

WHAT TYPE OF RP MODEL WILL BE CHOSEN FOR DIFFERENT KIND OF PRODUCTS

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1. Introduction

Several methods of RP were developed for different purposes. Some of them are more appropriate for special purposes, some of them less. The oldest and one of the more universal methods of RP is stereolithography. That is simultaneously one of the most frequently used methods in industry.

The common characteristics for all methods are listed below.

2. Materialising concepts

Solid object printers can be used to create three dimensional concept models rapidly and cost-effectively within design department. The first step allows communication among designers and other parts of company (sales and marketing) at early stages of the product development.

Thermo Jet solid model is commonly used as a fraction of conventional model, only to estimate and support virtual model. These models are rather inexpensive, but they have several disadvantages for other purposes besides visualisation of computer generated virtual model.

The surfaces of thermo jet RP models are rather bad and small features designed at the product are neglected. The model is good for estimation of simple geometry parts like housings of mobile phone and similar parts.

3. Prototypes made faster, production starts quickly

Stereolithography or other method used for RP results in plastic prototypes and exact models within a shortest time. Apparatus used to generate prototypes are compatible with all CAD systems. Specially, injection molding is the next step after rapid prototyping. Mass production for mass consumption products are well

established in the industry of plastic products. Visualisation, prototype construction and rapid tooling are steps in the chain which are necessary to shorten time-to-market.

4. Mass products

Rapid prototyping is being used in various branches of industry, especially in the economy of mass consumption and industry dealing with new technologies. It is worth to mention that all products, especially sophisticated products with high level of security use rapid prototyping. Here are some of products which will be mentioned:

- automobile, aviation and aerospace,
- electrical, electronics and communication,
- medical and science,
- toys and sports articles,
- appliances and household articles.

Advanced researches are conducted in a higher engine power and better reliability. Rapid prototypes of engines were made of special materials to enable visualisation processes of heating and cooling. The other equipment were used to detect zones of temperature distribution.

Several parts and items for electrical, electronics and robotics industry, preferably those which are very small in dimensions and with narrow tolerances are produced using RP technologies.

Medical implantates like skulls, bones and hips and others for surgical purposes can be produced by rapid prototyping.

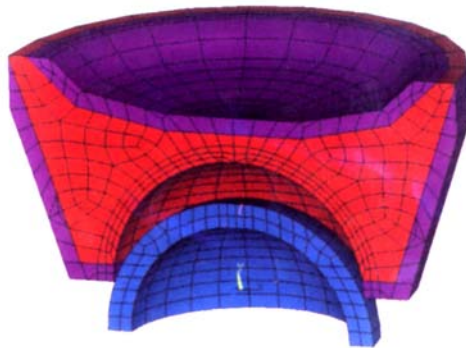


Fig.1. RP model of hips

Toys and sports articles like skis, tennis rackets, motorcycle parts, could be made using RP more comfortable.

Appliances and household articles like vacuum cleaners, bowls, parts for many other appliances are developed by RP to reduce time up to 50% and find an ergonomic design easy to handle and maintain.

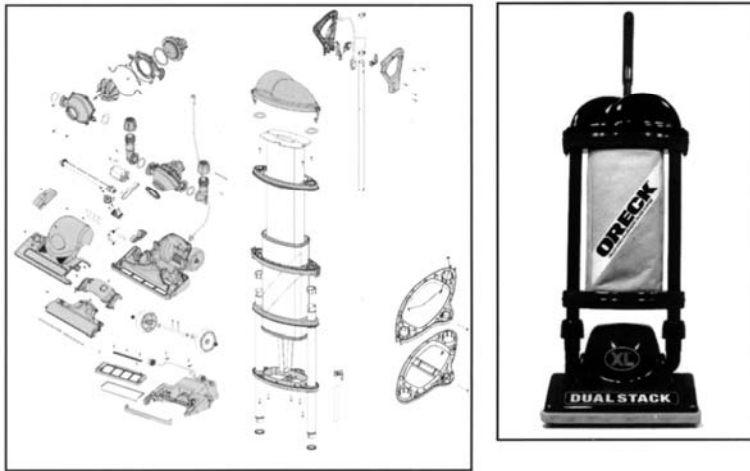


Fig.2. Vacuum cleaner comprises of 31 parts

All mentioned products including watches, mobile phones and infinity of others are produced in series of millions. Their prices have to be concurrent for market. Design and colour have to be acceptable and modern.

5. RP methods for supporting mass production

Some of the RP methods are well known but not definitely developed. All of the methods can be subdivided into :

- subtractive and
- additive methods.

Both of them have advantages and disadvantages. In this paper only additive methods are discussed. As it was mentioned previously, stereolithography method is the oldest but also the best developed one. The parts made by stereolithography are rather expensive, but that fact is not barrier for widely extended usage of it.

Price for building rapid models will be included in the cost of products. The RP product is accurate with limited physical durability. Materials for stereolithography are expensive. In spite of all disadvantages a number of rapid models increases every year. Figure 3. shows the number of models in last three years.

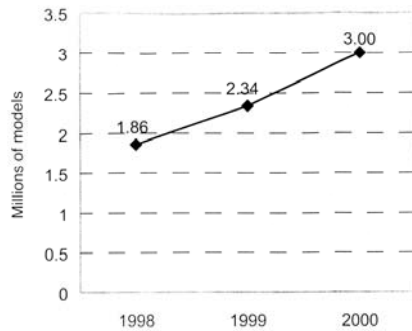


Fig.3. Number of models in last three years

The next figure shows increase in number of the machines for building RP models.

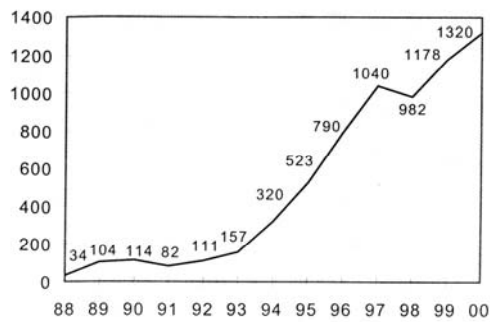


Fig.4. Number of RP machines put in the models production in last twelve years

Rapid prototype models are mostly used for testing functionality. About 22,7% of all models are built for these testings, 18,2% for assembly testings, 16,9% for visual aids for engineering, and 13,4% for prototype tooling.

Rapid prototypes might be used as patterns for cast metal 6,3% or ergonomic studies 4,6%.

Almost all RP models are made of plastic material. One of them recently developed is ABS (acrylonitrile butadiene styrene). It is suitable for other purposes not only for models. It can be used for investment wax casting or elastomer concerning of its high impact strength. Laser selective sintering a part of stereolithography cured metallic powders to build rapid model. It is not convenient for rapid models in mass production.

4. Conclusions

The most appropriate method for rapid prototyping are Thermo Jet printing for design estimation and stereolithography for functional testing parts and assemblies. Fused deposition modelling is an alternative method which enables testing of the bigger parts successfully better than the other methods.

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Summary

Nowadays competitive market in global economy needs a quick reaction on customer demands. The new economy developed several approaches to perform ways for reaching a new product. One of the phases in new products creating is a rapid prototype. RP is made for verification the function of product as well as its construction and properties like aerodynamical shape etc.

In this paper several methods of RP are discussed and appropriated recommended for different purposes.

Key words: rapid prototyping, rapid models, rapid methods