INFLUENCE OF MOISTURE CONTENT ON BULK CHARACTERISTICS OF SAWDUST ARISEN AT WORKING OF PARTICLEBOARDS

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Abstract
Garin composition and bulk characteridtics of the dust from working of particleboards were determined. Also the influence of moisture contenton the poured and tapped bulk density was describet. The angle of repose and sliding angle of repose are depend on the moisture content.

Key words: *Bulk density, angle of repose, wood dust, particle boards*

INTRODUCTION

The mechanical tooling of wood being always a stage of its processing into final goods is connected with a formation of lots of waste including particles with the high degree of the disintegration. The most small waste appear in many places of the production plant and are the reason of the one from most serious threats of the work environment - dustiness of productive rooms. The elaboration of effective methods of reduction of dust threats demands the exact knowledge of the physical characteristics of worked materials which influence on the proprieties of the waste arisen from them (Dolny 1999).

In the process of the design of the dedusting installations especially important becomes the recognition of the dust particle sizes and first of all the participation of the particles with most small diameter - being situated in the range of dust fractions. In the next order it is necessary to determine mass and angular proprieties of poured and dropped waste filling the containers. All these characteristics are different for every kind of wood and every kind of waste (Dzurenda 2002, McGlinchey 2005). They are also subject to influence of other factors. The objective of research described in this paper was the determination of the influence of the moisture on physical proprieties of dust waste from the tooling of particle boards.

MATERIAL AND METHOD

The grain composition of dust waste with the use of the set of test sieves was determined within the effected research. The poured bulk density, tapped bulk density, angle of repose and sliding angle of repose as basic physical proprieties were taken into consideration. The influence of the moisture content on these proprieties was also

described. The moisture of samples was fixed on 10 levels beginning from the initial moisture 8% and enlarging in turn every 10%.

The poured bulk density of the dust was determined by freely filling of the measuring vessel with the constant capacity. The determination of the thickness tapped bulk density consisted in the location of this container on the sieve shaker for 10 minutes.

The angle of repose and the sliding angle of repose were determined to use laboratory devices shown on the fig. 1 and 2.

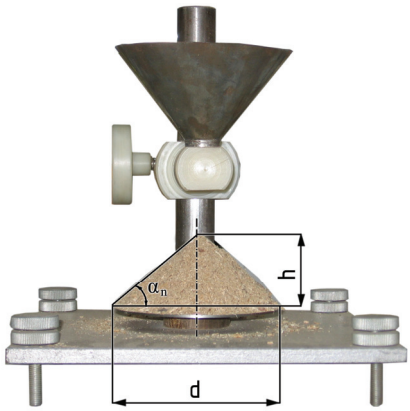

Fig. 1 Measurement of the angle of repose

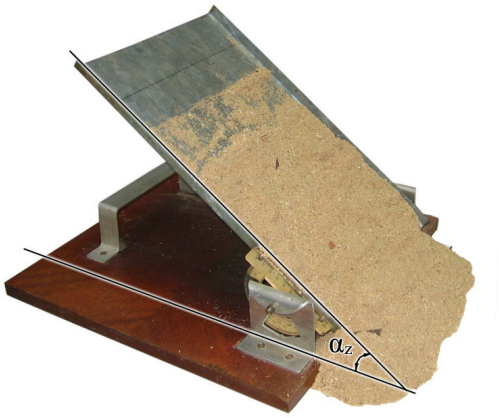

Fig. 2 Measurement of the sliding angle of repose

RESULTS

As distinct from the roughing of wood, where waste material are chips arisen as a result of the immediate activity of tools, in the tooling of particleboards the wood is crumbled again. The first time, when wood is cutting on chips, on needs of producing of the boards. Second time during the tooling of these materials in furniture plants. An effect of such double influence is the waste with the very wide dimension range including a large participation of dust particles (fig. 3).

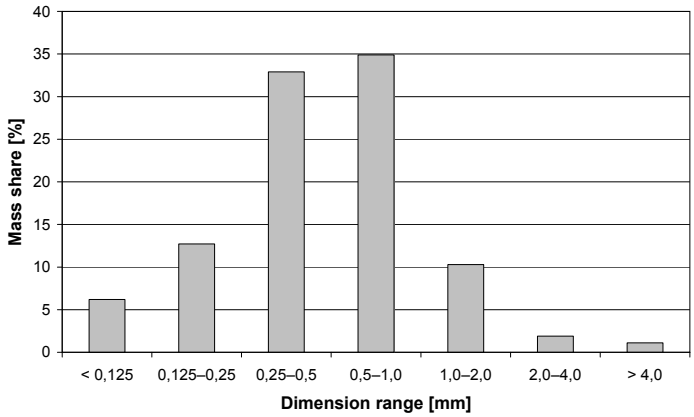

Fig. 3 Grain composition

The detailed analysis of grain composition of received waste materials showed that the greatest mass share had particles with dimensions 0,25-1,0 mm. They make 67, 8% of the whole mass. The particles with dimensions below 0,25 mm and above 1,0 mm give in sum 32,2% masses of chips. The shares of each fractions decrease in the direction of extreme quantities, smaller than 0,25 mm and greater than 1,0 mm.

Both bulk densities taken into consideration in the research are subject to the influence of changes of the moisture content. This change is not one-way. In the first phase of the growth of the moisture content 8-30% the fall both densities is observed . Although the mass of particles grows during the humidification, the whole volume of waste material increases even more. The result of it is the decrease of poured bulk density and tapped bulk density. This decrease is observed to the fibre saturation point when the wood volume enlarges. After the transgression of the moisture content 30% wood no longer swells, grows only its mass by the humidification. Then occurs the progressive increase of both densities (fig. 4).

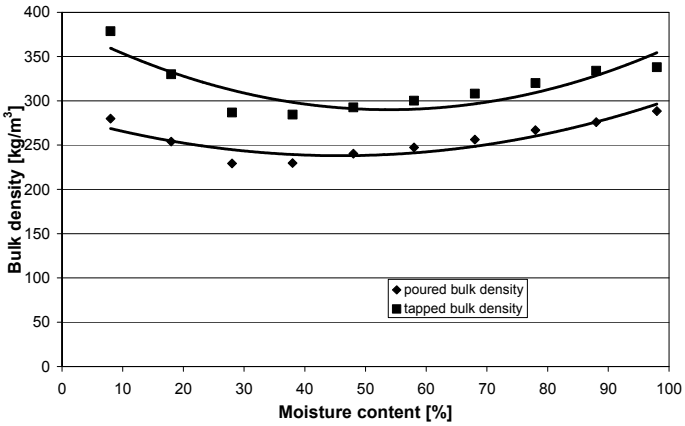

Fig. 4. Bulk densities of the dust

Presented results confirm the influence of the moisture content on angular proprieties of waste material. The value of the sliding angle of repose increases along the growth of the moisture content. For example for chips with the moisture content 8% the sliding angle of repose amounted 32,7°, for 48% - 40° and for the moisture content 98% already over 54° (fig. 5).

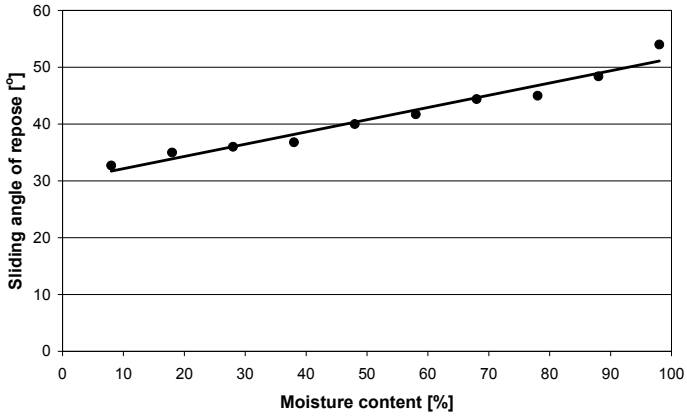

Fig. 5 Influence of moisture content on the sliding angle of repose

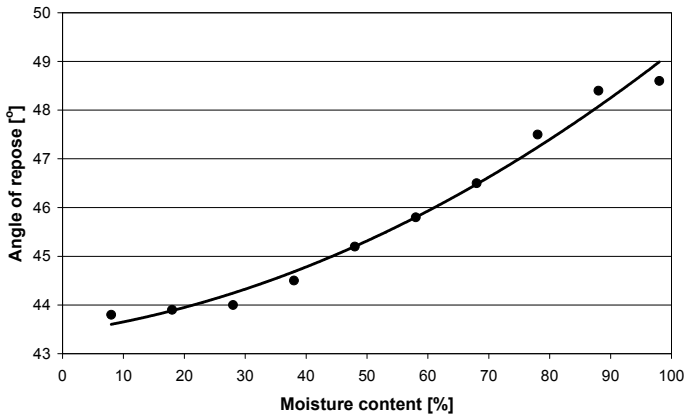

Fig. 6 Influence of moisture content on the angle of repose

The angle of repose of waste material with the moisture content 8% amounted 43,8°, for the moisture 48% - 45,2° and for 98% already over 48,6° (fig. 6). The occurrence of these increases is connected with the growth of the forces of the adhesiveness of particles. This is clearly perceptible after the transgression of the moisture content 30%, when free water begins to appear in the dust layer. The larger increment of value of the angle of repose for waste material with the moisture content > 30% than for the moisture range 0-30% is the result of this.

CONCLUSION

1. The waste arisen during the processing of particleboards are characterized by the large inhomogeneity. The largest mass share in waste material have the particles with dimensions 0,25-1 mm. They make up 67, 8% of the whole mass. The dust particles (< 0,3 mm) make up till 41,5%.
2. The values of the angle of repose and sliding angle of repose grow along the increase of the moisture content of chips.
3. The poured bulk density and the tapped bulk density change under the influence of the moisture content. In the first phase of the humidification (0-30%), the values of bulk densities decrease. The further growth of the moisture content causes only the increase of both bulk densities.

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