AUTOMATED QUALITY CONTROL FOR FEEDSTOCK AND PRODUCTS

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At Angarsk Refinery, quality control of feedstock, intermediate products, and commercial products is performed by four laboratories: fuel, water, gas, and oil. In addition, most of the refinery's commercial products are controlled by the company's central technical control laboratories.

- The fuel laboratory controls the quality of products and intermediate products from the units and the feedstock, commercial products, and intermediate products from tank farms.

- The water laboratory controls the operation of purification installations and circulating water system units, as well as the quality of wastewaters. Samples of wastewaters are analyzed according to a graph. Violations of industrial regulations or manufacturer's standards (MS) for the composition of wastewaters are determined based on their results.

- The gas laboratory monitors industrial emissions from the installations, emissions from process and ventilation systems, and performs routine analyses of gases and fractions from installations, feedstock, and commercial products (asphalts) from tanks.

- The oil laboratory performs routine analyses on oil unit installations and analyses of feedstock, intermediate products, and commercial oils in refinery farms and commercial product warehouses.

Operating information is recorded and processed by laboratory staff in several operations logs. In addition, the staff enters the results of routine analyses each day and regularly transmits them by telephone to the operators of the installations, refinery dispatcher, and environmental protection department.

Altogether, the information entered in the logs characterizes the operation of process installations and the quality of the refinery's feedstock, intermediate products, and commercial products. It is used for control of manufacturing processes, certification for shipped products, preparation of daily and monthly summaries for refinery and company management, and for the company's quality control department.

The necessity of automating quality control in the refinery was due to the large volume of day-to-day data on the quality and shipment of products established by the laboratories, labor intensity of processing it, and the wide range of users. Four problems had to be solved to implement it:

* automating a number of laboratory personnel functions;
* providing for monitoring product quality and bringing the necessary information from the laboratories to refinery management;
* providing for operative assignment of data from the company's technical control department to plant management;
* organizing communication of the results of routine analyses to the installations.

The first three problems were completely solved, but solution of the fourth has been delayed due to the lack of high-speed transfer systems within the refinery.

Let us examine the solution of these problems in more detail.

AUTOMATION OF LABORATORY WORK

Systems arbitrarily called "Operative Quality Control (OQC)" automated maintenance of data bases on the quality of feedstock, products from installations and tank farms, commercial products, wastewaters, and industrial effluents, and preparation of certificates for shipped products and different kinds of information on quality and perturbations. They operate on information entered manually from the automated work places of laboratory
The OQC system provides for:
- entry of the results of laboratory analyses of samples from installations, tank farms, tanks, and other facilities, and information on transport for shipped products and shipment;
- supplying day-to-day information on quality indexes and rejects;
- preparing files of analyses and rejects and retrieving the data on demand;
- automated formation and printing of quality certificates for commercial products in tanks and for shipment;
- keeping a product shipping log from the beginning of the year and providing information on shipment for any date selected;
- statistical processing of data on quality.

**MONITORING PRODUCT QUALITY**

The refinery's management was interested in rapid access to data on product quality and obtaining operative and retrospective information on the evolution of manufacturing processes, respect of regulations, and the cause of rejects.

The information going to management from the individual laboratories is excessive and is not collected appropriately, that is, by composition and organization of presentation, and it is not oriented toward the management level. This has also made it necessary to develop a special software package for presentation of the data for managerial users.

The software package for monitoring the quality of the feedstock, intermediate products, and commercial products allows controlling quality in the entire production chain — from feedstock to commercial product, including intermediate fractions and intermediate products from installations and farms and environmental pollution. This ensures the creation of a unified data base on product quality, supplemented by data from all OQC systems running in the company.

The user interface allows examining the data in different modes. The system review covers:
- data from the last routine analyses of the quality of products from the installations;
- data from routine analyses of all samples from the installations over 24 hours;
- the results of analyses of product quality in farm tanks;

![Refinery Product Quality](image)

**Fig. 1.** Monitoring of product quality in refinery farms.