HIGH MAGNETIZATION MAGNETIC NANOFLUIDS AND NANO-MICRO COMPOSITE MAGNETIZABLE FLUIDS-MAGNANOMICROSEAL

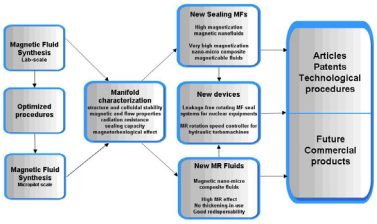
Goal of the project

The project is oriented to the extension of performances of rotating seals and adaptive motion control devices to meet the requirements of several well-defined new applications, by high and very high magnetization sealing fluids and new type of magnetorheological fluids to be synthesized.

Short description of the project

The project concept and objectives are illustrated schematically in figure 1.

The workflow is organized as follows: lab- and micropilot scale synthesis of high magnetization and radiation resistant magnetic nanofluids and nano-micro composite fluids for heavy duty rotating seal and semi-active magnetorheological motion control applications; advanced structural, magnetic, rheological, magnetorheological characterization of the new magnetizable fluids; accelerated ageing and sealing capacity tests; design, manufacturing and experimental testing of leakage-free rotating seals for nuclear equipments and magnetorheological rotation speed controller devices for hydraulic turbomachines. The seal systems proposed for nuclear equipments offer much higher level of environmental protection over traditional sealing units due to the leakage- free property of magnetic fluid rotating seals, increasing the commercial value of the solutions proposed.



Project implemented by

- Romanian Academy – Timisoara Branch (project coordinator), Politehnica University of Timisoara (Partner 1),
- SC ROSEAL SA Odorheiu Secuiesc (Partner 2) and National Institute for R&D in Electrical Engineering ICPE-CA Bucuresti (Partner 3).

Main activities

(1) Synthesis, surface coating and dispersion of nanoand micron size magnetic particles in non-polar and polar carriers. Influence of composition, particle size and volume fraction on colloidal stability, magnetic properties and flow behavior; (2) Magnetic nanofluids and nano-micro composite magnetizable fluids for high pressure rotating seals and magnetorheological devices. Magnetic nanofluids for heavy duty rotating seals. Qualification Procedure; (3) Design, fabrication and testing of magnetofluidic rotating seals for special exploitation conditions; (4) Design, fabrication and testing of a semi-active MR rotational speed controller for hydraulic turbomachines.

Results

The main results of this project refer to the elaboration of the following: (i) technological procedures: synthesis of high magnetization sealing fluids; synthesis of nano-micro structured magnetorheological fluids; and (ii) qualification 1 procedures: magnetic nanofluids for sealing applications in nuclear equipments; magnetic nanofluids for rotating seals for nuclear equipments.

The contributions of Politehnica University of Timisoara refermainlytocomplexmagnetic,rheological and magnetorheological analyses of the magnetic sealing fluids and nano-micro structured magnetorheological fluids.

Also, the involved procedures, technologies, devices and know-how are favourable for patent applications, as well as for development and exploitation by the industrial partner from the project.

Implementation period

2012-2015

Applicability and transferability of the results

The technological progress is strongly evidenced by future commercial products planned for the industrial partner SC ROSEAL SA: 16 new type of magnetically controllable fluids, 1 prototype and 3 functional models of magnetofluidic devices for nuclear and hydraulic power engineering.

Fields of interest

Synthesis of magnetic nanofluids and nano-micro composites; accelerated ageing test procedures for organic compounds; magnetic, magneto-rheological and thermal investigation of magnetizable fluids; design and manufacturing of rotating seal devices; investigation of swirling flow phenomena.

Research centre

Research Centre for Complex Fluid Systems Engineeringy

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Research team

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