An Automatic Tunnel Lining Concrete Construction Robot System for Practical Use

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The "Automatic Tunnel Lining Concrete Construction Robot," which replaces manual tunnel lining concrete work with a PC-controlled, automatic mechanical system (joint development by West Nippon Expressway, Shimizu Corporation, and Gifu Kogyo), has been put to practical use. The robot uses medium flow lining concrete, which has excellent flowability and does not cause material separation. The system also takes advantage of the characteristics of medium flow lining concrete to achieve one-man automated concrete placement using a shotcrete pouring system.
All operations such as concrete pumping, pipe switching, movement of the placing equipment to the placing entrance, and formwork vibrator compaction are patterned and controlled by a PC system to achieve automatic construction (Fig. 1, Photo 2). The work status and compaction state can be visualized and monitored by real-time data from various sensors attached to the centers, and the execution status can be stored in a database.
The finished surface of the lining by the automatic installation of the automatic compaction system with the automatic pouring system and formwork vibrator pattern is excellent, with no peeling, bubbles, uneven coloring, or overlapping lines, and this installation method has finished linings with a small variation of concrete strength (Photo-2).

Photo 1 Automatic Concrete Lining System

Photo 2 Tunnel Lining

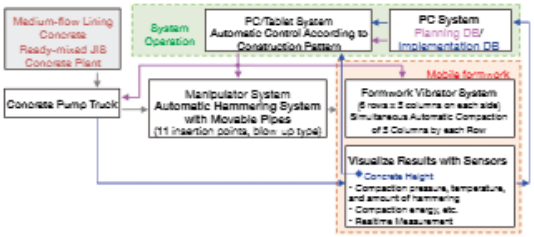

Fig.1 Automatic Construction System Using Medium Flow Lining Concrete