

**DEVELOPMENT OF A NEW PRODUCT BY REVERSE  
ENGINEERING AND RAPID PROTOTYPING**

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**ABSTRACT**

*The digital CAD model of the product plays a key role in modern industrial production. Reverse engineering and 3D-digitalization become beneficial when the products of complex geometrical shapes are in question. The paper presents development of a new product by reverse engineering principles using 3D-digitalization and rapid manufacturing technology.*

**Keywords:** Product development, Reverse engineering, 3D-digitalization, Rapid prototyping

**1. INTRODUCTION**

Industry producing has constant need to innovate and to improve present producing processes and systems. The present meaning and relations in industry producing are changed by technological revolution with very fast operating and application of researches into concrete technologies, technical processes and new products. The explosive science development in the last years is result of computer technology applications. Their application has automated and integrated the producing, increased flexibility, development and application of intelligent producing systems to enable the development of the new philosophy. Introducing the new technologies as: reverse engineering and rapid prototype producing are shown quality change in the meaning of market demands [1,2,4].

**2. REVERSE ENGINEERING**

The reverse engineering – *RE* presents a process that occupies all engineering activities beginning from physical model recording, making internal computing of the same to technology process projecting. Because that, the reverse engineering is divided into three essential phases: scanning technology/3D-digitalizing, reconstructing methods, and rapid technology producing. The ground process of the reverse engineering is 3D-digitalizing that confirms that the continuous progress in the computer technologies enables making of the new concepts in the engineering activity sphere. The technology of the rapid producing presents the new methods of the forming technology of complex parts [3,5,6,7,8].

Through application of the reverse engineering can be reconstruct many products and produce with *RP* technology processes. That confirms meaning that the reverse engineering gives "the new life" to product.

The reverse engineering is applied in [9]:

- forming of the new part/product,
- processing of technical documentation for present parts/products,
- changing of parts/products for original which are out of date,
- repairing or modification of present parts/products,
- problem analyse in the present technology,
- optimizing of product/action processing,
- projecting of the new producing type,
- data base forming for parts/products.

### 3. THE REVERSE ENGINEERING APPLICATION IN THE DEVELOPMENT OF MOBILE PHONE HOLDER

Becoming of analysed prototype/part in the paper has defined flow (figure 1). The action begins with the reverse engineering application, where real mode takes mobile device and over phases: digitalizing, reconstruction, modelling, process preparing, it comes to prototype- mobile phone device [6].

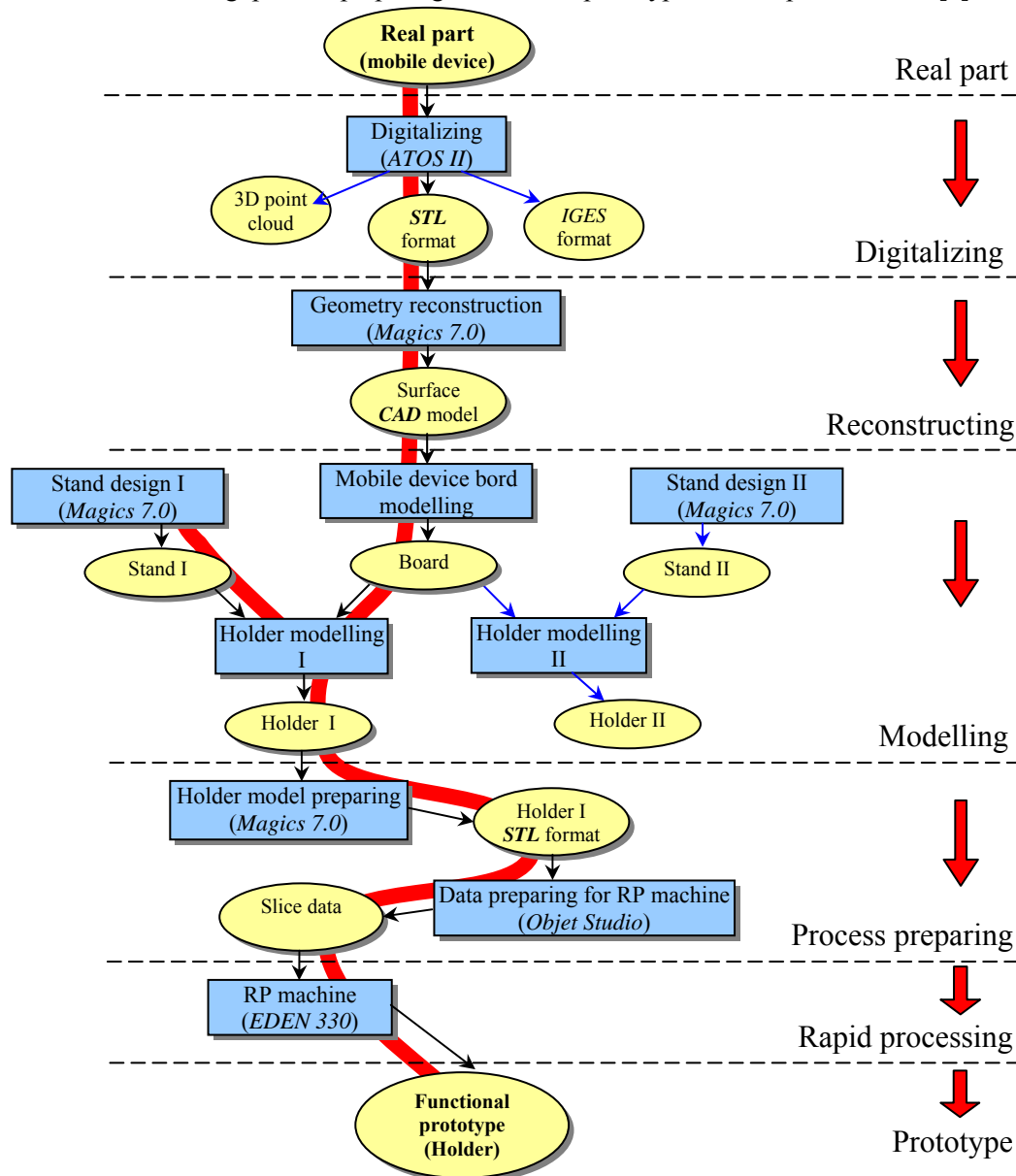


Figure 1. Algorithm of prototype producing of mobile device holder

### 3.1. 3D-digitalizing and reconstructing

Mobile device (figure 2) is digitalized by help of optical measuring system ATOS II. The results of 3D scanning with measuring system ATOS II can get in STL format, IGES format or 3D point cloud. The reconstruction of virtual/computer model along the gotten results is provided in defined software packages that can reconstruct computer mode into 3D surfacing or SOLID object, where the surfaces, gotten by scanning can translate into element mathematic surfaces.

The analyse and geometry reconstruction of digitalizing model of mobile device is made in program Magic 7.0. The digitalized device model in STL format is reconstructed and gotten computer/virtual model, shown at the figure 3.



Figure 2. Real model



Figure 3. Reconstructed computer/virtual model

### 3.2. Modelling

Stand modelling and board are made also in program *Magic 7.0*. 3D computer model of mobile device (figure 3) are used for board modelling of mobile phone.

The internal board part for mobile device is gotten by subtraction of computer/digitalized model from board body. The internal board surface, shown at the figure 4, follows the geometry and form of computer/digital model. Getting this surface, presents the most important step in modelling of mobile device board. The stand holder is modelled by two variants. The final form of the first variant of stand holder is shown at the figure 5. The joint is modelled from several spheres of defined dimensions. The connection of down part with joint is made helping the cylinder under defined angle.

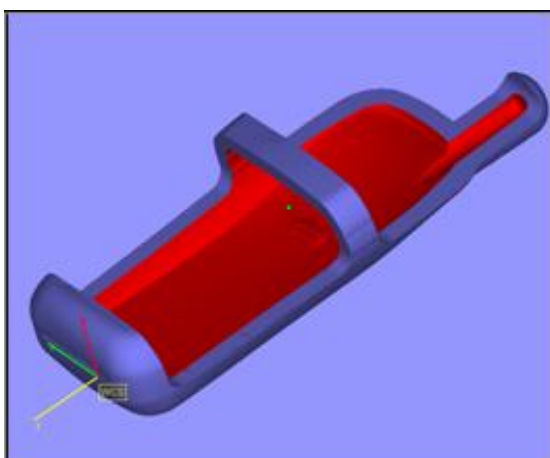


Figure 4. Board surface modelling

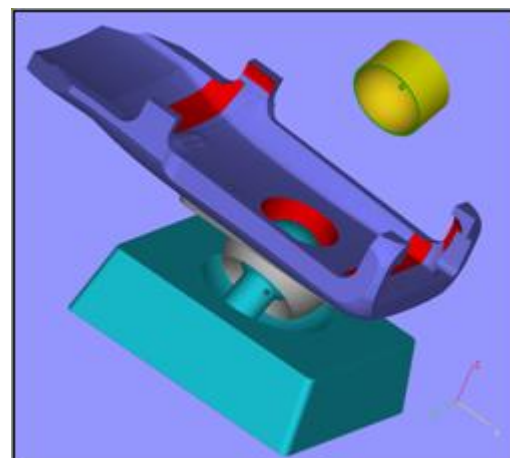


Figure 5. Holder model

### 3.3. Rapid producing

Prototype is made by PolyJet process with 3D printer *EDEN 330*. It is needed for holder prototype to import *STL* file into software *Object Studio* and on the platform to take defined orientation and model position. For selected model orientation there is run the command for producing, software automatically delayers model and acts on RP engine one to another. The processing lasts to printing on the last layer.

The processing of model holder of mobile device on RP engine *EDEN 330*, lasts 8 hours where is consumed: 222 g model material *FullCure 730* and 239 g supported material *FullCure 705*.

The support from model, made on RP engine *EDEN 330*, is carried out with water jet under defined pressure. After taking out of model support, the model is deleted and so is gotten finally holder prototype for mobile device [6].



Figure 6. Holder prototype for mobile device

## 4. CONCLUSION

The producing demands continuous involving and improving of present products, from which application efficiency, depend survival of many producing business systems. The industry stand changes quickly under conditions of advanced producing and computing technologies. The most important producing aims are fast development and achieving of competition advantages on globalized world market. The made beneficies and factory status are the ground efficiency indexes. More market demands require from production the new competition solutions that go out in the phase of product development. Applying the modern methods and techniques as reverse engineering and 3D digitalizing it is enabled to get 3D CAD computing model of parts of complex geometry form.

In the described example, applying modern technologies, we have gotten holder prototype for mobile device in short time.

More applications in technological developed world have the methods and techniques of fast development and product processing and they are the main generators of competitive advantages.

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