Environmental water objects pollution level control and management systems

[1]Kartlos Kachiashvili

Introduction. The scientific and technical revolution, having aggravated the contradictions between the man and nature, has caused necessity of the solution of many ecological problems. It is connected not so much to imperfection of the initial technological decisions, how many with low productive and executive discipline. In such conditions the basic attention is necessary to give to increase of efficiency of the control both quality management of air and water, perfection of existing, the development and introduction of new technologies that have not or have not enough of wastes, creation of the automated systems of monitoring and management of quality of an environment. Such systems already function in many countries of the world, but the works on their improvement and qualifying proceed [1 – 4].

Without use of the automated monitoring systems of pollution level of water environments it is impossible to solve the tasks of operative monitoring. In particular, the tasks of management, which allow by influence on a sources of pollution to keep an environment in a condition, suitable for ability to live of the man. The automated monitoring systems of quality of water develop many firms of USA, England, Germany, France, Hungary and other countries. These systems basically differ from each other by set of measured parameters of water and the tasks, realized in them, i.e. at the end, their functionalities and degree of automation. In this sense the offered system favourable to differ from others and do not have analogue. In particular, in it are realized the original algorithms of reception, storage and display of the information, processing of the measuring information, estimation of the current and perspective condition of controllable environment, distribution of the recommendations, modelling of processes of propagation of pollutants, detection of emergency pollution sources etc.

Purpose: the offered automated system of the operative control and quality managements of water environments is intended for the operative, authentic and objective control, study, analysis and management of a condition of controllable object, perspectives of its development. It consists of the automatic analyzers of quality of controlled waters (AAQCW) both of the center of collection and processing of the measuring information (CCPMI). CCPMI is realized on base of IBM - compatible personal computer, where with the help of switched (or allocated) communication lines transfer the measuring information on meanings of concentration of controllable parameters of water environment from auto analyzers of quality of waters through the equipment of data transfer type of MODEM. In CCPMI there is a processing of the acting measuring information by methods of the statistical analysis of multidimensional temporary series, generalization of received results and acceptance of the decisions on a condition of controllable object on all area covered by automatic analyzers. The results of processing are represented as the conclusions, recommendations and advices with the purpose of an optimum estimation and

[1] Kartlos Kachiashvili, Professor, chief researcher of The I. Vekua Institute of Applied Mathematics of the Tbilisi State University, 2, st. University, Tbilisi, 380043, Georgia; phone, fax (99532) 23-72-47; (email:kartlos@viam.hepi.edu.ge).

acceptance of the decision for improvement of a condition of controllable environment. For presentation and convenience of perception of received results their graphic representation are used widely.

Information – program and mathematical maintenance (IPM and MM) are realized as a complex of the applied programs, which function in operational system MS DOS and allow to include in system 50 – 60 of waters quality analysers, each of them measuring up to 20 various ingredients. Now is started an elaboration of the WINDIWS version of this system in which the quantity of included analysers will be limited only to technical opportunities of used computers and MODEMS. For example, for computers Pentium-IV with frequency of 1 000 MH (megahertz) and volume of the memory a minimum 10 Mbyte, the minimum quantity of included analyzers in one CCPMI will be 120 at measurement by each of them up to 50 various components.

The basic characteristic features of system: efficiency of processing of the measuring information, reliability of received results, fast adaptation to changes of the characteristics of controllable objects without intervention of the man, simplicity of study and service, flexibility of use as the tool of the control and research, clearness and convenience of representation of received results.

Opportunities: The system is realized so, that of any new development is not necessary at inclusion in it new AAQCW or at change both quantity and names of the measured parameters. It is possible by the help of realization in system of a mode of "Installation", which enable automatic to adjust all system according to the brought in changes concerning the names of measured parameters, their quantity and ranges of measurement, quantity of included in system of AAQCW, information - inquiry and other information if it is necessary.

Let's bring the short list of tasks, which are realized in CCPMI [5]:

1) The reception from AAQCW of the coded information, which contain number of AAQCW, status of measurement, time of measurement, the results of measurement and other service information.
2) Transfer of the instructions from CCPMI to AAQCW as the coded information for management of modes of operations of AAQCW.
3) Decoding of the information received from AAQCW and their distribution on the bases. Start of a mathematical software of system, which solves the tasks of the analysis of the measuring information, allocation of he trends and casual part of measured parameters, calculation of the correlation functions, calculation of an optimum step of work of AAQCW, estimation of a condition of controllable object in current and prognosis moments of time with an estimation of reliability of the accepted decision, entering of the accepted decisions and recommended actions in the appropriate report forms ("Operative sheet").
4) Preparation of the report forms ("Indication" (in which enter the results of decoding of last message from AAQCW), "Operative sheet", "Daily report", "Summary report for one decade", "Summary report for one month", "Summary report for one quarter", "Summary report for one half-year", "Summary annual report").
5) Work with Databases (is intended for the attendants) for the automatic solution of system questions arising at the service of system, modifying of measured parameters, quantity of AAQCW etc.

- Generation of the directory of files.
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- Preparation of files.
- Communication with the information - inquiry base (IIB).
- Cancellation of files.
- Conducting the normative- inquiry information (NII).

6) The adjustment of system with which help will be adjusted automatically all system according to the brought in changes by the help of modes.
   - The name of parameters.
   - Initialization of the database.
   - Coefficients of smoothing.
   - Scale of parameters.
   - Number of telephones (or other essential elements) of AAQCW.
   - Extreme allowable concentrations (EAC) (established norms of polluting substances for a different components of an environment).
7) The information base for a storage of annual measuring information on all AAQCW (intend the base to make a storehouse of many years' standing information for 10, 20 or is more than years).
8) Research.

   By methods of mathematical statistics, realized in the given section, it is possible to investigate the measuring information on anyone AAQCW for any time interval in limits of the submitted data in base.

   Are realized the tasks: graphic representation of measured parameters; statistical research of measured parameter (allocation of trends and random components, identification of the probabilities distribution laws of random components, calculation of estimations of the basic numerical characteristics and their interval estimations); the regress analysis of the measured parameters (auto regress, regress between the measured parameters of one AAQCW, regress between parameters of two AAQCW, multiple regress); full correlation analysis of the measured parameters; prognosis of the measured parameters (with the help of definition of regress model, without of definition such as model).
9) The reports updated in process of receipt of the measuring information in CCPMI.
10) Intend to realize the Internet access to any information stored both in a database of second computer and to results of mathematical processing of the measuring information.

    The user from the Internet can start any task from the units "research", carry out processing any file of the measuring information and take of processing results.
11) Also intend to realize the transfer of the information under the Internet (both measuring, and results of mathematical processing).
12) Calculation of the concentration of polluting substances in the given point of the chosen site of the river with the help of mathematical models at the simultaneous account of set of pollution sources from this site.

    The start of these tasks realize from the keyboard of the given computer. We are going to do it from the Internet.
13) In case of presence of emergency pollution on the given site of the river start of the software package for automatic detection of the originators in emergency pollution.

Under the guidance of the author of this work diuring of many years were created the analogous systems on the Soviet engineering. In particular, such systems developed and introduced in the cities: Tbilisi, Odessa, Moscow, Kemerovo, Riga. The last years actively is continued a development of models, methods, algorithms both software on monitoring and management of pollution level of an environment water objects.

On the fair will be demonstrated the automated water quality control system operates within data processing center and the software packages of "Application Package for Realization of Mathematical Models of Pollutants Transfer in Rivers" [6] and "Automatic Detection of River Water Emergency Pollution Sources" [7].

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