Testing the Mechanical Properties of Vero Family Materials by using Multijet Technology

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Abstract— With Additive Manufacturing (AM) abilities hastily increasing in commercial packages, there exists a need to quantify materials' mechanical residences to ensure reliable performance this is robust to versions in surroundings and construct orientation. even as prior research has examined method-parameter and environmental effects for am procedures which include extrusion, vat photo polymerization, and powder bed fusion, current comparable studies at the cloth jetting process is restrained. Specializing in polypropylene-like and elastomeric-like substances, the authors first represent the anisotropic residences of six special gradients constituted of blending the two substances in preset portions. Three build orientations had been used to fabricate components and examine tensile pressure, modulus of elasticity, and elongation at damage for each cloth. The authors additionally present results from a research of how getting older of elements in unique lighting conditions impacts cloth houses. The effects from these experiments provide a more advantageous knowledge of the material behaviours relating to material jetting method parameters and can tell cloth choice when manufacturing load-bearing parts.

Key words: Multijet Technology

I. Introduction

Additive Manufacturing (AM) is quickly evolving from a method for prototyping to a desired alternative for manufacturing quit-use merchandise. due to the nature of a layer-by-layer fabrication procedure, customizable artefacts are plausible that shop fabric, time, and price compared to traditionally-manufactured components. The first form of creating layer by layer a 3D object using computer-aided design (CAD) became rapid prototyping,

Advanced with in the 1980's for developing models and prototype components. This technology became created to assist the conclusion of what engineers have in thoughts. Rapid prototyping is one of the sooner additive manufacturing (AM) processes. It permits for the creation of published parts, no longer simply model [1]. From thousands of years of humankind history, we can see that most of our civilization was founded on the base of forming shaping technology, and actually the history of humankind civilization has been propelled by the envelopment of forming/shaping technology. And we can conclude that our beautiful future will benefit a lot from the frontier field of modern forming technology which we are now devoting in, such as rapid prototyping and manufacturing (RPM) and its derivative techniques. Modern forming/shaping science is the science that researches on orderly organizing the materials into a three-dimensional (3-D) part with determined shape and functions [8].

Innovative technologies are essential to enhance the competitiveness of business enterprises. However, before a technology is implemented, it needs to be studied in detail. It is necessary to determine all the factors affecting the process, including technical and economic risks. One of the risk assessment tools is the Failure Mode and Effects Analysis (FMEA), commonly used in the aviation, automotive, electronic, and chemical and health industries. The applications of the FMEA method are discussed in Ref. [1], which is considered to be an overview of several dozen publications from the period 1992–2012. The paper characterizes the method, its variants and modifications; it also classifies the models and the modifications [5]. In the PolyJet process, a print block consisting of the inkjet heads deposits the support or build materials in drop-by-drop deposition patterns, which are smoothed by a roller and cured by a UV lamp (Figure 1).

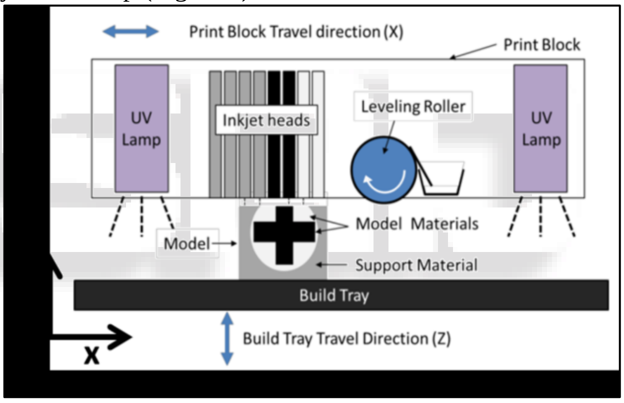

Fig. 1: Representation of the PolyJet Printing Process

While material jetting processes, such as the PolyJet process, offer unique multi-material capabilities, research is still needed to identify the impact that process variations have on the quality of the final manufactured part. For example, this style of layer deposition can introduce build defects and inconsistencies due to how the material droplets are spread and bond. In order to ensure that load-bearing, end-use, material-jetted products meet the required specifications (which could include having high ultimate tensile stress, directionally-independent ultimate tensile stress, or strength longevity), variations in the material properties must be examined [2].

II. 3D Printing General Principles

A. Modeling

3D printable models may be created with a computer-aided design (CAD) package, via a 3D scanner, or by a plain digital camera and photogrammetric software. 3D printed models created with CAD result in reduced errors and can be corrected before printing, allowing verification in the design of the object before it is printed. The manual modelling process of preparing geometric data for 3D computer graphics is similar to plastic arts such as sculpting. 3D scanning is a process of collecting digital data on the shape and appearance of a real object, creating a digital model based on it.

B. 3D Process

3DP process is a MIT-licensed process in which water-based liquid binder is supplied in a jet onto a starch-based powder to print the data from a CAD drawing. The powder particles4 ISRN Mechanical Engineering. Which is a medical grade PC. The main advantages of this process are that no chemical post-processing required, no resins to cure, less expensive machine, and materials resulting in a more cost effective process. The disadvantages are that the resolution on the *z* axis is low compared to other additive manufacturing process (0.25 mm), so if a smooth surface is needed a finishing process is required and it is a slow process sometimes taking days to build large complex parts [1]. In (Figure 2) is shown the basics fused deposition modeling process.

III. DESIGN CONCEPT

Design of each and every materials should based on some standard dimensions. That standard dimensions are given by the testing society. For the tensile and flexural test, the dimensions are given by the ASTM (American Society for Testing Materials).Each test have a definite shape of the testing material. For the tensile test the material should be in Dog bone shape. The maximum length of the tensile test specimen is the 165mm. For the flexural test the material should be in the rectangular shape and the dimension is the 125mm.

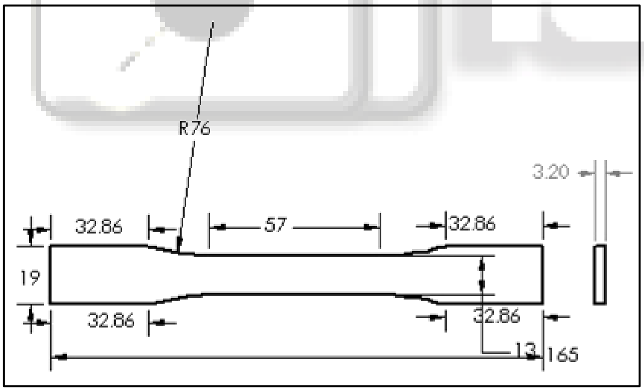

Fig. 2: Tensile Dog Bone Shape

Autodesk (the manufacturer of AutoCAD) makes a product that is nearly identical to Solid works, called Inventor, which is a parametric program for design of solid parts and assemblies. Solid Works is a 3D mechanical CAD (computer-aided design) program that runs on Microsoft Windows.

IV. CONCLUSION

Though the printer-produced resolution is sufficient for many applications, printing a slightly oversized version of the desired object in standard resolution and then removing material with a higher-resolution subtractive process can achieve greater precision Some printable polymers such as ABS, allow the surface finish to be smoothed and improved using chemical vapour processes based on acetone or similar solvents Some additive manufacturing techniques are capable of using multiple materials in the course of constructing parts. These techniques are able to print in multiple colours and colour combinations simultaneously, and would not necessarily require painting. Some printing techniques require internal supports to be built for overhanging features during construction. These supports must be mechanically removed or dissolved upon completion of the print. All of the commercialized metal 3D printers involve cutting the metal component off the metal substrate after deposition. A new process for the GMAW 3D printing allows for substrate surface modifications to remove Aluminium steel.

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