Professorial Lecture UiTM
Prof Dr. Wan Mohd Nazri Bin Wan Abdul Rahman, SAP.

Development of Kenaf Oriented Strand Board (OSB) and Commercial Trial

Program

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Auditorium Perdana, ILD Bandar Enstek

21 Januari 2026 (Rabu), Jam 10.30 pagi

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Transkrip:

29:17 : Bismillahirrahmanirrahim Assalamualaikum warahmatullahi wabarakatuh Salam sejahtera. Salam UiTM Dihatiku, Salam Malaysia madani. Dekan tadi sebut FSG Padu. Alhamdulillah terima kasih kepada pengacara majlis kita pada pagi ini Tuan Haji Faizal. Saya baca salutation Yang berusaha Prof. TS Dr. Azhan bin Hashim Rektor Universiti Teknologi MARA Pahang. Yang berusaha Prof. Dr. Yarina binti Ahmad Penolong Naib Canselor Kepimpinan dan Pembangunan UiTM ILD. Yang berusaha Prof. Ir. Ts. Dr. Hamidah binti Mohd Saman. Terima kasih semua. Yang berusaha Prof. Ts. Dr. Mohd Rozi bin Ahmad Dekan Fakulti Sains Penggunaan UiTM. Terima kasih Prof. panjang lebar latar belakang saya tadi. Yang berusaha Prof. Ts. Dr. Mohd Fadzhel bin Mohd Nasir, Timbalan Ketua Pengarah Pembangunan Lembaga Kenaf dan Tembakau Negara LKTN. Yang berusaha Puan Syafinaz binti Abd Rashid daripada Lembaga Perindustrian Kayu Malaysia (MTIB) Barisan Jawatankuasa Eksekutif Negeri, Ketua-ketua Agensi Profesor-profesor, para sarjana, tak lupa juga pada keluarga saya yang hadir pagi ini dan para pelajar yang berpagi-pagian dari Jengka tadi Terima kasih atas kehadiran semua. Alhamdulillah.

31:16 : Izinkan saya menyampaikan syarahan ini dalam bahasa Inggeris. First of all, I would like to acknowledge this publication this work to all collaborative of all institutions and individual who involve in this project. Namely of course, University Teknologi MARA Cawangan Pahang especially. National Kenaf and Tabacco Board (LKTN), Tokyo Agriculture University. Our team members also from Tokyo Agriculture University. Malaysia Timber Industry Board former director of MTIB, Institut Kimia Malaysia and also Universiti Malaysia Kelantan. Thank you so much for their contributions. So, this book, the development of kenaf (OSB) and commercial trial marks a significant milestone in Malaysia where by we want to promote Kenaf would be one of the source of biomass for our would phase industry or would composite industry in Malaysia. So, why Kenaf? Because is a fast growing characteristic. So we go further after this.

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32:57 : So what is Kenaf all about? I need to get my glasses. So, this is Kenaf. The scientific of Kenaf is hibiscus cannabius. Kenaf have been introduce to Malaysia i think late of 1999 and the research intensively been done early 2000 until now. And this plant from Africa surprisingly same thing goes to our palm, oil palm also from Africa. So we do the R&D development and everything. On our local climate conditions, so thats how the research on the basic the planting materials the sole condition, the climate and everything need to be carried out from pur researcher to make sure that we have a good planting material in the future. This crowd a good thing that i mentioned just now it tooks only for 3-4 months. Depends on the application. So, the most valuable part from this Kenaf is a fiber. The application almost similar to the ham, jute or flax in Europe. So this is in the tropical region i think jute and Kenaf is a main major fiber from this climate region.

34:43 : So, So, the most valuable is a from the stem. We do have the leaves MARDI will come out the research on the leave for animal feed. But for this study or this study government give mandates to focus more on stem. So, 2 type of main part of Kenaf stem is a fiber and core. So let have a look of photo from this one. This is a Kenaf stem. The fresh Kenaf stem. So, the bottom here we have a fiber, the fiber and also the core in the middle. The fiber consist of 10% around stem. But the rest 90% the core. But fiber is the most valuable part as compared to this core and fiber. So what we will do with the fiber. A lot of applications have been carried out by the LKTN to come out various product from the fiber. So this the fiber from the mechanical process and this is from the rating process. This is the most expensive fiber from the bio rating process. So, i also have some studies with associate Prof Dr. Adila one the textile together with Prof Rozi as well. But today I want to talk more on the application of the core to produce OSB wthat we have here. I think all of you familiar this board. So the board basically an alternative to the plywood in our country because the cost to produce plywood getting increase due to the shortage supply of big diameter log. So, this is like alternative to our industry. Another application can you see here hopefully that from textile part we aim to, its not replace, but for the alternative to the carbon fiber for automotive industry. And then, of course this is our main topic today on the oriented strand board.

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37:24 : If you go to the decathlon, so this photo I took from decathlon Shah Alam. so we can see many type of display using oriented strand board. So today, this is a commercial board from a commercial line. So this topic, the development basically we come out with the recipe and the before we proceed to the factory. Research been done to make sure everything that running smooth at the factory site. So, our government come up with the Biomass Action Plan in 2023 end of 2023 launched by our Deputy Prime Minister at that time. The direction towards 2030 whereby we want to optimize usage of biomass in our country. So this is something great area whereby on the forestry sector or agriculture sector do not cover on this biomass. Sometime people consider biomass is a low value or like a waste for example. But we need to turn this kind of biomass to wealth and contribute to our economic growth. By doing so we have an alternative to our wood. So then thats why now forestry department they try to come up with the fast growing plantation species support the industry. And now I think we need also to consider any lignocellulose substitutes material to reduce our independency from the forest. So by doing so we can protect our forest and give some space for our tree in the forest to grow and of course we need to protect our water catchment area, wildlife a lot of the environment is need to be taken care because we are moving towards develop nations. So i think this is a good step for the government to promote biomass in the future.

39:47 : Then, we move on to OSB. What is OSB? In Malay we call Papan Tatal Berorientasi. Thats the words from the Dewan Bahasa. So, is oriented. So, the structure close to the plywood the orientation of the fiber similar to the plywood. So this OSB started in North America especially Canada and United State. So they are dominated this product for the last 20 years i think. But in the European region and ASEAN region they are focused more on the medium density fiber board and particle board. So i think we can see the trend now moving towards this region for the demand of OSB in the future because the price of plywood getting increase.

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40:56 : So lets have a look on the wood composite. A good thing about wood composite we can custom the usage of wood composite in term of density, the size as compared to the solid wood. So in wood composite we have three types of material. First, veneer to produce plywood and in the middle we have a particle to produce a waferboard. OSB. and particle board. And the third one is a fiber including paper industry and also medium density fiber board. In this hall we can find a lot of wood composite surrounding us. Even though you are sitting on the chair right now is also we have a composite material.

41:50 : Alright. So, this a top 10 players of OSB or manufacture in the world lead by West-Fraser, Louisiana-Pacific, Georgia-Pacific and we have Lulling Group from China as well coming up. So this is i would say latest panel board in this family of wood composite. So lets have a look on the application of OSB. so this is some photos application of OSB in our furniture, housing, or construction. So its is we call it a middle midstream products before we come up with the end product like a furniture or in any housing construction site. So we can see a lot of application especially for fast or i would say we call it fabricated house definitely design from this product. So another one is become popular is the modular system, tiny house and everything. So they put on the design and fabricate at the factory and its become more efficient as compared to the traditional constructions. All right, lets move on to the era of wood composite in Malaysia. It started with the Son Timber in 1950s and then we shift to the because the supply again is the development basically related to the raw material supply. So then the era of the plywood in 1970s we can found many plywood factory coming up and then the era of the rubber wood our industry last time enjoy rubber wood very much from the rubber industry.

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44:04 : Due to the replanting exercise they have a plenty of rubber wood and thats how particle board and MDF coming up until now, but again we have also another issues now our farmers tend to plant oil palm rather than replant with the rubber. Then again the shortage of rubber also happen right now. So that is the dilemma what happened in our country and that is why OSB come into the picture as alternative to the plywood. So this how the thing started and in Malaysia actually the planning to set up OSB plant in Negeri Sembilan already been planned by heavier board in 1995. But only 2015 pioneer OSB construct their plant in Pokok Sena, Kedah. So they claimed that they are the first manufacturer global produce OSB using tropical wood. Tropical means rubber wood here. So here in this playboard here we can see the combination of Kenaf strand and also rubber wood. So, this is the good thing about the industry is main for export. So this is the major destination export from pioneer OSB.

45:30 : Currently just picking up the awareness about the importance of OSB in this region, in ASEAN region. For your information, Pioneer OSB is the only factory in Southeast Asia, only one, only one in Malaysia and only one in Southeast Asia. And the rest is in the mainland China. In China they have 52, Professor Zhang from Central South University, so Professor Du mentioned to me that in China you have 52 OSB line. So in ASEAN region only China and Malaysia. And this is the destination export of our board to Vietnam, Korea, and also China. Of course we need to compete the board from North America as well. So something interesting about when I visit Kunming, China, so when I have an opportunity to discuss with Professor Du, they come up with the different type of OSB. I will show you later. So in this region, OSB dominated by China. So once I knew that, then I planned to have a trip to China. In 2024, I attended a seminar organized by Southwest Forestry University. So that is the beginning of my OSB exploration, but how the thing is being set up in China. Then during the seminar I met with Professor Du, a prominent professor at Southwest Forestry University. He is a former president of Southwest Forestry University and he is very active on wood composite.

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47:27 : So from the support from Professor Du and Southwest Forestry University, I managed to visit one of the OSB factories in China. It's located in Pu'er, southern part of the Yunnan. So something interesting here, China come up with their own standard, not following the American standard. So this is something interesting for me. I have an idea what to do, so that's why after coming back, we do the improvement of the board. So this is another photo from the factory in China. Currently they are using eucalyptus. I am now discussing with Professor Du to come up with another fast growing species. Hopefully, because the weather condition towards southern of Yunnan is subtropical, so I think we can do something from our experience to grow some subtropical species to support this industry. And the latest information I got from Professor Du, China government now they put on the restrictions to cut eucalyptus only 7 years and above. So now we need to find out the alternative to cut below than 7 years, we need to introduce a new species. Quite interesting, the plant is straightforward. As compared to the production line in Europe or from America, their machine is quite big. In China it's more practical. Okay, so that's the introduction about this OSB and Kenaf. So let's go to what we are doing at the lab. So this is the development stage, it started from the basic properties, anatomical properties. We do the laboratory trials, pilot scale and also the development. So I go very quick, I know it's very technical, but I try to mellow down the content. So this is how Kenaf looks like at the microscopic on the left. And here is the rubberwood. So our finding together with Professor Boyashi, the character of the anatomical from Kenaf core and rubberwood, not so much difference.

49:58 : So that's why we are quite confident to mix up Kenaf core with rubberwood. So this is the photo from the anatomical sections, cutting. And before that, we also do the size of the strand, what are the appropriate size. So in this case, we use two size, the length 75 mm and also 125 mm. Then after that, we confirm all the character of the material we are dealing with. Then we proceed for the lab trial with the consideration of the strand analysis, anatomical analysis, the target density, the resin modification probably, and the ratios and the temperature, how we want to maneuver and try to test what are the best recipe for this OSB from Kenaf.

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: So we come up with a very intensive lab trial. And so this is, sometimes we have a good result and then we do after that. I mean, not really convincing, then we never give up, we do the improvement from time to time until we discover the recipe. So this is one of the parameter we are doing with our team. This is some photos from our lab. Please come to Jengka. We have all these facilities, our team, our colleague from Jengka also coming here. Thank you for coming, our student also, yeah. So you have the best facilities for wood-based industry in our country, basically.

51:47 : All right. So this is another lab activities on the trial and we come up with a prototype, we do the combination of the density. And then for the first trial, it is quite struggling in terms of the performance. You can see the performance is far away from the minimum requirement of the standards. So then from that, we discuss and do another modification. So then again, we try to focus on the single density, and again, the result also not so good. Then we proceed another one, the third one. Then we can see that there is an improvement from the third trial. So close to the minimum requirement of the standard. And finally, at the trial number four, so we found, yeah, what we are doing here with the combination of rubberwood and kenaf core with density of 700 kilogram per meter cube, then we got a good result for us to proceed to the factory for the commercial trial.
So then after that, when we have a good result, we go to the factory. Pioneer OSB is belong to the best grade group. So we start our trial in September 2024.

53:24 : So this is how the factory looks like in Kedah, Pokok Sena, Kedah. So the factory, I think the setup of the factory cost half billion. And this is some photos at the control room. Thank you so much, Pioneer OSB, for giving us this opportunity to come out the trial at the factory. So this is another photo from the OSB line in Pokok Sena, Kedah. And Alhamdulillah, we managed to produce a finished board, this one, with 23 meter cube of OSB. Then from that, we do the testing. We found that 100% rubber wood produced by Pioneer OSB is around 30 megapascal with 4,000 megapascal for the modulus of elasticity. Slightly lower as compared to when we put the Kenaf core inside.

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: But it still meet the minimum requirement of the standard. So from this exercise, we never give up. I think we need to do something. And we do another development. So this stage, we go back to our lab. And we find out another recipe whereby it is better performance from the combination of rubber wood and Kenaf core here. So we do alternate at the face layer and the core layer, and Alhamdulillah, we got this result, a good result. And hopefully, Inshallah, we will proceed with another trial with the... We now try to apply through the MOSTI Grant for the next level.

55:20 : Okay, so this is analysis. We are coming. We are very happy with the results, and we are looking forward to come up with another exercise.
So in conclusion, it's the end. So in this journey, we found that Kenaf can be combined with the rubber wood for commercial manufacturing. And with the density of 700 kilogram per meter cube, and the strength size should be like 125 mm in length and we hope that this will be a milestone for the industry to consider and increase their capacity for the export market. Okay, this is our way forward. Recently, two days ago, I managed to meet with the owner of Pioneer OSB, Mr. Peck, together with, you see, Dr. Shukor here, and also Dr. Lee Seng Wah. And we are now getting the consent from the industry to get another exercise for the next level. So again, way forward, I'm looking for five-layer OSB. So Inshallah, I will work closely with Professor Du in China, and we think that we can add more Kenaf core inside. So instead of 5%, hopefully we can increase up to 30%. So that is our target, and as I mentioned just now in the early of my lecture, our target is for the biomass. So we want to optimize usage of biomass in our country and reduce the impact on the forest. Okay, I think with that, thank you so much. Assalamualaikum warahmatullahi wabarakatuh. Thank you.