DETERMINATION OF THE OPTIMAL PARAMETERS OF A PRECIPITATION ELECTRODE OF A WET ELECTROSTATIC PRECIPITATOR

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The steady increase of livestock and poultry production and marketing in Ukraine and abroad encourages the construction of new or renovation of current premises for the keeping livestock and poultry. The exhaust air from livestock houses contains an extremely large amount of bacteria, harmful gases and dust – 103 billion microbes, 23 kg of ammonia and other substances are emitted from a calf shed for 10 thousand livestock per year [1]. Another problem that needs to be solved is the spread of particular odors over long distance – up to 5 km in summer [2, 3]. That is why the implementation of effective purification systems is a necessary and promising area of work. Various means for cleaning are used in the industry, but for agricultural applications the best choice, according to the work of scientists from different countries, is electrostatic precipitators which use chemical solutions and a moving or rotating precipitation electrode. Complex purification taking place in such devices consists of purification by ozone which is formed as a result of corona discharges and purification with chemical liquid that is on the surface of precipitation electrode. Improving the existing designs of wet electrostatic precipitators is aimed at finding the most efficient rotation mode and surface shape of the precipitating electrode. In order to determine the optimal parameters of a precipitation electrode of a wet electrostatic precipitator, an experiment was conducted in which three surfaces with different structures were compared at different rotational speeds. For the indicator of optimality is taken the mass of the working fluid on the surface of the precipitation electrode during rotation, because the more working fluid is on the surface, the faster the chemical reaction of exhaust air purification occurs. For the experimental measurements a smooth disk, a mesh, and a smooth disk with mesh surface on both sides were used. The measurement results are listed in Table 1.

Table 1

The type of precipitation electrod		The rotational speed of the precipitation electrode, rotation^{-1}				
		0,2	0,25	0,5	1	2
	1.Smooth	5,3	7,7	13,3	10,0	6,7
	2.Mesh	6,0	8,3	15,3	12,7	10,7
	3.Smooth with the mesh	27,0	37,7	42,3	39,7	37,0

According to the obtained results the graph was constructed (fig. 1).

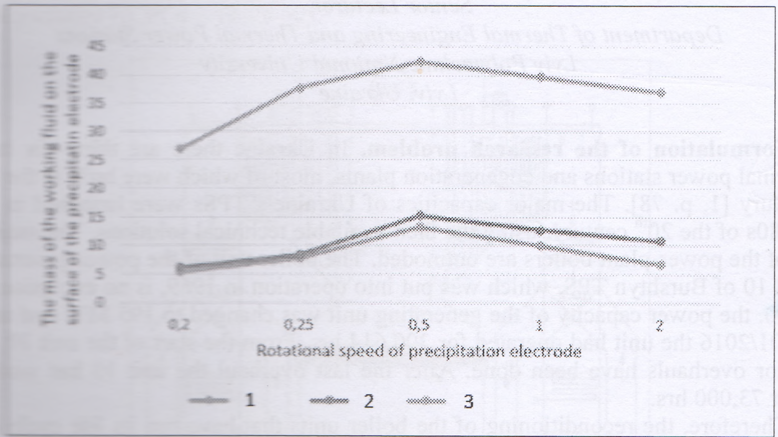

Fig. 1

Experimental studies have confirmed the results of previous studies that the overall surface dimensions and rotational speed affect the mass of the working fluid on the surface of the precipitation electrode. It is determined that the optimum surface of the precipitation electrode to hold the maximum amount of working fluid is a disk with a distributed (mesh) surface on both sides.

References:

1. Zoohygienic standards for livestock facilities. Directory. G.K. Volkov, V.M. Repin, V.I. Bolshakov et al. / Ed. G.K. Volkov. M. Agropromizdat. 1986. 303 p.
2. F.G. Tomikov Zoo hygiene in industrial pig breeding. L. Coloss, 1980. 229p.
3. Veterinary and sanitary requirements for the design, construction, reconstruction and operation of livestock premises. M. VO «Agropromizdat», 1988.