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Study of the Influence of Technological Parameters on Generating Flat Part with Cylindrical Features in 3D Printing with Resin Cured by Optical Processing

Aurel Tulcan [1,*], Mircea Dorin Vasilescu [2,*] and Liliana Tulcan [2,*]

1 Department of IMF, Politehnica University Timisoara, 300006 Timisoara, Romania
2 Department of MMUT, Politehnica University Timisoara, 300006 Timisoara, Romania
* Correspondence: aurel.tulcan@upt.ro (A.T.); mircea.vasilescu@upt.ro (M.D.V.); liliana.tulcan@upt.ro (L.T.)

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Abstract: The objective of this paper is to determine how the supporting structure in the DLP 3D printing process has influences on the characteristics of the flat and cylindrical surfaces. The part is printed by using the Light Control Digital (LCD) 3D printer technology. A Coordinate Measuring Machine (CMM) with contact probes is used for measuring the physical characteristics of the printed part. Two types of experiment were chosen by the authors to be made. The first part takes into consideration the influence of the density of the generated supports, at the bottom of the printed body on the characteristics of the flat surface. In parallel, it is studying the impact of support density on the dimension and quality of the surface. In the second part of the experiment, the influence of the printed supports dimension on the flatness, straightness and roundness of the printed elements were examined. It can be observed that both the numerical and dimensional optimum zones of the support structure for a prismatic element could be determined, according to two experiments carried out and the processing of the resulting data. Based on standardized data of flatness, straightness and roundness, it is possible to put in accord the values determined by measurement within the limits of standardized values.

Keywords: 3D printing; additive manufacturing; surface deviation; parametric dimensioning; digital light processing; design of experiments; 3D metrology

1. Introduction

In both research and production, the quality obtained by the 3D printing process has an essential role in making parts or assemblies with the functional role [1–4]. At the same time, the use of this technology allows us to reduce manufacturing costs [5,6], as well as the level of pollution [7–10]. 3D printing is a relatively new technological process [11,12] that permits the generation of parts faster than other similar methods of fabrication. In the specialized literature, there are several studies related to 3D printing, among them are those dealing with the medium's evolution in time [13,14].

The flat and profiled surfaces have an essential role, both in terms of kinematic and functional movement. The use of such an approach to generating specific features of the parts at low expense allows a reduction of both costs in design and production [15,16]. It is possible to take into consideration the analysis of the flat or round surfaces, which ensure the generation of the facets on which the movement can be achieved linearly or by rotation, with high speed and precision.

Generation of round or flat elements created by the conventional processing of injection materials or by the Fused Depositing Modeling (FDM) printing process [17–19], used the melted plastic as an extruded component and deposited it layer-by-layer in predetermined locations.

In the digital light processing (DLP) [20] the optical polymerization of materials is taken into consideration for generating parts.

Influence of Technological Parameters on the Dimension of GEAR Parts Generated with PLA Matherial by FDM 3D Printing

MIRCEA DORIN VASILESCU*, TRAIAN FLESER
Politehnica University Timisoara, 2 Victoriei Sq., 300006, Timisoara, Romania

The purpose of this research is to establish the technology of 3D printable production on the principle of FDM of gears made of PLA, ABS and PETG mainly. In the paper we present first the dimensional generation and specific aspects that need to be considered to produce gears with internal or external teeth of the cylindrical type with vertical or inclined teeth. Generating the gears appeared as a necessity for the reconditioning of the components of the processing machines and of the electric machines made both in the process of elaboration of the bachelor's and the laboratory works, with reduced energy resource consumption and low pollution as low as possible. After the construction, we past to identify the dimension that have implications for both mechanical and kinematic resistance to achieve a product with good cinematic and functional characteristics. After that are made an analysis of the layers generated, both from the computer simulation and from the point of view of the analysis of layers physically generated on a gear tooth with external teeth.

Keywords: 3D printing; fabrication parts; dimension gear, PLA material, FDM printing

Obtaining parts that have a structure composed of type gears is a complex and relatively difficult process of processing especially when the difference in diameters is large or very large (fig. 1.). From the areas in which such components with maximum economic efficiency can be used, we list those of repairing components made of metallic or non-metallic materials, in which the mechanical stresses are reduced or have average values [1-4]. From both the experimental and the specialized literature, we can conclude that there are a few materials that can be used successfully to achieve these goals.

Fig. 1.Geometry gear 3d printed

The study is geared both to determine the technological efficiency for the implementation of PLA, ABS and PETG materials for the making of 3D toothed parts by FDD (Fused Deposition Modelling) [5, 6] technology, as well as the realization of components under the new imposed conditions using materials and recyclable technologies that pollute less the workspace. The polluting factor must be seen both from the point of view of the energy resources used to obtain the raw material and from the point of view of the reintroduction into the industrial circuit of the material that was used in the toothed wheel components by recycling the damaged wheel material method, (Life Care Assessment) [7, 8].

From the point of view of these three materials, as can be seen from (table 1), the materials considered have similar resistance characteristics. It can be seen from the analysis that the best compressive strength is PLA and approximately the smallest elongation at break, respectively the highest modulus of elasticity between the three materials. This conclusion leads us to assert that the first recommended material would be PLA [9-12] for toothed wheels, followed by PETG and finally due to the large range of different ABS values.

If we compare the values of compressive strength from (table 1) with those of aluminium or cast iron, we find that they are comparable (table 2).

Table 1
MATERIAL PROPRIETIES FOR 3D PRINTING

Material	Dens. in gr/cm³	UTS in MPa	CS in MPa	E in GPa	IS in J/m	EB in %
PLA [13,14]	1.24	50	153	3.5	15 - 45	6
PETG [15,16]	1.29	53	55	2.1	77	18
ABS [17,18]	1.0-1.4	37 - 110	65	2.0-2.6	70-370	3.5-50

UTS is Tensile Strength: Ultimate, CS is Compressive (Crushing) Strength, E is Elastic (Young's, Tensile) Modulus, IS Impact Strength: Notched Izod, Dens. is Density, EB is Elongation at Break

It can be concluded from this analysis that, from the point of view of the compression resistance, the two types of printed and non-metallic or metallic materials, are with compression resistance in the domain of relatively same values, while from the point of view of the breaking requests, the differences are relatively large three to four times smaller.

Table 2
NON METALIC AND METALIC MATERIAL PROPRIETIES

Material	RR. in MPa	UTS in MPa	CS in MPa	RI in GPa	EB in %
Aluminium 6082 [19]	140 - 330	290	28 - 66	31 - 72	10
Aluminium 6063 [20]	145 - 186	241	29 - 37	31 - 41	12
Aluminium A380 [21]	160 - 325	290	32 - 65	35 - 72	35
Greycast iron [22]	150 - 400	160-450	570 - 1290	49 - 125	0.5

RR is Breaking Resistance, RI is Bending Resistance

* email:mircea.vasilescu@upt.ro

Influence of Technological Parametrs on the Dimension of Threaded Parts Generated with PLA Matherial by FDM 3D Printing

MIRCEA DORIN VASILESCU*, TRAIAN FLESER*
Politehnica University Timisoara, 1 Mihai Viteazul Blvd., 300222, Timisoara, Romania

In this research are establish the technology of 3D printable parts by the principle of FDM 3D printed for threaded made by PLA, ABS, Nylon or PETG. In the paper are present first the dimensional generation and specific aspects that need to be considered to produce threaded with internal teeth of the metric, round or trapezoidal type. Generating the threaded appeared as a necessity for the reconditioning or made of the components of the processing machines made both in the process of elaboration of the bachelor's and the laboratory works, with reduced energy resource consumption and low pollution as low as possible. After the construction, it is identify the dimension that have implications for both mechanical and kinematic resistance to make a product with good cinematic and functional characteristics. After that are made an analysis of the layers generated, both from the computer simulation and from the point of view of the analysis of layers physically generated for a threaded with internal teeth. At the end are presented which are necessary for operations to obtain a product with good features starting from two types of thread generated 8x2 and 10x2 moments.

Keywords: 3D printing; fabrication parts; dimension threaded, PLA material, FDM printing

In the moving system are components that have a structure composed by threaded and rigid structure for assembling construction [1, 2]. The generation of the thread is a complex and relatively difficult process. Part of this process is presented in (fig. 1.). The generation principle is specific to each type of the generation program. On the left side is the variant for generation in CATIA or INVENTOR where we generate a trapezoidal coil that it is made by roto translation process of generating of the thread. In FUSION 360 [3] the generation is carried out using a direct realization module that allows the principle to be obtained on the actual completion of a specific spiral library.

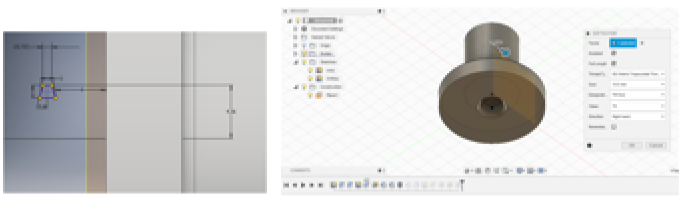

Fig. 1. Geometry conventional threaded to be made, left INVENTOR solution, right FUSION 360 solution

From a constructive point (table 1) of view most threaded components are made with two or more parts, which are mounted with fixing elements, centring and positioning relative one in relation to the other. This makes in terms of manufacturing costs to be relatively high, due to the precision necessary for installation.

Table 1
PART ROUND THREADED MADE

Diametru	Pas	D1	D2=d2	D4	ac	H1	H4=h3	z	d3
10,00	2,00	8,00	9,00	10,50	0,25	1,00	1,25	0,50	7,50
8,00	2,00	6,00	7,00	8,50	0,25	1,00	1,25	0,50	5,50
8	1,5	6,50	7,25	8,50	0,25	0,75	1,00	0,38	6,00

In order to achieve and mount nut a composite system made from a single part is conceived, as can be seen in (fig. 2.). The marker has both the fastening part on the motion element as well as the positioning and adjustment part of the mechanical lost motion.

In figure 2 was conducted the generation of the part using program INVENTOR [4] at which the thread was made by trapezoidal type for that is in the left part and the second is by round type in the right part. Note that the principle is the same, namely to make first the hole in the part in which you have conducted the element and then threading will be achieved by generating in a plane thread coaxial with the hole axis and perpendicular to the circular part the hole. From these it can see that we use to effective generation and not visual rather than imposed by 3D-generation programs by type CATIA, INVENTOR, Solid Work.

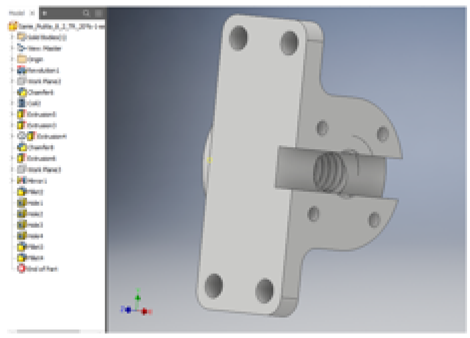

Fig. 2.Geometry 3D printed threaded by made

From the areas in which such components with maximum economic efficiency can be used, we considered:

-the repairing components made of metallic or non-metallic materials, in which the mechanical stresses are reduced or have average values

-the generated new parts at which the mechanical stresses are reduced or have average values.

From both the experimental and the specialized literature, we can conclude that there are a few materials that can be used successfully to achieve that condition. In this study are determinate the technological efficiency for the implementation of PLA, ABS and PETG materials for the making of 3D toothed parts by FDD (Fused Deposition Modelling) [5-7] technology, as well as the realization of

* email: mircea.vasilescu@upt.ro; traian.flesher@upt.ro

Constructiv and Technological Consideration on the Generation of Gear Made by the DLP 3D-Printed Methode

MIRCEA DORIN VASILESCU*
Politehnica University Timisoara, 2 Victoriei Sq., 300006, Timisoara, Romania

The aim of the work is conduct to highlight how the technological parameters has influence of 3D printed DLP on the generation of wheel, made from resin type material. In the first part of the paper is presents how to generate in terms of dimensional aspects specific design cylindrical gears, conical and worm gear. Generating elements intended to reduce the cost of manufacturing of these elements. Also are achieve the specific components of this work are put to test with a laboratory test stand which is presented in the paper in the third part of the paper. The tested gears generated by 3D-printed technique made with 3D printed with FDM or DLP technique. After the constructive aspects, proceed to the identification of conserved quantities, which have an impact both in terms of mechanical strength, but his cinematic, in order to achieve a product with kinematic features and good functional domain specific had in mind. The next part is carried out an analysis of the layers are generated using the DLP and FDM method using an optical microscope with magnification up to 500 times, specially adapted in order to achieve both visualization and measurement of specific elements. In the end part, it will highlight the main issues and the specific recommendations made to obtain such constructive mechanical elements.

Keywords: 3D printing; fabrication parts; generated gear, DLP material, DLP printing

Design and implementation of components for mechanical and electromechanical command type of wheels that have a structure composed of wheel type is an important component of the transformation processes but also on order. From a constructive point of view, there are several types of wheels. The most common are the wheels and gear wheels, followed by the trapezoidal belt [1].

We will study how the gears on the principle of generating the CAD generation and after that on an FDM (Fused Deposition Modelling) [2-5] and after this on a DLP (Digital Light Processing) made in optimum conditions. For the first case, are generated a double pinion with vertical teeth. In figure 1, it can see the wheel generated CAD principle consist of a pinion and a great rate of generated of the profile.

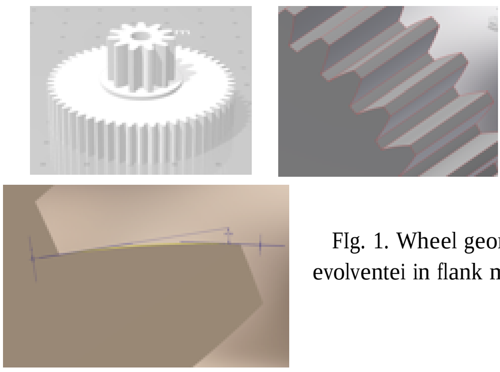

FIg. 1. Wheel geometry and evolventei in flank made in CAD

The generation on the principle of 3D printed by FDM structure is one composed of three layers lower minimum and the same upper and three-layer perimeter so as you can see in figure 2. To generate the inner part is a type structure with 40% density minimum in order to have a durable structure, but also with good properties of requests but also generate involute gear profile on submission of material [6].

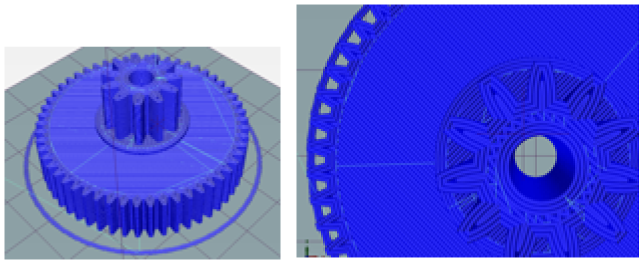

Fig. 2.Wheel geometry and involute flank by FDM printing

The profile generation side is very accurate on the programme to generate teeth. The wheel profile as can be seen in figure 3 is generated by merging the four points on the flank of the first of which is generated from the base of the tooth and the second at the tip of the tooth for a small module.

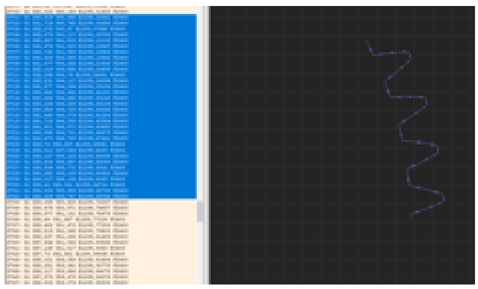

Fig. 3.The program GCode to flank involute wheel

It possible to seen that the small number of points to change the angle of teeth is smaller and higher (6 point) for how it grows no matter what would be the kind of program that makes command line program generation figure 4. The generation program made with RepetierHost. In figure 5, it is possible to see the program generated with IdeaMaker.

* email: mircea.vasilescu@upt.ro

Influence of Constructive and Technological Parameters at Generated Spiral Parts with DLP 3D Printing Process

MIRCEA DORIN VASILESCU*
Politehnica University of Timisoara, 2 Victoriei Sq., 300006, Timisoara, Romania

This work are made for determine the possibility of generating the specific parts of a threaded assembly. If aspects of CAD generating specific elements was analysed over time in several works, the technological aspects of making components by printing processes 3D through optical polymerization process is less studied. Generating the threaded appeared as a necessity for the reconditioning technology or made components of the processing machines. To determine the technological aspects of 3D printing are arranged to achieve specific factors of the technological process, but also from the specific elements of a trapezoidal thread or spiral for translate granular material in supply process are determined experimentally. In the first part analyses the constructive generation process of a spiral element. In the second part are identified the specific aspects that can generation influence on the process of realization by 3D DLP printing of the two studied elements. The third part is affected to printing and determining the dimensions of the analysed components. We will determine the specific value that can influence the process of making them in rapport with printing process. The last part is affected by the conclusions. It can be noticed that both the orientation and the precision of generating solid models have a great influence on the made parts.

Keywords: 3D printing; fabrication parts; dimension threaded, resin material, DLP printing

Consdructive and dimensional aspects at generation of the spiral part

CAD realization of spirals can be made using more than one method [1-7]. The first of these is a graphical method that adds a picture surface generated and that is most used. The second method is the cutting generation in a cylindrical surface of the spiral using as directory to generating. The cutting sections called generators may be of different shapes. For the case of this paper, we will use triangle [8] and arc type generating element respectively. The advantage of the generating of the spiral element in a structure may be reducing the number of items that needed for making the assembly [6, 7, 9]. If the first two variants are, the accomplishment of cylindrical spiral type elements, the third variant are generated the planar spiral (Figure 1.) or conical spiral elements (Figure 2.).

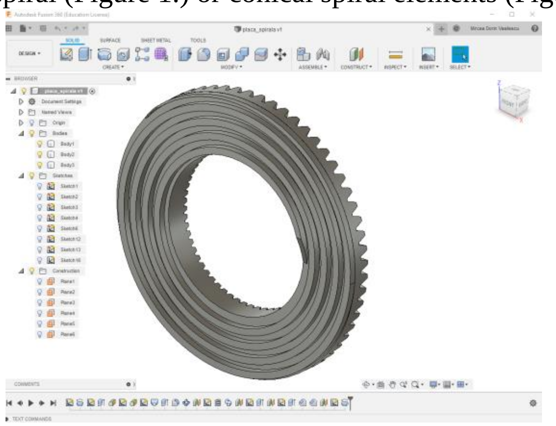

Fig. 1. Geometry 3D printed plan spiral

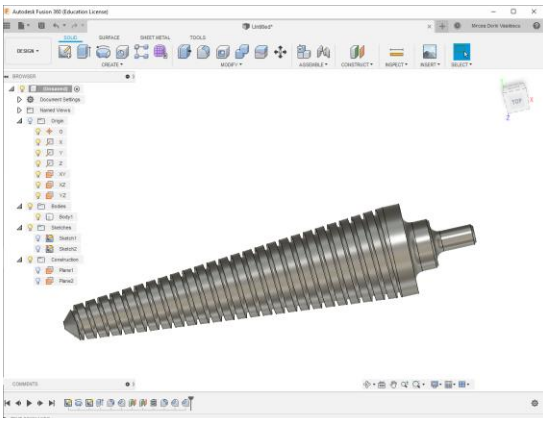

Fig. 2. Geometry 3D printed conical spiral

Spiral plan element was generated for the realization of a lathe chuck 3D printed with functional but also didactic role. Spiral element rotated after Z-axis with the help of a conical gear disposed on the opposite side of the spiral surface. That is specific to a universal lathe with a diameter of 50 mm. To generate the specific interface Design we used module from [5, 10, 11]. Spiral surface is subject to a solicitation of sliding friction. Conical gear surface is subject to a solicitation for contact pressure.

The rotation of the conical spiral component is made after the horizontal axis X. This is used for the alimentation with granular material in an installation for abrasive water jet cutting. From the point of view of the function of component it can be seen that in the channel will be moved a granular material. The abrasive wear solicitation of channel are very important effects.

**email: mircea.vasilescu@upt.ro*

Influence of Technological Parameters on the Emision on DLP 3D Printing Process

MIRCEA DORIN VASILESCU*
Politehnica University Timisoara, 2 Victoriei Sq., 300006, Timisoara, Romania

The present work addresses the issue of emissions requires it made in resin polymerization processes at 3D digital light process (DLP) printing. From an emission point of view, both particulate and chemical emissions are analysed in the form of gases during the DLP printing process. In the paper, we present first the element, which are study. In second part of the paper, we presented the printer, material for printing, measuring apparatus for emission and measurement methodology. In the three part of paper, we made the determinations for gas emissions. Will follow the determinations for particulate emissions. In the final chapter, the data generated by the printing emissions related to the problems specific to the laboratory activity and it has made the specific conclusion in rapport with the printing process.

Keywords: 3D printing; emission particles; air pollution, resin material, DLP printing

Introduction in emision for 3D printing

In the process of technological realization of components through 3D printing, an important component is the protection of the environment from the space in which the technological process are developed. Several studies conducted for making component with thermoplastic process determinate the emission. Some of these printing materials affected the environment. For PLA type material re made study in [1, 3] and/or other to ABS [2, 6] material. Different types of materials analysed comparatively [4, 5]. For the study of emissions in the 3D printing process on the DLP principle, we made a study to follow both the print process and post print phases. In the study were followed both the elements specific to temperature and humidity in the printing process and the components of gaseous and particulate emissions emitted. For particle it is determinate the PM2,5 (Fine Particulate Matter) and PM10 (Coarse Particulate Matter) of emission. For air it is determinate the TVOC (total volatile organic compounds) and HCHO (Formaldehyde). The AQI air is determinate in the same time.

Considerations on the printer, matherial for printing and aparat for determineted of emision for 3D printing

For the printing are used a 3D printer type Anycubic Photon (Figure 1.). The used printer are printing probe for study the modification of rectangular parts in 3D printing process.

For printing, we used a specific resin for printing (Figure 2.). It is a green transparent resin type Anycubic.

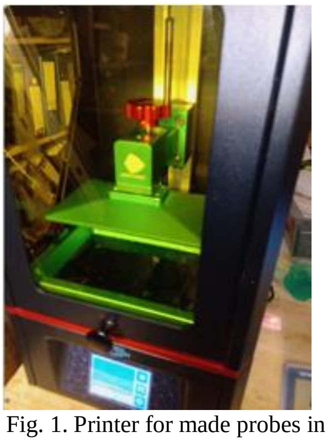

Fig. 1. Printer for made probes in the 3D printed process

Fig. 2. Printer, resin and apparatus for made probes in the 3D printed process

For measurement of the emission an apparatus are used. It can determine all the elements mentioned in the first part of the work (Figure 3.). It is possible to see that the apparatus JBL-B600 [7] ensures the determination of the intended emission elements.

For made the measurement are designed which was positioned at a distance of 160 mm from the 3D printer (Figure 4.). The printer although it is equipped with a ventilation and filtration system emits unfiltered elements in the atmosphere. This is the principal motive for this experiment.

COMPARATIVE STUDY BETWEEN THE GENERATIONS OF 3D PRINTED PARTS BY THERMOPLASTIC OR OPTICAL POLYMERIZATION

Mircea Dorin Vasilescu[1], Aurel Mihail Țîțu[2],
[1]Politehnica University Timisoara, Piața Victoriei 2, Timișoara , România, mircea.vasilescu@upt.ro
[2]Lucian Blaga University of Sibiu, 10, Victoriei Street, Sibiu, România, The Academy of Romanian Scientists, 54, Splaiul Independenței, Sector 5, Bucharest, Romania, mihail.titu@ulbsibiu.ro

ABSTRACT: The work is focused on the identification of specific elements that can have influence on specific generation of components for equipment used in unconventional technologies. In the first chapter are analyzed the specific processes that allow the generation of component by 3D printing thermoplastic solution type FDM or photo polymerization by DLP or SLA solution. They are determinate the similarities and differences between transfers of the energy for thermic plasticization and the transformation in solid structure from liquid material in the second part with CAM system. In the third part are analyzed the solutions to generated constructive components or assemblies by 3D processes CAM-CNC process. In the fourth part of the work was analyzed the specific 3D printing parts through this process of printing considered. In the last chapter it is determined the economic aspects of the parts generated by the 3D printed process used. The analysis will be done both by optical and dimensional measurement of the part in different points and by dimensional measurement of the part with digital measuring devices and optical method. The paper also refers to the methodology of generating of the part and the influence of the way they generated on the characteristics of the generated parts.
KEY WORDS: 3D printing, surface dimension, FDM printing, DLP printing, fabrication parts, statistical data

1. CONSIDERATIONS ON THE PROCESS OF FDM AND DLP OR SLA 3D PRINTING

For the realization of assemblies or components for areas specific to conventional and non-conventional technologies, both the cost of realization and the technological accuracy and dimensioning of their realization and mounting are important. Additive-generating technologies it is the object of many studies in several works both nationally and internationally. Some of these concerns the problems of mechanical resistance [1], others on technological labor of product [2, 3], but also of functionality of this component [4].

The process of generating a part from a geometric point of view is relatively similar in the three-generation processes. For both types of printing processes FDM (fuse deposit modelling) and DLP (digital light processing) or SLA (stereo lithography) in the first phase, the CAD drawing of the part that is intended to perform physically must made in the same type. The importance of generation is evident for printing processes that are very accurate. For models that are for general use, but also for industrial type, it is possible to see that the most accurate printers are DLP-type [5, 6], followed by SLA type [7, 8] and the lowest precision of generating is FDM [9, 10]. In view of the latter conclusion, it is possible to say that depending on the functional role of the generated element, the printing principle and the method of generating chosen for the solid body.

Printers from the same range of printer used to generate the part with 3D printing process. For FDM are used a printer type Fabrikator Mini (Figure 1.). Printer price 180 Euro.

Figure 1. FABRIKATOR MINI FDM 3D printer [10]

The printing characteristics from printer consideration are:

- Print size 80x80x80 mm,
- Filament 1.75 mm,
- Z positioning precision 2,5 microns,
- XY positioning precision 11 microns,
- Printing speed for good structure 10 to 50 mm/sec, recommendation from [22], very good 10 to 20 mm/sec, good <40 mm/sec, normal<50 mm/sec,
- Nozzle diameter 0,4 mm,
- Nozzle plug maximum 250-degree C.

INFLUENCE OF TECHNOLOGICAL PARAMETERS ON THE ROUGHNESS AND DIMENSION OF FLAT PARTS GENERATED BY FDM 3D PRINTING

Mircea Dorin Vasilescu [1], Ioan Vasile Groza[2]
[1] Politehnica University Timisoara, mircea.vasilescu@upt.ro
[2] Politehnica University Timisoara, mircea.groza@upt.ro

ABSTRACT: This paper it is focuses on the establish the principal setting parameter for the 3D printing process which have an influence on the surface characteristics of the flat parts. In the first part of the paper are analysed the principal value of the parameter which may have a relevant influence for the printing of the 3D plane surfaces for the FDM process. This method is chosen because on the one hand the costs of generating planar objects are small, but the principle of generation is relatively simple from a technological point of view. Surface analysis will be done both by optical and ruggedness measurement and dimensional measurement by digital measuring devices. The paper also refers to the methodology of generating flat surfaces and the influence of the way they are generated on the characteristics of the generated parts. It is apparent from point of view of the areas generated literature there are few references in this direction.
KEYWORDS: 3D printing; fabrication parts; roughness surface, dimension surface, FDM printing;

1. INTRODUCTION

Obtaining plan parts by depositing plasticized material in the form of lines and layers is a relatively new generation process and which, from the point of view of generation, is well known now [1, 2]. From the point of view of generating the plane parts, the process of the parts generation is similar, whatever it is the process or program of the generation takes place.

The work it is made to determine technological efficiency for the implementation of 3D printing parts and assemblies used in industry under the new conditions imposed using recyclable materials and technologies that pollute less the environment. The polluting factor must be seen both in terms of the energy resources used for the raw material and in terms of the reintroduction into the industrial circuit of the material resulting from the decomposition and re-composition of the material that has been used in the components we have name LCA (Life Care Assessment) [3], [4].

2. TYPE OF 3D CAD AND SLICER USED FOR 3D PRINTING

The generating process for a plan view is based on drawing a sketch that is then translated vertically to obtain the part volume. In (Figure 1.) it is possible to see such a part plan generated and where are put the nominal dimensional values of this part.

Generation was done with Inventor 2017. The generating phase is important, and it usually must be followed by a 3D-generated drawing verification phase and saved in a standard stl type. Checking the geometric dimensions of the items generated is very important. Typically, in the practice of the generation part the nominal cote is the value at which it is generated the part.

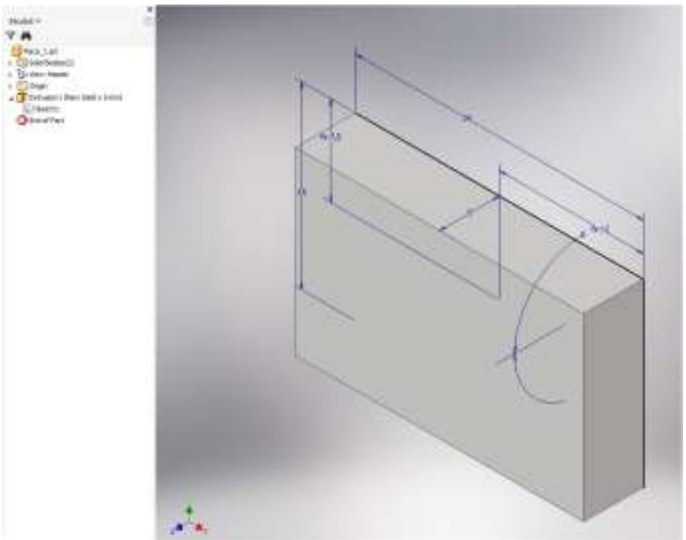

Figure 1. Part plane 3D designed [11]

The values tolerated for generating it is put in the execution documentation with his limits. It is recommended that the nominal value of the dimension, to be effectively at the nominal value at which it must be ad the amount of deviation for the contraction, so the effectively generated 3D documentation to have after the contraction the functional value. It can then verify that the ensemble can move parts relative or fixed, being able to realize the constraints imposed by the relative motion or relative positioning of the parts. It can thus be observed that it is very important to know precisely the contraction of the material after the

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Economical Considerations over 3D Printing Components for Abrasive Water Jet Machinery

Mircea Dorin Vasilescu[1,a*], Tiberiu Aurel Vasilescu[2], Ioan Vasile Groza[1]

[1]MMUT, Mechanical Faculty from Timișoara, POLITECHNICAL University of Timişoara, Bd. Mihai Viteazul no.1, 30 0322 Timişoara, România

[2]Ioan Slavici University, student Economical Faculty, Str. Paunescu Podeanu Nr. 144, Timișoara, România

[a]mircea.vasilescu@upt.ro,

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Abstract. The purpose of this research is to analyse the technological and economical aspects of making 3D print pieces to produce functional parts and subassemblies for abrasive waterjet processing equipment. The authors of this paper intend to make a clarification on the technological and economic approaches of material that can be used to make such a reference in terms of economic efficiency and technology. In the paper are analysed all the aspects involved in generating the necessary elements on the mechanical side of them by FDM (Fused Deposition Modelling). The paper is structured in a five chapters in which it is presented in a logical order the analysis of the materials that can be used in the mentioned technological field, the technological parameters specific to the analysed process, the method of generating the parts and their realization from a practical point of view and presenting the main economic aspects that involve the manufacturing costs of specific parts through 3D printing technology for components of water jet processing equipment with suspension abrasive media.

1. Materials Used to Make Components for FDM Water Jet Installation

Materials that can be used to generate components or sub-assemblies for the water jet processing with abrasive suspension or water jet only shall have both thermoplastic and mechanical strength properties specific to granular abrasion resistance, cavitation, or stress compression, stretching, etc.

In terms of the tensile strength of such plastic materials, there are studies and recommendations made, from the point of resistance to surface at the tensile strength [1, 2], but on the wear or resistance to abrasion, there are few and very limited information.

From the point of the procedures for making the parts from plastic material there are five major 3D printing processes [3]:

- making of parts by depositing material usual named FDM (Fused Deposition Modeling), in which the deposition of material is made in the semiliquid condition [4];
- making of parts by inter-granular welding of an energy source such as SLM (Selective Laser Melting) [5]:
- making of parts by made pellicular resin films with an energetical which acts on this film with laser beam or ultraviolet radiation as SLA (Stereolithography) [6] or DLP (Digital Light Processing) [7] or SLS (Selective Laser Sintering) [8];
- making parts by adhesion of the granular material with a liquid material as BJ (Binder Jetting) [9];
- making parts by laminated layers as LOM (Laminated Object Manufacturing) [10].

From the point of view of the mechanical strength of the materials used for printing, it can be stated that they must be resistant both to the action of the active medium that is of the abrasive type and of the liquid type, in some places of the water type, in other areas of the hydraulic oil type. These restrictions will result in a selection of the material and its resistance to cavitation or sinusoidal pulsation with a periodic symmetric or asymmetric. From the point of view of the

INFLUENCE OF TECHNOLOGICAL PARAMETERS ON THE STRUCTURE AND DEFORMATION OF FLAT OR ROUND PARTS GENERATED BY DLP 3D PRINTING

Mircea Dorin Vasilescu[1],
[1] Politehnica University Timisoara, mircea.vasilescu@upt.ro

ABSTRACT: The paper is focuses to establish the principal setting parameter for the 3D printing DLP (Digital Light Processing) process, which have an influence on the surface characteristics of the flat or round parts. In the first part of the paper are analyzed the principal value parameter which may have a relevant influence for the printing of the 3D plane surfaces for the DLP process. This method was chosen because a relative reduce costs of generating planar surface for objects occurs, but also for the generation mode is relatively simple from a technological point of view. The printer and the program used for generation is presented, which both constructively and functionally will be analyzed, both as functionality and as component design possibilities. Next chapter allocated to the ordering of technological parameters of 3D generation by printing the parts with define the main technological generation parameters of the parts with statistically ordering data. This step is important to ensure the assembly conditions of the components, and also to the fact that the materials used to make the parts produce different behavior after the three directions in terms of contractions and the dimensions variation. In the last chapter are presented some of the domain specific elements generated by 3D printing with DLP are used. Surface analysis will be done both by optical and dimensional measurement of surface. The dimensional measurement of the part made with digital measuring devices and optical method. The paper also refers to the generating methodology of flat or round surfaces and the influence on the characteristics of the generated parts. It is apparent from point of view of the areas generated literature there are few references in this direction.
KEY WORDS: 3D printing, surface dimension, DLP printing, fabrication parts, statistical data

1. CONSIDERATIONS ON THE DLP 3D PRINTING PROCESS

To be able to realize the study it is necessary the first conception of a model to study the DLP 3D printing process. To observe how it modifies the surface and dimensional characteristics have generated a probe that is the square (Figure 1). Generation was made with Fusion 360 Educational version [1]. The volume of the probe is 4.044,524 mm^3 and the area is 2.346,35 mm^2.

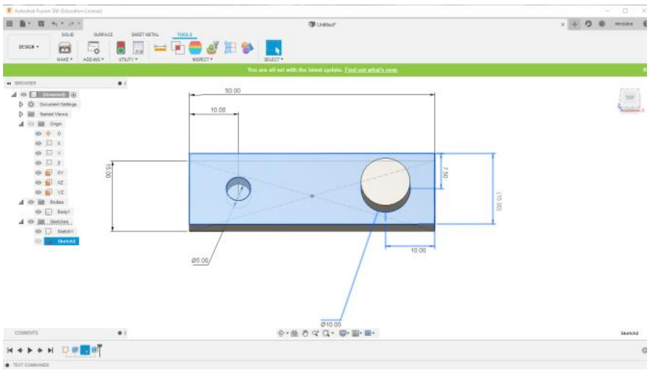

Figure 1. CAD generated probe

It has a flat surface and lower respectively. We also generated two specific items. One a cylinder with 10 mm diameter and other a hole with 5 mm diameter.

For the generation of the probe it is necessary to save the 3D CAD model generated in a solid form with a specific resolution. In (Figure 2) the generation with high resolution is presented. The difference with the others cases is dependent on the resolution that it can be generated in particular areas.

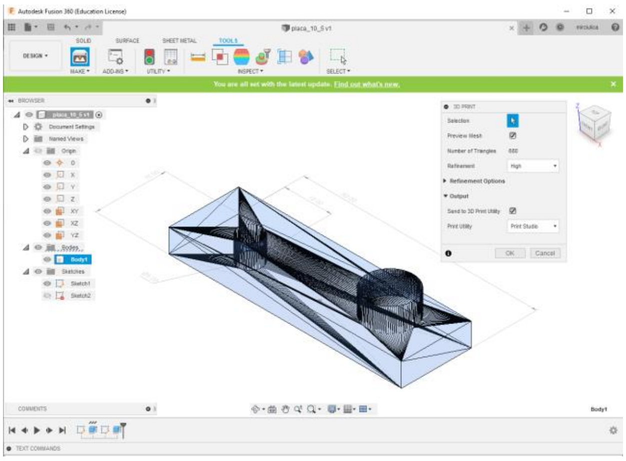

Figure 2. Figure 4. Probe high resolution generation

There is such a major difference that will highlight the realization of the concluding part of the paper in order to identify the optimal generation. In (Table 1) is presented the specific data generation process of the hole and the cylinder.

Table 1. Data for the hole and cylinder of generation part

Refinement	Number Triangles	Circular points		Arc length circle	
		Cylinder	Hole	Cylinder	Hole
High	680	57	40	0,55	0,39
Medium	392	55	38	0,57	0,41
Low	256	49	24	0,64	0,65