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# CHALLENGES IN ORIENTED STRAND BOARD R&D IN MALAYSIA

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*Abstract:* Oriented strand board (OSB) is a wood based panel product made from wood strands that oriented parallel within others. The strands are bonded together by adhesive with the presence of pressure and heat. The orientation gives high strength properties which nearly resemble to plywood. OSB is widely used in North America and Europe in construction due to its strength and available at big size. However in Malaysia, the utilisation is at the early stage and limited. An early study was made here to develop the product. Several factors effect the product development has been identified and they are raw material, processing of raw material, OSB manufacture, Adhesive utilisation.

Keyword: Oriented strand board, OSB, rubberwood, Acacia mangium

# INTRODUCTION

Oriented strand board (OSB) is a kind of wood based panel products that widely used in the western for construction and structural purposes due to it high strength properties which nearly resemble to plywood and able to produce at high scale and size. OSB is made from long, thin and narrow strands that oriented parallel within others. The board normally consists of at least three layers of oriented strands where the core layer is perpendicular from the surface layers. The strands are glued together by thermoset adhesive, which cured by applying pressure and heat.

The utilisation of OSB in Asian is very small and limited for non-construction purposes such as billboard and packaging box. The users preferred plywood as major panel source mainly because of it proven strength and much available at reasonable cost. However, the forest source for timber is coming depleted and limited and these might encourage the panel producers and consumers to shift to other alternative wood based panels particularly OSB. Therefore, research on OSB is necessary to provide the technology and information towards the realization of OSB industry in Malaysia.

Early research and development (R&D) in OSB has been pioneered through an IRPA project entitle 'Development of Oriented Strand Board for Structural and Non-structural Application' which was granted in 1996. The project involved a government agency and higher learning institute namely FRIM and UPM. Through this project, the researcher managed to develop a process and technology in manufacturing OSB using selected tropical wood species, despite to identify several factors or key points that need to be looked into prior to establish an OSB industry in the country. Part of the factors is raw material, processing of raw material, board manufacturing, glue utilisation and lastly end-product diversification.

# **RAW MATERIAL**

The availability of raw material is one of major point that needs to be considered prior to establish an OSB plant in any particular area. Wood size and quality factors are nearly not a problem since OSB is an engineered panel product therefore could be produced from small diameter and poor quality of logs. In Europe, logs with diameter 80 to 100 mm obtained from the thinning of spruce and pine forests has been used for commercial OSB (Caesar 1997). The continuity supply of the wood material is much important. Here, *Acacia mangium* and rubberwood was identified as potential raw material for OSB.

About 64 thousand hectares of land has been planted with fast growing trees mainly Acacia mangium under Compensatory Forest Plantation Project in Peninsular Malaysia (Anonymous 1998). In Sabah and Sarawak, A. mangium was widely planted in the reforestation and rehabilitation of abandoned shifting cultivation areas (Alik 1999). However A. mangium was reported to be susceptible to fungi attack that caused heart rot disease (Gibson cited in Lee *et al.* 1993) resulted to low yield of solid wood.

Rubberwood with total area of 1.6 million hectares (Mohamad 1998) is planted for latex and the wood is highly demanded as wood source for furniture, particleboard and MDF industries. Currently, Malaysia has 10 MDF mills and 9 particleboard mills in which 7 of them depend solely on rubberwood as raw material.

Between these species, rubberwood is much preferred as raw material for OSB manufacture because it has whiter and creamy wood colour, and the log price is cheaper than *A. mangium*. Though the rubberwood log is highly demanded, it still not fully utilised in certain area due to the location, which is far from the demander.

# PROCESSING OF RAW MATERIAL

In OSB manufacture, the raw material should be debarked and flaked prior to mat forming. The strand size needed is 60 to 150 mm in length, 35 mm in width and 0.5 to 0.8 mm in thickness (Rahim *et al.* 1999). Two kinds of flaker machine i.e. drum and disc type is usually used for processing the logs. In this project, disc-flaker with diameter size of 1 meter was used to produce the strands. The machine is capable to process rubberwood billet of 6 inch in diameter and 9 inch in length.

Rubberwood strands processed using the disc-flaker was found to curl as they come out from the machine. This phenomenon is specific to rubberwood as it not happened to other species namely *A. mangium* and pine, which were processed using the similar machine.

Early study shows that the curling of rubberwood strand is effected by thickness, width, moisture content and drying. This curling may caused the unevenness in glue distribution on the strand surface during glue mixing process. Thus may reduced the board strength or properties. A depth study covered the identification of related cutting pattern and wood composition is on going to further understand the phenomenon.

# **OSB MANUFACTURE**

Likes any other wood based panel products, commercial OSB is produced through a nearly full automation process in order to obtain high volume and uniform product without ignoring the quality. A forming process has been established for producing OSB at laboratory scale (34 cm x 34 cm in size). However this process is much time consumed because the glue sprayed strands have to be manually arranged to the mold that consist parallel plastic slots. The mold need to be removed and rearranged each time new  $\exists$ rands layer want to be made. The strands mat then pressed with the presence of heat to cure the adhesive.

The laboratory produced OSB was found to be uneven in strand distribution, thus resulted to the unevenness in board density. The strands keen to coagulate to the middle of the mat at each layer during the former, whereas the edge parts have tendency to spread out during pressing. This may as an effect of producing small size board. The study is on going to produce laboratory scale OSB with excellent strand distribution.

### ADHESIVE UTLISATION

Thermoset polymer adhesives with moisture resistance ability are often used in OSB manufacture because the panel usage is mostly for exterior application. Phenol formaldehyde is a good example and widely used for wood adhesive. Others are melamine urea formaldehyde and isocyanate (Caesar 1997). Isocyanate can form bond of high strength, durability and water resistance, however the price is much higher compared to phenol formaldehyde and very reactive during the polymerisation that needed higher safety precautions.

In Malaysia, phenol formaldehyde adhesive is commercially produced to cater wood industries other than OSB, where the adhesive physical properties and chemical composition are different depending on it application. A joint research was made with a commercial adhesive manufacturer to produce phenol formaldehyde adhesive special for OSB manufacture. Several critical factors effected it properties were identified and they are chemical ratios, viscosity, solids content and alkalinity.

# **PRODUCT UTILISATION**

Today, the market of wood based panel especially particleboard and MDF is very competitive due to high number of producers. Price and quality play big role in attracting buyers. Certain producers work harder by diversified their end products to create many target markets. Example, a producer could sell his fibreboard as office furniture besides selling it as general-purpose panel.

Similar approach could be made to those interested to venture in OSB here. They should identify their market and be product specific. Further research is on going between the agency and private sector to identify the potential and suitability of OSB utilisation.

# CONCLUSION

Though the R&D on OSB in Malaysia is still at the early stage, there is a need to equip the country with sufficient information and know-how technology therefore it can be directly utilised if there is any necessity. Few factors effect to the establishment of OSB industry here has been identified and need further studies.

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