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**Research area: Product aims**

End products made of paper, paperboard and board // Corrugated products

**Key words:**

medium density fibreboard, wave structure, corrugated board, lightweight construction

**Title:**

**Development of wave structures made of thin medium density fibreboard to be used in lightweight construction and packaging**

**Background/Problem area**

Lightweight construction is an important topic of paper and wood materials industry. In general laminar materials made of natural fibres are quite light. The density of paper, board and even medium density fibreboard is obviously below 1.0 g/cm<sup>3</sup>. The most important transport packaging is made of paper or rather board. For this purpose multi-layered corrugated board (heavy duty corrugated board) is produced. The usage of paper-based honeycomb plates made of corrugated board or hexagonal expansion honeycomb in lightweight construction of furniture, panelling and dividing walls reduces the components' weight significantly and helps to make the handling during processing and transport easier. However the amount of material costs of corrugated board production is about 50 % of the total production costs. Accordingly it is of great interest to reduce the material usage especially when there are further positive additional effects expected for example a better moisture resistance and a positive CO<sub>2</sub> footprint.

A for this purpose potentially usable material is very thin medium density fibreboard (MDF). This material can be produced quite cheap and is able to reach up to 50 % higher specific rigidity values compared to common paper. Furthermore it is produced in a dry-process in contrast to the wet method which is commonly used for paper and board production. Because of that the water consumption of the production of thin MDF is about 75 % lower. Regarding thermal and electrical energy the production technique of thin MDF creates energy savings of about 5-10 %. If it succeeds to create thin MDF with an identical grammage, homogeneity and temperature deforming as paper including a comparatively higher elastic modulus, significant material savings of packaging and lightweight construction can be realised.

**Objectives/Research results**

The aim of the project is to produce high strength thin medium density fibreboard with a grammage between 100-200 g/m<sup>2</sup>. The thin MDF should have a homogeneous material distribution and should be able to be converted into wave structure with common corrugating machines. The field of application of the produced thin MDF should be inside light building boards and heavy duty corrugated boards.

In the project progression the following results have been achieved so far:

- Production of the fiber grades required especially for thin MDF production. A 50/50 mixture of beech and pine, which is decomposed with a pressure digestion of 8 bar in the laboratory refiner, seems to be particularly suitable.
- Production of thin MDF samples, which have a sufficient defibering behavior, so that the recyclability in the paper circuit is ensured, whereby the circulation water load has to be considered when selecting the binder.
- Performing the non-woven forming process by means of an airlaid system and hot-pressing stage of thin MDF, which could be subsequently, formed into sinusoidal wave profiles.
- Extensive characterization of different samples of varying fiber-adhesive-combinations and comparison of their properties with those of conventional corrugated paperboard (base material and after lab scale wave forming).

The substance of the next project steps is the verification of scale-up and industrial relevance:

- Investigation of the transferability of the optimal process and recipe parameters developed for the production of thin MDF from basic research into a larger scale.
- Investigation of the formability of the thin MDF produced under industrial conditions under practice-relevant operating conditions (corrugation formation process).

**Application/Economic benefits**

Due to the significant increased rigidity values of thin medium density fibreboard compared to conventional corrugated board it should be possible to realize considerable material and cost savings in the final product.

This results in new approaches for paper converter for product development in material reduced heavy corrugated MDF.

For MDF manufacturers new markets are getting established for innovative MDF products in the packaging industry and in lightweight construction for wall coverings and perspective in the furniture industry.

**Period of time: 01.01.2016 - 30.06.2018**

**Remarks**

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