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TECHNOLOGICAL PROCESS OF SOUND-ABSORBING PANELS

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ABSTRACT: The paper is presented the aspects of technological process used at fabrication of sound-absorbing panels. The experiments and tests have made at "Congips"Co and "Dosestilos"SRL from Oradea, in collaboration with University of Oradea and Technical University of Cluj-Napoca. The results emphasized the high quality of new sound-absorbing panels and using them in practical applications.

1. INTRODUCTION

In last time, the using of sound-absorbent panels has get a large applications in building range, in special at cased ceilings and walls for halls of concert, library, offices, malls, sports arena, etc.

The gypsum is widely used for interiors, such as coatings, dry partitions, ceilings and wall linings, under shape of tiles or plasterboard. The main properties of gypsum are lightweight, acoustic and thermal insulation, fire resistance and regulation of hygrometry.

The manufacturing of gypsum from natural gypsum involves crushing and grinding the gypsum mineral, then firing it at 150^{0}C. One important item of gypsum, used for sound-absorbing panels is plaster gypsum.

The main reaction for obtaining of plaster gypsum is dehydration, respectively water elimination from the structure. In function of heat gypsum temperature, the dehydration is made in two phases [2-5]:

- Forming of calcium sulfate hemihydrate ($CaSO_4 \cdot 1/2H_2O$), which is produced at temperatures of 95-120^{0}C, with the chemical reaction:

$$CaSO_4 \cdot 2H_2O \rightarrow CaSO_4 \cdot 1/2H_2O + 1 \cdot 1/2H_2O \quad (1)$$

- If the temperature is raising above 300^{0}C the dehydration is going on results anhydrous:

$$CaSO_4 \cdot 1/2H_2O \rightarrow CaSO_4 + 1/2H_2O \quad (2)$$

Consequence of these reactions, the stable gypsum has transformed in an unstable product (hemihydrate plaster or anhydrous), which has always the tendency back in a hydrated stable state. If the temperature is above 300^{0}C until 700^{0}C results an anhydrous. At treatment of hemihydrate at 1200-1400^{0}C the death plaster is obtained.

The experiments and tests about sound-absorbing panels have made at "Congips"Co and "Dosestilos"SRL from Oradea in collaboration with University of Oradea by "Doctoral School of Oradea", supervise by Prof. Ioan V. Mihaila, PhD and Technical University of Cluj-Napoca by Prof. Mariana Arghir, PhD. The research and lab tests performed with the purpose of obtaining new materials with sound absorbing qualities have been realized by the development of some common CNPU-research contracts between our universities [1].

There are designed and executed two receipts of modeling alpha-plaster, for which have made lab tests to determine the main characteristics of them.

In a first version, the formula contains 35-40% of modeling alpha-plaster, 2-5% calcite micinizated, 3-5% dehydrated chalk, 5-8% white cement, 1.5 – 2.5% expanded polystyrene with a density between 12-15kg/m^3 of which 30% grained to 0.7-1 mm, 0.5-1% delay setting, 3-5.5% powder oxides and pigments and 36-44% water, the percentage being expressed in weight.

In the second version, has changed the expanded polystyrene with expanded perlite, which has great porosity, light density and a good natural absorber of sound and vibrations.

The experiments have been carried out and with other receipts by used modeling alpha-plaster or modeling beta-plaster, but only used as add the perlite and acceleration's additives.

The lab tests of mechanical properties have made in conformity with standards SREN 13279-2/2005 and SREN 13279-1/2005 [6,7].

This paper has the aim the presentation of technological process of fabrication for modeling alpha-plaster panels with high properties of sound and thermal insulation.

2. TECHNOLOGICAL PROCESS OF SOUND-ABSORBING PANELS

The experiments about sound-absorbing panels have carried out at "Dosestilos"SRL of Oradea, where was tested new receipts and casted the new sound-absorbing panels.

The installation used of casting the sound-absorbing panels on the base of modeling plaster is a kneader machine type "COROS OP5" Siemens (Fig.1), which it's able to have an automated control of the process [4].

Fig.1. The kneader installation type "COROS OP5" SIEMENS [4].

The receipt used at casting process of sound-absorbing panels on the base of modeling plaster has the composition of 6l of water with modeling plaster (95%) and perlite (5%).

The mixed composite material has approx. of 3.5kg and it was reinforced with the matrix of glass fiber with length of 3mm.

Fig.2. The matrix of glass fibers [4].

Fig.3. The mixed composite material [4].

After realized the mixed composite material of modeling plaster the technical process of fabrication the sound-absorbing panels is following by preparing the mold of casting. The mold is clean with silicon and after that, it's fulfill with the bulk material and start the vibration of mold for realized a uniform setting of composition inside of mold. The size of mold is (597x597) mm.

Fig.4. The mold of casting and the inner designer of mold [4].

After this preparation of mold and its vibration, it's start the fact of casting process of panels, presented in Fig.5 and Fig.6.

Fig.5. The sound-absorbing panel inside of mold casting [4].

Fig.6. The mold and taken out of panel from modeling plaster [4].

After the casting process, the panel is extracted from the mold and it's finished with drying process, which can be made progressive with dryer at 600^{o}C, or natural drying during of 3 days.

The results of mechanical tests of new sound-absorbing panels that have made in lab of "Congips"Co, highlighted the high characteristics of them and confirmed this process of fabrication for modeling plaster panels.

3. CONCLUSIONS

In this paper has presented a certain fabrication process of modeling plaster panels with high properties of sound and thermal insulation properties.

The receipts and the fabrication process of sound-absorbing panels emphasized the originality of authors and them application in practice.

4. REFERENCES

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