Current status of manufacturing cast prototypes by using 3D-Printing technology in Korea

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1. Introduction
During the last decade, a class of technologies has emerged by which a computer-aided design file of an object can be converted into a physical model through special sintering techniques by using casting sand. So-called rapid prototyping (RP), or 3D-printing of sand molds, has been early verification of product designs and quick production of cast prototypes.

In the present reviews, current status of manufacturing cast prototypes by using 3D-Printing technique in Korea was introduced.

2. 3D Printers for sand molds
Compared to conventional 3D printing process, 3D-printer for sand mold do not produce cast prototypes, but sand molds for production of the cast. Because sand cannot be melted by itself, only SLS (Selective Layer Sintering) type 3D printers can be used. For sand cores and molds, the well-known shell core and cold box type molds can be applicable to the 3D printing process.

E-design group, KITECH, Korea have each types of 3D Printer, as shown in Fig. 1.

Fig. 1 3D Printer for sand molds installed in KITECH.
(left : EOS S750, right : Voxeljet VXC800)

EOS S750 is mainly used for shell core production, and Voxeljet printer is used for fabricating cores and external molds.

3. Examples for sand mold manufacturing by 3D Printer
Fig. 2 shows sand molds for hydraulic valve cast. Cope and drag was fabricated by using 3D printer with conventional casting design of the molds.

Fig. 2 Cope and drag by 3D Printer

Fig. 3 Shell core for hydraulic valve

After manufacturing cope, drag, and core, three components were assembled and ready to cast, as shown in Fig. 4.

Fig. 4 Assembling cores

Fig. 5 Cast prototypes

4. Summary
3D printing application to cast prototypes was introduced in the present review. The 3D printing technology is predicted to be major technology of the future casting foundry.