

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****HYDROGRAPHIC PRINTING: AN OVERVIEW****Shammi Mehra***

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DOI: 10.5281/zenodo.809180

ABSTRACT

Graphics technologies have made significant evolution with the time and achieved new horizons in the field of technology. Hydrographic printing is an innovative printing process. Hydrographic printing is a technique of applying two dimensional printed designs to complex 3D surfaces using water. Prior to this innovation, printing on such complex surfaces are done by chemically or electroplating techniques. A customized pattern can be printed simply onto complex surfaces. It is applicable where direct printing is not possible. In this technique, water-soluble transfer PVA film that carries a special ink is placed on the surface of water and ink is activated by reagent. Finally, the object is gradually immersed into the water through the floating ink film that stretches and wraps around the surface of object and adheres to objects. It is suitable for materials like metal, plastic, ceramics, glass, and hard wood. In other words, it is an industrial printing process that is printing on a product for either decorative or functional purpose. There are a few methods namely manually, automatically and computational for carrying out this printing process. This research paper presents a summary of the hydrographic printing and describes the working of hydrographic printing concisely.

KEYWORDS: Hydrographic printing, complex 3D surfaces, Water-soluble PVA film, Industrial printing.**INTRODUCTION**

Hydrographic printing is known by a few different technical names such as hydro dipping, water transfer printing, hydro printing, cubic printing and fluid imaging. It is one of the recent innovations in the printing sector that enables to print colored patterns to three dimensional complex surfaces.

For years, the automotive industry has embraced this technology ranges from airplane interiors to cell phone, including exterior of an automotive accessories and motorcycle helmets including like plastic, wood, steel and ceramics.

Nowadays carbon fiber, wood grain and geometrical patterns may be seen on some vehicle interior printed on a production line using hydrographic process. It overcomes problems faced by traditional printing process such as hot screen printing, transfer printing and three dimensional printing.

A multiple colors can be added to objects using 3D printing during fabrication process but cannot be added to manufactured objects. Therefore hydrographic printing comes into existence to solve the problem found in three dimensional printing processes. Using multiple immersions, printing can be done on full 360° coverage of a manufactured three dimensional object.

Today, applications of this technique are highlighting in many new areas of manufacturing including, medical, marine, computer, and general industrial.

MATERIAL AND METHOD

Hydrographic printing is one of emerging technique in the field of graphic technology particularly for irregular surfaces of three dimensional objects. It is not a fabrication or manufacturing process like 3D printing but is a transfer process of colored ink to the object. Various types of hydrographic printing are explicated as:

Procedure Of Hydrographic Printing

The hydrographic printing procedure completes in the following stages:



- Colored film preparation
- Primer or Base Coating
- Ink activation
- Object dipping
- Colored ink transfer
- Washing and Cleaning

Color Film Preparation

A colored film made of PVC is prepared by rotogravure printing process or inkjet printer. The film having a graphic pattern to be transferred is insoluble in water.



Figure: Inkjet Printer

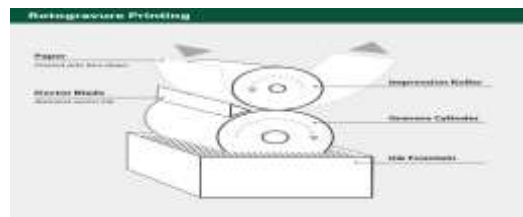


Figure: Rotogravure Printing

Primer Or Base Coating

This operation is performed before printing on the objects to form a smooth surface. A coating of primer is applied on surface of the object to be printed that improves adhesion property and resists from corrosion. Then a coat of base coating is applied that ensures good adhesion to printing ink on the object

Ink Activation

A printed color film is placed on the surface of water in tank and then a chemical reagent is sprayed by sprayer manually or automatically. During this process the colored ink starts floating on water and base of film is settled down. Therefore the graphic pattern to be printed is formed in this stage.



Figure: Ink Activation by Spraying a specific Reagent

Object Dipping

The object to be printed is gradually immersed manually or automatically depending on the types of printing process on the floating film in water tank.



Figure: Object Dipping (Manually)



Figure: Object Dipping (Automatically)

Colored Ink Transfer

This step is the main among the steps because of transferring ink to object. In this stage, the floating colored ink on water transfer to the three dimensional objects. As the object is gradually immersed into the water through the floating ink film that stretches and wraps around the surface of object and adheres to objects.



Figure: Colored ink Transfer

Washing And Cleaning

Finally the printed surface of object is washed and cleaned manually or using automatic machine.

Types Of Hydrographic Printing

- Manual hydrographic printing
- Automatic hydrographic printing
- Computational hydrographic printing

Manual Hydrographic Printing

In these types of technique all steps of printing occurred manually by skilled operator. It is suitable for stochastic color design, inaccurate and Job type of production.

Automatic Hydrographic Printing

It is similar to manual hydrographic printing but some steps occurred automatically except placing the colored film on water tank, spraying reagent and immersing. It is also applicable for stochastic color pattern, and mass production.

Computational Hydrographic Printing

This technique predicates how the colored films will expand when the three dimensional object is immersed .In this technique, three dimensional surfaces to be printed are first simulated on computer

Using application software and the application software then translate the three dimensional colored pattern into two dimensional pattern that requires to be printed on colored film. The object to be printed is then dipped precisely using computer and automated machine and this entire system aids to transfer the colored pattern on the complex object immediately.

In this process, the object is attached in mechanical gripper and immersed on flexible colored film floating on the water along with a fixed direction. Both the object direction and immersion position are measured using 3D vision system.

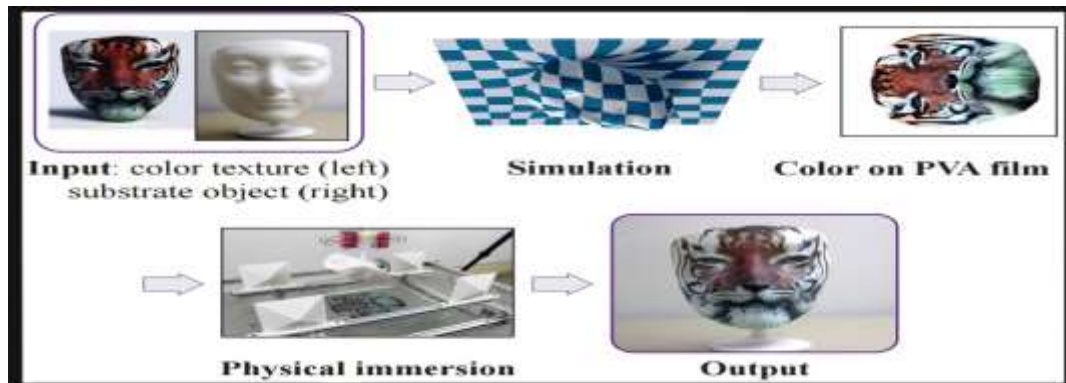


Figure: Computational Hydrographic Printing Workflow

PROS

- It is the simplest process of printing on the surface of three dimensional objects.
- It is applicable for irregular surface of three dimensional objects.
- Hydrographic printing is reasonable.
- It can be printed on a varieties of materials such as Glass, Metal, Wood, Plastics and Ceramic
- Customization printing can be done by computational method.
- Multiple-immersion from a single colored film

CONS

- Conventional Printing is uncontrollable.
- Colored films may be destroyed.
- It is not suitable for the surfaces of rubber and fabrics materials.
- Experienced operator is needed.

CONCLUSION

This paper presented an overview about the summary of hydrographic printing and its types along with their working procedures. It is concluded that the hydrographic printing named by various names is an innovative technique for printing complex three dimensional objects. In nutshell, this technique is suitable for automotive industry and other segments for repeatable graphic pattern as well as customized printing.

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Mehra, S. (2017). HYDROGRAPHIC PRINTING: AN OVERVIEW. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, 6(6), 320-324.
doi:10.5281/zenodo.809180