

## MAGNETIC NANOFUID ROTATING SEAL SYSTEMS FOR HIGH PERIPHERAL SPEEDS - HISPEED NANO MAG SEAL

### Goal of the project

The project technical objective is to achieve at experimental model scale new leakage-free MNF sealing systems for high peripheral speeds (up to  $30 - 70 \text{ m}\cdot\text{s}^{-1}$ ) in the sealing area, designed to equip gas turbo-compressors.

### Short description of the project

The project proposes the development of seals with magnetic nanofluid (MNF), which has significant advantages compared to conventional mechanical seals: hermetic sealing, exceptionally long lasting operation without intervention (5 years), minimal wear (only viscous friction), virtually zero contamination, optimal torque transmission, wide operating range ( $10^{-8}$  mbar - 10 bar), relatively simple and cost efficient execution.

### Project implemented by

- SC ROSEAL SA Odorheiu Secuiesc (Project coordinator)
- Romanian Academy – Timisoara Branch (Partner 1)
- National Institute of R&D for Izotopic and Molecular Technologies Cluj-Napoca, Politehnica University of Timisoara (Partner 2)
- Politehnica University of Timisoara (Partner 3)
- Romanina Research and Development Institute for Gas Turbines – COMOTI Bucharest (Partner 4)

### Implementation period

July 1, 2014 – September 30, 2017

### Main activities:

- laboratory and micropilot scale synthesis of magnetic nanofluids with carboxylic stabilizers and magnetizations between 400-1000 G
- conception, design and implementation of new experimental models of sealing systems with magnetic nanofluid for high peripheral speeds
- testing and performance evaluation of new experimental models sealing systems with magnetic nanofluid, designed for high peripheral speeds

### Results

- methods for synthesis and characterization of high magnetization nanofluids with carboxylic stabilizers
- experimental models for new sealing systems
- experimental models for sealing systems – innovative version with magnetic nanofluids with carboxylic stabilization

### Applicability and transferability of the results

The expected results will facilitate design and low cost industrial scale production of an original sealing system with stable MNF at high temperatures ( $160 - 180 \text{ }^\circ\text{C}$ ), for high peripheral speeds (up to  $30 - 70 \text{ m}\cdot\text{s}^{-1}$ ) in the sealing gap. They have some important advantages compared to conventional mechanical seals: hermetic sealing, high reliability, relatively simple construction, low execution cost. These performances indicate the market towards ROSEAL Co. is heading, namely the gas turbo-compressors in fertilizer and petroleum refining industry.

### Financed through/by

Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI) .

### Research centre

Research Centre for Engineering of Systems with Complex Fluids – Laboratory of Rheology and Magnetometry, from Politehnica University of Timisoara.

URL: <http://mh.mec.upt.ro/ccisfc/>

### Research team from Politehnica University of Timisoara

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