

## Investigation of Cyclone Stave Thermal Performance with Five Step Heat Exchangers

Between the varieties of existing heat-exchange apparatuses served for heating and cooling fine dispersive materials cyclone heat exchangers which exchange a fine finder and a gas flow in suspension have become the most widespread ones

The method of five-staged cyclone furnaces for production lime calculation is offered. The thermo-technical calculation is done on the basis of a material and thermal balance between different elements of the furnace: a lime refrigerator, a limestone heater and a decarburization with a precipitant. Heat balance equation takes into account the possible air leaks and changes engineering parameters of solid and gas phases along the cooler flues, incomplete heat exchange between the solid and gas phases, the heat loss to the environment.

The calculation is done for a furnace device which produces 50.000 t of lime per year. The fuel material is a natural gas with a combustion heat of 33,5 MJ/m<sup>3</sup>. The degree of calcium limestone burning in a decarburization is 95%. The precipitation balance of material in all cyclone furnace elements is taken as 90%.

The results of calculation are the following:

Indicators of	The value of the performance of five step cyclone furnaces				
	1	2	3	4	5
Temperature, C:					
- Flue gases	758	582	437	300	157
- Heating limestone	758	582	437	300	157
- Ready lime	58	118	216	372	618
- Air heating	58	118	216	372	618
specific consumption:					
- natural gas, m <sup>3</sup> /t of lime	114,6				
- equivalent fuel, kg/t of lime	131				

The technology can be used for calculation of heating the fine dispersion material in cyclone heat exchangers and for calculation of heat exchangers with a less number of stages with addition of proper corrections to basic calculations for material and thermal balances.