

## Large Oil Companies' Competition in Nanotechnology Patents

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Oil prices are setting new records day by day. Oil companies still tend to invest on new technology to increase their profits. Nanotechnology is a great tool in this way so the companies try to develop the technology and protect their achievements. In this survey, Statnano tries to study nanotechnology patents registered by oil and gas companies.

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Nanotechnology has recently become a prominent area of research. Companies have quickly reacted to the rise of nanotechnology, committing considerable resources to ensure that they benefit from this technology. Oil and gas companies intend to take part in this international effort to establish a position for itself among the benefactors of this technology.

Patents are one of the most important innovation indicators to assess the technological competitiveness of innovation systems (national, regional, or sectoral), as they are one possible output of R&D processes, among others. In innovation studies, they are used to mirror the present technological profile, but also to take a look at the near future as patents are also an established indicator of future economic activities reflected in production, employment, or exports etc. Statnano tries, in this survey, to study nanotechnology related patents granted or registered by oil and gas companies. "Forbes.com" is used as a source to extract the World's biggest oil and gas companies. The website is among the most trusted resources for senior business executives, providing them the real-time reporting, uncompromising commentary, concise analysis, relevant tools and community they need to succeed at work and have fun with the rewards of winning. Patents registered by the companies were extracted via orbit.com using a well-defined [search string](#).

Table 1 gives 30 biggest nanopatent holding companies. The patents published or granted












between 2003 to 2013 in USPTO and EP. The table shows origin of companies, the number of all patents, nanopatents and share of nanopatents of all patents registered by the companies. Among these companies, there are 12 American companies and almost 70 % of nanopatents belong to [USA](#).




















ExxonMobil and Chevron registered 865 and 503 patents respectively. Among top 5 companies, only ExxonMobil and Chevron have the share of nanopatents more than 10%. Chevron is an early mover in nanotech. The company formed a spin-out called MolecularDiamond Technologies to produce diamondoids. These are nanometer-sized diamond molecules found in petroleum that can be used as nanotech building blocks in energy as well as drug design and electronics.

Halliburton forecasts using nanoscale catalysts to break apart oil products for increased yield. Shell and BP also believe in nanotechnology. They are betting on new technologies like nanocomposites to strengthen drilling tools, and nanocatalysts to increase yield and prop up oil and gas production.

Another fact is the presence of 3 Japanese Companies in the list, while [Japan](#) has no oil and gas resources. [Japan](#) with 175 nanopatents has key role in the area.

Table 1: Top 30 oil & gas companies according to number of nanopatents (publications and grants)

No.	Company	Country	Nanopatents	Total patents	Share of nanopatents
1	ExxonMobil	 <a href="#">USA</a>	865	5953	14.53%
2	Chevron	 <a href="#">USA</a>	503	3769	13.35%
3	Schlumberger	 <a href="#">USA</a>	456	6981	6.53%
4	Baker Hughes	 <a href="#">USA</a>	435	5974	7.28%
5	Halliburton	 <a href="#">USA</a>	423	5655	7.48%
6	Royal Dutch/Shell Group	 <a href="#">Netherlands</a>	278	4441	6.26%
7	BP	 <a href="#">UK</a>	226	4274	5.29%
8	Total	 <a href="#">France</a>	128	2099	6.10%
9	ENI	 <a href="#">Italy</a>	103	581	17.73%
10	ConocoPhillips	 <a href="#">USA</a>	98	1164	8.42%
11	Nippon Oil	 <a href="#">Japan</a>	83	901	9.21%

12	Ashland	 <a href="#">USA</a>	83	900	9.22%
13	Nippon Mining	 <a href="#">Japan</a>	69	784	8.80%
14	<a href="#">China</a> Pet &Chem (Sinopec)	 <a href="#">China</a>	58	237	24.47%
15	Petrobras-PetróleoBrasil	 <a href="#">Brazil</a>	47	377	12.47%
16	Smith International	 <a href="#">USA</a>	44	1149	3.83%
17	Weatherford Intl	 <a href="#">USA</a>	40	2023	1.98%
18	MOL	 <a href="#">Hungary</a>	33	195	16.92%
19	Noble	 <a href="#">USA</a>	31	462	6.71%
20	Hess	 <a href="#">USA</a>	24	331	7.25%
21	BJ Services	 <a href="#">UK</a>	24	463	5.18%
22	Saudi Arabian Oil	 <a href="#">Saudi Arabia</a>	24	541	4.44%
23	Cosmo Oil	 <a href="#">Japan</a>	23	162	14.20%
24	Chesapeake Energy	 <a href="#">USA</a>	22	359	6.13%
25	Neste Oil	 <a href="#">Finland</a>	19	139	13.67%
26	Sasol	 <a href="#">South Africa</a>	17	399	4.26%
27	RIPI	 <a href="#">Iran</a>	17	35	48.57%
28	Statoil Group	 <a href="#">Norway</a>	14	336	4.17%
29	Repsol-YPF	 <a href="#">Spain</a>	10	30	33.33%
30	Tenaris	 <a href="#">Luxemburg</a>	10	126	7.94%













One of the main indicators used in current survey is "the share of nanopatents of all registered patents". Table 2 reveals the companies have most shares of nanopatents. The indicator shows the role of nanotechnology in companies' research and developments.

According Statnano, [Iran](#)'s Research Institute of Petroleum Industry (RIPI) has highest share of nanopatents with 48.57%. However RIPI registered 35 patents, almost half of them are in nanotechnology area. RIPI demonstrated its high capabilities in using nanotechnology in oil industries during last 5 years. The RIPI's nanobased projects and products include carbon nanotubes, lightweight cement slurry, production of iron oxide nanoparticles and hydroconversion process which are at preliminary stages of production. The project related to producing carbon nanotubes is now being implemented at laboratory and semi-industrial scale. RIPI also manufactures nanoparticles of different metal oxides at semi-industrial scale. The lightweight cement slurry is another product of RIPI in which silica nanoparticles and carbon nanoparticles have been used.

Repsol-YPF with 33.33 % is second and [China](#) Pet &Chem is third company in the list with




24.47%. Comparing table 1 and 2 shows that ExxonMobil and Chevron have the most registered patents and also high share of nanopatents.

Table 2: Companies with most shares of nanopatents

Company	Country	Nanopatents	Total patents	Shares of nanopatents
RIPI	 <a href="#">Iran</a>	17	35	48.57%
Repsol-YPF	 <a href="#">Spain</a>	10	30	33.33%
<a href="#">China</a> Pet &Chem (Sinopec)	 <a href="#">China</a>	58	237	24.47%
ENI	 <a href="#">Italy</a>	103	581	17.73%
MOL	 <a href="#">Hungary</a>	33	195	16.92%
ExxonMobil	 <a href="#">USA</a>	865	5953	14.53%
Bharat Petroleum	 <a href="#">India</a>	2	14	14.29%
Cosmo Oil	 <a href="#">Japan</a>	23	162	14.20%
Indian Oil	 <a href="#">India</a>	8	57	14.04%
Neste Oil	 <a href="#">Finland</a>	19	139	13.67%
Chevron	 <a href="#">USA</a>	503	3769	13.35%
Petrobras-PetróleoBrasil	 <a href="#">Brazil</a>	47	377	12.47%

One of the most important points in the Middle East history is oil. Oil was discovered, first in Persia in 1908 and later in [Saudi Arabia](#) (in 1938) and the other Persian Gulf states, and also in Libya and [Algeria](#). The Middle East, it turned out, possessed the world's largest easily accessible reserves of crude oil, the most important commodity in the 20th century industrial world. Table 3 gives share of Middle East countries in nanopatents in oil and gas industries.

Table3: Middle East countries and their nanopatents(grant and publication)

No.	Country	Nanopatents	Nanopatents in oil & gas section
1	 <a href="#">Saudi Arabia</a>	189	99
2	 <a href="#">Iran</a>	124	48
3	 <a href="#">Turkey</a>	94	30

4	 <a href="#">Jordan</a>	30	4
5	 <a href="#">UAE</a>	22	10
6	 <a href="#">Egypt</a>	20	7
7	 <a href="#">Pakistan</a>	16	11
8	 <a href="#">Kuwait</a>	13	8
9	 <a href="#">Lebanon</a>	7	3
10	 Azerbaijan	6	0
11	 <a href="#">Kazakhstan</a>	4	2
12	 <a href="#">Yemen</a>	2	2
13	 <a href="#">Iraq</a>	2	0
14	 <a href="#">Bahrain</a>	1	0
15	 <a href="#">Qatar</a>	1	0

[Saudi Arabia](#) had registered 189 nanopatents. While the current nanotechnology capability within the Kingdom of [Saudi Arabia](#) is low compared to other countries that have launched nanotechnology initiatives, recently there has been an increase in nanotechnology R&D at both the academic and industrial level within the Kingdom. The kingdom is going to ensure that nanotechnology research is focused on improving the local economy. In order to accomplish this it must be linked to the Kingdom's overall industrial and economic strategies. The principal industrial sector that stands to be beneficiaries of a mature nanotechnology research enterprise is oil and gas. By nanotechnology the Kingdom is expected to substantial increases in scientific knowledge, publications, patents and new jobs in the many areas of science and nanotechnology. According to table 3, [Saudi Arabia](#) has highest number of nanopatents and [Iran](#) and [Turkey](#) are second and third in the list. However, Saudi Arabia published nano-articles less than [Iran](#) and [Turkey](#). So it seems in oil and gas area the kingdom invested on nanotechnology in choosing between nanosciences and nanotechnology. [Saudi Arabia](#), [Iran](#) and [Turkey](#) are likely to be large regional players in nanotechnology and leading the scientific and higher education revolution in the Middle East. [Qatar](#) has no nanopatent in oil and gas. It seems nanotechnology has not been listed in [Qatar](#)'s national priorities. However, recently some research areas relevant to [Qatar](#)'s national need were announced which nanotechnology was there.