

## WOMEN IN INDIAN ENGINEERING SCENARIO

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Article history:	Abstract:
<b>Published:</b> 10 <sup>th</sup> March 2022	Engineering from ages has been perceived as a man's forte. Women have struggled and some are still struggling to get a foot hold in this all men's land. Women empowerment has been a topic of debate since so many years still the women are lagging much behind in population level of Engineering sector among others. This paper starts with the introduction to the issue and concludes on the measures suggested by author. Highlights of paper include discussion of Powerful female engineers in India, measures taken in direction of women empowerment by various organizations.
<b>Keywords:</b> Women; Women in Engineering; Female Engineers	

### 1. INTRODUCTION

Women rarely select Civil, Mechanical or other related branch owing to the job profile it offers. The perception is that it is physically demanding to work with sledge hammers and heavy machineries. People subconsciously connect women with art and men with science [3]. Sometimes this is done deliberately too. Also women when join work after a gap do find it difficult to adjust as compared to men who rarely take time off their job for family. Travel and Safety limits and inflexible work hours add to the woes. Women often find that their skills aren't used during placements and they're not treated equally to their male counterparts. Women also tend to experience inappropriate behaviour or unwanted attention more often than men. It does feel uncomfortable for a woman when she goes to a site and realise that everyone is staring at you, simply because her gender makes her seem out of place. Other than the stares, construction sites are not generally set up for women. This might be due to unconscious bias or the thinking that there won't be many women using the site and thus it's not an accommodating place to be as a woman. If we take a simple case: A simple personal protective equipment (PPE) - it's rare to be on a site that has safety boots in small sizes. Similarly, there are no hi-vis jackets made for women on site. Whilst all these issues might seem small, this jigsaw of small pieces builds up to a picture in which women just aren't made to feel as welcome in the construction industry.

Only those women who overcome these barriers and negativities are able to contribute to the field. Women are no longer underrepresented in the field of Engineering. It is very essential to have a gender diversified group in any sector in order to cater to all types of thought processes. Engineering is a part of STEM and can be very exciting chosen career. Women should know that work-life balance can be easily enjoyed successfully at both the places. Women have better leadership qualities, relation building skills, initiative taking capabilities as compared to their male counterparts. [4]

There was a greater entry of female techies in 20<sup>th</sup> Century. The first University ever to grant an Engineering degree to a woman was University of California, Berkeley. That was in 1876 and Elizabeth Bragg was the recipient. [1]. After world war 2 started there was shortage of male engineers in US as most of them joined the armed forces and this paved way for the other gender. Then companies like General Motors, Curtiss Wright among others started training the female fraternity. They partnered with various Universities and started giving Engineering courses which could be finished in a year or so and trained the females mainly on aircraft technology. Gender stereotypical roles were also changed due to industrialization resolution.

Year 1960 saw only 1% female engineers out of lot which increased to 11% in 2000 [5]

### 2. FAMOUS FEMALE ENGINEERS IN INDIA

Considering political and social ideologies, Women still have unequal treatment in India. Still there are handful women in India who have a magnificent career in Engineering. They have a major share in developing technologies which is used by millions. Vice President of Apple iphone Ms. Priya Balasubramaniam played a pivotal role in for deals of India for manufacturing. Twitter's Vice President of Engineering Nandini Ramani is the most crucial decision maker in the product strategy. Google's Vice President, Product development has worked diligently on Google's cloud and Infrastructure. Komal Mangtani is head of data Intelligence, Uber. She acts as Advisory board member for Women who code and is very keen on developing engineering skills among women. Aparna Ramani is Director of Engineering at Facebook. Her team helps in processing real time data and analytics. Ruchi Sanghvi who also happens to be the first Indian female hired by facebook is founder of South Park Commons. Ms. Venmal Arasu is Sr. Vice President of Intuit and e-bay has recognized her as "role model for women". Ms. Anjul Bhambhri, Vice President, Platform Engineering,

Adobe has featured in Forbes, Silicon Angle, among others. Kirthiga Reddy, Managing Global Client Partner at Facebook has been listed in the Fortune India's Top 50 Most Powerful Women and has reserved a place among India's 25 most influential women. Prachi Gupta is Director of Engineering at LinkedIn. Padmasree Warrior is CEO of NIO and has also worked with Microsoft, Spotify, Gap Inc., CISCO and more. [6-7]

Taking a flashback, Kalpana Chawla was the first female Indian to go to space. A. Lalitha - India's first woman Electrical Engineer was a young widow. Fighting all odds, she, in 1964, became the first woman engineer from India to attend the First International Conference of Women Engineers and Scientists which was held in New York. Vinita Gupta - Founder and Chairman of Digital Link Corporation (now Quick Eagle Networks) is credited as the first woman of Indian origin to take her company public in the United States.[8] P.K Theresia is still known as the only woman who was the chief engineer of a Public Works Department of state in all of Asia. Leelamma (George) Koshie is one among the first women engineer trio. Rajeshwari Chatterjee, the first woman engineer from Karnataka, is also known to be one of the first women to pursue her studies outside the country. The field of telecommunication engineering was introduced in India in the year 1945. The first batch of telecommunication consisted of all men except one, who stood out from the crowd, Rajyalakshmi. [9] Sudha Murthy, Chairperson of Infosys Foundation, was first female to be appointed at TATA Engineering and Locomotive Company. Sudhira Das founded first Women Polytechnic College in Bhubaneswar. Tessy Thomas was first woman scientist to handle a missile project in India. Ritu Karidhal is recognized as Rocket woman of India[10]

Mangalyaan Mission of ISRO had 10 women assigned to the project out of 500.

### **3. METHODS EMPLOYED FOR WOMEN EMPOWERMENT**

23rd June is celebrated as International Women Engineers Day.

There are various organizations all through the world which promote females to be engineers and scientists. These places give women engineers to meet and inspire other women in Engineering like IEEE Women in Engineering (WIE) [2] and Society of Women Engineers. IT giants — Tech Mahindra and Wipro — are the only Indian companies after Dr. Reddy Laboratories to make it to in the Bloomberg Gender Equality Index (GEI). The GEI index is based on five parameters — female leadership and talent pipeline, equal pay and gender pay parity, inclusive culture, sexual harassment policies, and a pro-women brand. This includes parental leaves, lactation rooms at the workplace and education programmes dedicated to women. [12] The ministry of science and technology will now rank institutions — offering STEM (Science, Technology, Engineering, Maths) education — on gender equality, according to the Times of India report. As many as 20 Indian institutions — including the premier Indian Institutes of Technology (IITs) and National Institutes of Science (NITs) — have joined hands to facilitate it. The ministry will rate the institutions as gold, silver and bronze based on the number of women scientists, faculty and research fellows. The move is aimed to 'recruit, retain and promote' women in the STEM education sector. [13]

The Vigyan Jyoti scheme, advanced by the Department of Science and Technology (DST), was announced in the 2017 budget allocation for the Ministry of Science and Technology together with a 2,000-crore-rupee purse. The scheme's aim: to arrange for girl students of classes 9, 10 and 11 meet women scientists, with the IITs and the Indian Institutes of Science Education and Research serving as the nodal centres, at least at first. A year later, and with some funds trickling in, some of India's premier institutes, including the IITs in Indore and Bhubaneswar and the IISER in Pune organized on-campus camps for 30 girl students over two weeks, as required by the government, as pilots. Senior women scientists attended the camps as role models to encourage the students to pursue careers in science. Several programmes launched by the government to encourage women to pursue scientific careers. These include a Indo-US fellowship for women in science, technology, engineering, mathematics and medicine to participate in international collaborative research in premier institutions in America; women-centric programmes under the Knowledge Involvement in Research Advancement through Nurturing (KIRAN) initiative; a Bio-technology Career Advancement and Reorientation (Bio-Care) scheme; and relaxing the upper age limit by five years for women candidates for junior and senior research fellowships awarded by the Council of Scientific and Industrial Research. The last is to help those who may need assistance with motherhood or relocation due to husband's transfer.[14]

Considering the need of gender advancement in STEMM area at institutional level, the GATI program is now launched by the Department of Science and Technology (DST). The GATI was one of the three initiatives of DST announced on 28 February 2020, the National Science Day, by the Hon'ble President of India at a celebratory programme dedicated to Women in Science held at Vigyan Bhavan, New Delhi. Several other schemes by DST are mentioned in[15]

### **4. INDIAN STATISTICS**

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As many as 40% of Indians who graduate in science, technology, engineering and maths (STEM) disciplines are women but Women constitute merely 14% of the total 280,000 scientists, engineers and technologists in research

development institutions in India, according to the United Nations. One in three research papers published in India, was written by a female author — in over 186 fields as per the Scopus database. According to the World Economic Forum Gender Gap Report, it will take 257 years to eliminate the prevailing gender gap in the workforce, globally. India ranks 112th in the Global Gender Gap Index in 2020. Women constitute merely 15% of faculty positions in science. One of the major reasons for the low participation is the gender pay gap. Despite the ground-breaking research and performance, women in the field of STEM are known to be paid less for their research work compared to men — not progressing as much in their careers thereby.

## **5. BACKING FEMALE ENGINEERS**

Women represent half of society, and when designing or fixing products, you need to understand all the users. There are countless examples of products designed by men that do not work as well for women. It is getting better, but we still have room for improvement. There are many engineering challenges ahead of us that will benefit from the involvement of women engineers. Women are known for being efficient problem solvers. They don't usually look for the easy way out of an issue and embrace them. They are resourceful and know where to go to get help. Women don't usually cut corners, which makes them valuable team members and good leaders in team settings. Sometimes it is hard for engineers to be creative. We are taught ways to solve problems, but often we need to reach outside our own experience and knowledge to come up with the best solutions. Women are best at it. Women generally bring different experiences than men.

## **6. CONCLUSION**

Success is not defined by gender, caste, color or creed. Those who really want, be it any gender, can break the barrier and write their own stories. There are more to Civil and Mechanical branches than just Site Engineers and execution.

Apart from some active efforts from the government of India, it is seen that there is now more literacy among women, more opportunities for employment, partly due to the liberalisation of the economy, increased urbanisation and impact of women's movements in India. However, we also do need to focus on the status of these women once they get the jobs to check if they continue to face the same kind of discrimination at work as they face in society.

We are not doing enough to target girls at a young enough age to consider a career in engineering, and we are not selling engineering as well as we could. If we haven't provided a compelling reason why a young girl should choose engineering as a career by the time she is in her teens, in all likelihood, she will never enter the profession. Once a young girl has made her choices, it's difficult for her to change course - especially if she hasn't chosen STEM subjects. If we want to bring more women in to engineering then we need to modify our approach. We need to re-think how we promote engineering as a career, focusing on the creative side, the search for new ideas and solving real world problems. We must share real stories of engineers making the world a better place to live and showcase how, as an engineer, you can really make a difference.

We need to ensure parents, teachers and careers services are equipped to signpost engineering as an option. Some companies and organizations are already spreading the word but we need more people involved and focus a little more on the younger generation. Ideally, we should be engaging girls in engineering before they reach secondary school.

We should share more stories about the innovations engineers have made in medical devices, artificial limbs, new ways to produce energy, how they can help the next generation and what they can do to help countries suffering from the effects of global warming, and several other aspects.

Engineering remains a challenging space for women; however, they managed to survive, noting that what was essential to their success was receiving help from others, especially when they were in the early stages of their careers.

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