풍력 발전에서 미래 연구를 위한 연구 집중으로서 등급 기준을 이용한 기술 로드맵 개발

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Development of a Technical Road Map for Future Research in Wind Power Generation using Grading Criteria as a Rubric for Research Focus

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요 약

일반적으로 기존 연구와의 중복성을 피하고 독창적인 연구를 진행하기 위해서는 연구자들은 사전에 특허 정보를 분석하여야 한다. 본 논문에서는 풍력 발전에 대한 현재의 동향을 이용한 등급 기준 개발을 주요국의 기술 위치, 국가별 피인용비와 시장력 확보지수, 특허 포트폴리오 분석, 특허 출원인 국적 분석을 통하여 수행하였다 .이러한 특허 정보 분석은 앞으로 풍력발전의 연구 개발의 방향을 결정하는데 활용할 수 있을 것으로 기대한다.

ABSTRACT

Generally, in order to avoid overlap with previous research and to initiate the innovative research, researchers must analyze patent information before research can begin. In this paper, the development of grading criteria using current trends in the wind power generation will be performed by analyzing the following criteria: technology position of major countries, impact factor each countries, patent family size, patent portfolios analysis, patent applied analysis, and analysis of nationality for a patent. This patent information for the wind power generation is expected to be useful in deciding the direction of future research.

키워드

Patent analysis, Impact factor, Patent map, Measuring information, Wind power generation

Ⅰ. Introduction

Extensive research and development efforts are being undertaken by research institutes and companies around the world pertaining to wind power generation. Unfortunately, many university and company research and development (R&D) efforts, are wasted as competing research istitutions have already developed a similar or superior product. This causes significant waste of research time and effort in the development of pre-existing products. Additionally, researchers may expend effort exploring avenues which are not congruent with current market trends. In order to solve such problems, it is necessary to perform a thorough analysis prior to initiating research efforts in order

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접수일자 : 2011. 05. 16 심사(수정)일자 : 2011. 05. 23 게재확정일자 : 2011. 06. 15

to target the correct research direction.

These methods are largely divided into two categories in an investigation of existing technology trends: quantitative and qualitative analysis. The former method utilizes the number of patents, the concentration ratio of innovation activity, the analysis of the patent's technical level, the estimation of cooperation relations and knowledge flow to determine fertile areas of further research. The qualitative analysis utilizes correlation analysis of patent and R&D, quality analysis of technology, portfolio analysis of patent and patent claim analysis to determine future focus of research efforts.

Due to the enormity of existing patent information, sorting through current patents and analyzing these patents can be both difficult and time consuming . However, the methodology of patent analysis involving the formation of a technical roadmap, was first proposed by MCIE(Ministry of Commerce, Industry and research in wind power generation through the analysis patent information using technology position of major countries, impact factor of each country, patent family size, patent portfolios analysis, patent applied analysis, nationality patent trend analysis, as a rubric for prioritizing future. research efforts.

Particularly, in this paper, a method for focusing research direction in the wind power generation using a thorough analysis of patent information is proposed. Energy) and KOTEF(Korea Industrial Technology Foundation)[1], it is not to find the research directly, but rather to form a roadmap for future industrial trends.

In this paper, the information analysis method proposed will find a research direction for future.

Ⅱ. DEVELOPMENT OF GRADING CRITERIAOF WIND POWER GENERATION

2.1 Analysis object

In this paper, we perform the patent analysis using the DWPI(Derwent World Patents Index) of Tomson scientific which collected 5892 patents in wind power generation from 2000 to 2009. The number of patent applications related to wind power generation has continuously increased globally between 2000-2009.

Specifically, the world market annual growth rate of wind power plants has increased near 30% during the past 5 years. In 2008, the number of patent applications increased significantly as 1,337compared to 648 in 2007. Fig. 1 illustrates the trend of patent application for wind power generation globally from the 2000 to 2009.

Generally, South Korean, Japanese and EU(European Union) patent systems disclose the patent information 18 month after the patent application, except in the case of early openings. However, we can expect that there are many applied patent in 2008 and 2009,due to the fact that many patents around the world in 2007 were not open.

2.2 Technical positioning of main countries

In this paper, we analyze the technical positioning of main countries between the degree of relative importance (activity index) and the relative growth rate. The activity index quantifies the degree of relative concentration of a certain technology in each country, if the value is greater than 1, it represent increased patent activity when compared to other countries. In this case, we can calculate the activity index c by using the following Equation (1).

$$c = \frac{a}{t} \tag{1}$$

where, a is the ratio of application patent of each

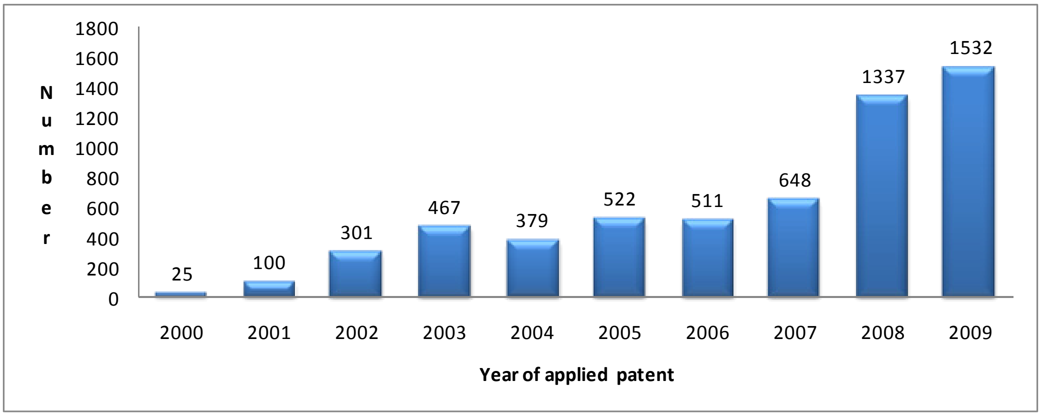

Fig. 1 Applied patient trend of wind power generation during the 2000-2009 in the world

country in wind power generation, t is the ratio of application patent t of each country in the total patent. The relative growth rate is computed from the arithmetical average of growth rate of each year and arithmetical average solved by using the geometric average. The year of analysis object was recently 5 years(2005-2009) in order to figure out the recent.

Fig.2 represents the technical position of the main countries, including South Korea, Japan, USA, Germany, China and Russia by using equation (1). As a result of analysis of technical position, both the activity index and the relative growth rate come out very high in China.

In Korea, the relative growth rate compared to China is high but the activity index is average. The German and Russian growth rates are comparatively low but the activity index is high. The Japanese's activity index is low compared to the United States, particularly the relative growth rate is represented as the lowest stage. In United States, the R&D focus on wind power generation was low not only compared to other country's patent application rates but also the relative growth rate is low among the comparative countries. Patent applications in wind power generation, compared to such a nation as South Korea, China, Taiwan, and the United States, the growth rate is comparatively lower than Germany and Japan.

2.3 Impact factor and patent each countries

We analyze the patent application focus level in one nation by calculating the CPP(Citations per patent) and patent family size. The citations per patent provides a representative index that the patent analysis object's (nations, enterprises and so on) effect on the activity of technology innovation subsequent to the patent's submission. The technical importance of individual patents can be evaluated using citations per patentas an indicator of an innovation's impact on other developing productions. The distribution of technology innovation globally can be determined using citations per patent as an indicator or the research and development being undertaken by any particular entity. The citations per patent calculated following equation (2).

$$CPP_t = \frac{\sum_{i=1}^{nt} c_i}{nt} \tag{2}$$

where, nt is the number of registered patents in t

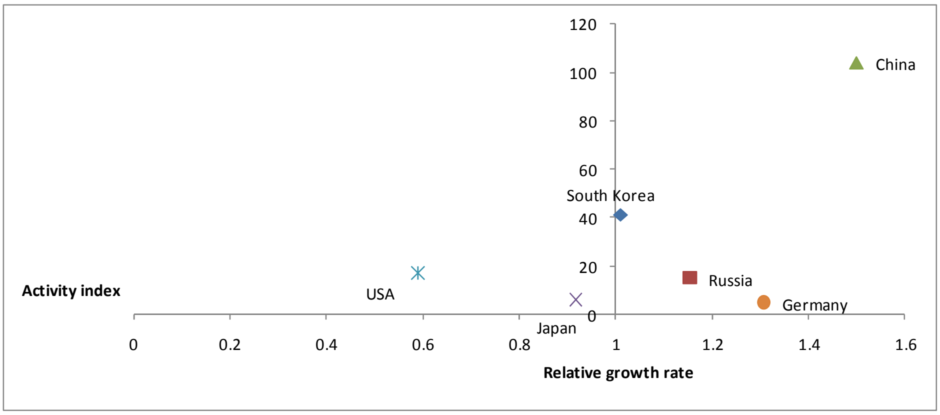

Fig. 2 Technical positioning of main countries

year, c_i is the citations per patent.

Consequently, CPP is the number of time of average citation by other patents since the registered patent to particular year or period.

The patent family size directly represents the regional protection range for relevant patent. And it indirectly provides the technical importance and information for value of the resultant innovation. It is many existence methods to compute for patent family size. However, in this paper, we used to find solution for patent family size as the ratio of the number of average family patent per one as a subject and the number of total average patent family such an equation (3).

$$PFS = \frac{N}{F} \tag{3}$$

where N is the number of average family patent per one patent as a subject, F is the number total average patent family.

Fig.3 represents the impact factor and patent marketability of South Korea, Japan, USA, Germany,

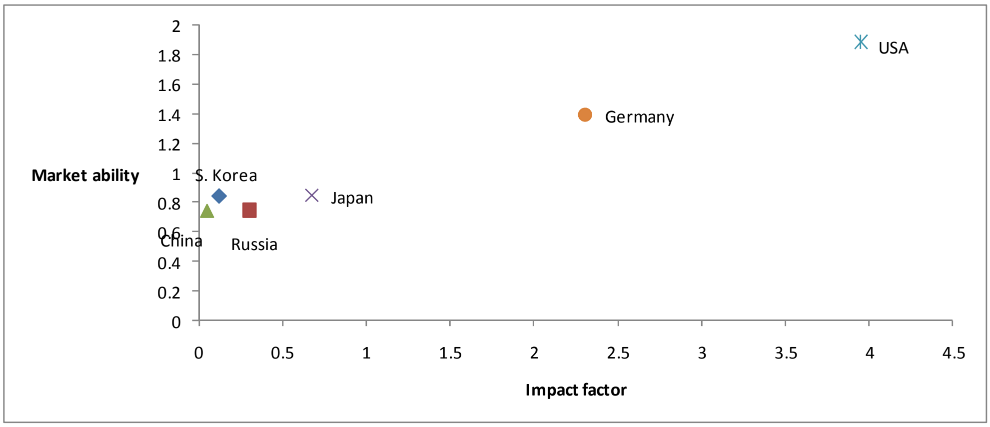

Fig. 3 Impact factor and patent marketability of each countries

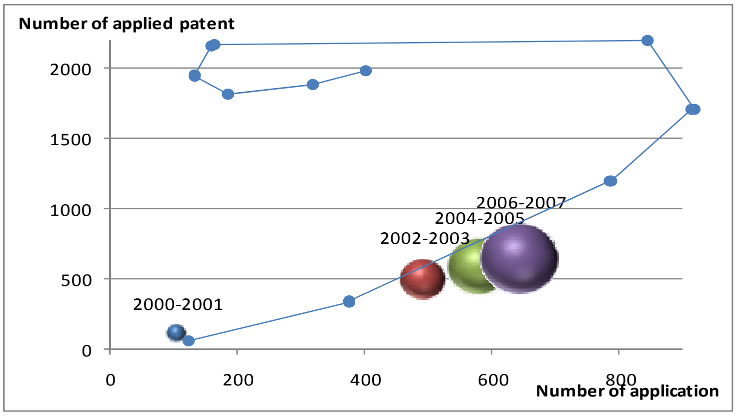

Fig. 4 The analysis of the patent portfolio

China and Russia by using equation (3). We are able to infer the marketability of the innovation by using the size of the family patent ownership as an indicator of the patent′s importance. This inference can be made as the applicant must invest heavily in the patent submission process, even more so when competing with patents abroad or foreign countries as they are either competing with the local technology or the profit with the commercials business to the related agency and nation.

However, it is necessary to limit the scope of the analysis to US, EP (European Patent) and WO(PCT) patents to limit the analysis to a manageable data set. As a result of impact factor and patent each countries, United States represents the very high position relatively for impact factor and patent compared to other countries. The Germany‘s impact factor is high but it is low compared to United States. One can judge that the United States insured excellent original technology if one conjectures that we considered the United States has a low of relative growth rate and the number of applied patent.

The high technology level in United States, Japan and Germany is reported through technical literature, such as papers and technical reports.

In the case of Japan, impact factor (0.67) is shown as being slightly higher than Russia (0.30), South Korea(0.12) and China(0.05)but remarkably low in comparison to the United States(3.94) and Germany(2.30). The impact factor in Russia, South Korea and China is low compared to main countries and the difference between of the those 3 countries is insignificant.

2.4 The Analysis of patient portfolio

The patent portfolio is used to evaluate the dispersion and concentration from the content and trend of patent specifications and also evaluated the degree of competiveness of the area of research and development. It is also used to effectively stop patent applications of rivals or can be use to stop patent applications in the future.

In the analysis of portfolio, we review the position of technology through the correlation of variation between number of applied patent and inventors. The analysis of the patent portfolio shown Fig. 4, is performed by using two year analysis intervals. The size of ball mean represents the accumulated number of applied patent and from the starting line the sections represent anevolution of technology as exploration level, growth level, development level, complete growth level, decay level period respectively.

2.5. The analysis of nationality

The analysis of nationality in patent analysis is generally performed by using nationality of applicant of the patent. However, it is not easy to figure out the nationality of applicant of a patent due to ambiguity in the patent information. Therefore, we frequently see that the analysis was wrong, as the nationality of applicant for the patent is unclear due to the enormous amount of patent applications. In this analysis, we analyzed the nationality of the applicant for a BASIC patent in Patent Information (PI) field of DWPI. BASIC patent in DWPI represented the family patent, the new records are created and managed on the basis of the family patent.

As a result of analysis, Japanese patents were the largest at27%, 1554 units among the total applied patent 5892 units and the next is China at 25%, applied patent numbers is 1,427 unit. Compare to the other countries, there is no quantitative difference between these two countries.

We know that there are many patent in China for F03D among the product of wind power generation. We estimated that it is related, not to the analysis of applicant for a patent, but rather the analysis of patent priority nation in this patent analysis,

The South Korea,as well Germany and Russia have applied for patent 5135 units (9%), 380 units(6%) and 139 units(2%), respectively. And the remaining 24 nations have applied for 396 patent units (7%).

The world patent and Europe patent applied 590 units(10%) and 189 units(3%) respectively.

III. Conclusion

In this paper, we deal with the development of grading criteria to analyze wind power generation technology trends by using technology position of major countries, impact factor of each country, patent family size, patent portfolio analysis, patent applied analysis, and nationality patent trend analysis to develop a road map for future wind power generation research.

We also interpret the patent and technical trend for wind power generation in the world through the utilization of grading criteria to generate a technical roadmap to determine future research trends. Therefore, it is expected that many researchers will use this method before beginning research and development efforts for wind power generation and its related research topics in order to avoid research overlap and avoid wasting research resources.

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