Potential Utilization of Wooden Particleboard Patent to Analyze Research and Development Foresight

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Abstract

Initiating commodities development from natural resources transforms into primarily issue that preserve many opportunities in utilization of potential and useful diversification model especially wood products. The value of technology analyzes foresight need to be used optimally to seek many opportunities in new variation technology that can implemented into market demand. Now the new technology has pushed into much needed to optimize the amount of raw material that could be processed into new product diversification. One of the problem solution that could comply with analyzing patent database is to find technology from Research and Development (R & D) result to be ready to use, for instance particleboard products as wooden product diversification. This paper discusses on how user could know their development of technology for market orientation through patent portfolio, licensing, status, competitor, innovation and monitoring on emerging market with patent database which has been registered on WIPO fields. Methodology applied in this paper is based on software named Total Patent in order to see more information related to particleboard technology utilization as potential consideration through leading patent-issuing authorities. The aim of paper is to obtain data from patent analysis in particleboard and to find out the development of technology foresight products which have been produced as well as how competitors movement, especially in wood utilization. The conclusion from utilization of R & D on particleboard patent database could be applied in case of developing opportunity in disseminating on industrial and stakeholders which requires impact on newest implementation of technology and level competitiveness in appropriate designation to wooden based products commercialization.

Keywords: foresight, prospecting, particleboard, patent, R & D.

Introduction

Optimizing potential natural resources nowadays often used as opportunity in gaining economy impact from product diversification. Performing globalization era, specific movement was needed to introduce many technologies that occur in line with market needs and no longer have to wait for technology to be pulled and pushed. Natural wealth with high variation of raw material could be used to feed national problem in empowerment economic sustainability. On the other side, it becomes more rarely use with appropriate technology. The economic driven from wood sectors beginning to show highly used in product development. One of the local economic development is by utilizing the potential nature as raw materials into finished goods through the industries. The industrial sector is believed to be the sector who is able to lead the other sectors in the economy towards current technology progress (Dumairy 1996).

Natural resources in Indonesia is very valuable with tropical climate, owned this country makes it a country that many agrarian sector relies on the support of development and needs of the people. The development of Research and Development (R & D) especially that comes from government institution rarely used because of the lack of information and dissemination on technology content. Technology with special uses need to absorb a process or steps to develop a new product or refine the existing products, where all its activities defensible. Wood development need to be seen as primer subject in order to reveal many benefit to society, inline product development in the wood industry from strategic and an operational perspective. Table 1 shows production of processed wood by type (CBS 2014) indicate fluctuation availability of raw material.

Processing technology become part of development in wood industries, for instant particleboard is also known as chipboard nowadays used as an alternative products which have been developed in order to overcome the shortage of wood. It is used to find replacement materials for the manufacture of wooden based products. Potential utilization of appropriate technology as an anticipation of the wood need as building material will increase in line with the rate of population growth is increasing rapidly. Currently, timber supply from forest is extremely difficult to meet the increasing demands, as the availability of wood in the forest as well as a good quality timber is limited (Mawardi 2009).

Table 1. Production of processed wood by type (CBS 2014)

Type of Processed Wood	Unit	Year 2014				Total
		Quarter I	Quarter II	Quarter III	Quarter IV	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pulp	Ton	746 632.82	1 601 726.54	2 244 160.62	864 507.79	5 457 027.76
Sawnwood	m^3	1 012 053.36	1 460 734.66	532 803.45	607 852.04	3 613 443.50
Chip & Particle	m^3	523 899.28	502 030.86	490 549.92	515 489.83	2 031 969.89
Plywood	m^3	592 001.68	410 339.42	382 508.23	410 163.58	1 795 012.91
Barecore	m^3	296 335.32	521 965.34	67 920.17	84 230.87	970 451.70
Veneer	m^3	282 812.86	249 924.67	174 004.96	179 202.34	885 944.84
Wooden Furniture	m^3	114 959.20	129 766.49	59 127.08	156 275.84	460 128.61
Moulding/Dowel	m^3	42 158.58	31 201.14	93 943.91	46 944.20	214 247.83
Flooring	m^3	887.81	610.61	2 354.90	163 461.27	167 314.59
Fibreboard	m^3	29 327.78	48 452.04	31 061.97	57 763.00	166 604.79
Others	m^3	857 663.07	511 245.05	500 093.91	943 006.08	2 812 008.10
	Ton	67 674.72	157 515.21	211 246.18	79 449.05	515 885.16

Total Patent software was used in this study to elaborate the user to know their development of technology for market orientation through patent portfolio, licensing, status, competitor, innovation and monitoring emerging market with patent database. Linkage with innovative and economically promising technology fields and markets will be identified through technology monitoring and technology foresight. The most important thing that it should improve their strategic alignment in the field of research and development and initiate innovation processes at an early stage in order to secure important competitive advantages. By entering the right keyword for subject purpose, the result of registered patent with R & D development in WIPO fields could be defined and the year's protection duration could also be known. Patent data could actualize the analysis of this knowledge-network, i.e. through quantifying and structuring patent data, understanding the knowledge development and structure becomes possible. The structure of data hidden in theses and patents could play a critical role as a 'proxy meter' in understanding the structures of R & D activities and related knowledge. The aim of this paper was to define strategic way to enhance potential prospecting utilization of particleboard from wood industries and appropriate technology that used for production on woodworking development.

Technology Foresight Through Patent Information Database

Intellectual property is the gateway for the birth of science and technology. In general, technology could not be borned by itself, just as a human being that is born from the womb of his mother. A technology is produced due to the power of human intellectual creations are realized through a stage of research that then generate innovation. As technological progress speeds up and the time needed for implementing innovation shortens, it is important to identify and regularly monitor global technology trends, which can have a key impact on social and economic development in the long term. Key science and technology trends should be monitored regularly because of the need to react quickly to technological changes and to make strategic decisions in a timely manner (Mikova and Sokova 2014).

The development technology increase along with globalization era, that need to preserve many opportunity from innovation that lead into economic sustainability. This is a chance to lift up many appropriate technology appear from R & D result to see the probably of implementation to push market orientation. Technology foresight appear for identifying future skills needs is becoming more and more acute in the context of the current dynamics of the global economy. Technology-driven sectors are an environmental dependent which is strongly associated with most rapid change and therefore uncertainty. Technological foresight is the term applied in studies that try to anticipate and understand the potentialities, evolutions, characteristics and effects of technological changes, particularly its invention, adoption and usage. Thus, it is possible to try to anticipate the technological and scientific advances and participate in a way to influence in the guidance of technological trajectories guaranteeing competitiveness and the survival of research institutions. The main point is to identify the chances for development and the options for present action (Coelho and Coelho 2003). Database from patent application could be used as a baseline for applying technology, especially identified model of product to enhance demand from customer or industry.

On the other hand, prediction of information need strategic foresight that comprises the activities and processes that assist decision makers in the task of defining the company's future course of action (Vecchiato 2012). In this case, foresight technology of particleboard mean to measure potential prospect of utilization to market

orientation, with prediction present into future prospective analyzes from other firm of output product generated.

Correlation with patent database commonly used as a basic tool to seek derivative product that could be processed in innovation step of technology, through statistical analysis of patent information at the end of suitable for strategic assessment of businesses and technologies. Patent information delivers graphs and tables, which show the trends in markets, technologies, competitors and development over time. An additional monitoring of technology provides dynamic analytics with high relevance and points out changes in patent landscapes. Patent is one of the seven types of IPR that has been officially implemented in Indonesia, loaded with information technology, economic, commercial and legal. Patent statistics contained in various data base of IPRs in the world which could be used to monitor scientific activity, market trends, technology development trend, dynamics of a competitor and also the innovation potential of the activities of company. By using the right tools and good analytical skills, then this information could be used as a strategy for research and development in organization (Hendrix 2014). Figure 1, shows data could be processed as a new technology firm base on patent database foresight.

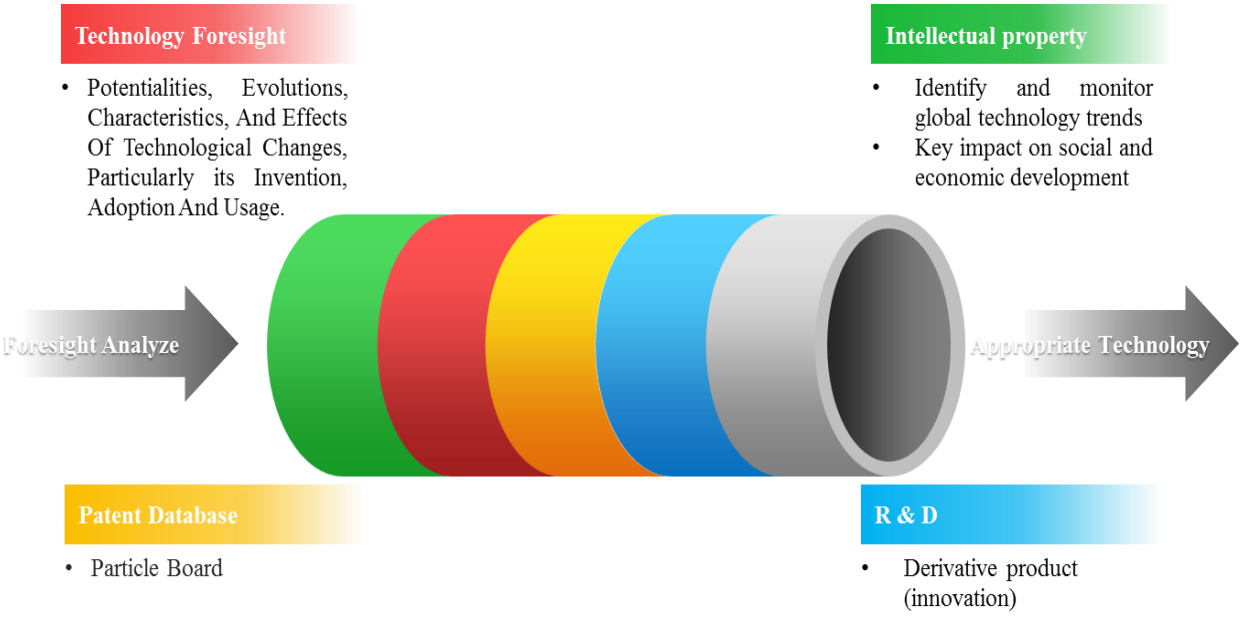


Figure 1. Systemic technology foresight process.

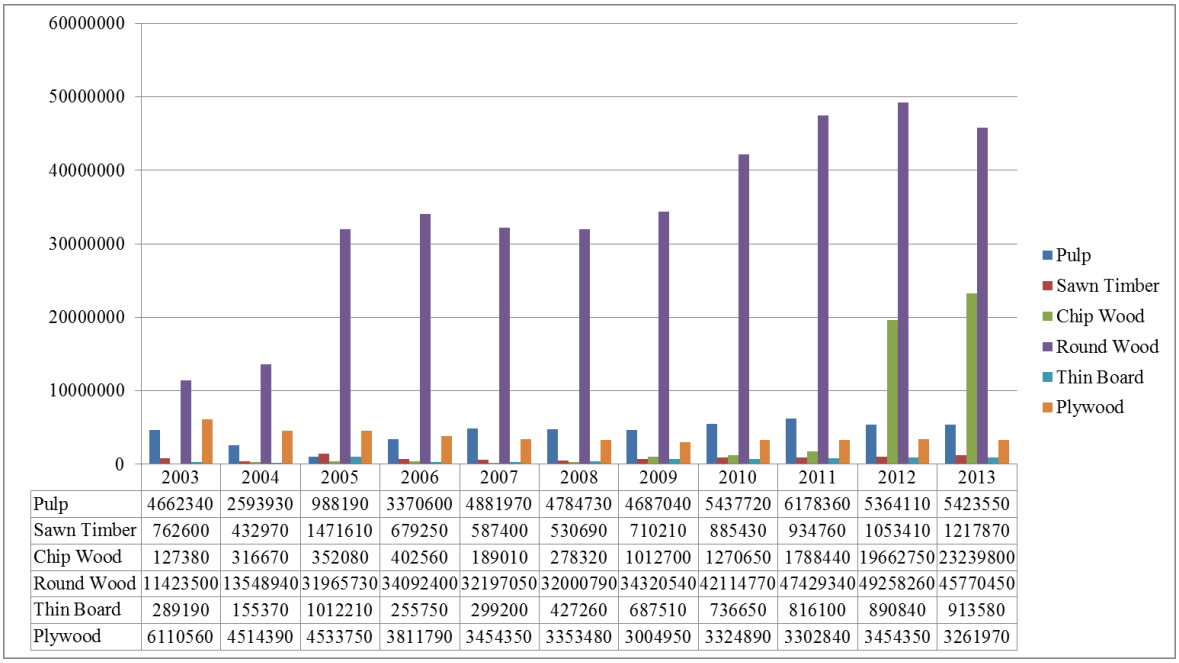
In this paper, for foresight technology used keyword particleboard for starting to seek document related to development of prospecting utilization for derivative product, process and market orientation. This method necessary used in order to measure the level of development of the utilization materials of particleboard, with primarily existing data through patent database for searching possibilities of utilization that could be seen widely in the productive efforts, so the fulfillment of wood product could be clarified based on existing uses.

Particleboard as Derivative Product of Wood

Forests as one of the natural resources of timber producers into capital is the basis for the wood processing industry sector to significantly grow especially for primer needs of human life. An example of the sewage treatments is particleboard, as this industry utilizes wood waste from wood processing industry as a raw material. The improvement demand of wood is a challenge for timber industry in Indonesia, especially to provide raw materials and it is ready to use both for the domestic market as well as the fulfillment of the foreign countries. From that statement it shows that the wood processing industry needs to find an alternative source of materials, both the products and raw materials. The imbalance between supply and demand that caused the deficit in the production of wood, it is imbalance between the supply of wood as raw material with its use in public life both for construction, household furnishings, furniture and others.

For wood sector, it could be lead into new innovative products that could break limitation through an anticipation degradation of shortage raw material, in deed for this case need one step in performing technology for solution. From data in Indonesia's forest is the largest tropical forest, the third largest in the world after Brazil and the Republic of Democracy of Congo, with an area of 1,860,359.67 km^2 mainland, 5.8 million km^2 of territorial waters and 81,000 km the coastline, Indonesia placed on order second only to Brazil in terms of the level of biodiversity (Departemen Kehutanan 2009). It means by correct management in

utilization could be seen in potential appropriate variation of product that occurs from new technology. Processed wood products in Indonesia are mainly exported to Asian countries such as Japan, Singapore, Taiwan, Hong Kong, China and South Korea. It is also exported to European countries and the United States. In 2002, the biggest sawn timber exported to Taiwan with volume of 286 279 m^3, or 73% of the total export volume of sawn timber. Plywood products, the largest exported to Japan at 1.29 million m^3, equivalent to 26% of the total export volume of plywood. Based on the data from the Ministry of Forestry from January to December 2013, which is processed from Timber Legality Information System, the export value of a group of Indonesian forestry products reached $ 5.75 billion. This figure is up to 11.21% compared to 2012. The forest products group A includes wood paneling, wood working, pulp, paper, and prefabricated wood buildings. Among those five categories, the highest export value is recorded for wood panel and pulp products.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Pulp	4662340	2593930	988190	3370600	4881970	4784730	4687040	5437720	6178360	5364110	5423550
Sawn Timber	762600	432970	1471610	679250	587400	530690	710210	885430	934760	1053410	1217870
Chip Wood	127380	316670	352080	402560	189010	278320	1012700	1270650	1788440	19662750	23239800
Round Wood	11423500	13548940	31965730	34092400	32197050	32000790	34320540	42114770	47429340	49258260	45770450
Thin Board	289190	155370	1012210	255750	299200	427260	687510	736650	816100	890840	913580
Plywood	6110560	4514390	4533750	3811790	3454350	3353480	3004950	3324890	3302840	3454350	3261970

Figure 2. Timber production forest of Indonesia from 2003 - 2013.

Technological innovations constitute a main driver for product innovations and efficiency enhancements when trading derivative products (Madhumathi and Ranganatham 2012). Innovations in trading technology enable customers to execute trades faster and easier. Derivative from woodworking process becomes primer used in daily life, it's shown from increasing demand for utilizing in household sectors. For example wooden furniture industries make a substantial contribution to development in tropical countries, producing important economic benefits and playing a significant role in promoting economic growth. For instant development of particleboard was a product of the utilization of waste wood processing that can be used in a variety of buildings and other constructions. In technical the used raw materials and densities of wood-based panels are a substantial influential factor with regard to the mechanical properties of the boards. Particleboard plants are especially attractive for countries with limited forest resources, since particleboard is a product that can make maximum use of wood waste as well as of a variety of species that might not otherwise be profitably used. Table 2, show data production of particleboard 2012 – 2014 (CBS 2014).

Table 2. Production of Particleboard Indonesia 2012 – 2014.

Year	Type	Unit	Quarter I	Quarter II	Quarter III	Quarter IV	Total
2012	Particleboard	m^3	96,045.76	-	92,581.11	14,493.85	203,120.72
2013	Particleboard	m^3	34,274.47	75,659.40	17,106.43	23,074.22	150,114.52
2014	Particleboard	m^3	523,899.28	502,030.86	490,549.92	515,489.83	2,031,969.89

Methodology

This research papers using qualitative research methodology, with approach to study literature patent utilization through R & D foresight analysis of documents database with data mining and information related to the topic of study by focusing on seeking the answers to the problems the study mainly on prospecting utilization of particleboard to enhance the development of market demand. Data mining is one of the method or processes for extracting hidden patterns from a collection of certain data that emphasize data mining is the most important stages that transform data into a patent information (Yanhong and Runhua 2013). Data mining and information is done with three approaches, namely:

1. Literature Study
   Browsing information related to the topics and issues from a various sources, such as books, journals, articles or papers of other scholars;
2. Patent Benchmark
   Analysis of patent database through document on utilization prospecting particleboard, using software Total Patent which is sourced in WIPO field.
3. Interviews and Focused Discussion
   The interview is intended to deep up information on a research topic of experts associated with the object of research through a discussion. The discussion will be focused to obtain information about energy issues in Indonesia, a research study that has been and will be done to overcome these problems. The second stage is the extraction of the data and information obtained of each approach. The last stage is to conduct the final analysis of the data and information analysis results obtained from the three approaches mentioned above.

The purpose of this study is to seek some information related to research topics through international patent database that connected to the results of research and development of prospecting utilization particleboard with technology foresight. The other target of searching and data analysis is to find the potential market and user that already apply for commercial interest and also to know the trends of technology and current research in progress. This paper is expected become the input for potential users of technology and useful source of information in the development of science and technology, as well as the nature of the modification process is implementation and reverse engineering of a technological information sourced from the patent.

Results and Discussion

Based on result searching indicate a large number of which have been exploited on the basis of utilization particleboard with software Total Patent using keyword “Particleboard” as a single phrase, it could be found about 160 patent registered in WIPO fields. The subscribe from all that patent from only search by TITLE subject, and range of 10 years publication date (August 24, 2006 until August 24, 2016). With major authorities from US, EP, WO, JP, KR, DE, FR, GB and CA, including kind of document from Application and Granted file. With in-depth analysis with many component that inline into software, do some minimized item such as searching top 5 on title, data range for 5 years (August 24, 2011 until August 24, 2016) and using type of pie chart, we can find data requirement as mention below.

Kind code patent that registered in utilization of particleboard in Figure 3 represent expression “patent document(s)” includes the following documents: patents for invention, inventors’ certificates, medicament patents, plant patents, design patents, utility certificates, utility models, patents or certificates of addition, utility certificates of addition, and published applications therefor also all of codes registered in country authorities that have patent office. From result show subject refers to A1 (Publ. of Application with search report) with number 204, A (Patent) with number 182, B2 (Patent after modification) with number 109, B1 (Publ. of amended claims) with number 36 and U (Utility model) with number 71.

Inventor name (a person who made an inventiv e contribution to the invention as *defined* by the claims of the *patent* application) especially apply in field of utilization particleboard that appear in result Marshal Medoff from University of California, Berkeley have registered 139 patent and Jiang Min is patent agent that work at Morris Manning and Martin Branch China with 7 patent show in Figure 4.

From assignee name (a person, a group of persons, or an organization that receives ownership rights of the intellectual property) in utilization of particleboard, recover that implementation of patent has already registered in Xyleco Inc. (is a small organization in the commercial physical research companies industry located in Wakefield, Massachusetts, United States) with number 123, Blank field is patent does not being used until this time with number 16, Ireco Inc. was industry knowledge, continuous improvement initiatives and innovative engineering concepts with number 15 and BASF SE was chemistry industry products and solutions range from petrochemicals, monomers, intermediates, dispersions and pigments, care chemicals, nutrition and health, performance chemicals, catalysts, construction chemicals, coatings and performance materials to crop protection with number 9, as shown in Figure 5.

In order to know International Patent Classification (IPC) which provide hierarchical system of language independent symbols for the classification of patents and utility models according to the different areas of technology to Which They Pertain Shown That in Figure 6.

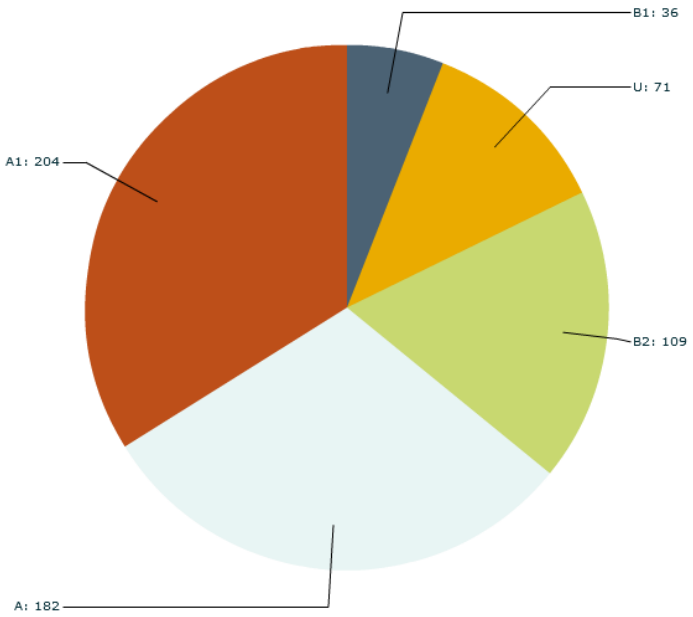


Figure 3. Kind code in field of particleboard.

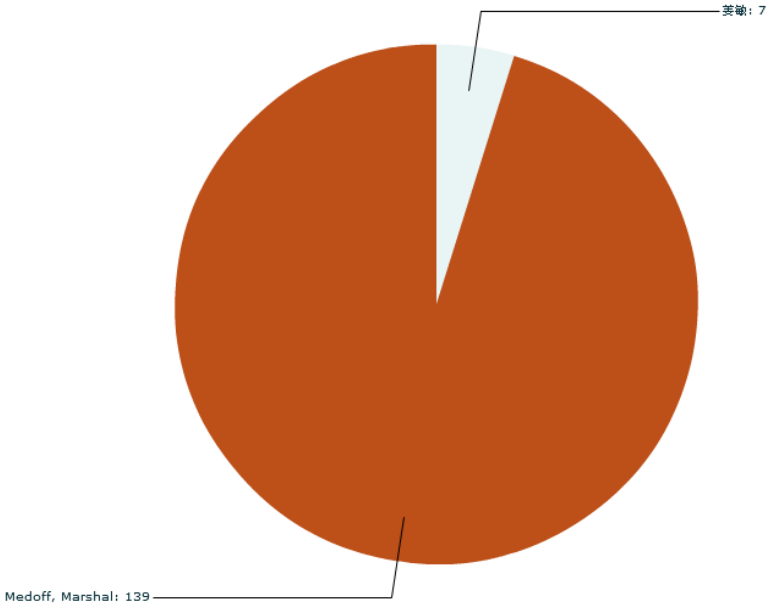


Figure 4. Inventor name in filed of utilization particleboard.

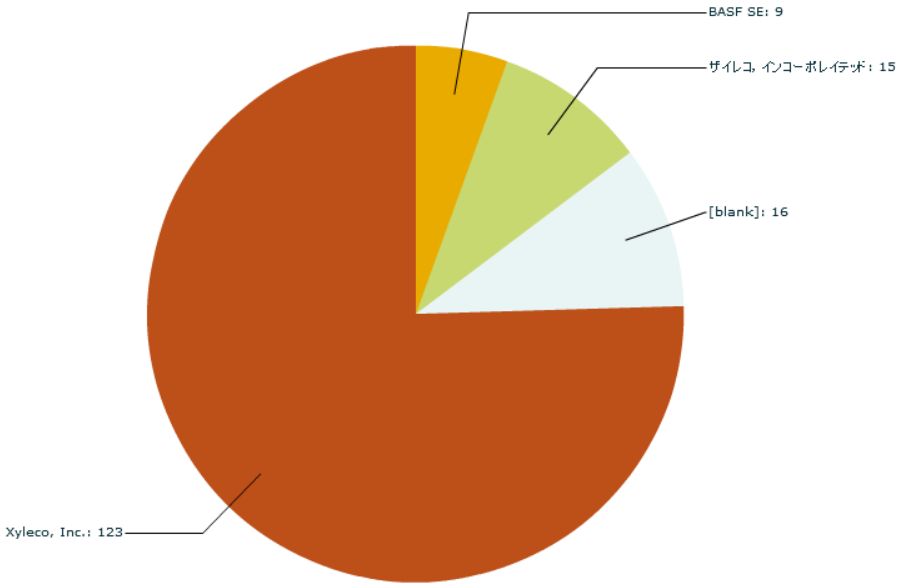


Figure 5. Assignee in utilization of particleboard.

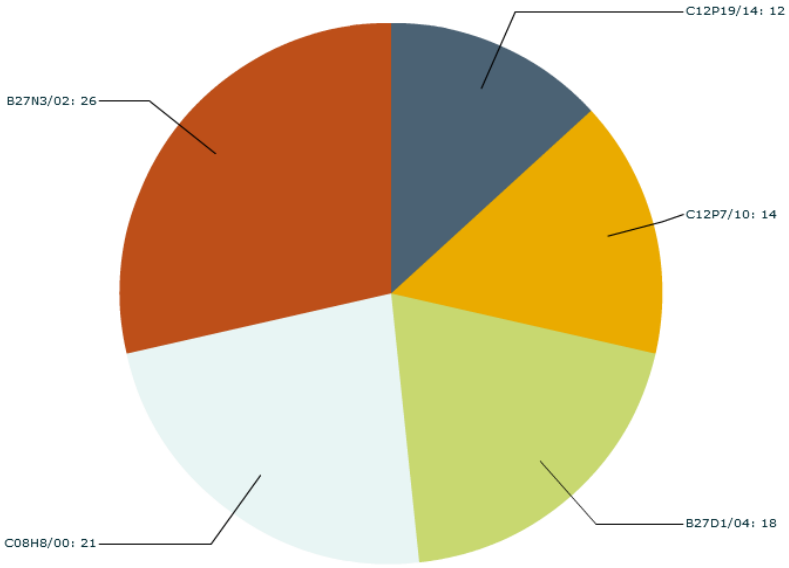


Figure 6. International patent classification in utilization of particleboard.

With Result **B27N3/02** area (Performing Operations) B27 (Working or Preserving Wood or Similar Material; Nailing or Stapling Machines In General) B27N (Manufacture by Dry Processes of Articles, With or Without Organic Binding Agents, Made From Particles or Fibres Consisting of Wood or Other Lignocellulosic or Like Organic Material) **B27N3/02** (From Particles) have 26 number of uses, **C08H8/00** Area (Chemistry) C08 (Organic Macromolecular Compounds; Their Preparation or Chemical Working-Up; Compositions Based Thereon) C08H (Derivatives of Natural Macromolecular Compounds) **C08H8/00** (Macromolecular Compounds Derived from Lignocellulosic Materials) have 21 number of uses, **B27D1/04** area (Performing Operations) B27 (Working or Preserving Wood or Similar Material; Nailing or Stapling Machines in General) B27D (Working Veneer Or Plywood) **B27D1/04** (to Produce Plywood or Articles Made Therefrom; Plywood Sheets) have 18 number of uses, **C12P7/10** area (Chemistry) C12 (Biochemistry;

Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering) C12P (Fermentation or Enzyme-Using Processes to Synthesize a Desired Chemical Compound or Composition or to Separate Optical Isomers from a Racemic Mixture) **C12P7/10** (Substrate Containing Cellulosic Material) have 14 number of uses and **C12P19/14** area (Chemistry) C12 (Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering) C12P (Fermentation Or Enzyme-Using Processes to Synthesize a Desired Chemical Compound or Composition or to Separate Optical Isomers from a Racemic Mixture) **C12P19/14** (Produced by the Action of a Carbohydrase, E.G. By Alpha-Amylase) have 12 number of uses.

Authorities that in charge in filling patent registration mean statutes in different countries for own management patent office. In deed need to apply especially when it comes to Patent Cooperation Treaty (PCT) give us opportunity from benefit and publication. Figure 7, show patent authority most registered in every country, for example registration in United States have 237 number filled, China have 208 number filled, Japan have 103 number filled, WIPO have 51 number filled and European Patent have 24 number filled.

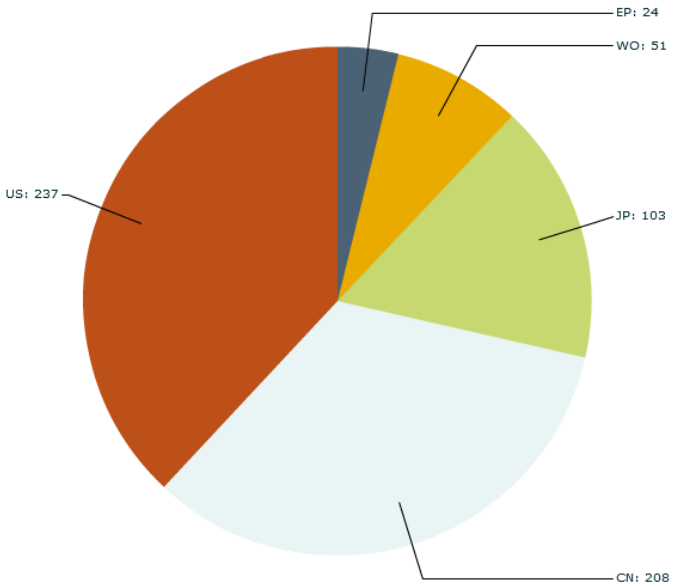


Figure 7. Patent authorities for country registration.

Conclusions

Foresight technology that came from R & D results, often used as a benchmarking from industries or stakeholder that needs to measure the level of their product output. From present knowing the leverage of particleboard has significant impact on public used, it could be seen from amount derivative product that produces for covering household requirement. The impact result from particleboard utilization could define list competitor, consume feedstock, study of dissemination information, target production, business commercialization, technology production tools, network distribution and jobs for rural communities.

Potential utilization of particleboard with patent analysis become a stage and direction where the technology want to achieve and use, especially through strategy, research and development, patent analysis and patent collaboration among users. The result is how to find the development of technology and products that have been produced as well as commercial processes connecting with technology users. Analytical from patent technology foresight define information can be used as a strategy for research and development of an organization. With expected to emerge results of research in the field of particleboard derivative product to enhance development of woodworking sectors that are innovative and highly competitive.

The result from patent searching database with foresight technology consist of number appropriate technology can be used with material transfer agreement (MTA) system that involve many user, industries, government and stakeholder that appear as a part of the work. And for common result in field of development particleboard still dominated in Asia region for source of material and production, but many assignee came from Europe region that formerly appear as user for end product. It's mean the derivative product from wood especially came

from particleboard becomes substitute product and mostly use as a primer needs in household sectors.

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