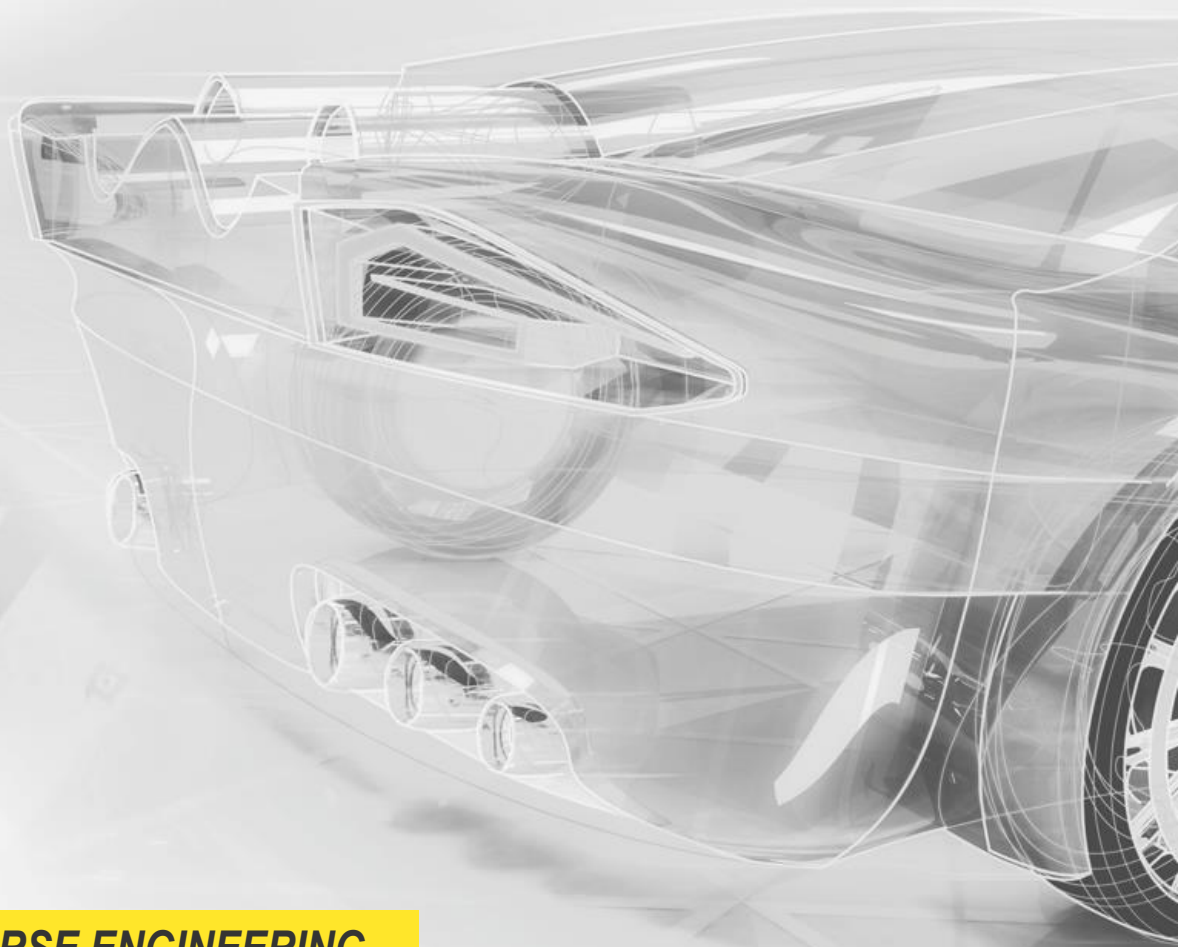
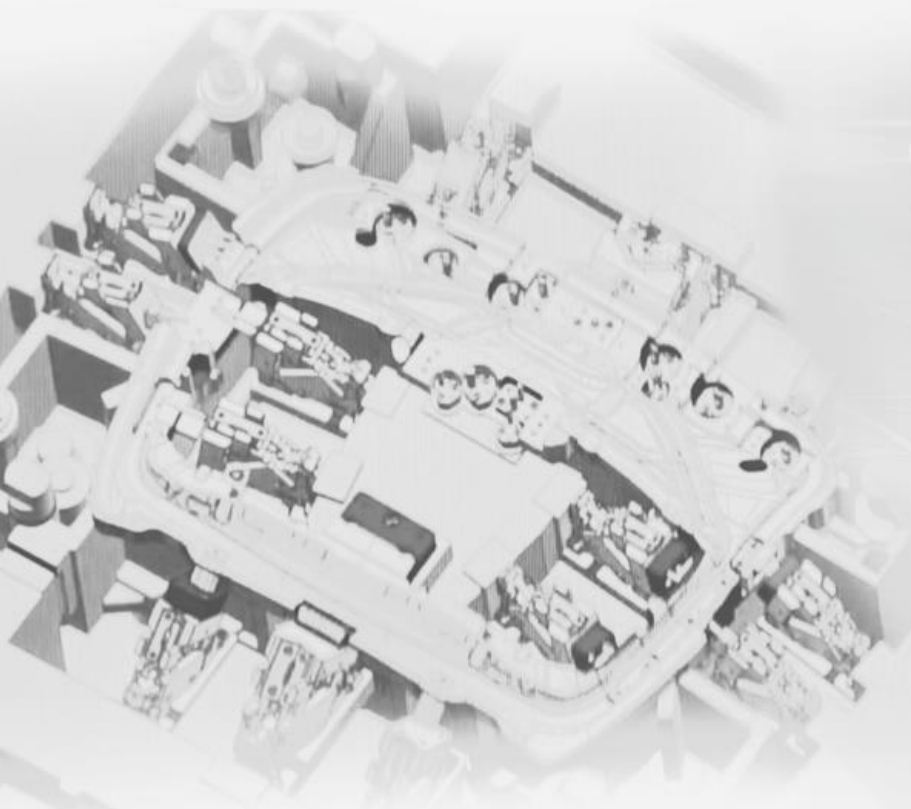


# FASI

MAKES IT EASY



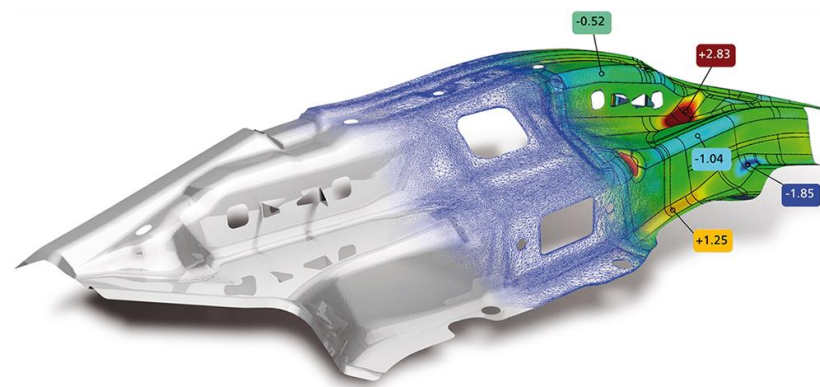
**REVERSE ENGINEERING**

## Reverse Engineering: What is it about?

FASI offer a service of **reverse engineering**.

It is a detailed analysis of the functioning, design and development of an object with a view to build a new one maintaining the same characteristics of the original one, with the only difference of an improved efficiency. In the field of design the notion **reverse engineering** summarizes the entire **3D digitisation process** of a real object to carry out an analysis or to perform a computer remodelling through the use of specific software.

To obtain files that can be used with the most common CAD software (Catia, Solidworks, Tebis, etc.) it is necessary to transform the STL file (point cloud) that has been obtained through the 3D scanning of a file composed by well defined geometrical entities: it is this very process that is defined **reverse engineering**.

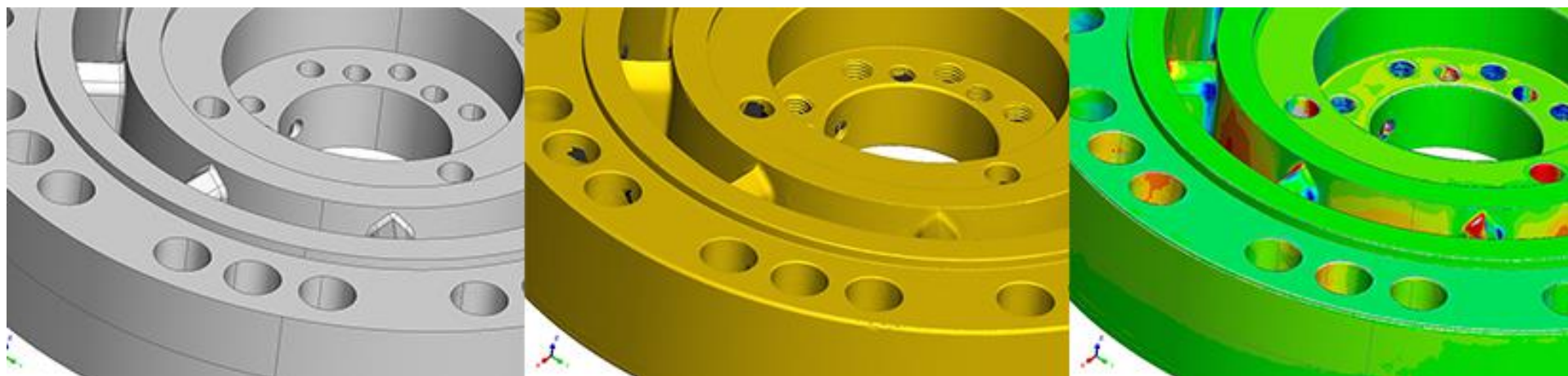


## Reverse Engineering: Why is it used?

Reverse Engineering, that is the recreation of the data of an existing object, meets multiple, different needs.

The recreation may infact be required because:

- the object is obsolete and the orginial design is no longer available;
- the object has an uncertain origin (an old component or out-of-production spare part);
- the object is a unique piece, such as an artistic or design piece;
- the physical object overtime has undergone to changes and it is intended to update its data.

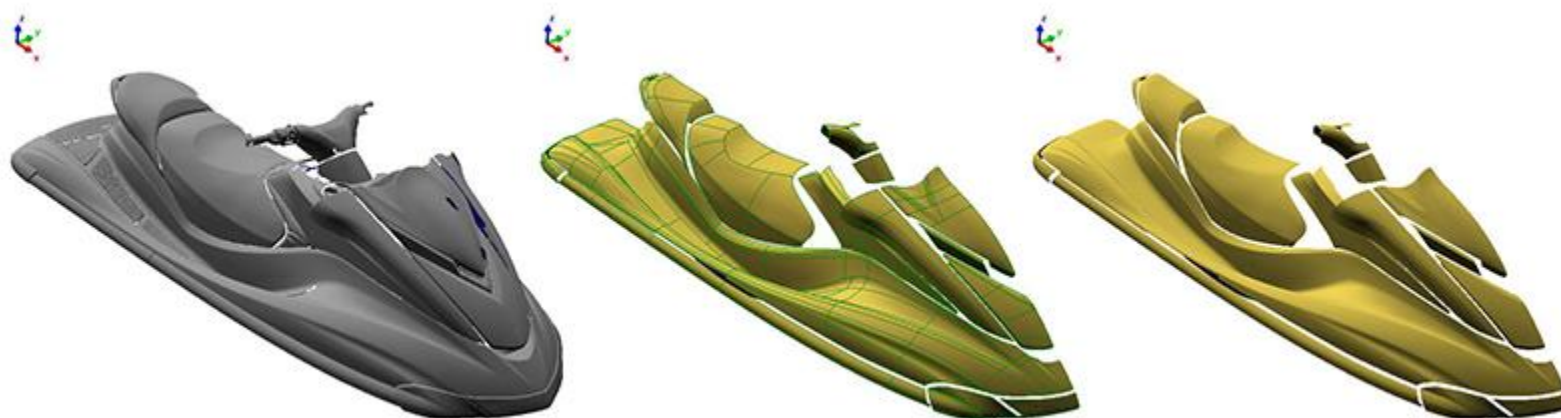


## Reverse Engineering: Realisation

Reverse Engineering, can be made with different techniques and software according to specific final needs.

The most commonly used types of **reverse engineering** are:

- **Parametric 3D reconstruction:** the final file consists of fittings, surfaces, curves and *cylinders* recognizable by the various CAD software;
- **3D reconstruction for exact surfaces:** the file consists of a series of surfaces that are “laid” on the scanning as if it were a “skin”. This system is best indicated when the forms are called "organic".



## Reverse Engineering: The phases of the process

The process of Reverse Engineering consists mainly of two phases:

### 1.Acquisition:

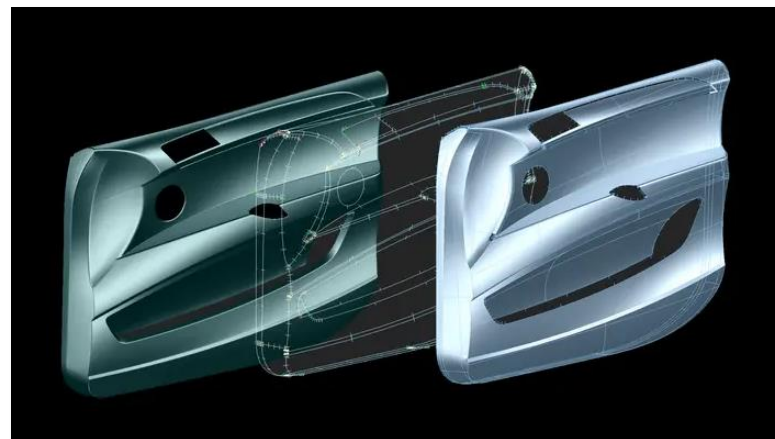
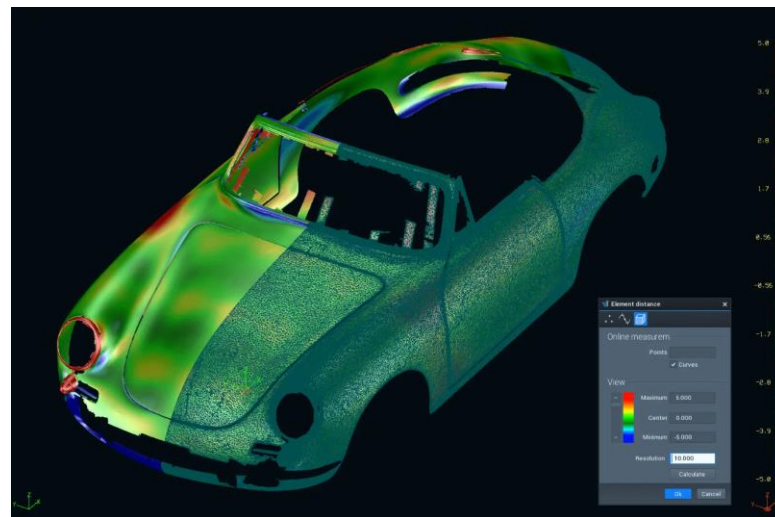
the object is digitised through 3D scanning (both optical and contact) such to obtain a set of continuous points commonly called "point cloud". To be displayed on dedicated software, this is represented by a series of polygons that connect all the points acquired and thus takes the name of "polygonal mesh". The higher is the density of the points detected, the better is the approximation of the "mesh".



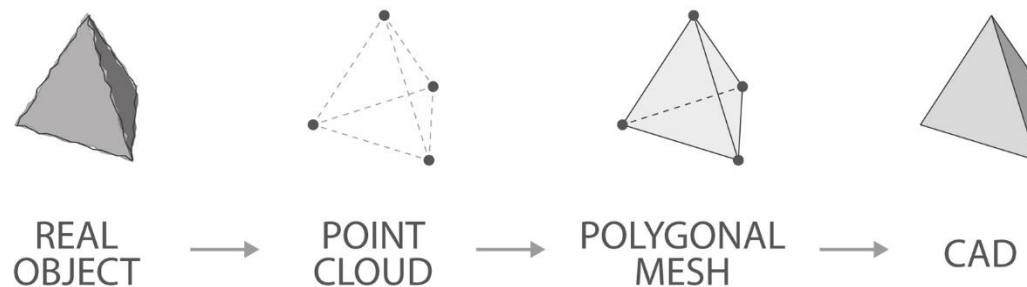
## Reverse Engineering: The phases of the process

### 2. Trasformation:

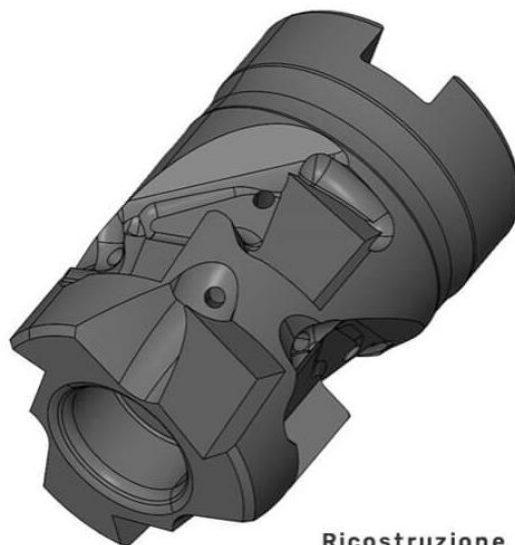
The point cloud of parametric entities is reworked by rationally and geometrically approximating the starting “mesh”. The new software dedicated to the reverse engineering – as for example TEBIS– allow to carry out solid remodelling directly from the data extracted from the “mesh”. In this phase the eventual presence of “background noise”, areas of discontinuity and distortion of the scan, may may affect the accuracy of the approximation. For this reason, before processing the transformation, it is important to reduce these imperfections with the appropriate tools.



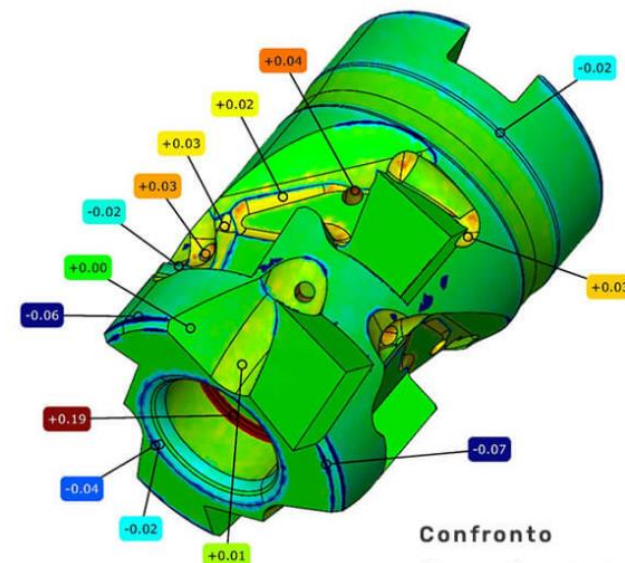
## Reverse Engineering: 3D overview



Scansione 3d  
3D scan



Ricostruzione  
Parametrica  
(reverse engineering)  
Parametric  
Reconstruction  
(reverse engineering)



Confronto  
dimensionale tra  
scansione e reverse  
Dimensional  
comparison between  
scan and reverse

## Reverse Engineering: Fields of application

3D reconstruction and modeling by reverse engineering have an almost unlimited field of application. In particular they may be used in the sculptural, industrial, mechanical, aeronautical, aerospace, automotive, civil, architectural, and medical fields.



**MECCANICA**

Mechanics



**ARTE E RESTAURO**

Art and restoration



**MODELLISMO**

Modelling



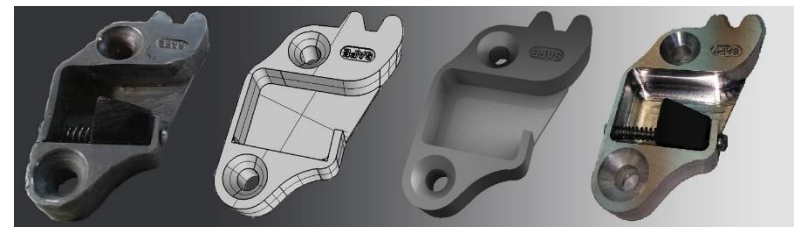
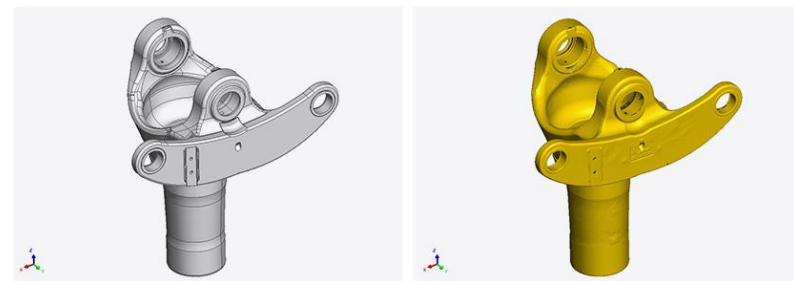
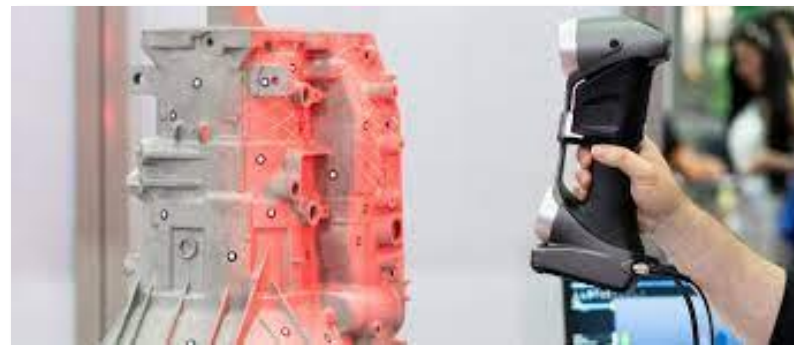
**INDUSTRIAL DESIGN**

## Reverse Engineering: Fields of application

### *MECHANICS*

Applications in Mechanics are the best known but also more complex due to the industrial sectors in which it is the protagonist. Constantly evolving CAD/CAM software is used here, allowing to achieve always better results but at the same time need of instruments that able to verify them to the best. In this sense, optical scans make all the difference. The possibility to make much more precise measurements allows you to push higher and higher in the quality of odierno. the machining work. Be able to recover in the race some projects without having to start from the beginning is a huge advantage in terms of time and costs and is therefore fundamental in the industrial panorama.

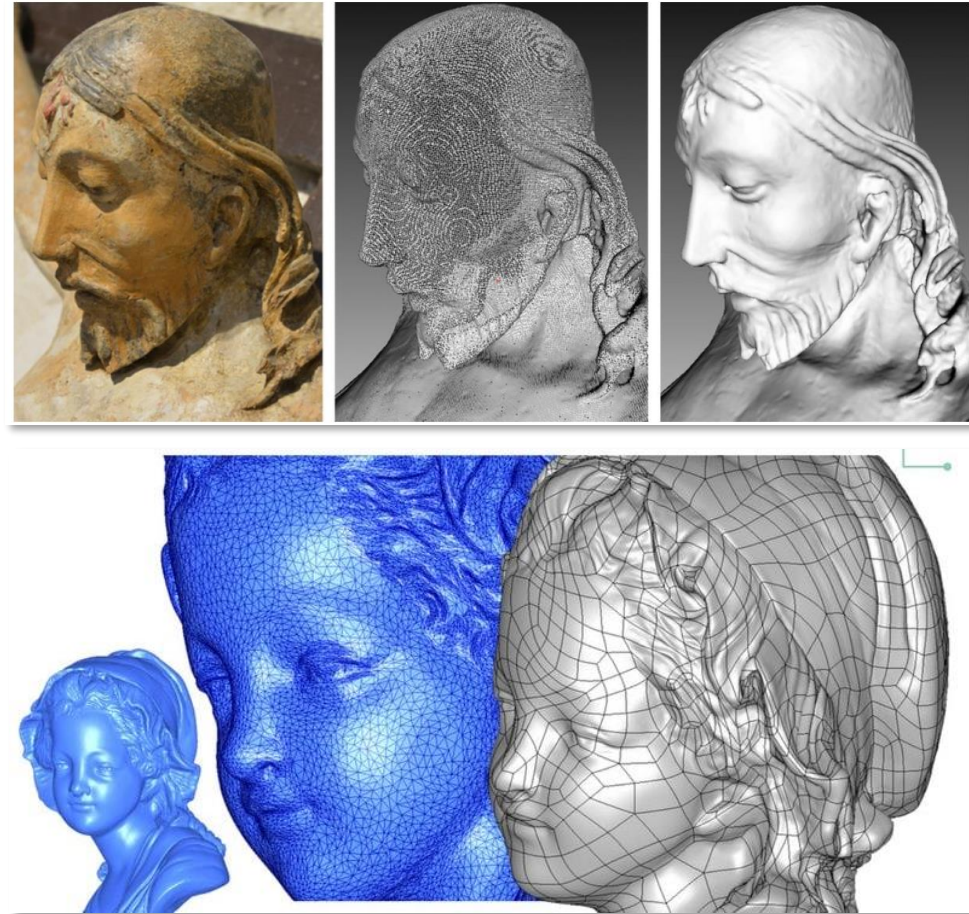
FASI offers valuable help to mechanical companies that want to increase their quality level offering a customized **reverse engineering** service. Die maker companies are offered the possibility, for example, to retrieve a parametric 3D file from old models or dies that were not designed with CAD (made by copy milling or cutting) from which obtaining a digital and more contemporary product. Perform quality and deeper dimensional checks creating a detailed and customized report for every need can also be a distinctive sign of the products offered of your own way of working.



## Reverse Engineering: Field of application

### *ART AND RESTORATION*

Optical scanning – already known in this field – allows to preserve or restore luster to all those objects which could hardly be returned to their original state. **Reverse engineering** and **3D reconstruction**, for example, are particularly useful in the recovery phases where it is not possible to restore the subject due to the poor state of some of its parts : in this case, through a **3D scanner for reverse engineering** it is possible to acquire the portion in question ,and then reconstruct it first in 3D and then physically through the technologies chosen without alternating the line and the original charm. Another use of this technology in the art sector may be the use of scanning for digital reproductions in virtual museums. In this case the STL file can be covered with the original textures obtained from the scanning or from other photographic procedures placed in the designated space.

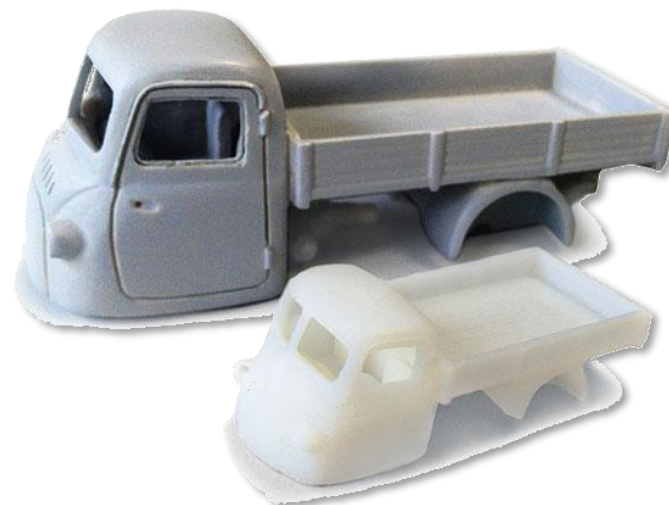


## Reverse Engineering: Fields of application

### *MODELLING*

Until few years ago modelling was a very limited sector: high costs and poor availability of materials and equipment had in fact relegated him to activities for a few and niche. Today, with the advent of new technologies at relatively affordable costs, the situation has clearly improved. The access to 3D CAD programs such as Sketchup, Rhino or the opensource Blender, for example, has allowed to many enthusiasts to develop also very complex customized ideas and projects.

FASI offer to enthusiasts and companies in the sector the best solutions for the modification of some details of static modelling, allowing to effectively correct defects and imperfections of the models. By analysing and comparing the 3D and the model in question, FASI is able to deliver a file ready to print using the most current 3D printers.



## Reverse Engineering: Fields of application

### *INDUSTRIAL DESIGN*

The Industrial design includes countless sectors among which car design, furniture design, yacht design, lighting design. In this field the optical scanning lends itself as an effective support to the designer who, after making sketches or prototypes of his idea, needs to give it substance.

FASI takes care of scanning the model and deliver to the customer a file that can be printed with 3D printer and that is editable and permanent. Any subsequent changes to that file can be done on PC with a CAD program or on the initial model, already having an excellent basis for the subsequent stages of development and production.

