PART 2. MATHEMATICAL MODELS IN POLLUTION

CHAPTER V. MATHEMATICAL MODELS TO ESTIMATE THE ENERGY - ECOLOGIC EFFICIENCY OF THERMOPOWER PLANTS (TPP)

Section 5.0. Introduction

In the previous chapters of this book the author emphasised the importance of the periodicity of an algorithm as a tool to prove something in mathematics. If the algorithm is finite the solution of the problem is exact. If the algorithm is purely periodic the solution is exact also. If the algorithm is not purely periodic then the solution is not given for the length of the preperiod but it becomes an exact solution for the loop. If the algorithm is not periodic then we have to decide when to stop in order to solve the problem within the limits of an acceptable error.

In the modern era the role of modelling theory in solving application problems is tremendously increasing.

We can generate algebraic, geometric, analytic, statistical, computational, probabilistic models.

The theory of algorithms plays a big role already in the computer science now. The future of applied mathematics will be to invent mathematical models and algorithms in order to solve the necessary application problems and these new models and new algorithms will perform the transaction from abstract to applied mathematics. In the sections, which follows we will develop a mathematical model, which deals with the estimation of the energy-ecological efficiency of the thermopower plants (TPP).

Section 5.1. A global methodology to estimate the energy – ecologic efficiency of thermopower plants (TPP)

Presently, the analysis of the impact of the thermopower plants on the environment as a result of harmful gas emissions is done individually for each type of gas. There is no

general methodology to treat this problem globally, that is, to take into consideration all the cumulative effects of the respective gases and also to make the necessary analysis from the point of view of estimating all the pollution effects in correlation with the useful energy produced. In this section we present, for the first time, a methodology which offers the possibility to treat as a whole, globally, this efficiency problem of the thermopower plants regarding their impact on the environment in two aspects: first, regarding the harmful gas emissions in the atmosphere, and second, regarding the quantities of the corresponding emissions in relation to the unit of useful energy produced. To achieve this, we generated the model described in [17].

SECTION 5.2. A NEW VARIANT METHODOLOGY TO ESTIMATE GLOBALLY THE ECOLOGICAL IMPACT OF THERMOPOWER PLANTS

This section will develop a variant of the methodology introduced in a section 5.1, which was used to estimate the atmospheric pollution by the fuel gases of thermopower plants (TPPs). It will take into consideration two virtual fuels, treated as limiting cases, in order to compare them with other real fuels. We will draw conclusions regarding the character of fuels used and optimal ways to use the energy of the fuels burned in TPPs from the ecological impact point of view and also of the efficiency of the electrical and/or thermal energy produced as in [18].

Section 5.3. The energy ecological efficiency of desulphurization and denox systems and installations in thermopower plants

In this section we present and analyze the evolution of the thermopower plant (TPP) Voitsberg of Austria from the past, when there were no measures taken against pollution, to the present, when it is provided with desulphurization (Desulph) and Denox systems and installations, and we globally evaluate it from the point of view of its energy ecological efficiency. Using the results of the analysis for the TPP Voitsberg, we similarly analyze the TPPs of Romania with power units of 330 MW, and we propose measures to improve the energy ecological efficiency in the existing TPPs, as well as to comply with the European norms regarding pollutant emissions for new units and those which are to be continued as in [19].