PRODUCTION OF HEAT-INSULATING AUTOCLAVED AERATED CONCRETE WITH USING MULTIFUNCTIONAL BLOWING AGENTS

Baranyuk Dmitriy Igorevich, student, Perm National Research Polytechnic University

scientific adviser: **Leontev Stepan Vasilevich,** assistant of Department of Building materials and special technologies

Advantages of using efficient thermal insulation materials



- preservation and energy efficiency;
- reducing the thickness of the walls of buildings;
- facilitate weight of bearing constructions;
- reduce load on foundation.

Autoclaved aerated concrete (AAC) particular properties

- lightweight porous structure;
- easily manhandled aircrete blocks;
- territorial and economic;
- availability of raw materials;
- incombustibility;
- environmental safety.



Segmentation of market of AAC with different densities





Shortcomings aluminum powder

- The need for calcination and using surface-active agent;
- high dusting;
- interfere with health;
- explosive characteristics;
- unstable properties.





Diagram of consumption of aluminum powder and specialized blowing agent





The main developers and suppliers of specialized blowing agents

- Eckart (Germany) «Stapa Alupor 905»;
- Schlenk (Germany);
- Benda-Lutz (Australia);
- HCK-TEK (Russia).









Production of AAC test samples



Graph of autoclave curing



Dependence of the density aircrete of type and consumption of blowing agents



Blowing agents consumption



The factors and variability intervals of factors

Factor	variability intervals			
	-1	0	+1	
Blowing agent, g	35	40	45	
Water and solid components ratio	0,55	0,6	0,65	
Gypsum, g	0	219	438	

Skin of response function of density depends on the water - solid components ratio and blowing agent

p=2125,67 - 24,17*A1+0,26*A1² - 4043,33*B/T + 3000,00*(B/T)²





Potential composition of autoclaved aerated concrete to 1m³

	D 200; B 0,5		D 500; B 1,5	
Element	allotment of materials, kg	Percentage, %	allotment of materials, kg	Percentage, %
Cement	67,2	9,65	95,0	12,12
Lime lump	134,4	19,31	140,0	17,87
Sand	268,4	38,56	298,0	38,03
Water	225,6	32,40	250,0	31,91
Aluminum powder	0,543	0,08	0,550	0,07
Aerated mixture	696,143	100,00	783,55	100,00

Reduction of the material by 12%

Results

- Samples of autoclaved aerated concrete were produce with using multifunctional blowing «Stapa Alupor 905»;
- This blowing agent allowed to stabilize process of structurization of AAC and had positive impact on Physical and thermal insulating characteristics of products;
- The heat-insulating autoclave gas concrete of brand on the average density of D200, class on the average durability of B0,5 is developed. These characteristics conform to requirements of GOST 31359;
- This material allowed to reduce materials and energy consumption of production.

Thank you for your attention!