Abstract

**Robustness analysis of technological units for drinking water clarification: normal and emergency operating conditions**

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(Technical paper)

The primary goal of a water supply system is the protection of human health by providing microbiologically and chemically safe drinking water. Significant changes in water quality require sufficiently robust systems for water preparation, performances of which are unaffected by present variations and changing operational conditions. Water turbidity is an important parameter of water filtration control and the efficiency of disinfection. The efficiency of turbidity removal in the drinking water treatment plant “Vodovod” in Banjaluka with normal operating conditions, with a maximal detected value of 25 NTU and emergency operating conditions, with a maximal detected value above 240 NTU was examined in this paper. Evaluation of the water clarification system robustness was done individually for periods of normal and emergency operating conditions (during and after emptying of the accumulation). A more strict goal value of quality of filtered water (0,5 NTU), than required by active legislation, was used for calculating the robustness index, which represents a new criterion for risk analysis in an existing practice. Data processing results indicate the high operational stability of technological units in normal conditions. Filtered water quality was below the goal value during a longer time of filter operation for all cycles. The recorded turbidity value was ≤ 0,3 NTU for 92,9 % of filtered water samples. It was established, by the analysis of water turbidity data, that 17% of all taken measurements in emergency conditions (336 samples) had higher turbidity than goal value (0,5 NTU). Big differences in raw water turbidity in a short time frame, during the emergency operating conditions, are a problem for immediate reaction in the drinking water plant. Calculated robustness index values point to the insubstantial efficiency of the water clarification process in a certain number of filter operating cycles. A significant impact of the plant´s operational conditions, suboptimal conditions of coagulation and flocculation, as well as the nature of suspended and colloid particles that comprise turbidity and their insufficiently intensive interaction with a coagulant, on filtered water turbidity in emergency conditions was observed. Aside from the negative influence on water turbidity, excessive coagulant dosage leads to an increasing concentration of residual aluminum in filtered water. Optimization of emergency working conditions could be done with adequate monitoring of water sources. That way, the potential risk of pathogen presence in drinking water would be lowered.

Key words: water turbidity, filtration , water quality, risk analysis