

A Study on the Uses of Green Manufacturing in Various Industries

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ABSTRACT

Manufacturing of "green" products, especially those utilized in renewable energy systems and clean technology equipment of all kinds. The "greening" of industry is accomplished by reducing renewable resource consumption, recycling and reusing trash, and decreasing emissions to minimize noise and waste. This article offers an overview of green manufacturing, including its overview and why it is needed, as well as green manufacturing methods that reduce waste and emissions. The present work focuses on ecological design for the environment, including energy efficiency and product production with reduced pollution. Further, author stresses the use of green manufacturing to produce a cleaner product that can be reused, resulting in a shorter product life cycle. An effort has been made to speak about sustainability accounting as well as green supply chain management. The main goal of green production is to preserve the planet while simultaneously reducing the product's quality.

Keywords

Emissions, Environment, Manufacturing, Technology, Pollution.

1. INTRODUCTION

In today's global environment, resources and population are major concerns. The ecosystem is important and any temperature changes make the earth imbalanced. The ISO has suggested a contemporary product quality control system and an environmental management system. The International Organization for Standardization (ISO). The main objective of this era is to minimize factory environmental damage. Green Manufacturing is a contemporary technique of production which is suitable for a sustainable development strategy. Because of High demand and inadequate supply, energy and services costs are increasing continuously. In addition, because pricing trends are difficult to anticipate, companies seek to generate energy and services effectively over wide price ranges. Moving on to price increases is one method of dealing with pricing volatility. On the other side, a rise in prices may require product modifications. Otherwise, increased production efficiency, which may be achieved by decreasing resource consumption and improving industrial organization, can assist to keep costs low[1].

The main objective of this article is to attract the attention of the manufacturer who produces the product in mass manufacturing. It is apparent that a lot of energy is consumed daily and a lot of trash is accessible; waste is hazardous and may lead to human extinction. In particular, toxic hazards are harmful to people. This article covers all the trash and green processing methods to

reduce waste and optimize the usage of renewables. Green production may not just be climate-friendly; it is frequently excellent for industry. Other actions to decrease the energy and resource density of manufacturing activities are typically comparable; nevertheless, what is good for the environment is usually good for the financial sheet[2].

1.1 Green Production

Green production refers to the revitalization of production processes and the development of ecologically friendly industrial operations. In essence, it is "greening" in the industry where workers use less renewables, create less carbon and trash, recycle and reuse goods and limit pollutants in their activities. Green manufacturers study, develop or implement technologies and practices that minimize their impact on the environment. The Bureau of Labor Statistics says that employees of industrial companies must have specialized expertise in green technology and processes such as:

- Energy generated from natural resources: staff may utilize renewable energy for their workplace to generate power, food and fuel. Examples of such sources include wind, coal, geothermal, sun, ocean, hydro, waste and urban solid waste.
- Efficient use of electricity: Workers may utilize particular tools and processes to increase their workplace energy efficiency.
- Reduction and avoidance of pollution, and reduction and recycling of greenhouse gases. Staff may utilize green technology and different methodologies to:
- Reduce or eliminate the production or discharge of pollutants in their operations.
- Mitigate or reduce waste material production
- Reduce emissions of greenhouse gases.
- Recovered, repurposed, recycled or composted waste goods.
- Workers may preserve natural resources by utilizing certain technologies and actions, such as sustainable agriculture, land conservation and protection of soil, water and wildlife.

1.2 Green Manufacturing Benefits

Green packaging not only helps the planet, but also more and more businesses throughout the nation find that focus on recycling and waste reduction will assist. The motivation, morals and public relations of employees are increasing, while business managers are enjoying a lift. Green packaging has now become a medium for long-term employment development in the United States. According to a recent study from Quality

Magazine, 26% of all renewable energy workers are currently hired by green manufacturing. In addition, clean and green manufacturing added 35 382 employees between 2003 and 2010, whereas most of the industries lost employment. Clean economy personnel profit from their advanced skills 13 percent more than other US economy workers.

1.3 Green Production

Green technology is used to monitor, simulate, conserve natural environment, and energy via one or more environmental sciences, chemistry, environmental controls and mobile devices and to minimize the negative impacts of human activities in today's world. Examples of renewable energy production technology include photovoltaics, bioreactors, wind turbines, bioremediation, bio-filtration & desalination. You don't have or take time to learn more, study small printing, decipher dark substances or find alternatives. The word "normal" has become in today's advertising an overused and deceptive BUZZWORD that has almost lost its significance[3].

1.4 Tools for Environmental Management

A number of conservation resources are accessible. Mass balancing is the study of the inputs and outputs of a process to evaluate its efficiency and waste. The whole cost accounting includes materials, energy, labor, waste management and other incidental costs. A further essential aspect of these instruments is the commodity life cycle; the shorter the life cycle, the less environmental damage happens. The systemic engineering phase of a product is divided into three stages:

- Preliminary design, idea and detail.
- Production construction. Production construction.
- Support for system and operational usage.

The associated cost functions are retrieved sequentially in the study with a view to the systemic engineering approach. Imposing more supplier responsibility on manufacturers is one method of striking a crucial balance between the benefits of the environment and the market. With the designing of their products to easily disassemble and reuse components, manufacturers have the unique ability to recover and remanufacture stocks. Product life cycle value design chooses the necessary goods and such choices (for example, use of easily recyclable materials and the elimination of unique materials, components and insecure materials) reduce adverse environmental implications. The life-cycle design cost of a component of the supplier, $Y(MT)$, depends on MT where T is the cycle of commodities life. Although there are many variables that affect the design and manufacturing costs of a component, it is fair to see it as one that increases the product design life from the viewpoint of product design[4].

1.5 Sustainable Manufacture

In the seventies and eighties, the concept of sustainability arose out of a series of workshops and publications, driven mainly by environmental mishaps, dangers and worries about toxic contamination and depletion of resources. The term "sustainable manufacture" is frequently used carelessly to describe behaviors designed to characterize and reduce environmental effects of production. However, sustainability demands much more than only the assessment and improvement of the environmental efficiency of industrial processes and structures. Despite this warning, this agreement may be maintained. When civilization consumes resources and produces pollutants at a rate that surpasses the capability of nature to recycle industrial and

societal waste into nutrients and riches of the environment, a technique is called unsustainable. Sustainability can only be handled strictly speaking within the meaning of a closed structure. Human, environmentally friendly and natural subsystems interact with subsystems of production. Consequently, sustainable manufacturing is an intricately connected notion to broader environmental and social processes. The basics of sustainable manufacturing engineers are highly trained in assessing the economic significance of manufacturing engineering methods as a business task. Measuring environmental and social efficiency in engineering and industry is more challenging. Manufacturing processes and technology utilize operations and procedures to make raw materials and resources marketable products that have consequences for sustainability. Inputs in production processes and structures are needed for content and energy; the trash and pollutants which are labelled as outputs are then utilized as inputs in other industrial, natural and social and political systems with economic consequences[5].

1.6 Green Sustainable Operations

As a creative environmental protection approach, sustainable green operations guarantee efficiency and environmental compliance of the inputs and outputs of electronics manufacturers (e.g., finished products, carbon emission, waste). Green operations focus quality- and process-oriented sustainable activities to balance and increase financial efficiency and emission management. Product-oriented green operations' environmental activity, also known as product management, aims to reduce environmental pressure using less harmful and non-renewable products in product production while also taking account of the environmental effects of product design, packaging and the content used. It promotes the recycling and reuse of commodities through eco-design and the use of green cycle components and packaging. The quality management of electronics producers acknowledges the environmental impact of products and their packaging from the purchase of raw materials through the processing of end-of-life items. The goal of this approach is to minimize the environmental impact of all components and materials associated with the product[6].

1.7 Management of The Green Supply Chain

Green supply chain management (GSCM) is defined by the integration into supply chain management of environmental concerns. The GSCM supply chain also includes the whole closed-loop supply chain from suppliers to distributors, consumers and reverse logistics. There are a variety of GSCM activities incorporated in green design, green sourcing, overall environmental quality management, environmental friendly packaging, shipping and other end-of-life commodities practices, including reuse, reprocessing, and recycling, according to academics. The global economy is changing more and more with the dramatic growth of major automobile manufacturers in Asia. International energy and environmental studies discussed the advantages of greening the automobile sector. The green supply chain of the automobile sector has picked up the imagination of many other businesses. It is important to analyze and measure its effectiveness while dealing with environmental issues throughout the globe. However, few research examined the GSCM success evaluation[7]. The integration of green concepts into the manufacturing process is thus essential to mitigate environmental costs, increase consumer competitiveness and ensure enforcement. The car

manufacturing sector in advanced nations is a promising and exciting business since, especially since its membership of the World Trade Organization, it has a broad demand. On the other hand, automotive supply chains are behind. The Chinese car industry is still in its infancy and there is little attention paid to the recycling of obsolete cars. In conjunction with increasing environmental problems, the government of China has strengthened its environmental laws. As a consequence, Chinese car manufacturers have started to study GSCM principles learned from international partners. The Malaysian government has also failed to address environmental issues, particularly the recovery of end-of-life cars. GSCM urges local vehicle manufacturers and governments to worry about their environmental responsibilities since Malaysia's automotive sector is expanding fast. Consequently, GSCM gains momentum as a useful instrument to reduce environmental hazards while providing economic advantages to farmers [8].

1.8 Green Application

Fuel is a major issue worldwide; the fuel used in everyday life is nonrenewable and will run out fast, requiring fresh fuel to be purchased. The only salvation is renewable fuels, such as sun, wind, tidal, bio diesel and other renewable products. Sustainable energy will thus be utilized as a heat source. Water purification is a distinct issue in human existence, since water is our main need, yet the water is not suited to consume owing to population and chemical techniques. The technique of solar distillation is very helpful when water is purified.

Cleansing the air since all plants absorb and convert it to oxygen, simple, nutritious green vegetables may be grown indoors to keep the air pure. The outcome will be a reduction in air emissions, and life on earth has access to more oxygen and less CO₂. Sewage treatment is in theory akin to water purification. The treatment of wastewater is essential because it cleanses water according to the criteria of pollution. More concentrated water is not being utilized for anything, while less contaminated water is being supplied to regions where significant use is made of water. It may contribute to a range of other conservation, biodiversity and other concepts. Solid waste management is recognized as purification, consumption, reuse, recycling and treatment of solid waste by government or city/town governing authorities. Energy saving refers to the employment of less energy-induced technology to reduce energy consumption. When someone requires less energy, fewer fossil fuels are used to produce power [9].

1.9 Green Production

Clean energy is gaining momentum worldwide. In June, the US, Brazil and China announced new climate change pledges. President Obama proposed in August a Clean Power Plan to reduce pollution by 32 percent from the levels of 2005 by 2030. The United Nations will host a climate change conference in Paris in December. Both of these regulations may have an impact on the manufacturing sector, whether it targeted at increasing car fuel standards or just raising awareness of customers [10].

Green manufacturing is an intelligent concept in terms of environment and industry. However, when environmental regulations start to develop, in some circumstances they will become compulsory. On the other hand, leading companies also

concentrate significantly on reducing pollution and increasing the quality of energy, and not only on laws. Green manufacturing will not disappear, even if the IoT appears to have supplanted it as the most popular trend. In reality, IoT will make a firm more ecologically aware. According to David, professor at the University of California-Berkeley: "The fit bit or Apple Watch provides proof that one has not had it before" This is similar to the growth of wearables. The accessibility of the industrial Internet facilitates tracking of resource use, much as the fitness tracker may monitor health data every day rather than once a year. In addition, it enables companies to evaluate the least harmful method to run a production. " In comparison to constructing a race vehicle, inefficiencies must be removed wherever they occur. You may be aware of the benefits of green production already if you are at your facilities currently saving energy and trash.

2. DISCUSSION

This is not the case when it comes to climate and economic improvement. "The air pollution has fallen by almost 70 percent since 1970, with the economy growing in size," the White House said. Green manufacturing is an essential part of a sustainable company because it promotes the discovery of latent value while benefiting the environment, consumers and society at the same time, both now and in the future. There is a lot of enthusiasm for green manufacturing in the industry. There is a major shift in theory, recognition and emphasis. The consumption of energy, water and resources and the depletion of both from industrial processes must be recognized by companies. There are nevertheless numerous business gurus to whom one may consult. For example, on its website, BMW promotes its green manufacturing initiatives and lists green practices that go beyond the 1998 certification of ISO 14001. Instead of highly solvent paints, waste water is pre-treated before shipment to a local public water treatment plant and manufacturers are urged to fulfil environmental requirements, if feasible.

Toyota is another industry leader. Although the business is famous for hybrid vehicles, it's just half of the green equation. It is not just the final result in green production, it is also the process. The process has also grown more ecologically friendly. According to the North American Environmental Survey 2014 the business eliminated, used or recycled 95% of its own solid waste last year. Toyota's Georgetown assembly factory is set to generate green electricity from local waste gas starting this year, sufficient for 10,000 vehicles to manufacture every year. The five main categories addressed by the survey are carbon, water, materials, ecological and outreach. Regardless of the feature of green manufacturing, growth still exists. For example, companies are trying to utilize less hazardous chemicals.

Recently it has been shown that the climate problem is considerably worse than we thought before. Green production, a growing worldwide development with a sustainable, long-term sustainability potential, takes a comprehensive approach to environmental issues. With such strong differences of opinion among governments across the globe, it is essential to establish a common voice in the fight against the climate catastrophe. Manufacturing has become one of the climate's most important pollutants. This is where green industrial motifs appear. Green production focuses mostly on changing existing industries and manufacturing methods as well as the mentality of customers in

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order to reduce industrial exposure to climate change and other environmental issues. By the way, green is not an insignificant word. In manufacturing facilities, across the supply chain and amongst consumers there are practical methods to encourage environmental behaviors.

Emerging Green Technologies (EGTs), independent of country, are bringing about a technological revolution that impacts the whole globe. Emerging green technologies are those which have attained some technical sophistication but have low consumer penetration or those which are theoretically relevant to the daily life at the early stages of technological maturation. The Fourth Industrial Revolution (Industry 4.0) and the IOT Industrial Internet of Things (IIOT) provide new opportunities for innovation in developing renewable, energy decarbonization, digital concepts to achieve more and extend commodity life cycles within a 'zero waste-to-deposit' system. A smaller carbon footprint, together with technical developments which will enhance performance, durability and sustainability in the productive sector, including the supply chain, will result in reduced use of natural capital and energy and create the foundation for a global circulatory economy.

Energy savings are the biggest advantage of green manufacturing. In this scenario, environmental and economic benefits go hand in hand. It is said to have a bright future for decarbonizing energy. According to the latest Energy Transition Commission (ETC) study, "Mission Possible," it is a genuine objective to achieve net-zero emissions in mid-100. The advantages of incorporating environmentally sustainable initiatives into production are becoming increasingly apparent, which not only saves money and enhances performance, but also improves the image of your company, making it a good business citizen as increasing demand from customers for environmentally friendly goods and packaging.

In addition, supply and raw resources are shrinking and the adoption of cheap green products and methods is necessary in all industries. Businesses are also searching for chances to join the circular economy, which is the traditional economy's 'take, produce and disposal' answer. Circular companies retain products as long as they are able to maximize their profits and recycle and reuse things, minimizing waste and concentrating on green resources. The biggest effect on industry would be to invest in green industrial operations. Businesses who adopt a positive attitude will save a great deal of money. Machines and installations are becoming increasingly more energy efficient, which may have a long-term impact on profitability of a business. Many of the gear on a typical floor is heritage equipment that may hinder a business from meeting its green production targets.

In addition to the actual manufacturing process, there are additional alternatives for a manufacturer to conserve resources. On the market, there are clever lights that can detect the natural light in an area and only illuminate the areas that require it. Everything as important as proper screening of all air flaps and compressors will significantly reduce the overall energy consumption of a business. In fact, a reverse logistics strategy (RLS) frequently helps to reduce the quantity of raw materials used to produce new components or products. If a product reaches the end of its life cycle, reverse logistics implies it is returned to the vendor. Once the store has possession of the old product, the leftover raw materials may be broken down and safeguarded. The usage of goods otherwise discarded will decrease the money spent on creating new ones.

Manufacturers profit from reverse logistics, but may also decrease the amount of waste produced by them. Instead of producing products in landfills, manufacturers should guarantee that the reusable items are really reused. This is especially true in the area of manufacturing. Steel is one of the most recyclable goods in the world and operates on a low profit margin. The raw resources they can reuse, the more likely they are to return. If companies focus on renewable packaging and commercial operations, carbon footprints may be minimized. This may have significant tax implications and federal government advantages. Manufacturers may be eligible for additional advantages if they invest in renewable energy projects like wind turbines or rooftop solar panels. A producer not only produces its own power but is also compensated for any energy it returns to the grid.

Not only are manufacturers emphasizing the significance of being environmentally friendly. The public has demonstrated that they prefer to do business with a company that takes into account the environment throughout the manufacturing process. A company that invests a significant amount of time, energy and money to make sure its products are produced worldwide will interact with the public. A manufacturer's support to a green business will significantly enhance its marketing efforts. Explaining what they do to reduce the use of trash and energy will make it even more attractive for prospective customers. Although a completely sustainable large-scale manufacturing operation is a few years away, plants nevertheless minimize their environmental impact. Every day, the packaging sector is greener as companies engage in new technology that simplify processes, equipment that reduce power use, and continuing lean production. This green emphasis helps not only the environment, but the industrial industry as well.

3. CONCLUSION

Using the topic of green manufacturing, this article sought to bring the researcher's attention to the need of using green manufacturing, also known as green technology, in the pursuit of environmental development. The author spoke about the advantages of green production, as well as its applications and manufacturing methods. In addition to being utilized in building, renewable energy provides a safer alternative for daily and business requirements. The article also addressed green operations, which defined the environmental protection concept as well as the methods used to preserve the environment. The green supply chain is an extremely useful instrument since it helps to develop the green brand and strategic advantage while also improving the efficiency of the industry. It is anticipated that future collaborative research projects would focus on how to integrate a broader variety of measurable sustainability solutions inside the building, including lighting and pressured air intake, as well as determining how to incorporate fixed costs into decision-making processes.

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