

Resilient and Sustainable Methodology – A Green Manufacturing Project Approach

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Abstract: In the current circumstances, it became important to save the mother earth by reducing impact of human being’s act in terms of almost all aspect. But main contributory factor about harmful acts which impacting nature is manufacturing technologies and waste generated by it. In the article, for overall manufacturing industries globally, the systematic approach research, implementation and results are put forward, by absorption of green manufacturing methodologies. A rapid movement to green technology is to reduce and eventually possible minimal impact on environment through pollution, wastes by giving highest quality and life of any products.

Keywords: green manufacturing, green fabrication.

1. Introduction

Today, severe impact on environmental factors, limited term natural resources and increased in population making it difficult for human being survival and a human advancement becoming saturated day by day. The turmoil between transferring the asset to product causing green earth to the black, containing oxides, nitrides, carbon black everywhere and becoming harmful environment for human life. As discussing in the article, green technology is the modern way and approach and at the same time necessary step taken to achieve the final product by minimalizing the pollution lowest energy consumption [1], [2].

In a scenario, manufacturing processes or approach is open cycloid system where only the end focus is to try to protect environment at the conclusion of manufacturing process. When, human being implements the Green Manufacturing, that approach would get each and every view point of product manufacturing turns greenish environment focus. The life cycle of processes, product, and quality with reduction in cost with timely deliverables can be easily happen along with main purpose of saving the mother earth.

2. Green Manufacturing in Contemporary Vision

With the fast advancement of the fabricating industry, natural issues have gotten to be increasingly unmistakable and gotten to be the consideration center of all nations. The "green wave" making the manufacturing industry alteration to conventional fabricating mode and advance green fabricating technology.

A. Globalization in Green Manufacturing Interest

In a survey, it is observed that around 20 nations, counting

the United States, United Kingdom, Germany, France, Switzerland, Finland, Singapore, Malaysia, and Australia, have actualized natural labeling to advance the advancement of "green items" in these countries.

Canada participated in “Green Plan”, whereas Japan cheering about “Green Industry Plan”.

B. Green Manufacturing Domiciliary Absorption

Currently, to establish green technology, necessary walk through should be followed such as,

- Green product design model evaluation
- Clean production technology for green products
- Flexible, recyclable machinery technology and its use
- Noise, Vibration & Harshness (NVH) control: use of Micro-Electrical Mechanical Devices (MEMS) sensors
- Use of recyclable raw material for recycled new product.

3. Green Manufacturing System

Engineering involved in green manufacturing approach comes along with the sub-system through:

- Marketing Green design
- Green production through recycled resources
- Green quality
- Assessment of process to sustain green environment

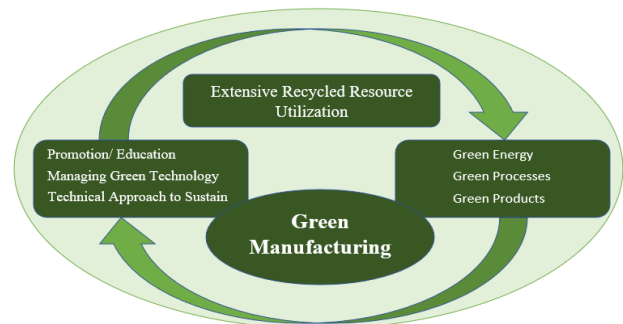


Fig. 1. Environment protection strategy

4. Green Project Management

In today’s world, awareness about pollution and ecofriendly product is getting increased along with customer demands and

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tough global competition. Enterprises have to come with new project management strategies which involves even green think to achieve green manufacturing.

In deep dive with project management, manufacturers need to establish a process to compete existing technologies in order to protect environment. This also brings a question on how to manage green project because of existing projects are using lots of resources wisely in government compliance which has a very less involvement of green band.

As per projects have main five phases of its life cycle management which includes Initiation, Planning, Execution, Monitor & Control and Closure of the project. For green manufacturing, industries need to make these phases green in all aspects of management.

Project initiation should be made in green way that must tell why this project should focused green product how it can deliver the value to business in compliance with environmental protection.

Second phase of green manufacturing will tell us statement of work including, that these are the requirements which must be achieved through green manufacturing, use of green resources and schedule to have risk planning as crucial for green earth.

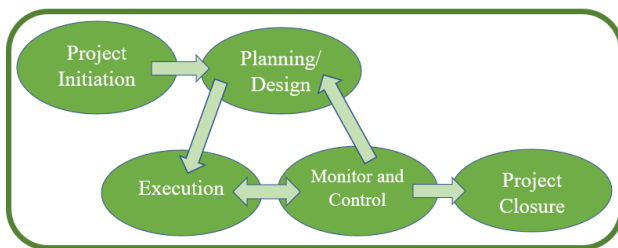


Fig. 2. Project management

In the stage of green execution, information/ awareness, and promotion of using green technology for green manufacturing through proper modes of communication and its tools used for project management has to be done in order to manage resources (people) and follow the processes for quality required by customers, again along with environment protection plan as per in Fig. 1.

Fourth phase highlights monitoring and control to sustain the project in compliance with expected quality by customer, scheduling by using green environment, overview of planned project and control the processes must followed in order to give green signal for green manufacturing.

Project closure often acts as fifth phase includes normally as transfer of deliverables but here in green manufacturing transfer of all green product and sustain the technology for further service and new projects.

5. Achievable Green Manufacturing Efficiency

Efficiency in manufacturing is vital and every industry strive to achieve it by implementing various basic to high level strategies. While implementing those strategies, enterprises often compromise long term effect of it from business to environment point of view.

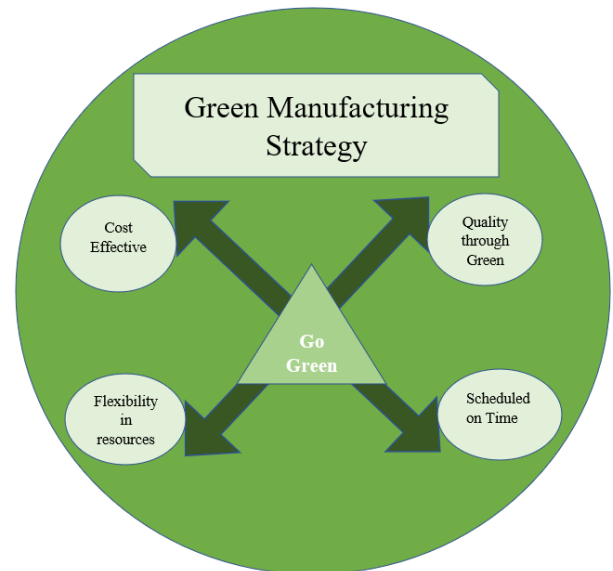


Fig. 3. Green manufacturing strategy

Making same kind of product over and over by using resources wisely will not bring efficiency and thus impact on business. On the other hand, using fewer resources (in terms of human, energy, cost, limited natural resources) for full production can be proved best strategy to make business valued in monetary terms. Minimizing or eventually, preventing waste is “Moneyco” (Eco & Money) friendly.

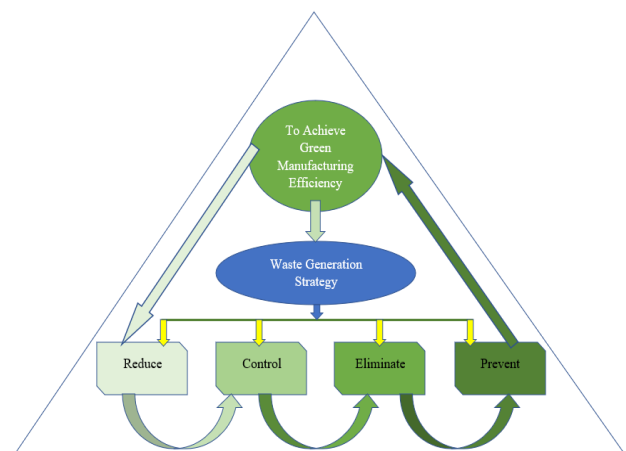


Fig. 4. Green manufacturing waste reduction approach

In production, reducing material wastes and energy consumption and will lower the production cost and time. Go green event will attract more customers because of quality, low cost and environment free which in turn best for business, government rules and of course mother earth.

Management needs to take initiative for this as a project similar to other project management strategies to have that taken initiative getting paid out through green efficient technology for positive Return on Investment (ROI).

6. Project Model for Green Technology Approach

The purpose of green manufacturing system model is to better understand the process and involvement of top-level

management to operator in the organizational structure.

- Assessment for current green level of manufacturing in the industry.
- Trace out the green plan for shop through various tools and control metric measurement for green transformation.
- Demonstrate the sustainability to achieve targeted results through continuous improvement for eco-friendly environment.

A generalized architecture of design and control for green manufacturing is as shown in fig. 5. System model can include and not limited to various factors but should have the plan as described in fig. 5. Showing modules of design and planning. Second module can give us idea about Controls and tools used for assessment and restrictions.

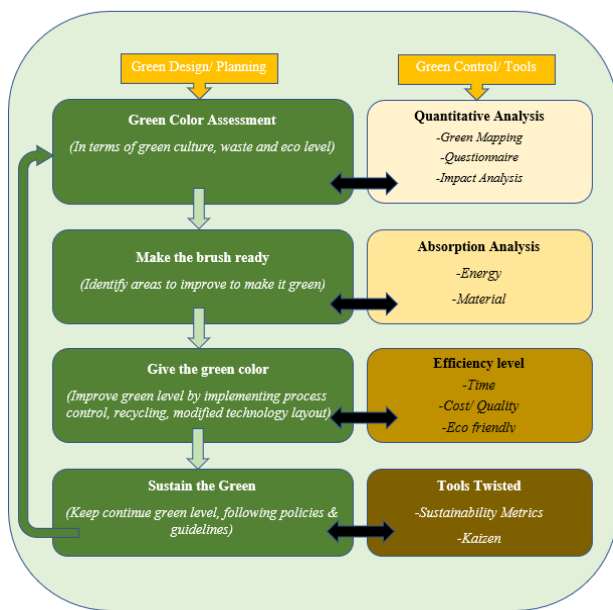


Fig. 5. Green manufacturing waste reduction approach



Fig. 6. Assessment layer model

The proposed system model for green manufacturing can be successful improvement in the implementation and improvement of green level at the industry point of view, highlights efficiency in planning and control activities in the

present system approach.

Taking to the architectural scenario of this system, it is a comprehensive explanation of green manufacturing which will surely attracts, researchers and enterprise to study and search new kind of approach withing green level to implement globally for protection of mother earth.

Lots of study and near future work is needed to actuate the industries to implement green band all over the place for environmental protection may be with the help local, federal government to come up with actual green methodology plan.

7. Green Manufacturing through Various Aspects

1) Global use & promotion

Green approach should be implemented globally with the use and focus on ISO 14000 standard written for management in environmental system to produce strictly green products. Import and export must be done only through this standard with “green mark” if applicable, else restricted.

2) Making social topic

To make the entire society aware of making green, it becomes vital to take efforts from leading delegates in order to generate support from all levels in the society. This will even create new relation from raw material supplier to end product manufacturer.

3) Absorption of green technology

Entire process of product life cycle management via green technology involves all grades of industries to implement the green band effectively. Further, will be a complex engineering methodology has to be discussed, design and implement wisely to target green environment.

4) Use of intelligence

Artificial Intelligence can be a friend while creating green manufacturing environment. System used for development is based on TQCS: Time in launch, Quality provided, Cost, Service offered by product. Green approach can be developed as TQCSEER, where “E” gives green environment focus, further “R” provides recycling of the product.

5) Industrialization

This will be really a world changing effect generated by green manufacturing. New industrialization and manufacturer come close and can work simultaneously for recycling of material or waste handling for green product can create a cycle.

8. Conclusion

The problem of sever impacts on environment which is currently and will eventually affect the human life has to be solved. It can be possible through captivating green manufacturing approach implemented all over the industries by sustainable green processes, resources, operation by motivating the entire human kind.

References

[1] Wang Zheneng. Development Direction of Modern Manufacturing -- Green Manufacturing [J]. *Equipment Manufacturing Technology*, 2010, (03):35-38

[2] Fengmei. Research and Application of Dry Cutting Technology based on green Manufacturing [J]. *Mechanical Design and Manufacturing*, 2011 (1): 109-111.

- [3] Burke, S., & Gaughran, W. F. (2007). Developing a framework for sustainability management in engineering SMEs. *Robotics and Computer-Integrated Manufacturing*, 23(6), 696-703.
- [4] Fanse, T. S. (2021). Design and Modification of MEMS Based Micro Cantilever. *arXiv preprint arXiv:2111.01890*.
- [5] Melnyk, S. A., Sroufe, R. P., Montabon, F. L., & Hinds, T. J. (2001). Green MRP: identifying the material and environmental impacts of production schedules. *International Journal of Production Research*, 39(8), 1559-1573.
- [6] Mursalin, R., Islam, M. W., Moniruzzaman, M., Zaman, M. F., & Abdullah, M. A. (2018, February). Fabrication and Characterization of Natural Fiber Composite Material. In *2018 International Conference on Computer, Communication, Chemical, Material and Electronic Engineering (IC4ME2)* (pp. 1-4). IEEE.
- [7] Avila, M., Gardner, J., Reich-Weiser, C., Vijayaraghavan, A., Tripathi, S., & Dornfeld, D. (2005). Burr minimization strategies and cleanability in the aerospace and automotive industry. *SAE Transactions, Paper*, 01-3327.
- [8] Mohanty, R. P., & Deshmukh, S. G. (1998). Managing green productivity: some strategic directions. *Production Planning & Control*, 9(7), 624-633.
- [9] Hoffman, A. J. (2000). *Competitive environmental strategy: A guide to the changing business landscape*. Island press.
- [10] Abdullah, M. A. Improvement of the Pyrolysis System by Integrating Solar Energy Based Preheating System. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, 18(3), 25-30.
- [11] Willson, T. (2011). Dollars and sense of green. The Canadian Manufacturing Online Magazine.
- [12] Fanse, T. S. (2022). Micro-Electro-Mechanical System (MEMS) Application and Prospects in Automobile. *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)*, 19(1), 17-21.
- [13] Lu Yi. Brief Analysis of the current situation and development trend of green Manufacturing [J]. *Light Industry Technology*. 2013 (08):36-39
- [14] Wang, L., & Lin, L. (2007). A methodological framework for the triple bottom line accounting and management of industry enterprises. *International Journal of Production Research*, 45(5), 1063-1088.
- [15] Guo Tianyi. Research on green Manufacturing Model and Key Technologies of Automobile Enterprises [D]. *Jilin University*, 2014.
- [16] Li Xiangang. Carbon Emission Analysis of Dry Gear Processing for Green Manufacturing [J]. *China Mechanical Engineering*, 2014 (16):14-19.
- [17] Fanse, T. S., & Shirbhate, A. V. (2022). Organizational Behavior Entity: Communication Modes in Project Management. *International Journal of Research in Engineering, Science and Management*, 5(2), 174-176.