KALKI Energy

State-of-the-Art Search Report
Wind Energy and Power Generation
16-Dec-08

KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report**

## IPEngine

www.ipengineservices.com

info@ipengineservices.com

**Tel: +1.617.517.9102**

**Fax: +1.617.849.5992**

**MA, USA**

## Contents

Introduction

Key Strings

Taxonomy

Patent Search Results

Non Patent Search Results

Patent Filing Trends

Top Inventors

Top Assignees

Top IPC codes

Technology Trends

Disclaimer

KALKI Energy

| Wind Energy and Power Generation - State-of-the-Art Search Report | <<Back to Contents>> |
|---|---|

**Introduction and Summary:**

A state-of-the-art search was conducted to identify patents and published applications (hereinafter, patent publications) and non patent literature in the field of wind energy, and specifically in the field of power generation by harnessing wind energy.

An initial look at the findings reveals that most of the PL is primarily focused on structural arrangements, modifications, and new designs related to wind energy systems. The NPL, on the other hand, seems to be concentrated on various types of control and protection mechanisms. In addition, the NPL disclose various algorithmic and mathematical models, useful in the estimation of required and generated power harnessed from wind energy.

The categorization and analysis of the various relevant PL and NPL reveal that there has been a growth in interest in developing, improving, and utilizing power derived from wind energy. The number of patent filings in various jurisdictions, and specifically in US and EP jurisdictions, have almost doubled in the last five years.

There are significant players such as Siemens and Matsushita, who are investing in the 'energy for future'. However, the companies that form the major share are small yet 'innovation and new technology' oriented companies such as Vestas and REPower Systems, to name a few. The initial analysis also reveals a few inventors who individually own a comprehensive patent portfolio related to 'wind energy and power generation' (e.g., Wobben Aloys with 28 patent publications). A separate report on competitive analysis of this domain would provide further insights about this information. The purpose of this report is to illustrate state of the technology and research relevant to power generation by harnessing wind energy.

In a nutshell, the entire landscape appears to be promising with plenty of space for new technologies and innovations focused on various technological aspects related to wind energy. A more comprehensive look at other aspects such as licensing opportunities, new products, and legal status may reveal a definite answer to various questions related to this field.

KALKI Energy

**Methodology:**

The methodology adopted for this search involved the following set of activities:

1. A keyword-based search was conducted on selected patent and non patent databases to obtain sets of results relevant to the chosen subject of study.

2. The key strings that were used to extract the results have been highlighted under the table for key strings (sheet titled 'Key Strings').

3. A taxonomy was created to categorize the above identified results into various technology levels. The taxonomy and the definitions corresponding to each of the levels have been summarized in the sheet titled 'Taxonomy.'

4. The categorized results were further used to generate trends and graphs depicting the evolution and growth in the chosen domain.

**Search Assumptions:**

1. All patent searches were conducted using 'Micropat' patent database, and all non patent searches were conducted on NREL, Scitation, Dialog Open Access, and Delphion non patent databases.
2. The total number of patent publications included the total number of published as well as issued/granted patents.
3. The scope of the search was limited to US,EP, WIPO, DE, and JP only.
4. The results relevant to the chosen field and published in the last one year have been presented in the sheets titled 'Patent Search Results' and 'Non Patent Search Results.'
5. Only 'one member per patent family' was used for the purpose of analysis.
6. Only English language documents were analyzed.
7. The analysis for patent publications was based on title, abstract, and claims.
8. All the search results correspond to the date of search; i.e., November 24, 2008.

KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

***Key Strings:***

***The table given below indicates the key strings used for each of the given databases:***

| S No. | Database | Search String | No. of Results |
|---|---|---|---|
| 1 | Micropat | Claims, Title or Abstract (wind near5 (power or energy or electric*))<br>Issue/Publication Date >=20071124 | 1,305 |
| 2 | Micropat | Claims, Title or Abstract : (wind near5 (power or energy or electric*))<br>Issue/Publication Date: 20071124 - 20081123 | 1,282 |
| 3 | Micropat | Claims, Title or Abstract : (wind near5 (power or energy or electric*))<br>Issue/Publication Date: 20061124 - 20071123 | 1,212 |
| 4 | Micropat | Claims, Title or Abstract : (wind near5 (power or energy or electric*))<br>Issue/Publication Date: 20051124 - 20061123 | 1,053 |
| 5 | Micropat | Claims, Title or Abstract : (wind near5 (power or energy or electric*))<br>Issue/Publication Date: 20041124 - 20051123 | 948 |
| 6 | Micropat | Claims, Title or Abstract : (wind near5 (power or energy or electric*))<br>Issue/Publication Date: 20031124 - 20041123 | 856 |
| 7 | Micropat | Claims, Title or Abstract : (wind near5 (power or energy or electric*))<br>Issue/Publication Date: 20001124 - 20031123 | 1,885 |
| 8 | National Renewable Energy Laboratory Database | In <Journal Articles OR Milestone Reports OR Presentations OR Subcontract Reports OR Technical Research Reports><br>Publication Date: 2007-2008<br>Wind and (energy or power) <in> (Title, Abstract) | 37 |
| 9 | Scitation Database | Wind and (Power or Energy) <in> (Title, Abstract, Keywords)<br>Publication Date: Jan 2007 - Dec 2008 | 40 |
| 10 | Dialog Open Access | In <Energy and Environment Research><br>Wind and (Energy or Power) <in> (Title) | 1,407 |
| 10 | **Delphion Non Patent Prior Art Search through -**<br>IP.com Article Abstracts<br>IBM Technical Disclosure Bulletin | In <Energy and Environment Research><br>Wind and (Energy or Power) <in> (Title) | 8 |

KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

***The taxonomy used for categorizing the results is presented below for reference:***

| S. No. | Taxonomy Levels | Definitions |
|---|---|---|
| 1 | **Structural Arrangements, Modifications, and New Designs** | *Any new or unique components or any new or unique design of the components of the 'Wind Energy Systems,' or any modification thereof, independent or in combination with the other components. For example, a new design of rotor blade or turbine.* |
| 2 | **Accessories** | *Any new, unique or improved additional components and/or features facilitating the functioning of the 'Wind Energy based Power Generation Systems.' For example, the foundation for wind mills and cords for supporting the system.* |
| 3 | **Control And Protection Mechanism** | *Any new, unique or improved systems or methods to control and protect the generated power using the wind energy and effective transmission of the generated power. For example, use of laminates on the rotor blades.* |
| 4 | **Software For Controlling, Monitoring And Calculation** | *The software applications for controlling, analyzing, monitoring, and/or calculating the processes related to the 'Wind Energy based Power Generation System.' For example, a software application for predicting electricity output for a given wind speed.* |
| 5 | **Storage** | *Systems and methods facilitating an eficient and effective storage of the power generated using 'Wind Energy.' For example, a unique combination of fuel cells for efficient storage of energy harnessed from wind.* |
| 6 | **Other Wind Energy Systems** | *Systems and methods disclosing other systems employing and harnessing wind energy; those other than the power generation systems. For example, production of 'Ethanol', from wind.* |

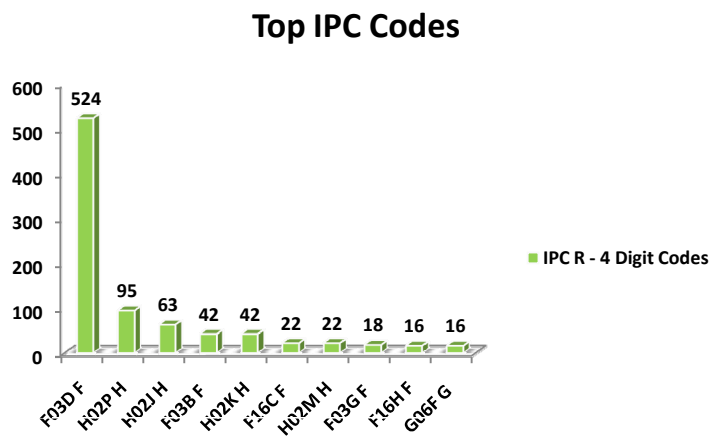
KALKI Energy

## Wind Energy and Power Generation - State of the Art Search Report

<<Back to Contents>>

***Top IPC Codes:***

The chart given below illustrates the top 10 'IPC Codes' for 'Wind Energy and Power Generation':




***Observations:***
***This chart represents the top ten 'IPC Codes' in the field of wind energy and power generation. F03DF is the top IPC code for Wind Energy and Power Generation. However, IPC Codes like H02PH and H02J also hold a considerable number of Patent Publications.***

| IPC R Codes | Description |
|---|---|
| F03D F | Mechanical Engineering; Lighting; Heating |
| H02P H | Electricity; Generation, Conversion, or Distribution of Electric Power |
| H02J H | Electricity; Generation, Conversion, or Distribution of Electric Power |
| F03B F | Mechanical Engineering; Lighting; Heating |
| H02K H | Electricity; Generation, Conversion, or Distribution of Electric Power |
| F16C F | Mechanical Engineering; Lighting; Heating |
| H02M H | Electricity; Generation, Conversion, or Distribution of Electric Power |
| F03G F | Mechanical Engineering; Lighting; Heating |
| F16H F | Mechanical Engineering; Lighting; Heating |
| G06F G | Physics; Computing; Calculating |

©2008-09 IPEngine

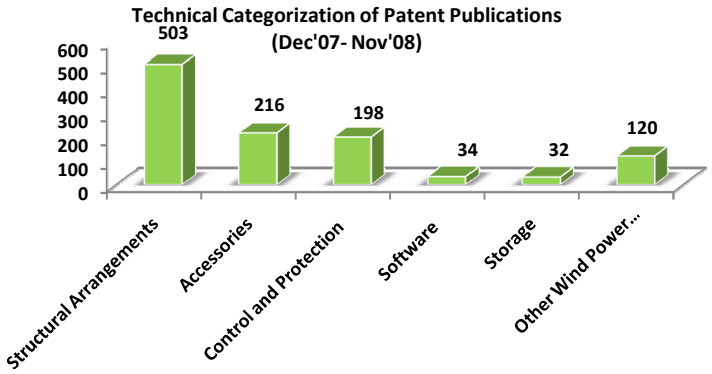
KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

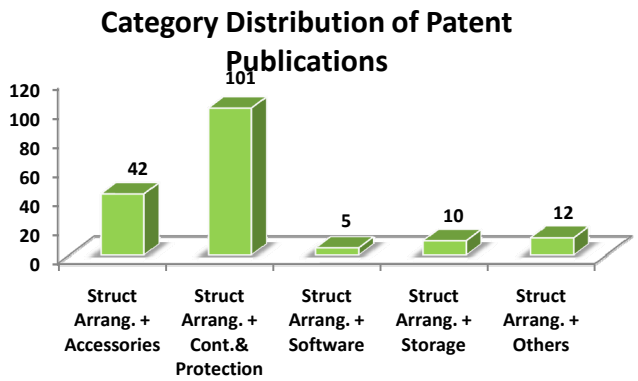
***Technical Categorization:***

*Please click on the categories below to view the corresponding charts:*

1. Patent publications categorized under various taxonomy levels
2. Patent publications corresponding to combination of structural arrangements with other categories
3. Patent publications corresponding to structural arrangements and its combination with other categories




***This chart represents the number of patent publications both published applications and issued patents for the year 2008 distributed in various technical categories of the field Wind Energy and Power Generation . The total number of publications were reported to be highest for the technical category 'Structural Arrangements.' The next highest number of publications are in the technical categories 'Acessories' followed by 'Control and Protection Mechanism.'***




***<Back to Top>***

***This chart represents the number of patent publications both published applications and issued patents for the year 2008 distributed in technical categories correspondng to the structural arrangements and its combinations with other categories in the field Wind Energy and Power Generation . The total number of publications were reported to be highest for 'Structural Arrangements' in combination with 'Control and Protection Mechanism.' The next highest number of publications correspond to the combination of Structral Arrangements is with the techical category 'Accessories.'***

KALKI Energy

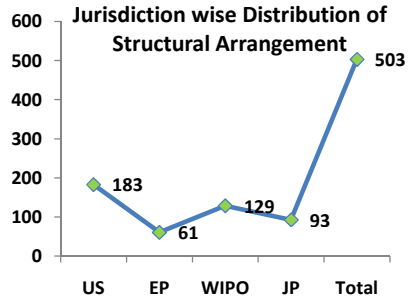
**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

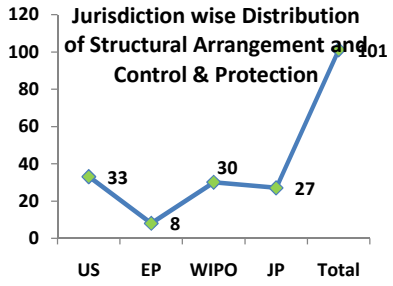
***Technical Categorization:***

*Please click on the categories below to view the corresponding charts:*

1. Patent publications categorized under various taxonomy levels
2. Patent publications corresponding to combination of structural arrangements with other categories
3. Patent publications corresponding to structural arrangements and its combination with other categories

*<Back to Top>*




***This chart represents the number of patent publications both published applications and issued patents for the year 2008 in various jurisdictions for the technical categories of the field Wind Energy and Power Generation. The total number of publications were reported to be highest for the US. Interestingly, the number of publications in the JP jurisdictions have out taken on almost all other jurisdictions. WIPO and JP share almost equal number of publications.***

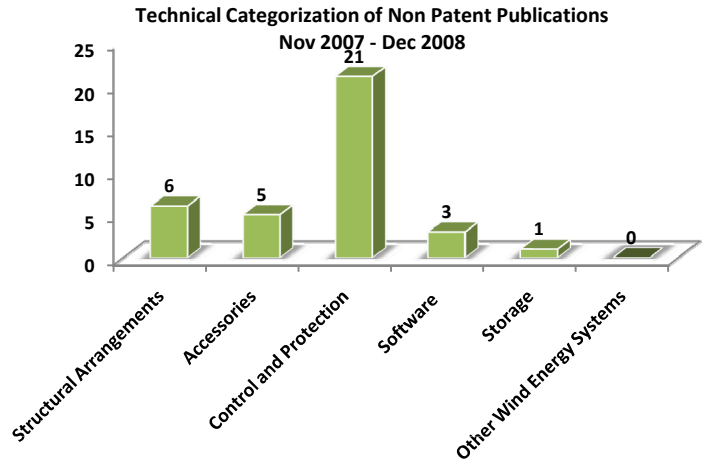
KALKI Energy

## Wind Energy and Power Generation - State of the Art Search Report

<<Back to Contents>>

***Technical Categorization:***

*The charts given below illustrate the categorization of the Non Patent Publications for Wind Energy and Power Generation:*




***The maximum number of non patent publications were identified under the category 'control and protection' mechanisms. However, none of the relevant technical non patent publication was identified related to 'other wind energy systems'.***

KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

***Filing Trends:***

*The filing trends corresponding to the categorized patent publications have been depicted below. Please click on the links below to view the relevant trends:*

1. Filing Trend for Year 2008: Number of patent publications published and issued in the year 2008 for various jurisdictions

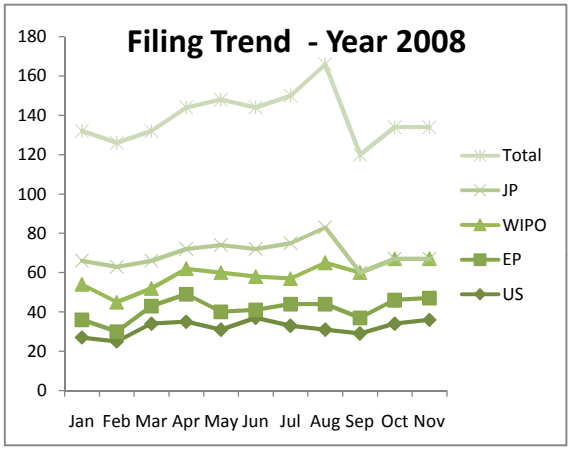
2. Filing Trend from 2001-2008: Number of patent publications published and issued between the years 2001 and 2008 (inclusive of all jurisdictions)

3. Filing Trend for US in Year 2008: Number of published applications and patents in the US jurisdiction for the year 2008

4. Filing Trend for EP in Year 2008: Number of published applications and patents in the US jurisdiction for the year 2008

5. Percentage Distribution of number of filings in various jurisdictions: Percentage share of each Jurisdiction (US, EP, WIPO, JP, and DE) in 2008

**1. Filing Trend for Year 2008:**




***This chart represents the number of patent publications both published applications and issued patents for the year 2008. The total number of publications were reported to be highest in the month of September, which met a steep fall in the month there after. Interestingly, the number of publications in the JP jurisdictions have overtaken almost all other jurisdictions. From Sep-Oct, a steep decline has been reported in all the jurisdictions. WIPO and JP share equal number of publications for the last three months. It may be noted that the number of publications have shown a sudden increase in both EP and US jurisdictions in the last two months.***

KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

***Filing Trends:***

*The filing trends corresponding to the categorized patent publications have been depicted below. Please click on the links below to view the relevant trends:*

1. Filing Trend for Year 2008: Number of patent publications published and issued in the year 2008 for various jurisdictions

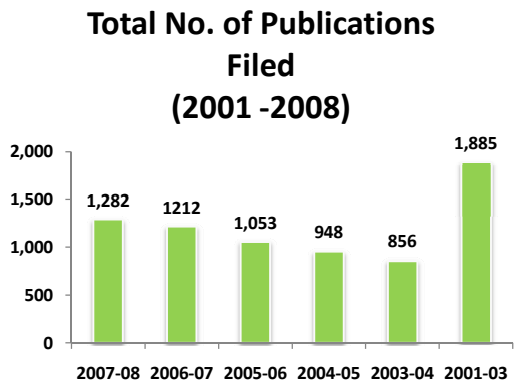
2. Filing Trend from 2001-2008: Number of patent publications published and issued between the years 2001 and 2008 (inclusive of all jurisdictions)

3. Filing Trend for US in Year 2008: Number of published applications and patents in the US jurisdiction for the year 2008

4. Filing Trend for EP in Year 2008: Number of published applications and patents in the US jurisdiction for the year 2008

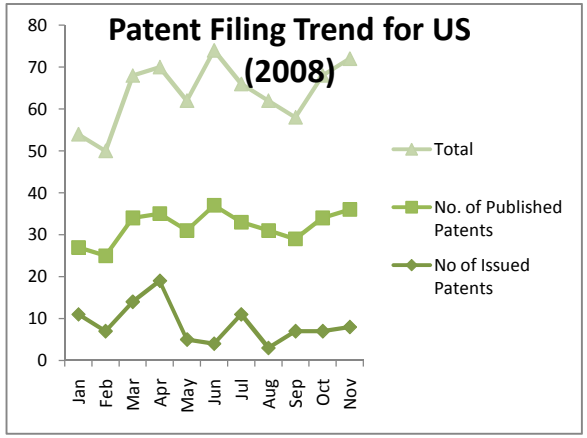
5. Percentage Distribution of number of filings in various jurisdictions: Percentage share of each Jurisdiction (US, EP, WIPO, JP, and DE) in 2008

**2. Filing Trend from 2001-2008:**




***This chart represents the number of filings between the years 2001 and 2008. The general trend has been on an increasing mode. Between 2001 and 2003, 1,885 publications were reported. After 2003, every year, approximately 200-500 publications are increasing. If the current trends are to be believed, it is expected that by the end of year 2008, the number of filings may cross the 1500+ mark.***

**3. Filing Trend for US in Year 2008**




***This chart represents the filing trend for the published applications in the US jurisdiction for the year 2008. The highest number of published applications were reported in the month of June. On the other hand, the highest number of issued patents were reported in the month of April. There has been a steep decline in the number of issued patents between the months of Apr-May and Jul-Aug. However, the number of published applications have increased in the last three months.***

KALKI Energy

**Wind Energy and Power Generation - State of the Art Search Report** <<Back to Contents>>

***Filing Trends:***

*The filing trends corresponding to the categorized patent publications have been depicted below. Please click on the links below to view the relevant trends:*

1. Filing Trend for Year 2008: Number of patent publications published and issued in the year 2008 for various jurisdictions

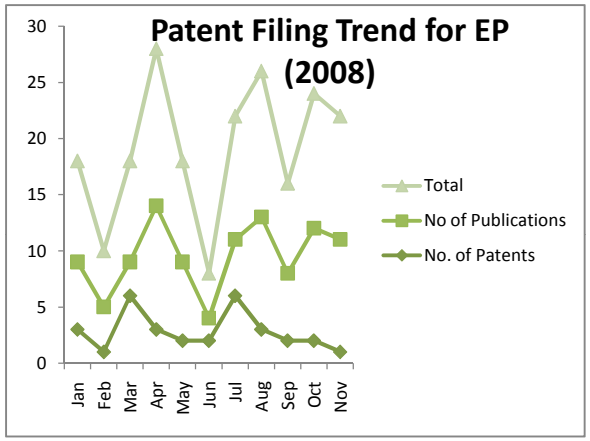
2. Filing Trend from 2001-2008: Number of patent publications published and issued between the years 2001 and 2008 (inclusive of all jurisdictions)

3. Filing Trend for US in Year 2008: Number of published applications and patents in the US jurisdiction for the year 2008

4. Filing Trend for EP in Year 2008: Number of published applications and patents in the US jurisdiction for the year 2008

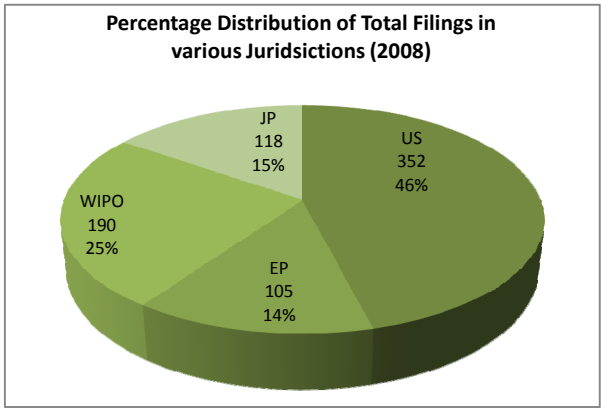
5. Percentage Distribution of number of filings in various jurisdictions: Percentage share of each Jurisdiction (US, EP, WIPO, JP, and DE) in 2008

**4. Filing Trend for EP in Year 2008**




***This chart represents the filing trend for the published applications in the year 2008 for the EP jurisdiction. In comparison to US, there has been steep rise and fall in terms of filing in this jurisdiction. A surge in the number of publications (25+) in the month of April, met with set backs in the following months of May and June. July and August saw some activity, but this increase was also for a limited time as September was followed by a sharp decrease with only 15 something publications. Noteworthy, for the last four months, there has been a decrease in the number of both patents and published applications in EP.***

**5. Percentage Distribution of number of filings in various jurisdictions**




***This chart represents the percentage distribution of total number of published applications and issued patents filed in various jurisdictions. As it can be seen from the chart, the maximum number of filings are reported in US jurisdiction (352), followed by WIPO (190). JP and EP approximately have the same share 14-15 percent.***

KALKI Energy

**Sample Landscape Report** <<Back to Contents>>

***Disclaimer***

Entire contents ©2008-09 IPEngine. All rights reserved. Reproduction of this publication in any form without prior written permission is forbidden. The information contained herein has been obtained from data sources believed to be reliable. IPEngine disclaims all warranties as to the accuracy, completeness or adequacy of such information. The search results identified are only up to the date of this document. No opinion, unless clearly stated otherwise, is expressed or implied other than the comments stated herein. IPEngine is not a law firm and does not provide any legal advice or legal opinion.

This report is only for illustrative purposes and should not be interpreted for actual representation of a patent ladscape in the stated exemplary technology domains.