



INSTITUTE OF MANAGEMENT, NIRMA UNIVERSITY

Summer Internship Report

SEFORGE LIMITED



On

"Global Demand and Supply of Tower Flange and Bearing Rings"

Submitted to
Dr. Samik Shome

Submitted by
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201225

MBA-FT (2020-2022)

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Institute Name	Institute of Management, Nirma University
Institute Faculty Mentor	Dr. Samik Shome
Purpose of the project	Global Demand and Supply of Tower Flange and Bearing Rings F.Y 2021-2025

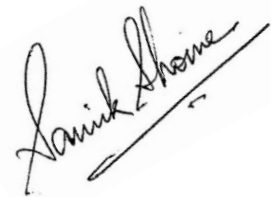


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Acknowledgment

An effective venture can never be set up by the single exertion or the individual to whom undertaking is doled out, however it likewise requests the assistance and guardianship of some familiar individual who helps in the undersigned effectively or latently in the culmination of fruitful.

I would like to thank **Mr. Pankaj Trivedi** (GM- Marketing) who gave me an opportunity for internship at SEFORGE LIMITED.

I acknowledge my deep sense of gratitude to **Mr. Alok Singh** (Senior Manager Marketing) and **Mr. Shailesh Shah** (Senior Manager Marketing) for providing me their valuable guidance and constant co-operation at every step of the project. This project was indeed the outcome of his clear vision and helpful attitude. Without their help and support, the fruitful culmination of this undertaking would not have been conceivable.

Lastly, I would like to express my sincere thanks to my faculty mentor from Institute of Management, Nirma University, **Dr. Samik Shome** for providing me with the necessary guidance before the start of my internship as well during the course of internship.

-Neel Bhaveshkumar Patel

201225

Executive Summary

2 months into Summer Internship at SEFORGE LIMITED Vadodara, Gujarat. SEFORGE LIMITED is 100% subsidiary of Suzlon Energy Limited. Company has two units one is forging division and another is casting division.

My role at SEFORGE LIMITED was of Market Research Analyst. This internship was quite beneficial in developing my interpersonal skills and etiquettes. The internship gave me enough possibilities to network with people from other domains, which let me realize how different operations of a business rely on one another.

The organization's top-level management is really approachable, and they provide me with invaluable guidance. Because my reporting superiors are gracious enough to allow me explore things outside of my job description, I am able to learn and contribute significantly.

Industry Profile

Sector (SEFORGE LIMITED)	Wind Energy Sector
Industry	Industrial Goods

The wind energy sector business includes the design, production, installation, and maintenance of wind turbines and other power equipment. Although the wind power sector is minor in comparison to the traditional power generating technologies (hydro, coal, natural gas, and nuclear), it is expanding considerably quicker at a pace of 25% per year. The wind power sector is rapidly globalizing and consolidating, with much of the recent wind farm building taking place outside of the more established areas. Several major businesses with market capitalizations higher than the whole wind power sector are currently investing heavily in wind power.

India's manufacturing industry is thriving. Investment in India's industrial sector is at an all-time high. The current level of Gross Fixed Capital Formation is \$614.85 billion USD. Government efforts such as 'Make in India' and 'Vocal for Local' are sector-specific and aim to establish India as a worldwide manufacturing base. As a result, more global behemoths are turning to Manufacturing Industry Advisors in India for Manufacturing Industry Business Setup in India.

COVID-19 has a significant negative impact on the global economy. So much so that the economy of nations such as the United States and the United Kingdom are hurting. India's economy has taken a knock as well, but the country has created chances in the midst of the crisis. India has developed as a strong industrial player. This is evident in the financial constraints that limit its capacity to create items at a higher rate.

Wind energy sector in India

In India, wind power has gradually increased during the previous three decades (1985-2015). With 37.5 MWs of installed wind generating capacity, the country currently ranks fourth in the world. The majority of this capacity was fueled by incentives such as expedited depreciation, generation-based payments, and favorable feed-in tariffs (FiT).

In 2015, India set a lofty goal of installing 175 GW of renewable energy by December 2022. When it came to solar power, however, it set a fairly modest goal of 60 GW for wind. With a total installed capacity of 25 GW, the local wind industry has already expanded.

Over the last few years, policy errors have made even this modest aim difficult to achieve. According to the Union Ministry of New and Renewable Energy, 13 GW of wind projects are in the pipeline (at various stages: tendered, awarded, and under development), with another 10 GW expected to be tendered in the coming months to meet the goal (MNRE).

On the other side, the industry is less confident. The wind power sector is losing its lustre, with diminishing capacity additions, a sluggish response to new auctions, and a weakening manufacturing sector. Wind projects may only reach 45 GW by March 2022, according to a new Crisil research.

With 302 GW at 100 m hub height and 695 GW at 120 m hub height, India has a considerable wind energy potential. All of this potential is commercially viable, according to K Balaraman, director general of the National Institute of Wind Energy.

Approximately 97 percent of this potential is concentrated in Gujarat, Karnataka, Maharashtra, Andhra Pradesh, Tamil Nadu, Rajasthan, and Madhya Pradesh.

Company Profile – Part (A)



Introduction

SEFORGE LIMITED is one of largest manufacturing facility for forging, which manufactures fully-finished machined rings pre-dominantly for wind, Oil & Gas, defence and aerospace. Company manufactures tower flanges and bearing rings.

Company has fully integrated state-of-the-art manufacturing units strategically placed in SEZs near major Indian ports. Company's infrastructure includes ring-rolling, foundry, machining, and painting capabilities, which allows to provide comprehensive end-to-end solutions to all of the customers. We have been accredited by the most stringent internal quality systems and standards.

Company's products are used in a wide range of industries, including wind, power, oil and gas, transportation, industrial machinery, mining, construction, defence, and aerospace.

Vision and Mission

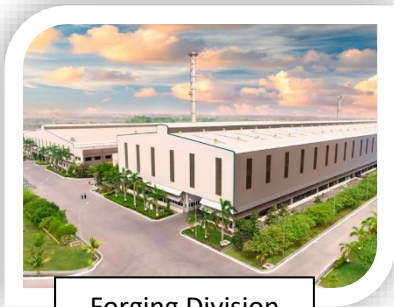
Vision is to be the preferred global supplier of large, high-precision castings and forgings by employing path breaking technological innovation and environment friendly processes that contribute positively towards value enhancement of all stakeholders.

Mission is to meet customer expectations by continuously improving our infrastructure, technologies, processes and fostering employee engagement.

SEFORGE LIMITED qualities and advantages

1. High customer response efficacy
2. Modern and unique production capabilities
3. Best in class quality production
4. One stop shop
5. Strong customer track record and legacy
6. Trusted partner for global OEMs

Plant locations

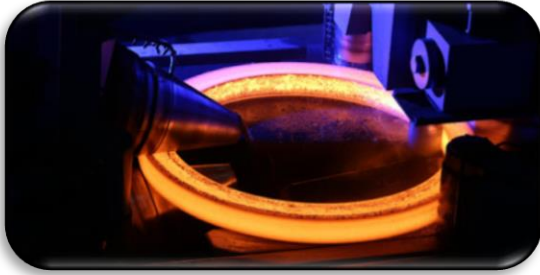


Forging Division
Vadodra, Gujarat



Casting Division
Coimbatore, Tamil Nadu

Products



Below the are services and products offered:

1. Tower Flanges
2. Bearing Rings
3. Gear Rims / Ring Gears
4. Oil and Gas Connector Rings

Product Application

1. Wind Energy
2. Bearing Industry
3. Aerospace
4. Oil and Gas Power
5. Material Handling
6. Construction and mining
7. Heavy Machinery
8. Defence

Customers of SEFORGE LIMITED

1. Suzlon
2. General Electric
3. SKF
4. Siemens Gamesa
5. Flender
6. Laulagun
7. Vestas

Global customers across five continents

1. Americas
2. Europe
3. Turkey
4. China
5. Indonesia
6. Australia
7. Brazil

Values of SEFORGE LIMITED

1. Continuous improvement
2. Innovation
3. Excellence
4. Agility
5. Integrity

Project Work - Part B

1. Introduction

1.1 Nature of project

Demand for wind power in the global market was 58.9 GW in 2019 and is expected to increase at a CAGR of 5.2 percent between 2020 and 2027. The growing need to replace traditional energy sources with green energy sources is expected to propel the demand in the coming years. Solar and wind power generation, which were once deemed costly, are now considered more cost-competitive than modern coal or gas plants. Furthermore, it is projected that in the coming years, building modern wind and solar power plants would be more cost-effective than running conventional coal or gas plants.

Thus, the nature of project is to establish and calculate the future demand of tower flange rings and what will be the approximate quantity that will be manufactured which depends on future renewable energy installations.

1.2 Objectives of Study

1. To determine the global demand of wind tower flange ring and bearing ring in upcoming duration of 5 years.
2. Competitors of SEFORGE LIMITED and challenges way forward.

1.3 Utility of Study

Expected utility or outcomes of study are as follows:

- Getting idea of installed wind capacity and future wind energy installation region wise as well as country wise
- Factors affecting demand of rings (Tower flange, Bearing Rings, etc.)
- Factors affecting future wind farm installations.
- Calculating rings to be manufactured in upcoming years.
- Calculation of demand of main shaft bearing, slew bearing and pitch bearing in wind energy sector as well as non-wind sector.
- Analyze the competition, its strategies.

2. Work Assigned

2.1 Approach

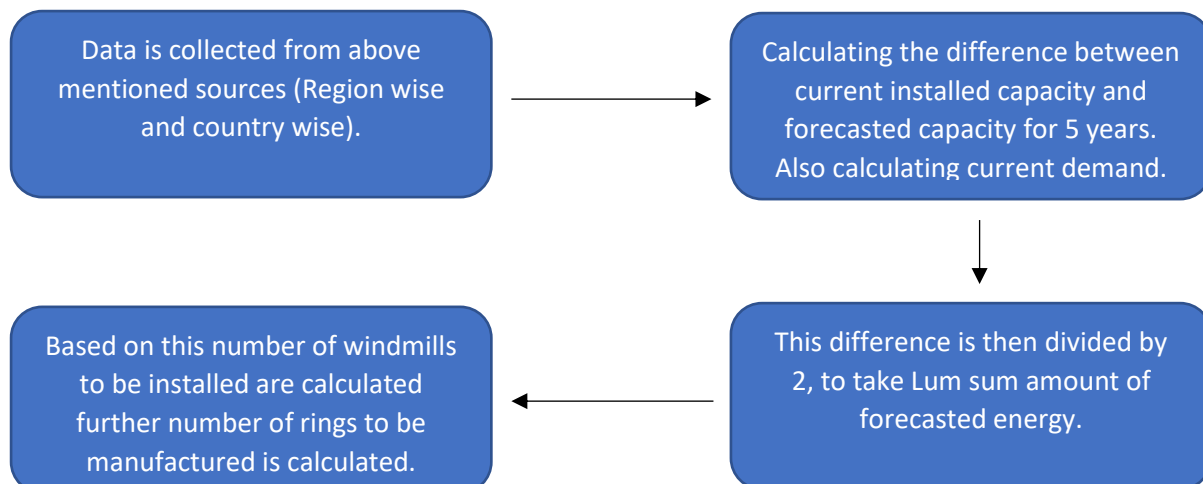
Steps of approach:

1. Determining the objective
2. Determining the driving factors
3. Determining the forecasted year or duration for which we want to determine data
4. Collection of data (Continent wise as well as country wise)
5. Analyzing data
6. Calculation of forecasted production as guided by company mentor.

2.2 Sources of Data

1. Global wind energy council (GWEC)
2. Statista
3. Google Scholar
4. Market reports

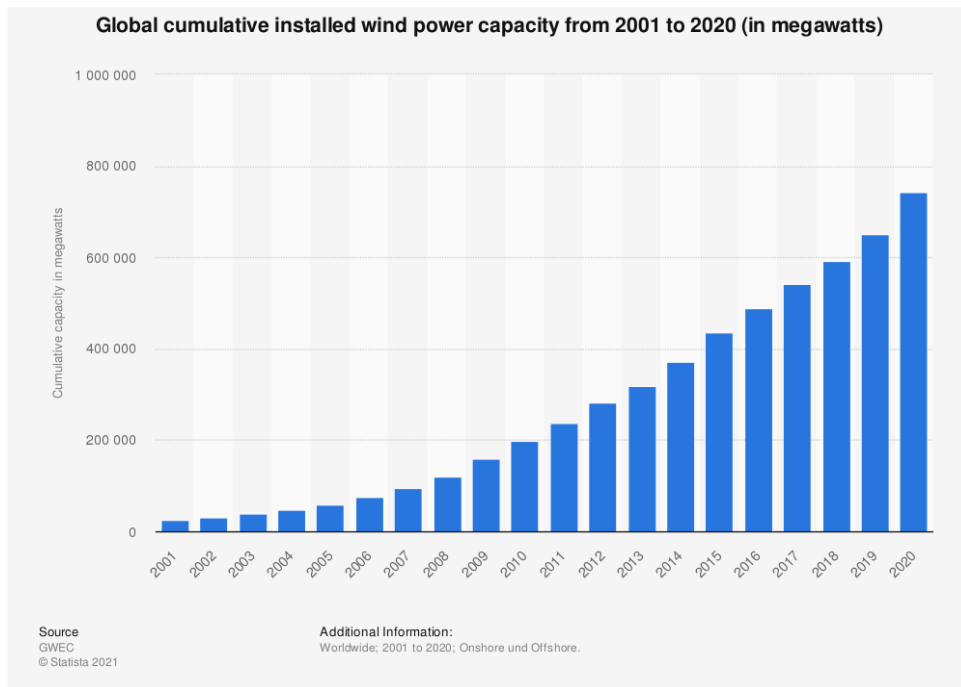
2.3 Method of analysis



2.3.1 Data collection

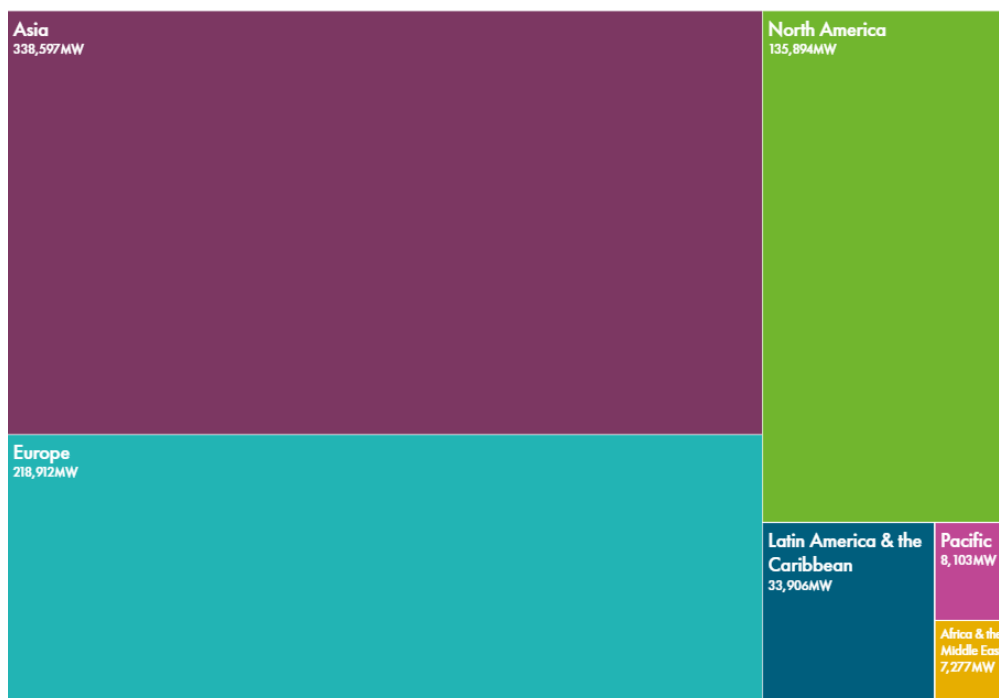
1. Current scenario of global wind power industry

In 2020, the total installed capacity of wind power worldwide will be about 743 gigawatts. Same year, onshore wind power output reached over 700 gigawatts.



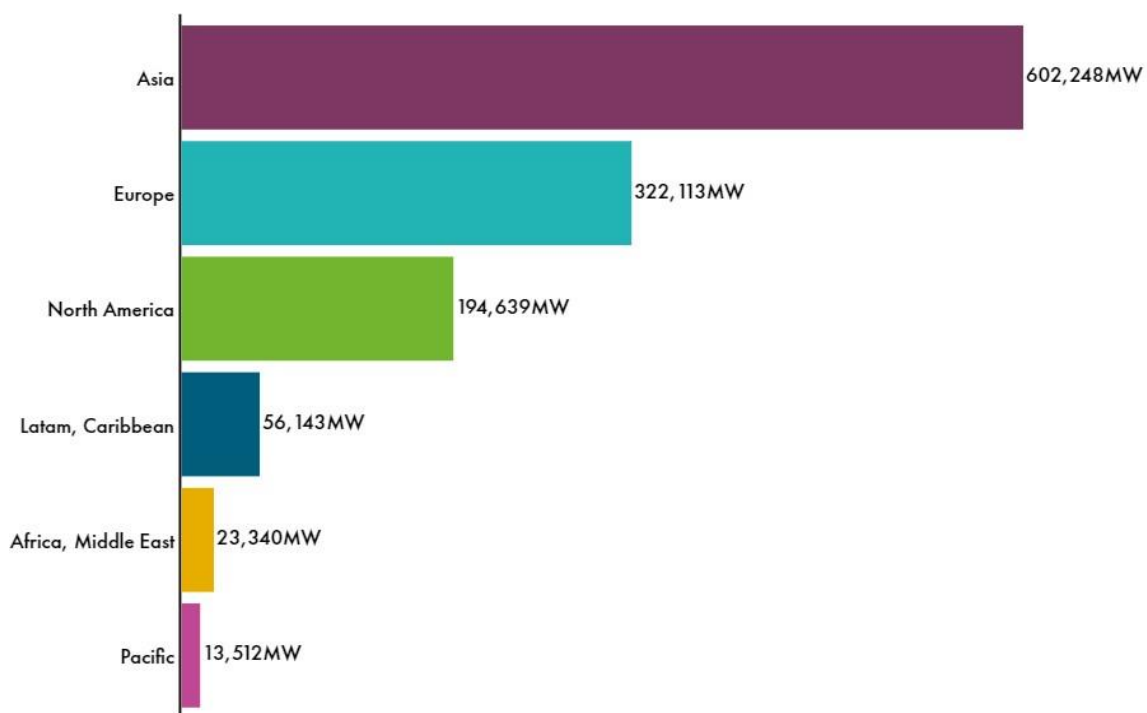
2. Future of global wind power industry

Total global wind power capacity by region



The global wind power industry demand was 589 GW in 2019 and is forecast to rise at a CAGR of 5.2 percent between 2020 and 2027. The growing need to replace traditional energy sources with green energy sources is expected to propel the demand in the coming years. Solar and wind power generation, which were once deemed costly, are now considered more cost-competitive than modern coal or gas plants. Furthermore, it is projected that in the coming years, building modern wind and solar power plants would be more cost-effective than running conventional coal or gas plants.

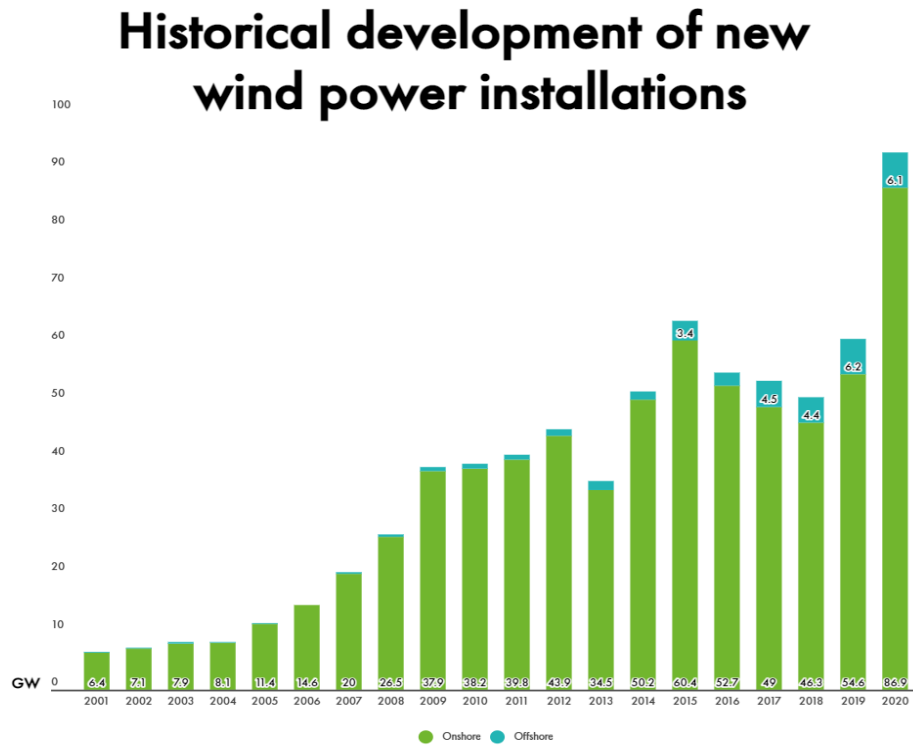
Growth of wind power capacity from 2021-2025 by region



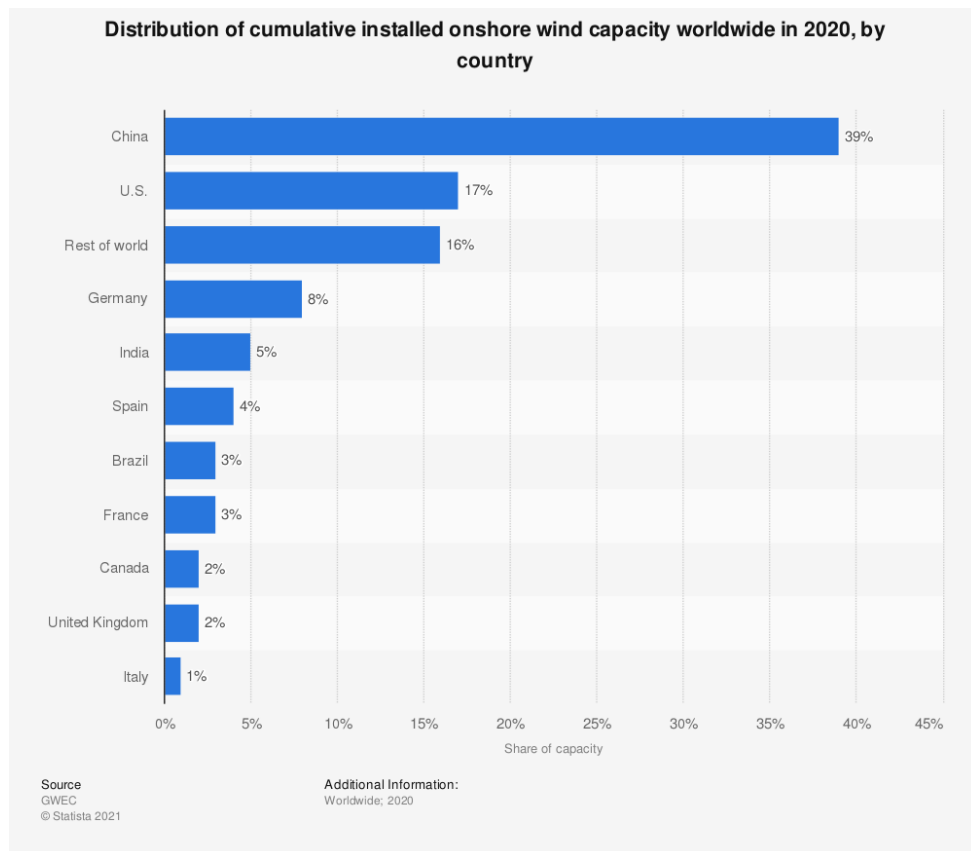
3. Factors Affecting future demand of tower flange

- ◆ Upcoming wind farm projects:
 - i) Off-shore
 - ii) On-shore
- ◆ Clean energy in demand Wind
- ◆ farms growth drivers

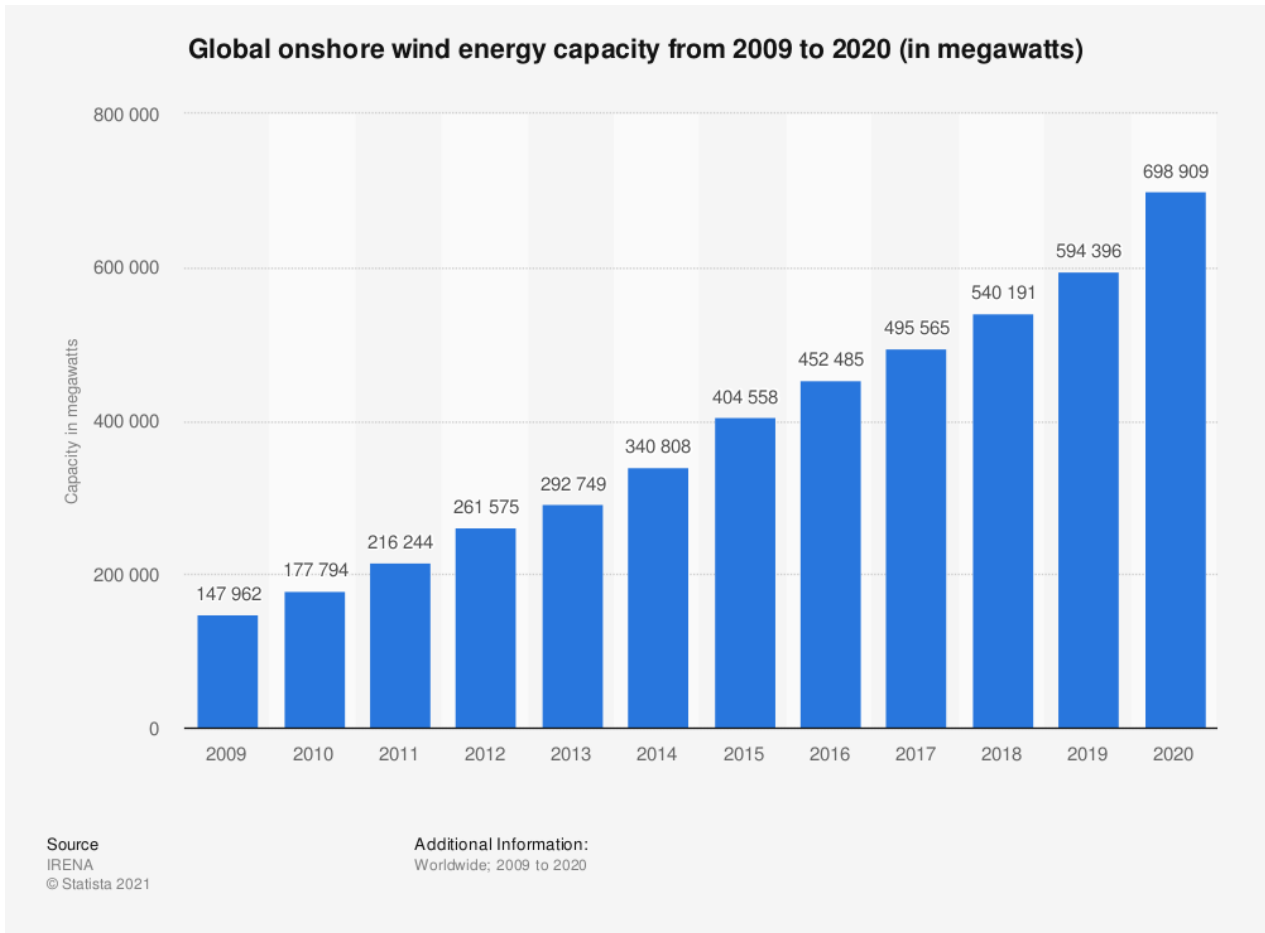
4. Historical growth of wind power installations



5. Current scenario of onshore installations

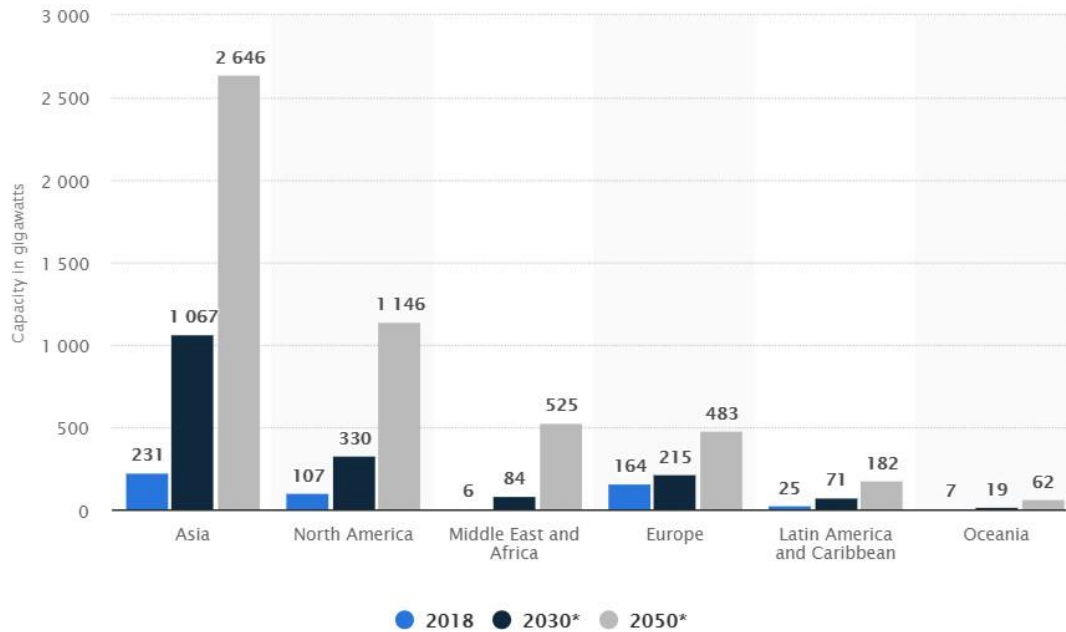


Since 2009, global onshore wind capacity has quadrupled, reaching more than 698 gigawatts by 2020. Wind energy has grown significantly in the last decade as countries across the world switch away from fossil fuels.



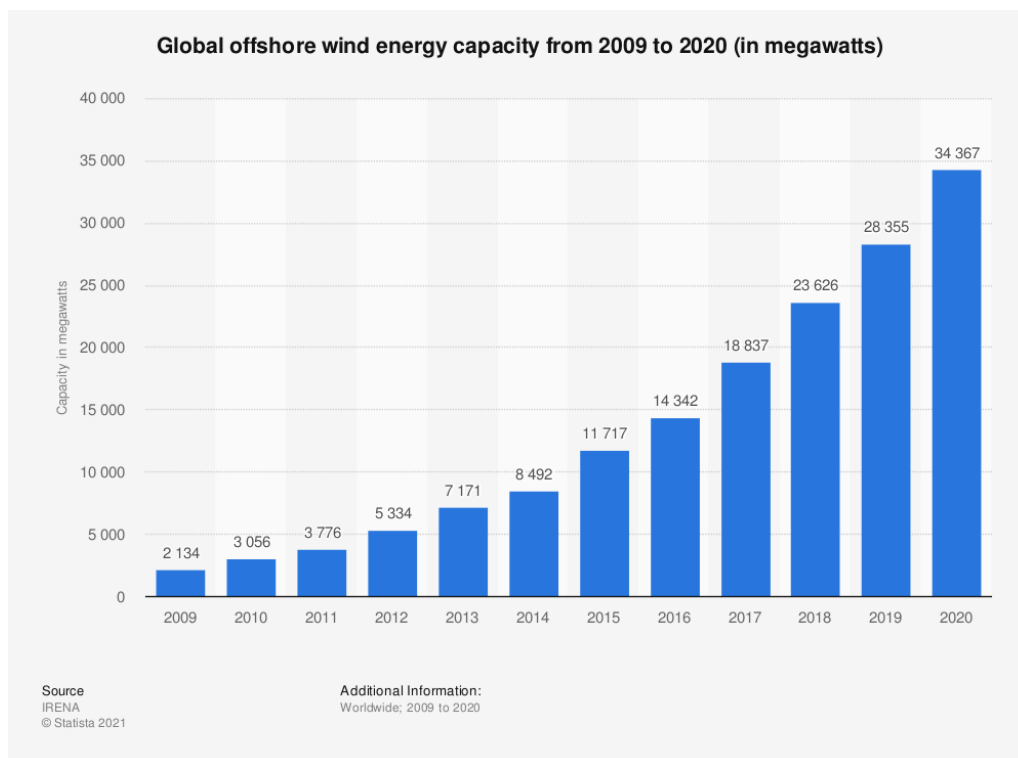
China is by far the world leader in wind power, with a total onshore output of 204.5 gigawatts in 2019. This was more than twice the potential of the United States, which is ranked second in the world. In the same year, China installed 26 gigawatts of wind power capacity, accounting for approximately half of all new wind power capacity installations worldwide. It is unsurprising that China has the most power in the world, given that it is host to the world's largest onshore wind farm, located in Gansu Province.

6. Future scenario of onshore installations



In 2018, Asia had the most deployed onshore wind power in the world, totaling 231 gigawatts. By 2050, this area is estimated to have deployed approximately 2.65 terawatts of onshore wind capacity. According to GWEC, 348 GW of additional onshore and offshore infrastructure is planned by the end of 2024, bringing overall wind power capacity to nearly 1,000 GW. "Over half of the onshore wind power added between 2020 and 2024 will be deployed in China and the United States.

7. Current scenario of offshore installations



Offshore wind energy capacity worldwide hit nearly 34.4 gigawatts by 2020. Offshore, stronger winds are available than those used to produce onshore wind energy. The worldwide offshore wind business is expected to be valued \$51.7 billion in 2024, expanding at a 14.21 percent CAGR between 2020 and 2024.

8. Upcoming windfarm projects

- (Taiwan) Gunkul Wind Farm. (Myanmar)
- Monsoon Onshore Wind Power Project (Lao People's Democratic Republic) Guimaras Strait Offshore Wind Farm. (Philippines)
- Theparak Wind farm (Thailand)
- Sukabumi Wind Farm (Indonesia)
- Cambodia Wind Power Pilot Project (Cambodia)

9. Global demand of tower flange

- Wind Power Flange industry revenue was 23885 million USD in 2019 and is expected to hit 51281 million USD in 2025, at a CAGR of 13.58 percent between 2020 and 2025.
- From above collected data it can be observed that China will be the largest potential buyer as it has many upcoming plans for wind farms and being a world leader in wind energy.
- Nations worldwide have now started taking global warming as serious issue and has started adopting clean and green energy due to which there would be increase in demand of wind energy.
- From statistics Asia, North America, Middle East and Africa would be the upcoming regions where wind energy would be on prime focus.

2.3.2 Demand forecast and production calculation of tower flange

Calculation for demand of flanges F.Y 2021				
Sr No.	Regions	Wind power installations MWs	Number of windmills	Number of flanges to be manufactured
1	China	45673	22837	114183
2	United Kingdom	1150	575	2875
3	Germany	827	414	2068
4	Netherlands	2000	1000	5000
6	Denmark	107	54	268
7	Belgium	813	407	2033
9	Japan	283	142	708
10	Taiwan	142	71	355
11	Spain	1281	641	3203
13	Brazil	1746	873	4365
14	Mexico	1913	957	4783
15	Sweden	884	442	2210
17	Canada	164	82	410
18	Italy	327	164	818
19	Australia	3258	1629	8145
20	India	1053	527	2633
21	Turkey	776	388	1940
	Total	62397	31199	155993

Fig: Tower Flange demand calculation for year 2021

Calculation for demand of flanges for forecasted period of 5 years				
Sr No.	Regions	Wind power installations (2021) MWs	Wind power installations for 5 years	Total Wind power installations(MW)
1	China	45673	172159	217832
2	United Kingdom	1150	13285	14435
3	Germany	827	9904	10731
4	Netherlands	2000	3790	5790
6	Denmark	107	1723	1830
7	Belgium	813	4828	5641
9	Japan	283	3994	4277
10	Taiwan	142	521	663
11	Spain	1281	11337	12618
13	Brazil	1746	4751	6497
14	Mexico	1913	3815	5728
15	Sweden	884	3277	4161
17	Canada	164	4592	4756
18	Italy	327	2285	2612
19	Australia	3258	4438	7696
20	India	1053	20000	21053
21	Turkey	776	2174	2950
	Total	62397	266873	329270

***Note: 1 Windmill = 6nos of flanges**

1 Windmill capacity = 2MWs

Sr No.	Regions	Total Wind power installations(MW)	Number of windmills	Number of flanges to be manufactured
1	China	217832	108916	544580
2	United Kingdom	14435	7218	36088
3	Germany	10731	5366	26828
4	Netherlands	5790	2895	14475
6	Denmark	1830	915	4575
7	Belgium	5641	2821	14103
9	Japan	4277	2139	10693
10	Taiwan	663	332	1658
11	Spain	12618	6309	31545
13	Brazil	6497	3249	16243
14	Mexico	5728	2864	14320
15	Sweden	4161	2081	10403
17	Canada	4756	2378	11890
18	Italy	2612	1306	6530
19	Australlia	7696	3848	19240
20	India	21053	10527	52633
21	Turkey	2950	1475	7375
	Total	329270	164635	823175

Fig: Tower Flange demand calculation for 2021-2026

Ball bearing market in wind sector

The wind turbine bearing market is driven by factors such as the increasing number of wind installation projects, improvements and innovation in the field of wind power generation, and an Demand for efficient wind turbine components and parts is increasing. The wind turbine bearing business is being driven by the growth in demand for energy production in rising nations, notably China and India. Wind power generation has grown significantly less expensive over time, but the technology necessary still demands a significant upfront investment. Furthermore, expensive and complex manufacturing processes, environmental problems such as rotor blade noise, and risks to animal habitat such as birds and bats due to blade rotation are likely to impede the wind turbine bearing market in the near future.

Gearbox (spherical roller bearings, cylindrical roller bearings, metric tapers, radial bearings, and angular contact bearings), main shaft (spherical, cylindrical, and tapered), electric generator (hybrid and electrically insulated radial ball bearings), rotor bearing (cylindrical/spherical thrust roller), and rotor pitch are the four categories of wind turbine bearings (slew rings). Based on end-user, the wind turbine bearing market can be split into three categories: residential, commercial, and industrial. The industrial sector includes agriculture, power generation, industrial automation, and telecommunications. The main end-

user of wind turbine bearings is the industrial sector, which accounts for a substantial share of the market. North America is the largest market for wind turbine bearings in terms of geography, owing to a shift toward the usage of wind and solar energy to satisfy carbon emission standards and reduce dependency on fossil fuels. Due to federal wind energy legislation and an increase in government initiatives to encourage wind turbine installation, the wind turbine bearing market in Europe and Asia Pacific is expected to develop significantly over the projected period.

With significant international and regional providers present, the global wind turbine bearing market is varied and competitive. The intricacy of the manufacturing process, offshore and onshore bearing applications, and the capacity of manufacturers to offer the same distinguishes them from competitors.

2.3.3 Demand forecast and production calculation for bearing ring

Calculation for demand of Bearing Ring F.Y 2021				
Sr No.	Regions	Wind power installations MWs	Number of windmills	Number of bearing set to be manufactured
1	China	45673	22837	68510
2	United Kingdom	1150	575	1725
3	Germany	827	414	1241
4	Netherlands	2000	1000	3000
6	Denmark	107	54	161
7	Belgium	813	407	1220
9	Japan	283	142	425
10	Taiwan	142	71	213
11	Spain	1281	641	1922
13	Brazil	1746	873	2619
14	Mexico	1913	957	2870
15	Sweden	884	442	1326
17	Canada	164	82	246
18	Italy	327	164	491
19	Australlia	3258	1629	4887
20	India	1053	527	1580
21	Turkey	776	388	1164
	Total	62397	31199	93596

Fig: Bearing ring calculation for year 2021

***Note: 1 Windmill = 6nos of flanges**

1 Windmill capacity = 2MWs

Calculation for demand of Bearing Ring for forecasted period of 5 years				
Sr No.	Regions	Wind power installations (2021) (MWs)	Wind power installations for 5 years (MWs)	Total Wind power installations(MW)
1	China	45673	172159	217832
2	United Kingdom	1150	13285	14435
3	Germany	827	9904	10731
4	Netherlands	2000	3790	5790
6	Denmark	107	1723	1830
7	Belgium	813	4828	5641
9	Japan	283	3994	4277
10	Taiwan	142	521	663
11	Spain	1281	11337	12618
13	Brazil	1746	4751	6497
14	Mexico	1913	3815	5728
15	Sweden	884	3277	4161
17	Canada	164	4592	4756
18	Italy	327	2285	2612
19	Australia	3258	4438	7696
20	India	1053	20000	21053
21	Turkey	776	2174	2950
	Total	62397	266873	329270

Sr No.	Regions	Total Wind power installations(MW)	Number of windmills	Number of Bearing set to be manufactured(inner+outer)
1	China	217832	108916	326748
2	United Kingdom	14435	7218	21653
3	Germany	10731	5366	16097
4	Netherlands	5790	2895	8685
6	Denmark	1830	915	2745
7	Belgium	5641	2821	8462
9	Japan	4277	2139	6416
10	Taiwan	663	332	995
11	Spain	12618	6309	18927
13	Brazil	6497	3249	9746
14	Mexico	5728	2864	8592
15	Sweden	4161	2081	6242
17	Canada	4756	2378	7134
18	Italy	2612	1306	3918
19	Australia	7696	3848	11544
20	India	21053	10527	31580
21	Turkey	2950	1475	4425
	Total	329270	164635	493905

Fig: Bearing demand calculation for 2021-2026

2.4 SE FORGE LIMITED competitors' analysis and learnings

Indian Companies

1.



Note: Studying above company Bay Forge has similar production line and no points as such can be taken for advancement purpose.

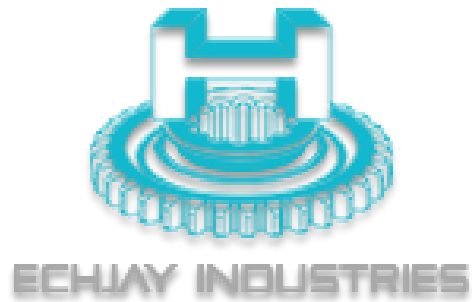
2.



Note: Product manufactured that are different from SEFORGE LIMITED

1. Titanium forgings that are used in aerospace, naval ships and many other industrial units.
2. Titanium forgings needs protection from oxygen, nitrogen and hydrogen like gases. Titanium forgings are in huge demand as they are used in aerospace and aircrafts.

3.



Note:

1. Low forging capacity as compared (in tonnes)
2. Cold forging facility available at ECHJAY industries. This forging helps in saving material as well as energy consumption.

4.



Note:

1. Press capacity 1600T to 16000T along with 80mts T hammer in advanced manufacturing facility.
2. Bharat forget has also facility for manufacturing of dies.
3. It has facility for closed die forging and open die forging.

Chinese Companies

1.



Note:

1. Outer diameter manufacturing capacity less than equal to 16m.

2. Similar heat treatment process and material testing process.
3. Huge production capacity 6 forging and rolling lines with 13500 tonnes oil press and 16m ring rolling capacity.
4. Production capacity 200000 tonnes/year
5. Main difference is just huge production capacity otherwise production process and products are similar.

2.



Note:

1. No specified information about production technicalities.
2. Makes two types of products:
Every flange component and rings which are used in wind power and main door frame
Pipe flanges
3. Annual production capacity 100000 tonnes/year.

3.



Note:

1. No technical information available.
2. Products manufactured are bearing forgings, flange forgings, gearing forgings, and other forgings like brake disc, ball valve forgings, manhole flange cover, steam turbine diaphragm, friction disc forging, flange forging, wheel forgings.

Korean Companies

1.



Note:

1. 15000T and 5000T press for manufacturing shaft forgings (Small and large).
2. 8000T press for ring forgings.
3. It has 3500T 2000T and 1500T press. Basically, this company has heavy forging capacity and also variety of forging products. This company is capable to do this as it has multiple capacity forging press.
4. 9500mm and 3000mm ring rolling mills.
5. Other process are similar to SEFORGE LIMITED.

2.



Note:

1. No technical information available
2. Frisa manufacture wide range of products for wide applications in different sectors like Aerospace, Construction and Mining, Industrial Machinery, Oil and gas, Power generation, wind power, Semiconductors.

3.



Note:

1. Wide range of press from 1000T to 4000T at Irura plant and 10000T press at Sestao Plant.
2. Wide range of ring rolling 1000mm to 10000mm
3. 11 gas furnaces
4. Other process is same with more capacity for machining

American and European Companies

1.



Note:

1. Hydraulic press 750T, 3000T, 5500T, 16500T
2. Two ring mills – 450/250-ton Wagner automatic radial/axial and a 275 ton radial mill
3. Wide range of products like complex shapes, spindles and shafts, rings, hollows, hubs/tooled forging, semi closed die forgings, bars, discs and blanks. Profile cutting.

2.



Note:

1. Similar capacity like SEFORGE LIMITED and similar products.

3.



Note:

1. No technical information and capacity available.
2. Products manufacture Flange, Valves, Bearing rings and special steel forgings
3. Information not available properly.









Conclusion:

1. SEFORGE LIMITED has fully functional and automated production line similar to its competitors.
2. Main difference is just between manufacturing capacity and equipment capacity.
3. If SEFORGE LIMITED wants to expand its production line and product variety it needs to install various range of press and ring rolling facility.
4. Other production process of machining, heat treating and metallurgy are very much similar to competitors, main difference is of capacity and machinery capacity.

Key Learnings and Takeaways

1. Production and demand depend on current situation
2. Driving factors of product i.e. direct and indirect
3. SEFORGE Ltd. Customer support
4. Marketing Strategies
5. Competitor analysis
6. Company's different levels and hierarchy
7. Effect of government policies to manufacturing industry

Project Summary

-  **Week 1:** Introduction to sector and company
-  **Week 2:** Market research for tower flange market
-  **Week 3:** Data computation for tower flange
-  **Week 4:** Calculating demand for tower flange F.Y 21 and for 2021-2026
-  **Week 5:** Data computation for bearing rings
-  **Week 6:** Calculating demand for bearing ring F.Y 21 and for 2021-2026
-  **Week 7:** Competitor analysis and additional point on how company can improvise
-  **Week 8:** Compilation of data and final report

SEFORGE LIMITED

Plot No. 1, SEZ Unit in AspenPark Infra Vadodara Pvt. Ltd.
Piparia, Taluka : Waghodia, Dist. : Vadodara 391 760, Gujarat, India
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CIN : U27310GJ2006PLC048563



Ref No: SEFL/HR/SL/2021/04

12th July 2021

TRAINING CERTIFICATE

This is to certify that **Mr. Neel Patel** has undergone an industrial training from **1st May, 2021 to 30th June, 2021** in **Marketing Department.**, reference to the proposal from Training & Placement department, **Nirma University.**

He has successfully completed the industrial training in the company.

We wish him a good luck for his future.

For SEFORGE Ltd.

A handwritten signature in blue ink, appearing to read 'Neel Patel', written over a horizontal line.

Authorised Signatory



ISO 9001 / 14001
BS OHSAS 18001
CE
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Declaration

I, Neel Bhaveshkumar Patel, hereby declare that this report is my original work and is not copied from anyone/anywhere. If found similar to other sources, I shall take complete responsibility of the action, takes thereof by the Institute.

Date: 12 July 2021

Place: Vadodara



Signature:

Neel Bhaveshkumar Patel

Roll No: 201225

MBA (FT): 2020-2022

Institute of Management, Nirma University