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Contents

Introduction.....	2
Cost efficient manufacturing process.....	3
What is manufacturing efficiency?	3
The importance of manufacturing efficiency.....	3
Recommendations for more cost-effective manufacturing processes.	5
Plan to minimize defects throughout the manufacturing process	7
Causes and types of defects in the manufacturing process	7
The negative effects of defects in the manufacturing process	8
How to minimize defects in the manufacturing process	9
Proposing a greener manufacturing process that utilizes 21st century tools	11
Definition of green manufacturing process.....	11
Importance of having green manufacturing process.....	11
21th century tools for green manufacturing process.....	13
Developing a socially responsible guide for the big green tractor company.....	15
Industrial Standards on disposal of chemical waste.	17
Green Alternatives to traditional manufacturing process.	19
Conclusion	20
References.....	22

Introduction

Big Green Tractor Company is reaching out for recommendations on how to streamline their operations while reducing their environmental impact and production costs. The organization is also looking for ways to minimize defects throughout their manufacturing process, which will lead to improved quality and customer satisfaction. In response to these concerns, this report will provide recommendations on the use of 21st-century tools to create a greener manufacturing process and more cost-efficient production processes. To minimize defects throughout the manufacturing process, we will examine ways to adopt a preventive rather than corrective approach, suggesting measures to ensure the consistency and accuracy of the entire manufacturing process.

With the increasing concerns on global environmental issues and climate change, many companies are seeking ways to reduce their carbon footprint and operate in a more sustainable manner. As such, Big Green Tractor Company has recognized the need to adopt an environmentally friendly approach in their production process to reduce pollution effectively. This involves identifying and addressing the sources of pollutants from their operations and implementing measures to minimize their impact on the environment.

In this report, we will examine the sources of pollution from Big Green Tractor Company's production process and recommend environmentally friendly measures to minimize the impact of these pollutants. The recommendations will consist of the use of innovative technologies to reduce, reuse, and recycle wastes along with the implementation of sustainable processes for the management of hazardous chemicals. By adopting these measures, Big Green Tractor Company will operate in a more environmentally-friendly manner, ensuring a healthier and more sustainable future for future generations

Cost efficient manufacturing process.

What is manufacturing efficiency?

Manufacturing efficiency is defined as the level of productivity and output achieved by a company in a given period, measured against the number of invested resources, such as labor, energy, and raw materials. The ability to optimize production processes while reducing costs and resource use is a critical factor in determining manufacturing efficiency. In the context of Big Green Tractor Company, manufacturing efficiency involves the efficient use of resources to produce high-quality products while minimizing waste, reducing pollution, and keeping defects to a minimum. Slack, Chambers, and Johnston (2007) define operations management as "the planning, scheduling, and control of the activities that transform inputs into finished goods and services" (p. 24).

For Big Green Tractor Company, manufacturing efficiency also includes the ability to design and produce products that conform to customer requirements and expectations. This includes meeting quality standards, meeting delivery timelines and adhering to customer needs. The ability to consistently produce products that meet customer expectations is essential to the success of the organization, as it leads to repeat business and customer loyalty.

In summary, manufacturing efficiency for Big Green Tractor Company is the ability to utilize resources efficiently, minimize waste, reduce pollution levels, and produce high-quality, customer-driven products. By consistently improving manufacturing efficiency, Big Green Tractor Company can improve its competitiveness, increase customer satisfaction, and create a viable, sustainable business model.

The importance of manufacturing efficiency

Manufacturing efficiency is crucial for the success and profitability of Big Green Tractor Company as it directly impacts the organization's ability to meet customer expectations, achieve business goals, and remain competitive. The importance of manufacturing efficiency for the company can be seen from several perspectives.

First, efficient manufacturing processes lead to cost savings, which translate into higher profit margins for the company. By optimizing the use of resources and minimizing waste, the organization can reduce manufacturing costs, ultimately leading to higher profit

margins. This financial success can enable the company to invest in research and development, improving its capacity to create innovative and better products.

Secondly, efficient manufacturing processes lead to increased productivity, allowing the organization to produce more output without sacrificing quality while utilizing fewer resources. This increased efficiency can lead to improved customer satisfaction, which is essential in generating repeat business and fostering customer loyalty. "lean production is an approach that focuses on the efficient use of resources throughout the operations system" (Slack, Chambers, & Johnston, 2007, p. 216).

Finally, manufacturing efficiency is a critical factor in the organization's ability to remain competitive in the marketplace. By producing high-quality products at a lower production cost, Big Green Tractor Company can offer competitive pricing while maintaining a high level of profitability. This provides a competitive edge over competitors and ultimately helps the organization to remain competitive.

In conclusion, manufacturing efficiency is essential to the success and profitability of Big Green Tractor Company. By embracing efficient manufacturing processes, the company can reduce costs, increase productivity, foster customer satisfaction and maintain a competitive edge, ultimately leading to sustained business growth and profitability. "Minimizing waste in the manufacturing process is a critical factor in green manufacturing" (Dornfeld, 2012, p. 63).

Recommendations for more cost-effective manufacturing processes.

There are three areas to look at to streamline operations and manufacturing process, which will reflect on manufacturing efficiency. Reducing waste, Increasing quality and effective communication via technology and in general.

Reduce Waste

Waste in manufacturing processes happen in material and Labor cost, reducing waste shall be emphasized on reducing waste in both materials and labor cost, the first step in reducing waste in materials is through optimizing the design process, If the design phase is effective this will reflect on all other manufacturing processes.

Waste in labor cost can happen due to poorly trained workers, failure in equipment due to poor maintenance... all these reasons will increase labor costs.

The company can streamline operations through reducing the use of paper documents and depend on technology to provide such function, this will make everything in one place.

The company can reduce waste through organizing products offerings, when you simplify the number of products offered to customers, this will allow company to focus and increase quality and decrease waste.

The company can reduce waste through ensuring having clean workplace which leads to better quality work and happier workers.

Improve Quality

Improving quality shall happens on all stages of the operation process, improving quality starts by the design process.

the company must focus on the quality of raw materials as well, which considered the first step of manufacturing, the department responsible for ordering raw materials must have

checklist for quality control to make sure that the order is correct and the quantity is as ordered in addition to checking for any defects.

During production inspection shall be taking in different stages to ensure the quality of products manufactured, if a problems happened during any manufacturing stage, operations must be halted to avoid significant waste in materials or labor.

Improving quality have so much impact on customers loyalty and confidence in the company products because they know that there purchases will be the same with no defects and with the quality they needs,

Effective communication via technology or in general

Communication is very important in streamlining operations, the use of ERP systems can save a lot of time and provide greater coordination and smooth operations between different departments.

ERP systems can be very beneficial in inventory management, automating reorder of raw materials, replenish of materials. Avoid high inventory costs resulting from too much stock. The company can use mobile apps for communication and work orders which will add immediate notifications to all team members. If there's any problem in operation it can be handled fast before any escalation, furthermore, all employees will have access to data they need at their fingerprints rather than using a computer or seeking a manager. This will save a lot of time.

Every department must know its role and order in the manufacturing process to avoid any delay or waste, For example Raw materials must be ordered by parts department, the parts department must ensure that they have the needed inventory or ordering the right materials quantity and quality as requested by engineering department, the engineering department must be notified if there's changes in requests. To streamline operations high coordination

must be exist between these teams and their need must be communicated clearly so everything will run smoothly.

Using the right communication software gives immediate alerts to involved parties which will reflects on material and labor costs.

Plan to minimize defects throughout the manufacturing process

Causes and types of defects in the manufacturing process

Design defects

Poor design is the first reason to cause defects, any manufacturing company wants to reduce defects must start by design phase. Design defects doesn't mean that product was manufactured incorrectly, it means that the product was manufactured correctly but the defect was inherent in the design itself for example mechanical defects which may makes the product dangerous to customers.

Manufacturing defects

Manufacturing defects means that the product was manufactured incorrectly and there are many reasons that cause manufacturing defects for example Using the wrong material will contribute heavily in causing defects in the manufacturing process. In addition to wrong assemble of materials and parts, Poor maintenance of machinery and equipment, Poorly trained employees cause defects in the manufacturing process.

There are many types of manufacturing defects such as

Raw material defects

Raw materials defects means defects in the raw material used in the production process, poor raw material quality or different materials than required by engineering department.

Visual defects

defects in the appearance of any part of the finished product. The desired appearance of the finished product is not the same as designed.

functional defects

defects in the function or the purpose of the product that was intended previously in the design phase.

Assembly defects

defects in the ways products are assembled.

Construction defects

defects in the materials used in the construction of the product such as nails, screws, bolts and fasteners for example.

Harmful chemicals defects

Defects caused by the harm caused by chemicals used in the manufacturing process

Marketing defects

Defects that happens in the marketing, Sales or distribution of the final product.

The negative effects of defects in the manufacturing process

Financial Losses

More defects means more cost involved in fixing, discarding or repurposing defective products besides additional labor cost to rectify issues. All of these will lower bottom line in the income statement and decrease ROI, and consequently minimize shareholders wealth which is the main goal of company management.

Lowered Productivity and efficiency

Due to lost manufacturing time and increased cost and waste in materials as well.

Decreased customer satisfaction and Loyalty

Increased need to deal with customers complaints and possible litigations

Decreased company reputation

How to minimize defects in the manufacturing process

There are several methods to reduce defects in the manufacturing process. We can divide them into two groups: Early phase strategies and Late phase strategies. Early phase strategies focus on reducing defects before the manufacturing process starts, while late phase strategies focus on reducing defects during the manufacturing process.

Early Stage Strategies

Product Design

Reducing defects must start by design phase which is the earliest stage of operations, poor design can significantly affect defects levels, design defects is considered intentional defects. Juran and Gryna (1988) state that "quality is not free" (p. 231), emphasizing the costs associated with achieving and maintaining high levels of quality.

Manufacturing flexibility

Having a balance flexibility in the manufacturing environment can greatly have positive impact on reducing defects. Creating flexibility in manufacturing process can done through applying new manufacturing processes in different stages of production.

Late stage strategies

Inspection

Highly trained employees shall be involved in the inspection of the product through different stages of production process to understand the root causes of defects.

Preventive measures

Through ensuring the effectiveness, efficiency and accuracy of machinery and equipment in the operation process can greatly reduce defects before they happens.

The company shall make evaluation of suppliers and make sure that purchasing procedures are done properly. According to Heizer and Render (2014a), "Capacity planning is the process of determining the amount of capacity required to produce in the future" (p. 128).

Quality Control and quality audit

There must be a quality control teams who are responsible for applying strict quality procedures throughout the production process can heavily reduce defects in the manufacturing process.

The company shall conduct a quality audit or supplier review against ISO 9001 standards which will give valuable information about personnel training, purchasing procedures, production, process control, inspection, testing equipment and machinery, labeling packing and storage of final products and other stages in the production process.

According to Juran and Gryna (1988), "quality control consists of the practical techniques for highlighting quality problems, analyzing the causes, and taking corrective action" (p. 122).

Communication

The biggest strengths the manufacturing companies have is well organized and cooperative team members and effective communication between different departments such as parts department, engineering, design and engineering departments is very essential in the identification and prompt treatments of any defects in the product.

Proposing a greener manufacturing process that utilizes 21st century tools

Definition of green manufacturing process

Green manufacturing refers to the process of updating industrial practices to be more eco-friendly. Simply put, it's the practice of making industrial operations more environmentally friendly by limiting their impact on the environment through measures like lowering energy consumption, cutting down on waste, increasing recycling rates, and decreasing emissions.

The primary objectives of a green manufacturing firm are to: Use fewer natural resources; Reduce pollution and waste; Reuse and recycle materials; and Control emissions.

Those that are serious about making manufacturing more environmentally friendly must investigate, create, or use cutting-edge technological tools in order to learn which procedures will have the most effect on their bottom line while having the least negative effect on the planet.

Importance of having green manufacturing process

For community

The industrial production sector is responsible for a significant amount of the ever-increasing output of greenhouse gases. Green manufacturing has gained popularity over the years as a result of its adoption of environmentally sustainable techniques and its contribution to the reduction of pollution. The things a company does affect the social well-being of its community and the world as a whole. By supporting sustainable projects, businesses can reduce the amount of harmful chemicals they put into the air over time. Overall, the goal of green manufacturing is to change the world's carbon footprint and make the world a healthier place for everyone. "Green manufacturing is an essential component of creating a sustainable future" (Dornfeld, 2012, p. 1).

For the company

Transforming the manufacturing business is no easy task, but it is an essential step in reducing the imprint that society leaves behind. When "sustainability" is a primary focus in the day-to-day operations of a company, the implementation of environmentally friendly enhancements will yield long-term benefits for the manufacturer.

Reduce cost

Production that is more environmentally friendly requires less energy and fewer raw resources. Not only is there a benefit to the environment, but there is also a cost savings associated with lowering the amount of energy used and the waste of resources. Because of this, the firm has the chance to increase the efficiency with which it produces goods, reduce the amount of waste generated by its operations, and see an improvement in its financial position.

Increase Sales

Consumers pay attention to the environmental effect of a product, and according to surveys customer claimed that they are more inclined to buy a product that is designated as being environmentally friendly. In today's highly competitive industry, implementing environmentally friendly practices might help increase sales and satisfy customer needs. "Green manufacturing techniques lead to improved environmental performance and greater customer satisfaction" (Dornfeld, 2012, p. 107).

Increase employees motivation and enhance recruitment.

Workers like to have a positive reputation for the firm they work for, and a green business gives them that opportunity. Workers' health and wellbeing may be negatively impacted by indoor air pollution caused by inefficient production processes, leading to acute conditions and even long-term diseases in certain cases. Employees at green offices are more

motivated to get their job done because they know their employer values social responsibility as much as profit.

Having a good reputation may boost morale in the workplace by making workers feel like they are contributing to something worthwhile. If you don't like your job but know that the firm you work for is helping the environment, you'll have a lot easier time finding meaning in your work. It's tough to look on the bright side of things when you hate your job and your employer does little to reduce its environmental effect. Heizer and Render (2014a) emphasize the importance of sustainability in operations management, stating "Sustainable operations make good business sense" (p. 236).

21th century tools for green manufacturing process

The 21st century has brought with it an unprecedented level of technological advancement that has significantly changed the way businesses operate. While technological tools serve as a critical enabler of business growth and development, they also play a critical role in preserving the environment. In recent times, the concept of sustainability has gained momentum as more people become concerned about the impact of human activities on the environment. In this light, it is essential that businesses become more sustainable by adopting eco-friendly practices and utilizing innovative tools to mitigate their carbon footprint.

One company that could benefit from such an approach is the Big Green Tractor Company. This company is a medium-sized enterprise that specializes in the manufacturing of tractors, and it currently operates using an analog production process. As part of efforts to become more sustainable and environmentally conscious, the company is now considering the use of 21st-century tools to create a greener production process. This report will provide a

detailed overview of the relevance of such tools to the company and how they can be implemented.

One of the critical tools that Big Green Tractor Company could utilize in its production process is the use of renewable energy sources. The company could consider incorporating solar energy, wind energy, and hydroelectric power as alternative energy options to replace its use of fossil fuels. Renewable energy sources are an excellent option for the company because they are environmentally friendly and create no carbon emissions. Besides, the cost of renewable energy has significantly reduced in recent years, making them a cost-effective alternative.

Another 21st-century tool that the company could incorporate is the use of software applications and platforms designed to monitor and control energy usage. These applications enable companies to track their energy consumption and analyze patterns of energy usage, enabling them to identify areas of waste and inefficiency. Implementing energy monitoring software would help the company better manage its energy usage and reduce its energy expenses while also reducing carbon emissions.

In addition to renewable energy sources and monitoring software, the company could also adopt sustainable building practices for its facilities. This includes using eco-friendly materials for construction, installing energy-efficient lighting systems, and utilizing natural resources to reduce energy usage. Sustainable building practices lead to the reduction of environmental harm by reducing energy consumption and minimizing pollutants released from the building materials.

A further innovative tool that the company could incorporate is 3D printing technology. 3D printing is a digital production process that involves creating 3D objects from a digital file. This technology can be used to construct parts, components, and whole assemblies, replacing traditional manufacturing techniques. 3D printing is environmentally sustainable because it allows for recycling, eliminates waste, and uses biodegradable materials. Besides, it is a time-saving and cost-effective alternative to traditional manufacturing, making the production process more efficient.

Adopting a greener production process through the use of 21st-century tools offers numerous benefits to the Big Green Tractor Company. It serves as a positive step in fulfilling its commitment to sustainability, and it has the potential to save the company money. There are also additional benefits such as the improvement of the company's image and reputation among environmentally conscious customers.

Developing a socially responsible guide for the big green tractor company.

Developing a socially responsible operational guide for pollutants is crucial for Big Green Tractor Company. The organization must adopt a socially responsible approach that considers the impact of their pollutants on the environment and the neighboring communities.

The first step in developing this guide is to accurately identify the pollutants generated by their operations. This identification could be through an environmental impact assessment report or conducting a pollution audit. This assessment will enable the company

to determine the sources of pollutants, their composition, the levels of toxicity, and the severity of their impact on the environment.

The second step is to establish and implement standard operating procedures that will prevent pollution and protect the environment. This includes implementing measures such as proper storage, handling, and disposal of hazardous waste, adhering to environmental regulations, and implementing safety procedures. This will lead to the minimization of the environmental impact of their pollutants and enhance the safety of their operations.

The third step is to conduct regular monitoring, inspection, and testing of the environment, to assess the effectiveness of the established procedures in reducing environmental pollution. This will enable the organization to take necessary corrective actions, where necessary, to prevent pollution or reduce its impact on the environment.

The final step is to establish a sustainable corporate social responsibility (CSR) policy that prioritizes the protection of the environment and the communities around the organization. This policy should be communicated to all stakeholders, including employees, customers, suppliers, and investors. The organization can also consider partnering with local organizations or governments to develop environmental programs that would improve the quality of life of the surrounding community.

In conclusion, developing a socially responsible operational guide for pollutants is necessary for the Big Green Tractor Company. The guide should encompass the identification of pollutants, implementing standard operating procedures, conducting regular monitoring and testing, and establishing a CSR policy that prioritizes the protection of the

environment and community. By adopting this guide, Big Green Tractor Company will establish itself as a socially responsible organization that prioritizes sustainability and environmental responsibility.

Industrial Standards on disposal of chemical waste.

The safe disposal of chemical waste is an essential part of operating a responsible manufacturing company. Chemical waste generally refers to various forms of hazardous waste, such as explosive, flammable, corrosive, toxic, and reactive materials. Therefore, it is crucial to adopt industry standards and guidelines on the disposal of chemical waste for a safe and sustainable manufacturing process. According to Pichtel (2014), "Hazardous waste management involves identifying, accumulating, storing, transporting, treating, and disposing of hazardous waste" (p. 165).

The first step in disposing of chemical waste is to develop a comprehensive waste management plan. This plan should include standard operating procedures that cover the handling, storage, treatment, transport, and disposal of chemical waste. By developing a waste management plan, an organization can prevent environmental liability, protect employees, and reduce its carbon footprint.

The second step is to adhere to government regulations on chemical waste disposal. Environmental agencies usually provide guidelines and standard permits on how to handle and dispose of hazardous waste materials. These regulations ensure that the related industries do not harm human health nor the environment and help the organization meet its corporate social responsibility objectives.

The third step is to identify all hazardous waste produced from the organization's operations and categorize it based on the hazard type. Hazardous waste can either be ignitable, corrosive, reactive, or toxic. By identifying and categorizing the waste, an organization can develop effective measures and an appropriate strategy for safe disposal of the chemical waste.

The fourth step is to safely store hazardous waste materials. The organization must ensure that hazardous waste products are stored in durable containers that are appropriate for the type of waste and prevent any harm to the environment and employees. The containers used to store the hazardous waste must be sealed and labeled appropriately. They should also be located in an appropriate and safe location away from other activities in the organization to minimize accidents.

The fifth step is to treat or dispose of the chemical waste material. Depending on the type of hazardous waste material, various methods of disposal are used. These methods include recycling, incineration, landfills, and treatment processes such as chemical, physical, or biological treatment. Proper treatment and disposal of hazardous waste ensure an organization meets environmental regulations and reduces the environmental impact of their operations.

In conclusion, the industrial standards for the disposal of chemical waste require organizations to adhere to ethical and legal guidelines while producing products and services. The disposal of chemical waste must be an essential component of the waste management system of an organization. The safe disposal of chemical waste materials will not only help to reduce the negative impact on the environment and human health but also improve the

organization's reputation. Therefore, an effective waste management plan that ensures adherence to government regulations and the use of appropriate techniques in the disposal of hazardous waste materials is necessary to ensure the safe and sustainable operation of Big Green Tractor Company.

Green Alternatives to traditional manufacturing process.

In the push for sustainability, organizations are seeking green alternatives that can help to reduce their carbon footprint. These alternatives can be implemented in the manufacturing process to achieve sustainability and reduce the environmental impact of the manufacturing process. As such, Big Green Tractor Company can adopt green alternatives in their manufacturing process.

One green alternative is recycled materials. The use of recycled materials such as plastics, metals, and paper can help the organization to reduce its environmental impact by cutting down on the use of raw materials. Recycled materials provide the same quality and functionalities as new materials, thus reducing waste at the production level.

Another green alternative is the use of bio-based materials in the manufacturing process. Bio-based materials include renewable resources such as vegetable oils, corn starch, and recycled food waste. These materials are renewable and easily biodegradable, making them environmentally friendly.

The third alternative is to reduce the use of energy. Big Green Tractor Company can implement measures to reduce the amount of energy consumed in the manufacturing process, such as using LED lighting and energy-efficient machinery. Investing in energy-efficient

measures will not only help to reduce the carbon footprint but also cut down on production costs.

The fourth solution is for the company to shift to low-emission power sources. This energy source switch can come from using solar technology or hydroelectric power to supplement or replace traditional energy sources like coal or oil. These power sources are renewable and leave minimal carbon footprint behind.

The fifth solution is to design products with the environment in mind. Big Green Tractor Company can implement eco-design principles in the production of their products, making the manufacturing process more sustainable. Eco-friendly designs can be implemented, such as designing products that are smaller and lighter or designing products using biodegradable materials.

Conclusion

In conclusion, streamlining Big Green Tractor Company's operations requires a multifaceted approach that emphasizes sustainability, cost efficiency, and quality control. Adopting lean manufacturing principles, implementing Quality Control techniques, and utilizing 21st-century tools can help to create a more sustainable and efficient manufacturing process. These recommendations will help the organization to minimize waste, reduce their carbon footprint, and improve overall product quality, thus leading to increased customer satisfaction, a more competitive edge, and a healthier future for all.

There are various green alternatives that Big Green Tractor Company can adopt in their manufacturing process to achieve sustainability. The implementation of these alternatives has benefits that include reducing waste, minimizing environmental impact and

lowering production costs. Therefore, Big Green Tractor Company should identify sustainable alternatives that can be implemented in their manufacturing process and make the necessary investments to ensure a greener and more sustainable future.

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