will evaluate the mesh surface using certain specific criteria such as rounded areas and curvatures and generate corresponding curves.



■ Drawing functions

enable direct drawing of polynomial curves and line strings on the mesh model.



You can use the gridding functions to create a wire grid consisting of edges and nodes that can be modified any way you like using the editor functions. In this way, you can move nodes around and smooth, tighten or tangentially link together edges.

Fully automatic surface generation

Tebis RSC uses the entire or partial wire grid as a basis to fully automatically calculate surfaces

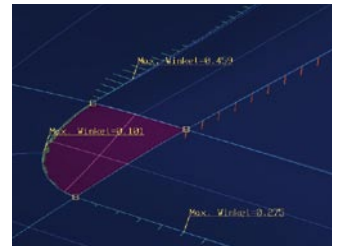
- that maintain an adjustable maximum offset to the mesh model
- that can be set to have tangential continuity to the adjoining surfaces and
- whose gaps to the adjoining surfaces are within preset tolerances.

The individual surfaces will be limited by the wire grid. Where necessary, the system will create trimmed surfaces (faces); otherwise the surfaces will be bordered by four boundary curves.

Optimizing the surfaces by optimizing the curve framework

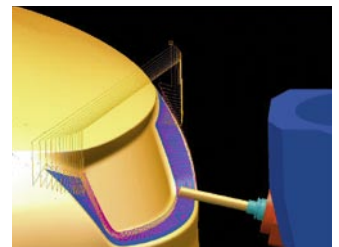
After the surfaces are generated, the wire grid will still remain the linking element and will manage the associated surface elements (BREP technology, Boundary Representation). The data on which surfaces border each other and where the user has defined tangentiality conditions are saved in the curve framework.

The analysis functions check the surface results for curvature characteristics and offset to the mesh model. If an RSC user has problems with some areas, he or she can use the graphic interface to modify and model the wire grid and optimize it in real time.



Milling surface models or processing them in other CAD systems

You can use the Tebis CAD/CAM functions to further process the generated surfaces any way you like, without having to switch systems. There are no restrictions, from modification design to automatic calculation of exaggerations to NC-technical implementation. You can use the direct interfaces to Catia, Unigraphics and Pro/E and the IGES and VDAFS standard interfaces to import the generated surfaces into other CAD systems and further process them there, e.g. to turn them into solids.



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THE CAD/CAM EXPERTS.