The World Health Organization has identified the problem of air pollution as one of the most serious environmental hazards to human health at the level of climate change. Classic "pollutants" are: fine particles, ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Of particular concern for health risks are fine particles with a diameter of less than 10 and 2.5 microns (PM10 and PM2.5). Particles of this size can get deep into the lungs, but unlike PM10 particles PM2.5 can penetrate even into the circulatory system, i.e. adversely affect the cardiovascular and respiratory systems, internal organs. This problem is most common in middle- and low-income countries. For the first time since 2005, the WHO has revised the PM10 and PM2.5 emission standards, which indicates the urgency of this problem and the urgency of the need to address it. According to the World Health Organization, diseases caused by cardiovascular and respiratory non-communicable diseases are the leading causes of human death. Mortality from coronary heart disease accounts for 16% of strokes and chronic obstructive pulmonary disease 11% and 6%.

In addition to the direct impact on human health, air pollution indirectly affects the cost and, consequently, the availability of medicines. In addition to the impact on humans, besides the increase in the number of dispersed particles in the air directly affects the costs associated with the production of precision equipment (for military needs, aerospace engineering), technological operations which are performed in controlled premises

The project aims to **solve the problem** of purification of air from fine particles with a diameter of less than 2.5 μm by increasing the efficiency of pre-treatment technology with acoustic field using resonators.

The **pioneering nature of the project** is determined by:

- The use of resonators, which are located in the path of the gas to be purified of fine particles.
- Application of computer modeling by the finite element method for meaningful consideration of all factors influencing the process of acoustic coagulation

Adding resonators to the design of acoustic coagulation equipment will achieve the following, firstly, create an additional barrier to the flow of air with particles, which will complicate the trajectory, lead to compression of the flow and, consequently, increase the likelihood of collisions between particles and resonators. Secondly, the presence of resonators will create a complex picture of the propagation of maxima and minima of acoustic pressure, which will complicate the trajectory of oscillations of the trapped particles and increase the probability of their contact with other particles. Thirdly, the resonance phenomenon will allow obtaining high values of acoustic pressure and amplitude of oscillations at lower energy consumption.

Project results:

1. Constructed computer and mathematical models can be used in the design phase of air purification systems that use pre-coagulation of suspended particles for individual use, general use and industrial needs. The model will make it possible to scale laboratory installations to industrial ones
2. The results obtained during the project will be implemented in the PhD dissertation section of the graduate student or master involved in the project.
3. Computer and mathematical models will be introduced into the educational process in the discipline "Computer modeling of pharmaceutical and biotechnological industries", taught in the 1st year of master's degree at the Department of Biotechnology and Engineering of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, which will improve professional training students.
4. Based on the results of the project, it is planned to publish 2 articles in peer-reviewed scientific journals included in the top 10 Scopus and 2 articles in Open Access publications on the following topics:
   - Mathematical modeling of the process of propagation of high-frequency oscillations through the resonator;
   - Computer modeling of the process of propagation of high-frequency oscillations through the resonator;
   - Study of the influence of resonant phenomena on the process of acoustic coagulation;
   - Implementation of acoustic coagulation technology in mobile robot systems to eliminate the effects of air pollution.
5. The results are planned to be covered at 3 international conferences for knowledge transfer and exchange of experience
6. Project materials and networks will be used to prepare and apply for Horizon Europe
7. Created laboratory stands and conducted research will increase the potential of Łukasiewicz Research Network to accept future researchers