Curiosity was and always will be in human nature. One of the examples reaches back to antic times. Philosophers like Thales were trying to answer the question: why some materials attract other materials in an invisible way? Nevertheless, their knowledge was not sufficient for proper interpretation of this phenomenon. In turn, the first mathematical description of the electromagnetism was introduced at the beginning of XIX century. Among others, the most important scientists of this era was Michael Faraday. He discovered that every material has magnetic properties. Since then, the weakly magnetic substances had been divided into two groups: para- and diamagnetics. The first are attracted by magnetic field and the second one are repelled from it. It took almost 150 years to construct devices, which are able to utilize this small magnetism - known as superconductive magnets. It is possible to use them to enhance the heat transfer by application of the strong magnetic field. Many researchers has investigated this issue with one-phase paramagnetic fluids.

Nowadays, there are great numbers of electronic devices which surround us. Their proper operation depends on many factors, for example optimal temperature, humidity, cooling media, etc. The operational conditions are very important, therefore their selection and optimization are significant. From other point of view the energy itself is valuable. Many research subjects are related to energy better utilization, more efficient devices or optimized systems. The most important factor in the efficient energy usage corresponds to the efficient heat transfer. Traditional coolants have one meaningful limitation, which is coming from their low thermal properties. The idea of nanoparticles addition to the base fluid was born in second half of XIX century, but it was only recently possible to accomplished it due to the technological development. The first report on nanofluid successful preparation was published in 1990s. Since then, interest in such fluids is constantly growing. There are more and more possible applications, among others: in solar systems, medicine and in daily life.

Proposed project combines two apparently different fields of knowledge: magneto- and nano- science. In both cases a lot of time passed from idea to application. Due to technology development and devices miniaturization there is great demand for heat transfer improvement. **Therefore, in the proposed project this two fields of science will be connected into one purpose – enhance heat transfer processes.**

The main objective of proposed research project is to prove that the same base fluid with nanoparticles is more efficient in transferring the heat than the same base fluid without them. This aim will be achieved by reaching the project milestones. The first one will be measurement of the base fluid and nanofluids properties, which is crucial for the following analyses. The second one will be conducting experiments in various temperature differences – at first with base fluid and after that with nanofluids. The tested nanofluids will be different from each other, they will have different particles amount within and the particles could be paramagnetics or diamagnetics. After the experiments the results will be compared. The next one step will be computer simulations of the phenomena occurring inside the experimental vessel on the basis of experimental results. Moreover, this modelling will be helpful to visualize fluids' move in the interior. The analyses will be conducted without and with magnetic field of various strengths.

The presented goals can be accomplished according to the equipment located at the Department of Fundamental Research in Energy Engineering at the AGH University of Science and Technology: a superconducting magnet – to generate magnetic field, a magnetic susceptibility balance – to measure the magnetic properties of tested fluids, a viscometer – to determine their viscosity and a pycnometer – to calculate their density.

Fulfillment of the proposed project objectives will provide detailed knowledge in several fields of science, such as: fluid mechanics, heat transfer, magneto-science and nanotechnology. What is more, the obtained results could bring future innovative solutions and better energy utilization.