Analytical Services at the Ammofos Chemical Complex

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Abstract—The history of the development of analytical services at the Ammofos Company is presented; the personnel structure, equipment, and system of quality provision are characterized.

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The Ammofos open joint stock company (OAO), one of the enterprises of Fosagro AG Holding, is a modern chemical complex manufacturing mineral fertilizers and one of the world’s top ten manufacturers of phosphoric fertilizers. In 1993, Ammofos was incorporated into the International Fertilizer Industry Association and has continuously maintained its niche in the global market. The products of Ammofos are successfully sold in more than 50 regions of Russia, and also on foreign markets, in the CIS, Western Europe, Asia, America, and Africa. The high level of the plant allows it to manufacture fertilizers meeting the highest global standards. A characteristic feature of the 35-year-old history of Ammofos is the constant technical modernization of its production cycles. The implemented modernization program implies the radical reconstruction of the production cycles with the aim of increasing the throughput of fertilizers and reducing their cost. The development of transport and power complexes and the introduction and sophistication of automated control systems on the basis of information technologies pursue the same goals. Now the enterprise produces double fertilizers containing nitrogen and phosphorus, and also triple fertilizers containing nitrogen, phosphorus, and potassium. In addition, the fertilizers include other useful macro- and microelements: sulfur, magnesium, calcium, and small amounts of copper, zinc, manganese, and iron. The field of application of these fertilizers is virtually unrestricted; they are universal, highly effective, and economical. More than two million tons of phosphoric fertilizers are produced annually.

At the enterprise systems of quality management, environmental protection, and labor safety have been introduced. Its policy in terms of quality is aimed at maintaining the company’s leadership amongst its peers; this policy is implemented, in particular, by the sophistication of the existing and the development of new technologies. In order to realize its goals and targets in terms of quality, the enterprise established an Analytical Center (AC) in 2005, which united previously separate units, such as the central plant laboratory, the centralized quality control department, and the industrial sanitary laboratory (Photo 1). Uniting the company’s analytical services has prevented the duplication of many procedures on which each of the separately existing structures had spent material and human resources, such as materials, document and qualification support, time-keeping, maintenance of industrial and labor safety, etc.

By conserving the basic functions and tasks of the divisions that formed the joint analytical center, company managers could organize operations interactively in many different directions, including solving planned and emergency industrial problems using the joint efforts of the former industrial and research laboratories of a corresponding profile; optimization of the schedules of analytical control; the planned attraction of laboratory personnel at the production control sites to the methodological analytical works of the analytical laboratory for performing experiments on the metrological certification of procedures and standard samples of the enterprise, the introduction of rapid and express methods into the control of technological processes, etc.

On the basis of the already available experience, the above tasks are most efficiently performed under a single unified administrative system.

However, the main advantage of the new structure is, clearly, the optimization of the production activity of the enterprise’s analytical services, the implementation of an integrated transparent control system under the following scheme: raw materials → technological processing → finished products → environmental control of the whole production site, and also the possibility of assessing the reasons for the disturbances of processing conditions, estimation of the efficiency of reconstruction and modernization, scheduling of inspecting and research works aimed at the elimination of the revealed disturbances, and sophistication of the operational processes and introduction of new ones.

Constantly monitoring the quality of products and the parameters of technological processes, experts of the analytical center together with industrial engineers choose the optimal technological conditions.
The enterprise is introducing the Manufacturing Execution System (MES system). Within the limits of this project, automated workplaces for inputting the data of the analytical control of technological processes with automatic report formation were developed and organized at the main shop laboratories of the AC. The reports are norm charts of the technological mode, daily reports, and summarized data for each site and production cycle for any time interval. All analytical data introduced into the system are accurately linked to the time of the selection of a sample and compared with the instruments’ records. Thus, the managerial efficiency of the technological processes was considerably increased.

The list of the problems solved in the last few years and put before the research sectors of laboratories includes the participation in starting-up and adjustment works on the systems newly introduced in the production of sulfuric acid; the analysis and investigation of the new and used types of catalysts; laboratory studies of the process of sulfuric acid decomposition of phosphoric raw materials of various qualities and origins; optimization of extraction conditions in the production of phosphoric acid aimed at increasing the efficiency of the processing of phosphoric raw materials; carrying out laboratory research into the selection of effective coloring additives and conditioners for fertilizers; market studies of new reagents, additives to fertilizers allowing the improvement of physicomechanical properties and agroefficiency; and the search for (elaboration) of new products and services.

The result of the teamwork of the experts of AC, the producers of mineral fertilizers, and the department of technical progress for the last few years was the development of the production of four new types of fertilizers. Thus, to satisfy the requirements of consumers, the production technology of color diammonium phosphate (DAP), for which the share of sales on foreign markets has attained a maximum, was developed and introduced.

The preliminary investigations performed by one of the laboratories to assess the basic possibility and economic feasibility of the production of fertilizer Super-MAF mark 13:56 have allowed the company to manufacture a pilot lot of the product and turn out industrial samples for primary market research. The fertilizer obtained is characterized not only by the highest concentration of nutrient chemicals, but also by optimum values of strength, flaking, and abrasion resistance. The