

3.18. INTERCONNECTED INFORMATION SYSTEM OF ENVIRONMENT ECOLOGICAL MONITORING FOR INDUSTRIAL ENTERPRISES

Potarin A.E., Nashchekin A.S., CJSC Nvision group, Moscow, Russia

According to laws of Russian Federation production activity must include means of ecological monitoring and control of human impacts on the environment by use of which it is necessary to arrange the basis for activities to reduce ecological risks.

The enterprises of ecological risks area first are the enterprises of power energy, chemistry production, oil and gas industry. In particular, according to the information of the Ministry of Natural Resources the enterprises of the extraction of fuel-energy minerals and production / distribution of electricity and heat produce more than 48% of all emissions of pollutants into the air. Accordingly, the enterprises of fuel and energy complex and monitoring the ecological situation and the organization of ecological risk management should be given priority in the implementation of industrial and innovative investment programs.

Risk management for ecological safety, compliance with safety standards is the highest priority for major industrial, mining and processing enterprises of fuel and energy complex now. Industrial environmental monitoring systems are used not only to assess the impact of industrial and technological processes for the objects of the natural environment, but also to assess the degree of compliance with safety standards at the enterprise.

The process of environmental monitoring includes the following main stages:

- Organization of observations, data collection and initial processing of samples and analyzes the environment state and the basic parameters of production technological processes;

- System analyses of consolidated data array;
- Analytics, reporting formation;
- Support of the management decision-making ecological risk-based.

The modern production ecological monitoring systems are the complex high – automatized systems provided data collection and analyses for environment in real time. It collect statistical data for environmental monitoring and, in case of emergencies, immediately notify the appropriate services directly to companies and FEMA, and in some cases, to take measures to stop the harmful effects on the environment through exposure to the relevant technological processes by industrial automation.

The latest automatic systems for environmental monitoring and control (ASEMK) have the function of the automated measurement of the ecological situation basic parameters, as well as the functions of collection, transmission, processing, storage and delivering to users as a source of information, as well as its results and adequate treatment. In addition the software ASEMK should have a wide range of statistical, analytical and heuristic algorithms in order to implement the predictive component of the assessment of ecological risks.

The structure ASEMK usually includes the following components:

- Measuring hardware systems, lower level equipment (sensors, observation station and points);
- Software – Laboratory information management system (LIMS);
- The equipment and software of information-analytical centre;
- Geoinformation analytical system.

Laboratory information management systems LIMS of ASEMK are used for samples, devices, users, laboratories management in general for each stage of the analytical process and many other laboratory functions executing. It provides the entire observation process automation – from the preparation of raw materials to processing the results, which are archived in a centralized storage system. LIMS is the centre of ASEMK.

LIMS is networking soft-hardware complex which consists of workstations connected into information computer network, users, LIMS servers (with functions of database and the application server) and the Data Warehouse server. The laboratory information final manipulation (input, output, transferring and control) are executing on the users workstations. Processing, stockpiling of laboratory information, organization and concurrent access to data for users are executing on LIMS servers. Archiving, long-term accumulation and issue a final and statistical information to consumers are processing in Data Warehouse server. Industrial database (for example, Microsoft SQL Server or Oracle) is used for data storage. LIMS database structure is defined by software architecture and the requirements of a particular company.

The functionality which is provided by LIMS ASEMK:

- measurement process management in laboratories of environmental monitoring;
- laboratory of environmental monitoring resource management;
- management of environmental monitoring data in long-term archives;
- system administration of laboratories for environmental monitoring.

Modern LIMS-system contains a Web-browser interface for remote registration of samples, data access and reporting documentation. Web-based interface provides secure access to LIMS information for the laboratory staff, remote users and external customers via Web-browser without additional software installation.

One of the major functions of the system is environment laboratory analyses management (sample registration, tracking tests, fixing the results and their further processing).

The functionality of the solution built on the LIMS basic provides to realize the requirements of ISO 9001-2001 “Quality management systems” and ISO 14001 “Environmental management systems – Requirements with guidance for use”

The compliance to the international standards ISO 14001 in organization structure, planning and control system, resources control methods which is necessary for efficient realization of ecological politic and strict compliance with the requirements of modern production environment are realized by wide functionality system opportunities and confirmed by considerable quantity of implemented solutions in world’s leading companies in metallurgy, petrochemistry, oil-refining, chemistry and etc.

Summary. Ecological risks management based on ASEMK is a relevant component of information systems of modern enterprises of fuel-energy complex. The article describes the main principles for modern ASEMK realization and the LIMS-functionality which is the central part of ASEMK.