

## 3D PRINTING TECHNOLOGY USED TO PRODUCE AUTOMOTIVE CABLES

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### ABSTRACT

*Current applications and the latest development in 3D printing technology are presented.*

*The feasibility of using 3D printing technology to produce automotive cables is discussed. Compared with the traditional cable production process and equipment, advanced 3D printing technology can achieve lightweight parts and fast production while reducing the superimposed deviations caused by multi-process production.*

*Combined with the requirements of raw materials in cable standards, material performance used in 3D printing is considered, the idea of using functional and environmentally friendly materials to meet the performance requirements of automotive cables is proposed.*

### KEYWORDS

Automotive cable, 3D printing technology, multi-process production

### INTRODUCTION

3D printing known as “additive manufacturing”(AM) in the scientific community, is one of the developing technologies found in major manufacturing industries. Initially, 3D printing was limited to prototype making and aerospace industries. The lack of knowledge and expensive machinery restricted its application for a long time. But with development of specialized polymers for 3D printing and advancement enables the use of AM technique in almost every sector. Electronic, informative, prototyping, automobile, and even biomedical engineering are developing their infrastructure for 3D printing facilities. Additive manufacturing is different from subtractive manufacturing, where the desired geometrical shape of the material is obtained by cutting, drilling, lasters, or any method that removes the specific materials sites. In contrast, additive manufacturing is the layer-by-layer shaping of material.[1]

Types of structures for automotive wires are various, involving many processes, and requiring many machines, many operators, and large-scale production sites. For cables, multiple processes mean long production cycles and high material losses. Each process requires tolerances, and less precise equipment and less skilled operations may lead to more waste.

Therefore, cable manufacturers seek more effective fast production modes.

3D printing technology is a precision production technology. At present, the most precise 3D printing technology can achieve an accuracy of 1 micrometer, which can meet dimensional requirements for automotive cable; 3D printing technology can achieve simultaneous printing of different materials, replace multi-process production, and reduce overlapping deviations caused by

multi-process production, obtaining lightweight products; 3D printing technology is completely computer-controlled and can replace manual operation.

### BACKGROUND ON 3D PRINTING TECHNOLOGY

In 1984, Charles began developing 3D printing technology.

In 1986, Charles W. Hull established the world's first company to produce 3D printing equipment, 3D sys, and launched the world's first 3D industrial-grade printer SLA-250 based on SL (Stereolithography) technology in 1988.

In 1988, Scott Crump invented the Fusion Deposition Molding (FDM) technology and established Stratasys in 1989.

1992: Stratasys launched the first (SLS) Selective laser sintering system;

1993: Ceramics were used for 3D printing;

1997: Titanium alloy was used for 3D printing.

2004: Nanocomposite materials used for 3D printing;

2008: A 3D printer that can simultaneously use several different raw materials was introduced.

2010: The first 3D biological printer, made of carbon fiber material for 3D printing;

2011: 3D food printers were introduced;

2012: Stratasys and Objet merged; 3D printing physical store; 3D printing pistol;

2013: Graphene 3D printing material.

2014: Stratasys released its first color multi-material 3D printer; HP releases MJF technology;

In 2015, 3D Systems acquired Wuxi Yiwei to create 3D Systems China; Carbon 3D releases Continuous Liquid Interface Manufacturing Technology (CLIP);

In 2016, Israel's XJet released a metal printing device for nanoparticle spray molding.

### 3D PRINTING CHARACTERISTICS

Compared to traditional product production processes, 3D printing technology has irreplaceable advantages:

1. 3D printing generates products directly from computers without the need for mechanical processing or molds.

2. With good design concepts and craftsmanship, this technology can simplify the production and manufacturing processes.

3. Reduce dimensional deviations caused by human and equipment factors during the manufacturing process.