

Letter from the CIS

By Alex Yelshin

Project development: Solid-liquid separation technology

A proposed environmental project in Belarus, will focus on improving solid/liquid separation methods in industry and environmental protection technology. The wide-ranging project, expected to run for three or four years, is currently being developed at the Novopolotsk Polytechnic Institute.

Political and economic changes in the countries of the former USSR have not yet promoted the solution of ecological problems in industrial regions. The reasons for this are not new, and are well known: production recession, inflation, and disintegration of the economic and managerial macrosystems into separate fragments, which often lack vitality without a cardinal reorganisation within the framework of the newly established independent states. It must be admitted that these processes are objective and inevitable under the conditions of a transition from totalitarianism to a society with a market economy, because of specific features of the former Soviet system.

However, some positive efforts aimed at overcoming negative processes – in particular in the field of environmental protection – have been observed. These efforts were initiated by areas and regions with developed industries, where the combined impact of such negative factors as low quality of the human environment, and social and psychological problems due to the transition to a market economy, badly affects the population.

With its large chemical, petrochemical and microbiological plants, the northern part of the Republic of Belarus – in particular Novopolotsk, where the largest enterprises of the European part of the former USSR are concentrated – is witnessing the consolidation of the general public and scientific and technical experts on an ecological basis.

One of the projects proposed, and open for the participation of all individuals and organisations concerned, is called 'Improvement of solid/liquid separation methods in industry and environmental protection technology for Belarus and the eastern part of Europe'. The project is being developed at the Novopolotsk Polytech-

nic Institute in Novopolotsk, Belarus.

The project research objectives are: improving filtration and membrane technologies for slurry thickening/dewatering in industry, waste sludge and biosludge treatment aimed at saving energy and increasing efficiency; the development of safe methods of hazardous slurry treatment, followed by the development of flexible separation processes and, as a possible branch of development, on robot and rotary-conveyor systems (draft investigations); and the determination of the role of separation processes in the protection of the environment and in the management of natural resources.

The project is expected to combine scientific, educational and practical activities.

Training objectives

These are the creation and application of educational courses and textbooks on a research basis for universities and industrial experts concerned with different aspects of new flexible and safe technologies for environmental protection and the treatment of solid/liquid wastes, as well as covering the economic, social and political aspects of environmental protection against liquid wastes using filtration and membrane technology.

Demonstration objectives

This covers the development of industrial slurry and solid/liquid waste treatment methods with advanced scientific methods and techniques in the fields of filtration, membrane technology, automation and robotic systems, and chemical engineering.

Objectives for the diffusion of scientific & technical information

It is envisaged that scientific books will be published on the problems covered

in the project, as well as articles in magazines, papers at regional and international conferences, and collaboration with international societies of professionals and experts.

Project development scientists expect that overcoming the inertia of traditional thinking and attracting new knowledge from technology, informatics and economics to project solutions will be a powerful impulse for creating new technologies such as slurry treatment (for active sludge, sapropel, biosuspensions etc.); the separation and utilisation/isolation of hazardous solid phases from liquids; the development of flexible pollutant protection systems etc.

The social and economic effects will be great, even with partial promotion in the direction of solutions to problems of active sludge dewatering, and minimising the environmental effect of wastes with hazardous solid phases.

Research objectives

The following research objectives are suggested in the project:

- Creating the principles of expert systems development, to encourage the synthesis of a new, non-traditional technology for industry and ecology with filtration and membrane processes as an integral part.
- Investigation of compressible cake properties versus external factors and concentrations (for cakes formed during slurry separation); and cake behaviour simulation in process conditions on the basis of improved model thickening, dewatering and separation methods for such slurries as active sludge, sapropel and waste water.
- The development of principles for building flexible automatic solid/liquid separation systems for hard working conditions or for hazardous products and wastes, where robots are used for equipment servicing or where processes are organised on the basic principles of rotary and rotary-conveyor machines.
- Investigation of the role of separation processes (filtration and membrane) in the problem of the rational management of resources and sustainable development of industry and society when cost minimisation for environment is needed. This also includes optimisation of educational programmes for engineers and experts in the field of separation processes in Belarus, as well as the stimulation of expert activity for the ecological education of society in general.

For project realisation, chemical engineering theory and practical methods

will be used as well as informatics, ecological, economic and experimental physico-chemical investigative methods.

The following results are expected:

- Integration of flexible technology for environmental protection with optimal methods for the thickening and separation of sludges with compressible cakes or which are difficult to separate; and separation processes in rational resource management.
- Draft schemes for fully automatic robotic systems, creating application principles for difficult and/or dangerous conditions.
- New resource-saving technologies for filtration and membrane separation for industry and environmental protection which will improve the quality of the human environment.
- The setting-up of a regional centre for the education of experts and engineers in solid/liquid separation in industry, and in environmental protection technology, as well as for the education of experts concerned with the rational management of resources in waste treatment.

Possible applications of project results may be expanded to other areas:


- The industrial extraction of lake sapropel in Belarus and Russia, which is used as ecologically harmful fertilizer, fodder admixture, and as raw material for valuable biologically active products. At the same time, the problem of cleaning sludge from the lake bed is solved, and the bioproductivity is improved. The loading on regional ecosystems will thus be reduced, because of the partial replacement of such fertilizers with natural ones.
- The thickening and dewatering of excess active sludges and slurries using energy-saving technologies, with the subsequent utilisation and/or isolation of wastes.
- The separation of hazardous solid phases from liquids, with the consequent minimisation of their volume and safe isolation during storage and transportation.
- Filtration and membrane separation technologies for various industries.

The project is expected to run for three or four years, with intermediate phases.

As a result of the USSR's disintegration, Belarus found itself cut off from powerful research centres in the field of solid/liquid separation located in Russia, the Ukraine and in Kazakhstan. Thus the Novopolotsk Polytechnic Institute intends to re-equip some of its laboratories with up-to-date facilities during the course of the project.

Within the framework of the project, the Institute is planning to set up a regional centre for training specialists in dispersal systems separation in industry and environmental protection technologies, as well as experts in rational resources management in the field of liquid wastes treatment.

During the project it is expected to establish contacts with foreign experts, firms and professional corporations concerned with solid/liquid separation, in order to make use of the experience accumulated elsewhere.

We must now hope that our economic crisis and financial problems will not strangle the project at birth... 

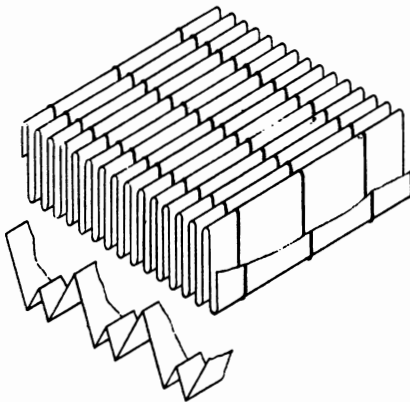


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