Research on Stormwater Pumping Station Network Equipment

Year of Research	2006・2007	

(Purpose)

This research describes the practical application of a stormwater pumping station network. It is assumed that the trunk line of a stormwater pumping station network is built deep underground. This study is an examination of network component systems focused on the construction, operation and maintenance of high-head pumps and machinery and electric equipment for very deep storm water pumping stations. This study also examines wide area operation and maintenance control systems of multiple stormwater pumping stations that utilize weather information systems. A manual has been drafted based on this study.

(Results)

(1) Machinery

It's assumed that machinery is installed deeper than 20m. Therefore, we organized facility design methods for very deep pumping stations.

①Items to be studied related to large water volume and level fluctuation: introducing a standby operation pump, considering valve opening degree and water hammering protection with speed based flow control, cavitation prevention

②Types of storm water pump: Vertical shaft pump (diagonal flow or vortex diagonal flow types)

③Generating machinery: Internal-combustion engines(gas turbines or diesel engines)

④Type of grit chamber: Grit chamber following main pumps, drying management

⑤Screening equipment: Continuous auto screening equipment, grit system with nozzles

Equipment planning and design procedures plus items to be studied are shown in Figure 1.

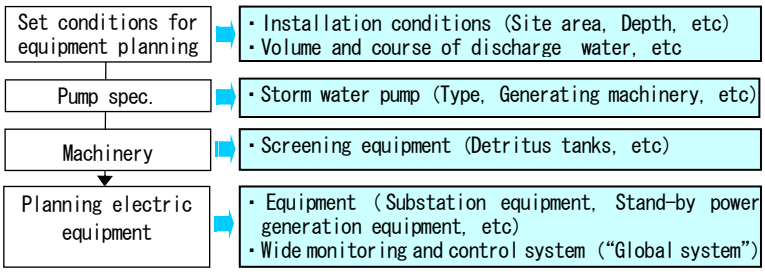


Figure 1 Planning and designing equipment

(2) Electrical equipment

This part describes capacity design adapted to machinery and methods of designing a "Global System" for wide area monitoring and control of a stormwater pumping station network.

Figure 2 is an electric equipment design flow chart.

"Global System" is a collective term for precipitation radar technology based rainfall prediction technologies, inflow prediction technologies, wide area monitoring, control, and operation systems for pumping stations. The constitution of a "Global System" is shown in Figure 3.

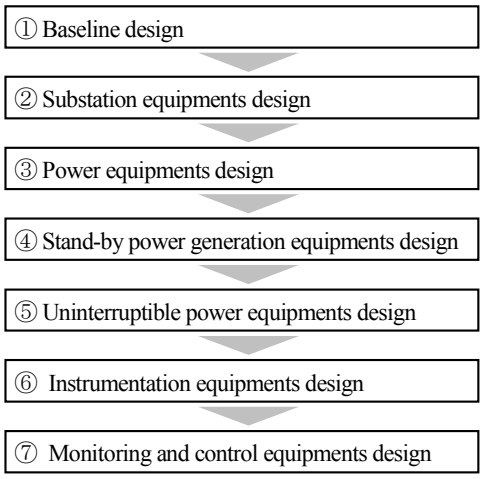


Figure 2 Electric design flow

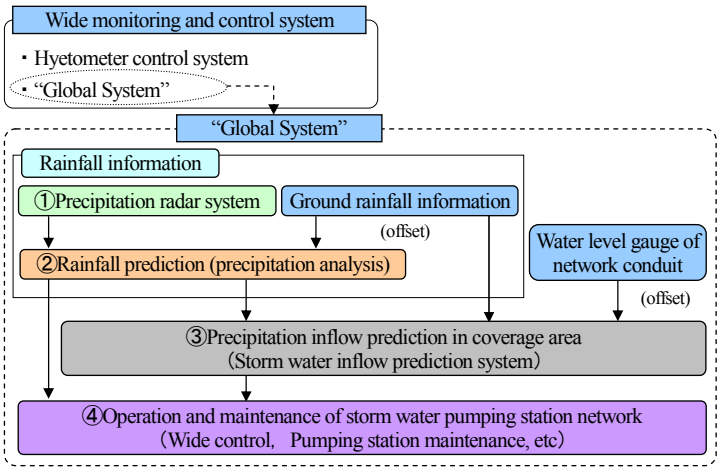


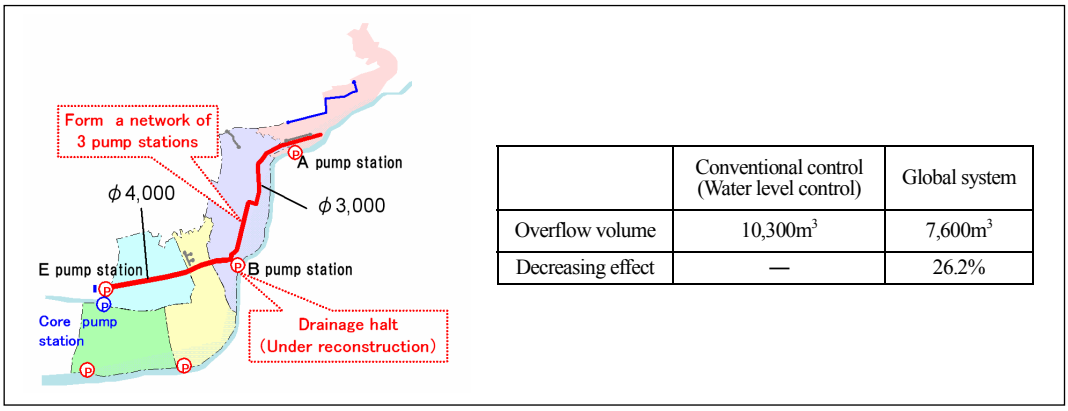
Figure 3 Constitution of "Global System"

(3) Case study

This case study was conducted to assess the effects of decreasing overflow volume.

Condition: The local excess rainfall reaches 107mm an hour around pumping station B (stopping draining during reconstruction). A new drainage pumping station is constructed at the end of the main watercourse.

The inundation volume was, as shown by the simulation calculation in Figure 4, 26.2% lower in the "Global System" case than under conventional control.



	Conventional control (Water level control)	Global system
Overflow volume	10,300m^3	7,600m^3
Decreasing effect	—	26.2%

Figure 4 Effect of decreasing inundation

(4)The technical manual

The results of this reseach of typical machinery and electrical equipment of very deep storm water pumping stations, and wide monitoring and control systems of storm water pumping stations have been compiled in a technical manual "Technical Manual of Storm water Pumping Station Equipment".

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