The aim of the research conducted in the project entitled "Influence of the applied voltage and the flow turbulence on the dust particles movement in the corona discharge region" carried out at the Institute of Fluid-Flow Machinery, Polish Academy of Sciences in Gdańsk, was to broaden the interdisciplinary knowledge about phenomena occurring in two-phase flows (gas plus dust) in the presence of corona discharge. On the one hand, we intended to broaden the basic knowledge about the occurring physical phenomena, and at the same time assimilate it so that it could be used in practice.

As part of the work, an aerodynamic channel was constructed to supply gas to the corona discharge reactors, enabling the delivery of air to the measuring section with given parameters, i.e. flow rate, temperature and humidity. Thanks to this, it was possible to perform precise investigations in stable, reproducible conditions. On the basis of this aerodynamic channel, a new research stand was created for advanced, precise studies of corona discharge and the electrohydrodynamic flow (EHD) generated by it, and for studying their effect on the behavior of dust particles. Advanced measuring equipment was used in the research stand created, including PIV system with high temporal and spatial resolution, as well as a system for measuring the concentration of solid particles suspended in a gas with a very wide measuring range (from several nanometers to several dozen micrometres).

A number of measurements were made on the created research stand, including influence of supply voltage, configuration of electrodes, primary charge accumulated on particles and primary flow turbulence on the EHD flow and precipitation of dust particles from flowing gas. Additionally, during the realization of this project, a numerical model for the analysis of results obtained from PIV measurements was developed. Thanks to it, it is possible to obtain additional information about measured flows, including determining the place and value of forces causing the EHD flow.

The conducted research resulted in a new, in a world scale, interesting results that bring us closer to a fuller understanding of the physical phenomena occurring in the area of corona discharge generated in dusty gas and complicated relationships between them. The research stand created and the numerical tool developed allowed us to develop our scientific workshop, which currently does not diverge from what the world's leading research centers dealing with measurements and analysis of EHD flows use.

During the implementation of the project, we managed to create a scientific team that gained extensive experience and knowledge. This experience will be used in the future for further basic research as well as for applied research. Understanding the complex physical phenomena occurring in the corona discharge area has already been used in the design of a series of medium-sized electrofilters, which are already produced and sold. Currently, work is underway on a highly efficient small electrostatic precipitator dedicated to dedusting fumes from small household boilers, which are the main source of particulate matter causing smog in Poland. The introduction of small electrostatic precipitators onto the market would be a very significant extension of the spectrum of corona utilization in practical applications. Moreover, the market success of a small electrostatic precipitator would contribute to reducing the concentration of suspended particulate matter in the air, and thus to reducing smog. This would undoubtedly have a huge impact on society.