ПЕРСПЕКТИВЫ, СТРАТЕГИЯ РАЗВИТИЯ И НОВЫЕ ТЕХНОЛОГИИ ХИМИЧЕСКИХ И НЕФТЕХИМИЧЕСКИХ ПРОИЗВОДСТВ. ЭКОЛОГИЧЕСКИЕ ПРОБЛЕМЫ И ПУТИ ИХ РЕШЕНИЯ

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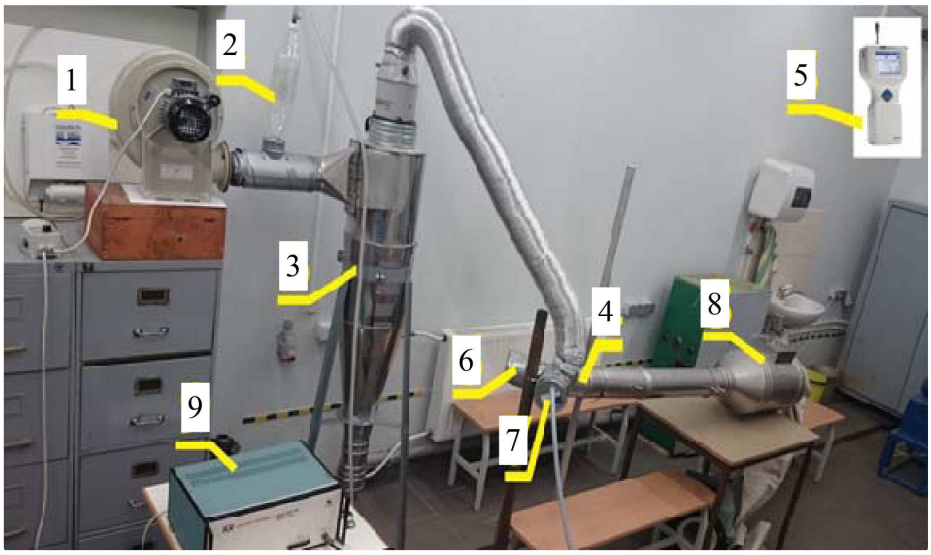
INVESTIGATION OF TWO METHODS TO PARTICLES COAGULATION OF INFLUENCE ACOUSTIC FIELD

Experimental Setup. In the Department of Mechanical and Materials Engineering (VGTU) there was constructed an experimental stand: 1) ventilation device, 2) dispenser, 3) cyclone, 4) acoustic chamber, 5) optical particle counter ErgoTouch pro 2, 6) aeroacoustic sound generator, 7) piezoceramic sound generator, 8) chamber 9) amplifier:

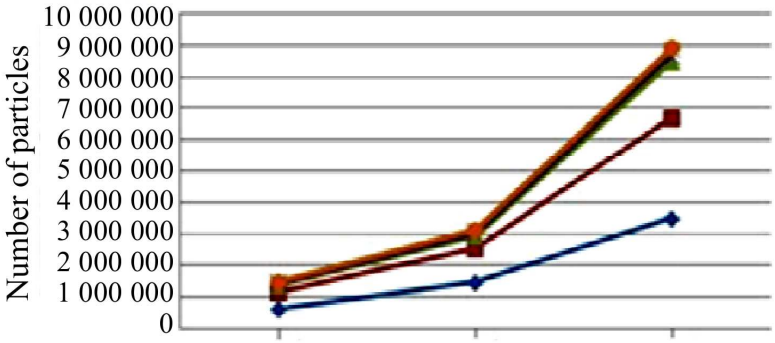


Picture 1 – Experimental Stand

During the process of investigations in the system of supply of aerosolic particles air is taken by the ventilator and is blown into a cyclone, which deletes from the air flow particles larger than 10 μm. By using a dis-

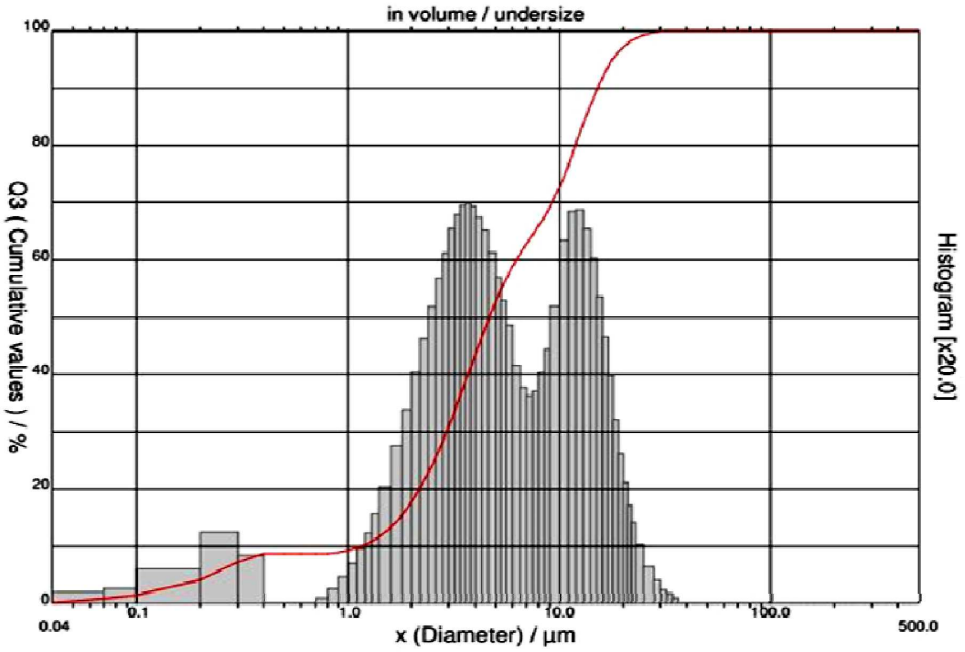
penser sand processed into small particles is input to the air flow which is being cleaned, the size of the elements of sand in it is not bigger than 1 μm. Further the air flow with the particles of sand moves through the duct towards the acoustic chamber. Before the acoustic chamber the pipe is mounted with the analyzer of concentration of aerosolic particles APC ErgoTouch 2 (diameters of particles (6 channells) – 0.3 μm, 0.5 μm, 1 μm, 3 μm, 5 μm, 10 μm; time of measurement – seconds; volume – 0.01 ± 5 % l/min precision). The device inputs air with a velocity of 2.83 l/m (error ± 5 %). Before starting the investigation the time period of input of air and the duration of measurements are set. Data how many particles there are in 1 m3 of air and of what diameter those particles are is obtained. Those results are calculated by the device automatically. There were done six different measurments: 1) without any acoustic field; 2) using a piezoceramic acoustic generator along the flow; 3) using aeroacoustic generator along the flow; 4) using a piezoceramic acoustic generator at a 45º angle to the flow; 5) using an aeroacoustic generator at a 45º angle to the flow; 6) using both generators. Measurings were done during 1 minute and every 20 seconds there was fixed a number of particles in the flow after acoustic field influence.

Results and Discussion. The results of the experiments carried out show that the best result of the agglomeration of particles was obtained by acoustic signal, which was generated by two generators of one another in front of another 90°.



	20 sec	40 sec	60 sec
10.0 μm	2977	4989	13 755
5.0 μm	30 641	83 391	211 513
3.0 μm	58 155	102 163	201 961
1.0 μm	228 009	404 280	1 770 832
0.5 μm	520 722	1 055 177	3 189 438
0.3 μm	619 824	1 451 108	3 474 044

Picture 2 – Change in the number of particles during one minute when both acoustic generators are working together



Picture 3 – Granulometric constituent parts of the particles which were sedimentated in the chamber after agglomeration process

With the measurement of the number of particles in time, it has been observed that the test by this method significantly increased 5 and 3 micrometers of particles compared to the tests performed using each generator separately. This means that finer particles (up to 1 micrometer) agglomerate into larger ones. This is illustrated by their granulometric analysis.

Granulometric analysis of the particles was made in the Laboratory of Building Products Technology, Vilnius Gediminas Technical University.

Conclutions.

1. Reduction of the dispersion of various pollutants is the major problem addressed in environment protection, so it is necessary to find an effective methods for solution.

2. One of the most effective method to prevent this kind of pollution is agglomeration of small aerosol particles using acoustic field.

3. The aim of this research was to improve the agglomeration process to make it more effective.

4. The results of the experiments has shown that the best result of the agglomeration of particles was obtained by acoustic signal, which was generated by two generators of one another in front of another 90°. It is a background for upcomming experiments, when it is going to change an angle between acoustic wave generators to see at which angle there will be the best result of agglomeration efficiency.

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