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SWOT ANALYSIS APPROACH FOR ENHANCING QUALITY CONTROL IN FABRICATION

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ABSTRACT

ORIGINAL RESEARCH ARTICLE

Using SWOT analysis for quality control in fabrication can be a strategic approach to assess both internal and external factors that affect the process. The process involved in the industry depends upon the type and nature of servicing needed for the fabrication maintenance broadly, overhauling, cleaning, welding, painting, polishing etc. This research seeks to offer practical methods for improving manufacturing processes and ensuring higher quality standards by analyzing internal strengths and weaknesses as well as external possibilities and threats. Case studies and practical examples will be utilized to demonstrate the usefulness of SWOT analysis in identifying critical areas for improvement and executing targeted quality control measures.

1. INTRODUCTION

The current technology status, technology development initiatives and future imperatives have been identified to propel Indian manufacturing industry achieve high growth rates in as far as General engineering and Fabrication Industries are concerned. Production efficiency, in turn, is dependent on ability to develop, import and adapt new technologies among other factors. India has made significant progress in various spheres of science and technology over the years and can now take pride in having a strong network of S&T institutions, trained manpower and an innovative knowledge base. Given the rapid pace of globalization, fast-depleting material resources, increasing competition among nations and the growing need to protect intellectual property, strengthening the knowledge base is an important issue. While India's technical talent is recognized world over, there have been serious institutional gaps in promoting industry-research institutions interaction. This report takes a critical look at the Indian manufacturing sector with respect to the technology and scientific resource availability.

All major industrial economies are characterized by the existence of a strong iron and steel industry and growth of many of these economies, at least in their initial stages of development has been largely shaped by the strength of their Iron and Steel industries. Products of Iron and Steel Industry are Pig Iron, Sponge Iron, Flat Steel Products, Long Products, Alloy Steel products, foundry products etc. Major consumers of steel products are engineering application, automobiles, construction and consumer durables. Iron and Steel is crucial to development of any modern economy and is considered to be the backbone of the human civilization. In fact, level of per capita consumption of iron and steel is treated as one of the important indicators of socio-economic development and living standard of the people in any country.

The Indian Iron and Steel Industry is nearly a century old with Tata Iron and Steel Co. (Tata Steel), the first integrated Steel Plant coming up 1907. At the time of independence in 1947, India already has a small but viable Iron and steel capacity of around 1 million top per annum. Today India is the 10th largest producer of steel. The initial period in the industry was dominated by bigger units. However, 70's as the emergence of small-scale secondary Iron and steel producers in the private sector to bridge the gap between the rising demand and stagnating supply from the existing integrated plants. During the 90's Sponge iron industry has been specially promoted so as to provide an alternative to steel melting scrap which was increasingly becoming scarce.

2. Literature review

Al-Hassan et al. (2000) presents maintenance is normally perceived to have a poorer rate of return than any other major budget item. Yet, most companies can reduce maintenance costs by at least one-third, and improve the level of productivity, by giving maintenance the management priority it requires. That priority must span all levels of an organization's management structure to develop an understanding at each level of the significance maintenance can have upon the success or failure of organization objectives [1].

Brah and Chong (2004) investigate the importance of increasing in the growing advanced manufacturing technology application stages. Therefore, equipment maintenance is an indispensable function in a manufacturing enterprise. The recent competitive trends and ever-increasing business pressures have been putting maintenance function under the spotlight as never before. For maintenance to make its proper contribution to profits, productivity, and quality, it must be recognized as an integral part of the plant production strategy. Thus achieving excellence in maintenance issues has to be treated as a strategic issue for manufacturing organizations to create world-class-manufacturers [2].

Baek and Gopinath (2005), in which the ridge waveguide can be regarded as a line defect within the silica opal. However, a line defect constructed in the bottom or on the surface of a 3D PhC (as constructed by using E-beam direct writing noted above) cannot act as an ideal light-waveguiding structure because the line defect was not fully embedded in a 3D PhC, which may lead to the leakage of guided modes from the surrounding dielectric.[3]

Cheng et al. (2022) may aid in the development of policies for the HSCM sector, which will enhance the country's welfare via the applicable convention on the strengths and possibilities presented. Analysis for research and further understanding the HSCM environment through field observation of the pharmaceutical industry in India is an excellent tool choice. It may help develop strategies for the HSCM sector, which will improve the country's welfare through the relevant convention on the strengths and opportunities provided. [5]

Endo, A., & Kamei (2022) concerns with the quality of material have drifted, giving rise to batch failures, slowdowns in manufacturing and a shortage of available resources all over the industry. On the other hand, inadequate quantification, fraudulent procurement procedures, tendering practices and poor financial management and payment are some of the major issues faced during the procurement process in different Indian hospitals. [6]

Fan et al. (2023) widely focused on developing strategies for specific industries, economies, nations, and multinational organisations to regional analysis by SWOT. The SWOT analysis considers internal strengths and weaknesses, as well as external opportunities and threats. Environmental segregation has been implemented in internal issues concerning identity, layout, the availability of tangible and intangible capital, potential, and profitability, as well as external issues concerning the political situation, economic turmoil, societal and technological developments, and environmental issues. It can provide policymakers with a clearer picture of

how weaknesses can be transformed into strengths by leveraging difficulties and seeing how risks can be turned into opportunities without the use of strengths.[7]

3. OBJECTIVE OF WORK

The improvement of the previously method used by SWOT technique for the maintenance should be as low as possible is the main objective of this project work.

The scheduled improvement is to cater for the under listed purposes.

i. Technology up gradation by implementing advance machining.
ii. Set the strategy to achieve the highest service order
iii. Minimizing the cost of the surrounding with the process of SWOT analysis
iv. To increase the profit by predict the break-even point in terms of cost.

4. METHODOLOGY

Welding and cutting processes which are most extensively used are :

Manual Metal Arc, Tungsten Inert Gas, MIG/MAG, Submerged Arc, Spot Welding and Oxyacetylene Welding and Cutting. Resistance Seam, Projection & Flash Butt Welding and Plasma Arc Welding & Cutting are comparatively less used. The processes which are sparingly used are

- flux cored, electroslag, electro gas, electron beam and laser beam welding. In the arc welding category, the pattern of usage broadly is:

- MMAW - Transformer Welding Sets	70%
- MMAW - Rectifier Welding Sets	18%
- MIG/MAG	8%
- TIG & SAW	4%
	100%

There are around 12 major active units manufacturing welding equipment in the organized sector, having individual annual production of about Rs one crore to Rs 50crores. Similarly, there are approximately 40 active small-scale units whose individual production ranges from Rs. 2 lakhs to Rs.100lakhs. There is an import of specialized category of welding equipment and the import level is Rs. 20 crores to 25 crores/year. The components and raw materials required for indigenous manufacture of welding equipment have more customs duty than for complete equipment. There is very marginal export from a few welding equipment manufacturers. There are various problems faced by welding equipment manufacturers and the major ones are :

- Scattered Market
- Lack of quality consciousness amongst user Industry – particularly General Engineering and

Fabrication Industry

- Low volume of demand for higher generation equipment.
- Quality of input raw materials is not upto the mark.
- Disproportionately high price of raw materials and components vis a-vis international prices.
- Advanced technology welding equipment is expensive to manufacture because most of the power electronics components need to be imported.

Some of the larger and old companies manufacturing welding equipment do have a sound manufacturing base in respect of production facilities, drawing and design capability, systematic layouts and good work culture conducive to quality production (Advani, Esab, Jai Hind Sciaky etc.). In these companies manufacturing technology methods involving plant and equipment are at par with other good and progressive engineering units in the country.

At present only one or two gas manufacturing units have these gas mixing unit for their own use. Users of MIG process have to essentially depend upon these two units for gases, which is very difficult. Unless the users can prepare

their own gas mixtures, this process may not develop to the desired levels.

Gas regulators and flow meters for dry gases are being manufactured in the country, but not for MIG/MAG welding, which requires CO2 gas. It has moisture most of the times. Indian manufacturers may manufacture good quality regulators and flow meters for use in IG/MAG process where CO2 gas is not essentially dry.

A task force needs to be formed which could have members from welding equipment, research institutes and concerned government departments. This task force may identify the problems of welding equipment industry and seek feasible solutions.

5. RESULT AND DISCUSSION

The Government of India allocates a budget for scientific and technological (S&T) activity under an R&D fund. The allocation has increased from Rs. 828 Million in 1950-51 to Rs. 28800 Million in 2014-15. In comparison, the share of industry in R&D has become of the order of Rs. 25162 Million, about 20 per cent of the government's contribution. The percentage share of major scientific agencies in total S&T expenditure is approximately 70 percent. In the total S&T expenditure by the government, the share of non-scientific ministries has been approximately 30 per cent combined for all sectors, including agriculture, rural development, energy, industry and minerals, transport, communication and others. The total expenditure on R&D, including from industry, is about 0.8 per cent of GNP for the past several years. Compared to most advanced countries, which spent between 4 and 6 per cent on R&D, this proportion is quite low

SWOT ANALYSIS DISCUSSION

SWOT analysis is applied on the fabrication units the result came out is shown below.

Strengths-

- Easy availability of raw material, power and workforce.
- Existence of undergraduate and graduate technical institutions, including one of high repute.
- Proximity to mother plants.
- Entrepreneurs are experienced in the core area of machining and fabrication.
- Cordial labor relations.
- Financial institution's willingness to fund viable projects.

Weakness-

- Low technology levels.
- Dependence on one or two customers coupled by lack of market information.
- Lack of marketing skills.
- Absenteeism of workforce.
- Lack of guidance in cost management. Let us discuss this.

Opportunities-

- Increased infrastructure activity within and outside the country gives good scope for executing large projects.
- Expertise of machining and fabrication of Sponge iron plants can be put into maximum use in emerging sponge iron clusters in other states.
- Opportunity exists for common procurement of raw materials, consumables and joint marketing.
- Opportunity exists for becoming a competitive fabrication and machining center for automobiles and engineering projects due to 3M advantages.

Threats-

- Slowdown in infrastructure activities will adversely affect the units.

FINANCIAL ASPECTS

Land & Building-

Open area with boundary wall & office (on rent)	Rs. 6,000/-
Cost of construction of slope for four wheelers platform, washing & servicing & water tank etc.	Rs. 1,80,000/-

Table 1 Machinery & Equipment's

Sl. No.	Machinery	Quantity	Amount (Rs.)
1	Arc welding machine 3 phase with cable & other accessories completed	01 No.	30,000
2	Gas welding unit complete with hose, gas generator, welding torch, cylinder etc.	01 No.	18,000
3	Air compressor with 1 HP motor, hose pipe, spray gun etc.	01 No.	30,000
4	Auto battery charger 12 volts complete	01 No.	9,500
5	Chain pully block with steel bars 2-ton capacity.	01 No.	12,000
6	Cost of hot chamber electrically heated	01 No.	1,20,000
7	Cost of car washing machine 2 HP electric motor with hose complete	01 No.	68,000
8	Hand tools – spanner set, banal vice, jacks, screw driver, plug wrench, monkey plier, and wheel wrench, denting & painting equipments.	--	15,000
9	Testing equipments – Battery tester, compression tester, tune vulcanizing etc.	01 No.	8,000
10	Water pump set 1 HP	01 No.	9,000
11	Diesel generator 10 KV	01 No.	60,000
12	Furniture & Fixtures, tools, benches etc.		18,000
	Total cost of machinery & Equipments		3,97,500
	Add. Transportation cost @ 10% of machinery.		39,750
	Electrification and installation		15,000
Total:			**4,52,250**

Table 5.2 Working Capital Requirement (P.M.)

Sl. No.	Particular	Nos.	Salary (Rs. P.M.)	Amount (Rs.)
a.	Manager cum supervisor	01	6,000	6,000
b.	Accountant	01	5,000	5,000
c.	Skilled Workers	04	3,500	14,000
d.	Semi-skilled workers	04	3,000	12,000
e.	Unskilled workers	02	2,500	5,000
f.	Storekeeper/Bill clerk	01	2,800	2,800
g.	Watchment	01	2,000	2,000
Total:				**46,800**

Raw Materials/Consumables

Sl.	Particular	Salary (Rs.

No.		**(P.M.)**
a.	Welding electrodes	2,000
b.	Gas Cylinder	2,000
c.	Diesel, Mobile oil, grease etc.	4,500
d.	Paints, varnishes, chemicals etc.	10,000
e.	Screws, bolts and nuts, cleaning brushes etc.	4,000
f.	Miscellaneous consumables	1,500
Total :		**24,000**

6. CONCLUSION

The Indian machine tools industry has poor technology competence due to the inward-looking economic policies and dominance of public sector organizations. While this helped India initially in attaining self-sustenance, it also led to adoption of obsolete technologies in the developed countries and limited efforts to absorb and improve the imported technology. Significant gaps exist in CNC controls, precision bearings and sensors.

- Predicting the BEP for profit at 56.43%.
- Adopt the government scheme to achive the order from firm.
- SWOT analysis have been done and work on the weakness in future scope.

REFERENCES

[1]. Al-Hassan, K., Chan, J.F.L. and Metcalfe, A.V. (2000), "The role of total productive maintenance in business excellence", Total Quality Management & Business Excellence, Vol. 11 Nos 4/5/6, pp. S596-S601.

[2]. Brah, S.A. and Chong, W.K. (2004), "Relationship between total productive maintenance and performance", International Journal of Production Research, Vol. 42 No. 12, pp. 2383-401.

[3]. Baek, K. H. and Gopinath, A. Self-assembled photonic crystal waveguides. Ieee Photonics Technology Letters 17 (2): p351, 2005.

[4]. Baradeswaran A. and Perumal A. E, "Composites : Part B Study on mechanical and wear properties of Al 7075 / Al 2 O 3 / graphite hybrid composites," Compos. Part B, vol. 56, pp. 464–471, 2014.

[5]. Cheng, B., Huang, J., Guo, Z., Li, J., & Chen, H. (2022). Towards sustainable construction through better construction and demolition waste management practices: A SWOT analysis of suzhou, China. International Journal of Construction Management, 1–11. doi:10.1080/15623599.2022. 2081406.

[6]. Endo, A., & Kamei, K. (2022). An exploratory study on procurement risk management in Japanese manufacturing companies. International Journal of Procurement Management, 15(1), 1–19.

[7]. Fan, P., Zhu, Y., Ye, Z., Zhang, G., Gu, S., Shen, Q. Alvandi, E. (2023). Identification and prioritization of tourism development strategies using SWOT, QSPM, and AHP: A case study of changbai mountain in China. Sustainability, 15(6), 4962.

[8]. Ganesan, L., & Veena, R. S. (2018). Make in India'for healthcare sector in India: A SWOT analysis on current status and future prospects. International Journal of Health Sciences and Research, 5(1), 70–76.

[9]. Jain, V., Ajmera, P., & Davim, J. P. (2022). SWOT analysis of Industry 4.0 variables using AHP methodology and structural equation modelling. Benchmarking: An International Journal, 29(7), 2147–2176.