

Letter to the Editor

Patenting and technology trends in the fuel cell industry

As with any new and emerging technology, hundreds of companies jump on the production bandwagon, hoping to be the first to bring the next-generation product to market. The fuel cell industry is no exception. With the fast pace of technological development, it is perilous for a company to lack knowledge of the patent landscape and where its competitors are moving in terms of their R&D. On average, about 12 new fuel cell patents are issued each week in the US and over 550 companies hold at least one patent related to fuel cells. Technology development in the industry has been on a sharp upward trend since 1995 and patenting levels will only continue to increase in the coming years.

Awareness of the patent landscape can provide many benefits including:

- *Protection from competitors.* Knowing your position on the food chain in terms of technology development and patent protection can increase the barrier for new players looking to enter the field or build off your technology and can help save time and money protecting your product position in the long term (from patent infringement suits).
- *Support product development.* Competitors (and even companies not involved in the fuel cell industry) may hold key patents and technologies that could be valuable to your ongoing technology and product development.
- *Provide business intelligence.* Learning key business information and the IP position of competitors can help your company stay ahead of the curve in terms of technology and product development.

The value provided by patent landscape analysis is often overlooked because tracking and analyzing this patent-related information can be time-consuming. Companies such as Metrics Group, M-Cam, Aurigin and Patent-Cafe provide software tools that have the capability of processing huge volumes of data and can provide valuable insights and information about the patenting and technology trends in a particular industry. Following are some examples of the kind of information that can be generated.

Who owns the core technology?

Research has suggested that patents receiving a high number of citations are likely to be technologically more significant than patents receiving a low number of citations or no citations at all. Thus, a common way of measuring patent leadership in an industry is to measure the number of citations

a company receives in parallel to the number of patents it holds.

Within the fuel cell industry, Ballard Power Systems' patents are the most highly cited of any fuel cell company. They also receive significantly more citations than expected based on the number of patents alone (see Fig. 1). This information indicates that Ballard's patents may be particularly important to the development of fuel cell technology and may be more valuable than the patents of competitors in the field.

Am I building off anyone's technology?

Building off the technology of others can be dangerous or beneficial. If a company's patents highly cite the patents of a competitor, it runs the risk of potential infringement, or even invalidation, of its own patents. It could also be beneficial and present opportunities for co-development or a strategic partnership.

Research indicates that Ballard Power Systems builds primarily on its own internal R&D and only slightly on the work of some its competitors. Ballard's fuel cell patents are most heavily cited by each other, indicating that Ballard is successfully appropriating the resources of its internal R&D efforts.

On the other hand, Siemens' fuel cell patents build heavily on the patents of Westinghouse Electric – not surprising as Siemens acquired Westinghouse Power Generation in 1998. Siemens' fuel cell patents have not been highly cited relative to the number of fuel cell patents it holds. Ballard and Plug Power are building on Siemens equally, but do not cite Siemens patents at a particularly high level. This is most likely due to the fact that about half of Siemens' 81 fuel cell patents have issued in the last 3 years and have not had much time to accumulate citations.

Is my R&D heading in the right direction?

Patent landscape maps may help provide insight into the direction of technology development for competitors or the industry as a whole. It can also identify emerging areas that a company may want to consider directing more R&D resources to.

Patent landscape maps in the fuel cell industry for the period beginning January 2000 to the present show a significant growth in the development and concentrations of proton exchange membrane (PEM) fuel cell patents and the emergence of metal–air fuel cell patents. Development of molten carbonate fuel cells have continued to decline in this time period, while solid oxide fuel cell patenting has remained strong.

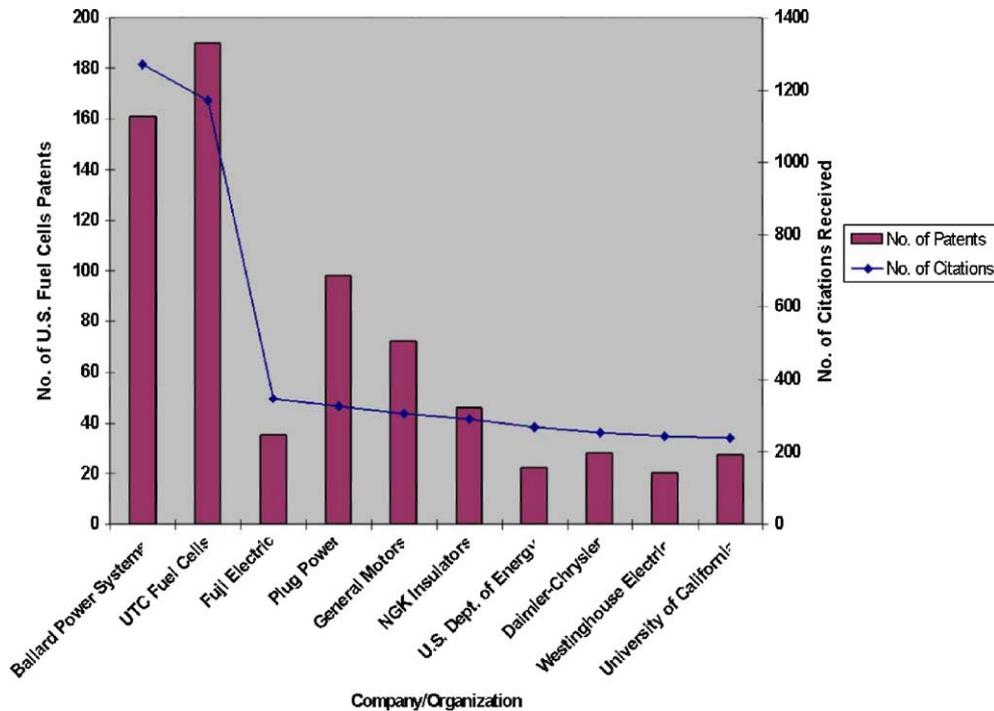


Fig. 1. Comparison of fuel cell patenting leaders.

International patent trends

Patenting around the world is on the increase, not just in the United States, although US companies still account for the majority of all fuel cell patents issued in the United States. Of all the countries outside of the United States, Japan holds the most US fuel cell patents, followed by Germany, Canada, and Great Britain (see Fig. 2).

The leading US fuel cell patenting companies are Honda, Toyota, and NGK Insulators. Siemens and a division of Ballard located in Germany are largely responsible for Germany’s US fuel cell patenting. Ballard also accounts for nearly all of Canada’s fuel cell patenting in the United States.

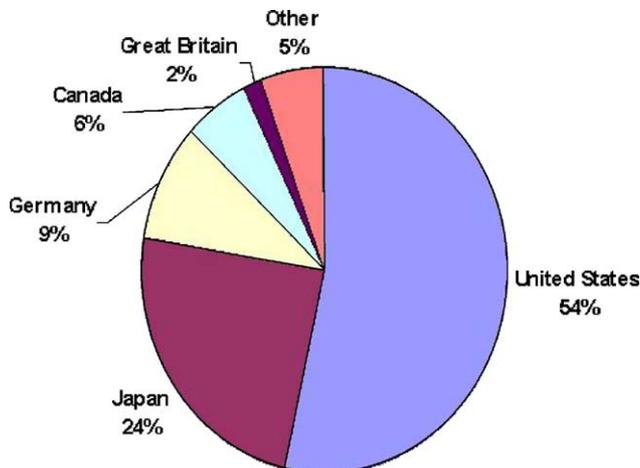


Fig. 2. US fuel cell patenting by assignee country.

Fig. 3 shows the trends over time in US fuel cell patenting by the leading fuel cell countries. The chart shows that throughout most of the 1990s, US and Japanese companies were issued about the same number of US fuel cell patents per year. Patenting by US companies grew steadily after 1997, and jumped dramatically in 2002. On the flip side, patenting levels by Japanese companies remained flat through 2001.

Although patenting levels have increased for Japanese companies the past 2 years, US companies are now being issued more than twice as many US fuel cell patents per year as Japanese companies. While German and Canadian firms have also increased fuel cell patenting in the US over the past several years, they continue to lag well behind the United States and Japan in overall fuel cell patenting.

The future of fuel cell patents and technology development

As fuel cell technology becomes more widely available (and accepted) on the market and in consumer products, it is only natural to assume that development will continue to increase and alternative fuel cell applications will emerge. For example, fuel cells are already expected to play a key role in mobile devices such as laptops and PDAs, allowing access to a power source for much longer periods.

With the international climate in its current state of turmoil and the price of oil and gasoline skyrocketing out of control, the government has continued to encourage fuel cell development, offering research funds and tax incentives to companies that can develop commercially viable fuel cell technologies.

Companies need to be on the leading edge of technology development and need to monitor the patent landscape in

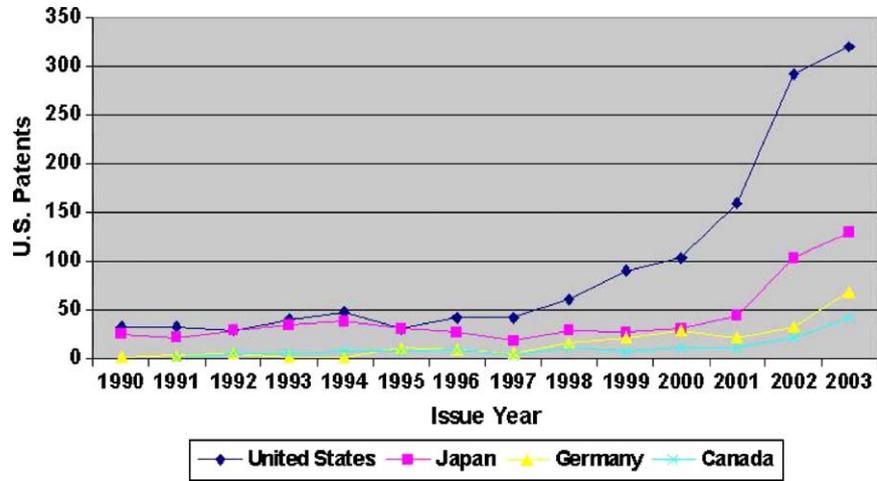


Fig. 3. Trends over time in fuel cell patenting, by assignee’s country.

order to stay ahead of competitors. Some of the examples of patenting and technology development trends presented are only a small slice of the information that can be obtained by utilizing patent analysis tools. With the rapid pace of technology development in the modern world, time is of the essence. Companies that do not follow these trends and recognize the impact on their business are at risk of getting left behind in the technology of the future.

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