

Development of 3D printing technology using ICT construction equipment

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1. Outline

“On-Site Shot Printer” is a 3D concrete printing technology developed by an industry-academia collaboration consortium (Gifu University, Japan Construction Method and Machinery Research Institute, Sumitomo Osaka Cement and Shimizu Corporation etc.). A spray nozzle is attached to the end of the arm of ICT construction equipment, and it enables direct printing at the construction site.

2. System

2.1 Materials and Spray System

The adapted dry spraying system significantly suppresses dust and rebound during spraying compared to conventional dry construction methods, due to the balance between cement-based powder and mixing water with added polymer emulsion. This spraying system allows continuous production of stable mortar during printing.

2.2 ICT Construction Equipment

The system uses construction machinery equipped with an MC/MG (Machine Control system/Machine Guidance system) system. Among these functions, this printing system uses the 2D machine control function to control the boom, arm, and bucket at any plane height, and the function to offset the plane height at regular intervals to control the nozzle position.

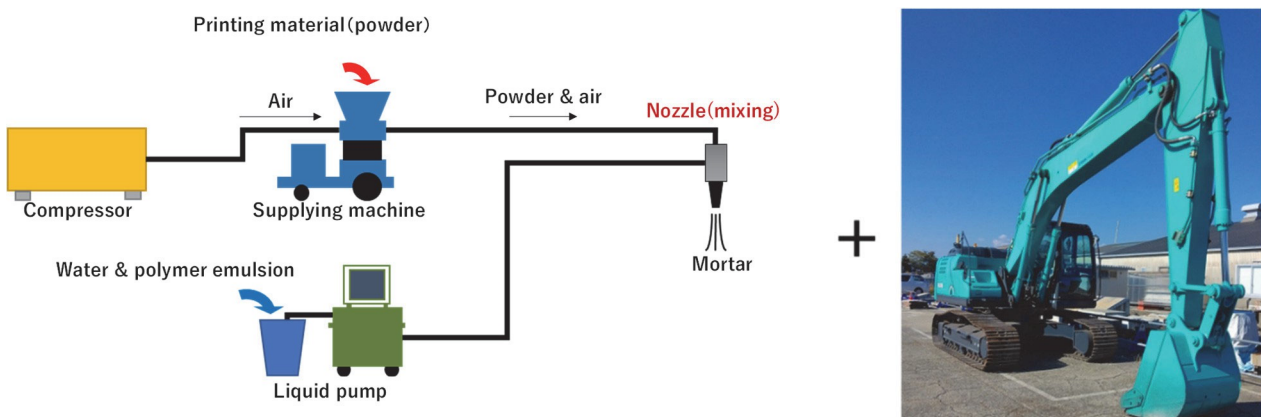


Figure 1 3D concrete printing system consisting of spray system and ICT construction equipment

3. Printed Structures

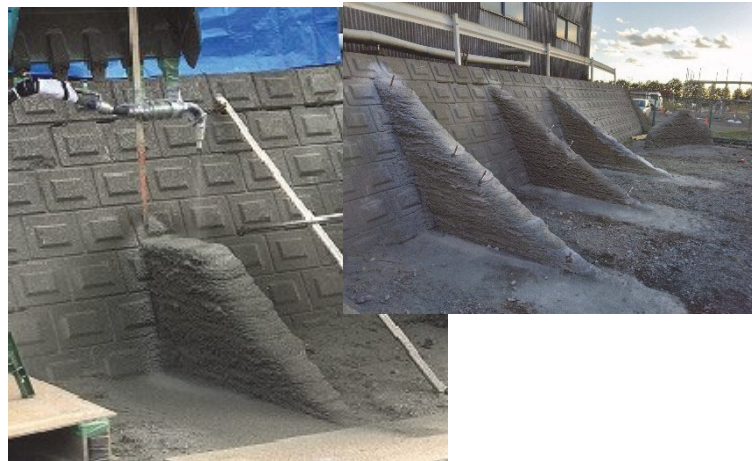
Figure 2 shows an example of printed structures. It is possible to create several types of wall structures that are sprayed downward and sideways.



Wall constructed by sideways spraying



Rectangular wall constructed by downward spraying



Triangular wall constructed by downward spraying

Figure 2 Examples of printed structures