

Statistical Modeling of the Serviceability of Sewage Pumps

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Sewage pumping stations represent an element of the sewer system, which is directly responsible for affecting serviceability; i.e., failing pumps may result in combined sewer overflows or flooding. However, failures of sewage pumps are not yet incorporated in sewer assessments due to lack of data. This paper presents the analysis of pump failure data provided by two sewer management authorities in The Netherlands. Pump failures have been studied accounting for the nature of the failures, the operation and maintenance procedures of the management authority, the aging of the pumps, and the changes in the environment of pumps. The analysis shows that sewage pumps fail relatively often due to the composition of sewage and the discontinuous operation of the pumps. The interarrival time and the duration of failures are highly variable and independent of the specific function of the pump. Resulting pump failure characteristics are applied in a Monte Carlo simulation to calculate the impact of failures on combined sewer overflow volumes. The results indicate that the serviceability of sewer systems is significantly affected by failing pumps. Therefore, including pump availability in sewer system assessments should be considered.

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