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# ON THE ISSUE OF IMPROVING THE TECHNICAL PROCESSES OF WATER TREATMENT

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**Abstract**: *The Harrington psycho-physical scale, which establishes the dependence of the desirability function on the variable physical parameters is used, as optimisation method for controlling of water treatment processes. There is described the quality of the water with multiple constituent components. The proposed method can be used for improving the operational efficiency of water treatment plants of sewerage systems.*

**Key words**: *Harrington psycho-physical scale, water quality, water treatment, control optimisation.*

## 1. INTRODUCTION

Required quality of treated water largely depends on the proper organisation of the process of technological control over the work of the treatment facilities.

Process control enables operation works in a certain mode and continuous monitoring of the quality of the initial and treated water.

Generally, the water quality is assessed by various indicators that is defined with sanitary-chemical and hydro-biological analysis.

As its known, full sanitary-chemical water analysis includes several indicators, such as: temperature, color, turbidity, suspended solids, residual ash, pH, total number of bacteria, etc [1].

The nature and number of indicators, that are subject to daily monitoring can be vary considerably depending on the type of water source, water treatment methods and requirements for water.

These indicators make it possible to evaluate the effectiveness of treatment plant and all its facilities.

Continuous monitoring of parameters allows the technologist to efficiently manage the process of water purification.

## 2. THE BODY OF THE ARTICLE

In this paper we consider the possibility to optimise the water quality control process with many composites (components).

The components that characterize the water quality can be described by a Harrington's psycho-physical scale, which establishes a relationship desirability function ($d_f$) with changing physical parameters [2].

The scale values of $d_i$ vary between 0 and 1 and the value $d_i \approx 0$ is corresponding to absolutely unacceptable quality of *i* – that criterion, which is corresponding to ideal quality $d_i \approx 1$

Solving specific technological problems of water quality control process modeling, uses gradation: "good", "satisfied", "bad", which correspond to the Harrington's intervals (1,00-0,69) (0,69-0,37) (0,37-0,00) [2].

For criteria $f_i$ (monotonic by preference) Harrington's function is defined as:

$$d_i = h(z_i) = \exp\left[-\exp(-z_i)\right]$$

$$z_i = \frac{(f_i - f_i^0)}{(f_i^1 - f_i^0)}$$

where: $z_i$ were coded values of $f_i$, criteria, which are dimensionless quantities: $f_i^0$, $f_i^1$ - the within the boundaries of the area "satisfactory" in the physical scale:

$$d_i^0 = h[z_i(f_i^0)] = 0{,}37, \qquad d_i^1 = h[z_i(f_i^1)] = 0{,}69$$

With several $d_i(I = 1, m)$ function values, it's possible to define a generalised indicator of desirability$D_1$, as the average geometric value of the desirable private functions:

$$D = \prod_{i=1}^{m} d_i^{1/m}$$

In this case, if any one of the desirability private function $d_i$ is absolutely unsatisfactory and generalized function of desirability *D* must be equal to 0, regardless of the level of other desirable private functions it is desirable$d_i$.

If all the private functions desirability$d_i$=1 (*i*=1, *m*), then *D* = 1.

## 3. CONCLUSION

It should be noted, that the generalized desirability function D is characterised by the same subjective desirability scales, in which measured a private function.

The method may be used to optimise the water quality control process with many components.

## REFERENCES

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