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INTRODUCTION

In order to ensure real growth and opportunities in the labor market, it is necessary to apply the organizational sustainability system, which may result in some challenges facing companies and organizations that want to implement it, and for this reason, Big Green Tractor management is making strenuous efforts to implement it. Organizational sustainability includes corporate social responsibility, streamlining operations, and environmental responsibility.

Purpose of the Recommendations Report.

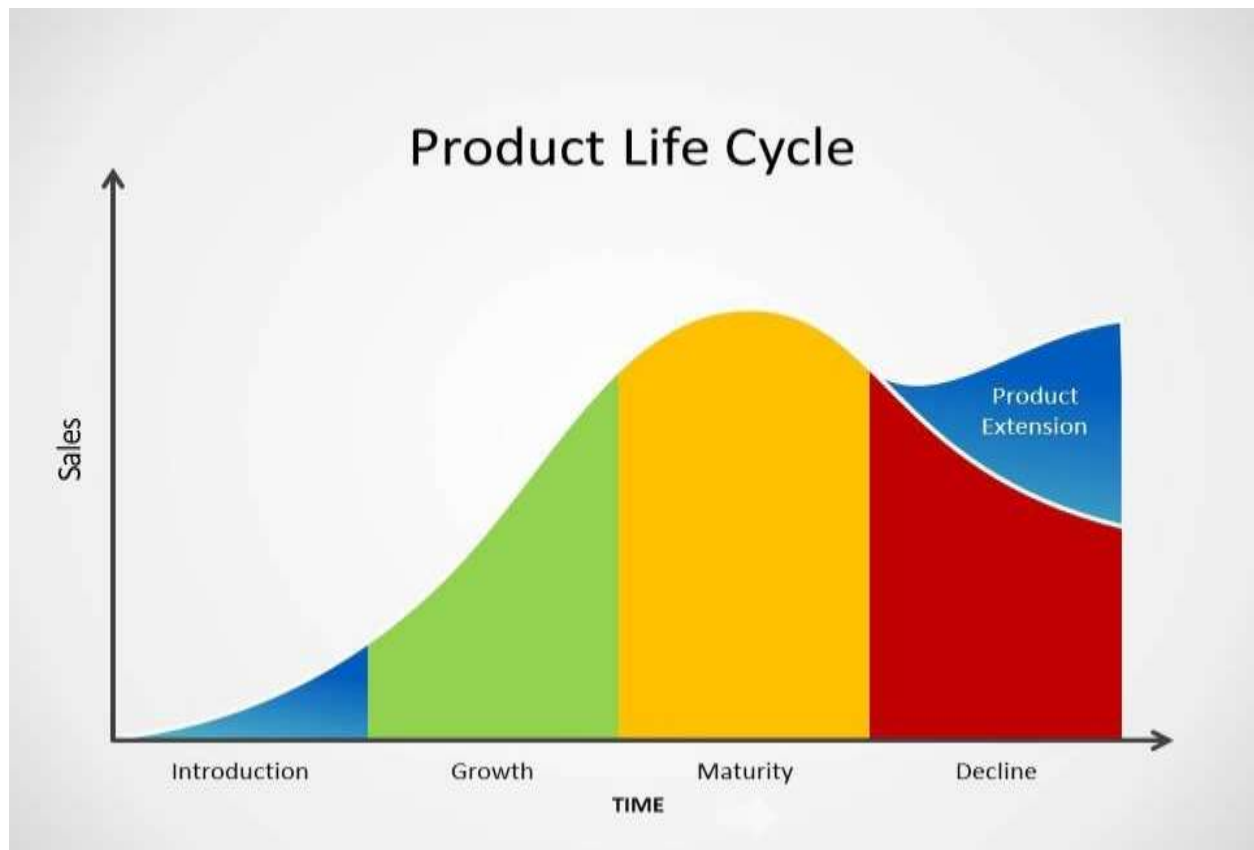
- SWOT & PESTEL analysis to find out the strength and weaknesses as well as the overall situation in the industry.
- Provide several recommendations that can be used to address the issues and challenges currently existing within Big Green Tractor.
- Recommendations for measures for a cost-effective manufacturing process.
- Different plans and practices to reduce defects within Big Green Tractor manufacturing process.
- Important 21st century tools for Big Green Tractor.
- Environmentally friendly methods that can be considered in Big Green Tractor to address the challenges it faces.
- Strategies for maintaining industrial standards for chemical waste disposal.
- Green alternatives to the conventional manufacturing process in the report.

THE BIG GREEN TRACTOR

The Big Green Tractor is an industrial tractor company located in Palembang (Indonesia). The company has been facing declining growth in the recent years and would like to streamline its operations to be more efficient. It is old company As it passed through the three product stages (Product Introduction, Growth, Maturity)and is facing the fourth stage (Decline).

Big Green Tractor plans to Product Extension throughout 2 main factors.

1. Create an operational industrial streamline procedural guide.
 - The recommendation should include more cost-efficient manufacturing processes.
 - A through plan to minimise defects throughout the manufacturing process.
 - The use of 21st century tools to create a greener process.
2. Develop a socially responsible operational guide.
 - Industrial standards on disposal of chemical waste.
 - Green alternatives to traditional manufacturing process.



PALEMBANG

Palembang, which is the capital of South Sumatra Province (Indonesia), has an area of about 352.51 square kilometers. It is primarily a river city and is located on both banks of the Musi River in the eastern lowlands of South Sumatra.. It had a population of 2,7 Million at the 2023, Palembang is the second most populous city in Sumatra, after Medan, and the twelfth most populous city in Indonesia.

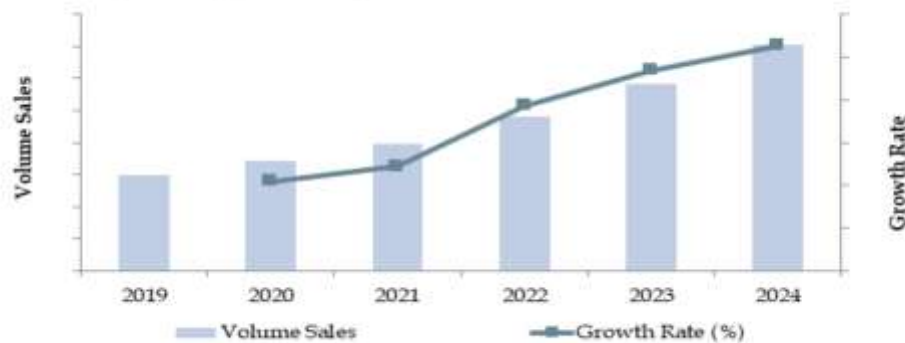
During the analysis, it was found that the tractor industry in Indonesia is a growing industry, which increases Big Green Tractor opportunity for development and modernization.

Indonesia Agriculture Equipment Market Overview and Size

The Indonesia agriculture equipment market reached a valuation of IDR 50 Trillion in 2023, driven by the increasing mechanization in farming, government support, and the growing demand for efficient farming solutions. The market is characterized by major players such as Kubota, Yanmar, John Deere, and New Holland. These companies are recognized for their extensive distribution networks, diverse equipment offerings, and customer-focused services.

In 2023, Kubota introduced a new range of compact tractors specifically designed for small to medium-sized farms, aiming to enhance efficiency and productivity. This initiative seeks to cater to the rising demand for more adaptable and effective agricultural equipment in Indonesia. Jakarta and Surabaya are key markets due to their high agricultural activity and well-developed infrastructure.

Market Size for Indonesia Agriculture Equipment Industry on the Basis of Sales Volume in Units, 2018-2024



Source: TraceData Research Analysis.

Name	Founding Year	Headquarters
PT Kubota Indonesia	1972	Jakarta, Indonesia
Yanmar Indonesia	1970	Jakarta, Indonesia
PT Pindad (Persero)	1983	Bandung, West Java
PT Rutan	1942	Surabaya, East Java
Mitra Agro	1980	Jakarta, Indonesia
PT United Tractors Tbk	1972	Jakarta, Indonesia
PT Trakindo Utama	1970	Jakarta, Indonesia
Satrindo Mitra Utama	1980	Jakarta, Indonesia
PT Altrak 1978	1978	Jakarta, Indonesia
New Holland Agriculture (CNH Industrial)	1999	Jakarta, Indonesia

PESTEL ANALYSIS

Political Factors, Palembang

- **Stable Governance:** Under the umbrella of the decentralized system of the Indonesian government, which provides it with an independent environment in infrastructure as well as in economic development.
- **Infrastructure:** The government is working on investing in roads, bridges as well as railway lines.
- **Foreign Investment:** The government is currently encouraging foreign investment.

Economic Factors

- **Promoting tourism:** Attracts local and foreign tourists.
- **Strategic commercial location:** Palembang is a major commercial and logistics center.
- **Agricultural and industrial sector:** The engine of the local economy is agriculture, palm oil, rubber, and manufacturing.

Technology

- **Digital economy & Electronic commerce:** Increasing Internet involvement in business as well as financial technology due to increased Internet penetration.
- **Smart Cities:** Government digitizes government services and continuously improves.
- **Manufacturing and Automation:** Significant growth in industrial automation, with a focus on the oil and gas sectors.

Social Factor

- **Skilled workforce:** Due to the presence of universities and technical institutes, which leads to attracting capital and investment.
- **Diverse culture:** It is a place where Malaysian and Chinese cultures meet,
- **Urbanization trends:** Increasing awareness and interest in education, housing and healthcare.

Environmental Factors

- Risk of Flood risks: require water solutions due to its exposure to floods due to its location on the banks of the river.
- Deforestation concerns: due to the expansion of palm oil plantations, which increases environmental risks.
- Fog and air pollution: due to seasonal forest fires, which leads to air pollution and poor quality.

Legal Factors

- Environmental policies: Laws have become more stringent than before in order to combat deforestation and reduce/control pollution.
- Business regulations: Although bureaucracy still exists, there is a trend towards improving the ease of doing business.
- Labor laws: There is labor protection, which affects wages.

SWOT ANALYSIS

In SWOT analysis, we are going to analysis deeper in our strength, Weakness, opportunity and Threats all of t Big Green Tractor.

Strength

- Has a market share, as it passed through the three product stages (Introduction, Growth, and Maturity) and is facing the fourth stage (Decline).
- Experience in the market.
- Intend to use more cost-efficient manufacturing processes & 21st century tools to create a greener process.
- Intend to be more environmentally friendly.

Weakness

- Facing declining growth in the recent years.

- Using traditional industries & no continuous improvement.
- Setting many Big objectives in the same time.

Opportunities

- Increasing the market share of tractors worldwide.
- Using 21st century technology to increase its market share.
- Encouragement by organizations interested in preserving the environment with environmentally friendly alternatives as well as waste management.
- Palembang is a major commercial and logistics center.
- Skilled workforce: Due to the presence of universities and technical institutes, which leads to attracting capital and investment.

Threats

- Business regulations: Although bureaucracy still exists, there is a trend towards improving the ease of doing business.
- Labor laws: There is labor protection, which affects wages.
- Competitors, many qualified compactors from India, USA with advanced technology.

MANUFACTURING PLANNING

Any manufacturing process requires clear master plans that contribute to the efficiency, effectiveness and economic cost of the production process.

Scheduling

- Is a planning with specific time frames and a time sequence for production activities and ensures that the implementers carry out their responsibilities in an organized manner and according to SOP.

Resource coordination

- Everything related to managing the system of machines, workers and materials.

Material planning

- Ensuring the supply of materials on time and in the required quantity accurately necessary for the production.

Logistics planning

- Logistics planning to organize the movement of materials and components as well as final products within the facility.

Personnel Management

- Selecting, appointing and organizing employees.

Inventory Management

- Inventory management is based on maintaining a balance between raw materials, the production process and the final product.

Quality Control

- Implements all measures to monitor and ensure quality starting from the raw materials supplied to the facility to the final product.

Decision Support Systems

- Makes the necessary decisions and visions to ensure the smooth running of the production process as well as the allocation of resources and plans.

COST-EFFICIENT MANUFACTURING PROCESS

Big Green Tractor Company intends to develop its manufacturing processes by focusing on simplifying the manufacturing processes .We will list several practices that are mentioned in detail in this study such as :-

- Six sigma.
- Lean Management.
- Total Quality Management.

OPERATIONS MANAGEMENT

Operations management (OM) is the administration of business practices To make the level of efficiency high within the Big Green Tractor. Operations management is concerned with raising the efficiency and quality of the entire system of labor, materials and services to the highest possible level of efficiency and reducing costs of all kinds and determining the added and non-added value:-

- Value Added: all activities related to the product, services / output (customer)..
- Non-Value Added but Essential: HR, PR, Security....
- Non-Value Added and Not Essential: Big Green Tractor must reduce or get rid of it.



OPERATION OF A TRANSFORMATION PROCESS

Here we list the eight most important basic factors needed to develop effective and highly efficient operations that will help Big Green Tractor to increase the efficiency of operations.

Operations as a Transformation Process



- MANPOWER : It is the labor force of all types and employees related to production and implementation of services. Attention must be paid to raising their efficiency and skills.
- MACHINERY: It is everything that includes equipment and machines that enter into the operations and production. Attention must be paid to maintenance schedules as well as periodic calibrations, fault detection and replacement.
- METHODS: It is the approved methods that are required for the production or service process and must be updated when necessary.
- MATERIALS: It is all the inputs necessary for the production process and focus must be on their quality, effectiveness and availability in the appropriate quantity.
- MEASUREMENT: All measurements/evaluations used to evaluate the product, which ultimately serve the product's interest and conformity to the company's specifications.
- MOTHER NATURE: Environmental factors that may affect the production process, and we do not neglect medical disasters and health crises, as well as climate and other environmental factors.
- MONEY: All types of financial resources required for the production process and how the company manages these funds.
- MANAGEMENT SYSTEM: It is the system for managing the production process in all its stages, which must be updated continuously in the event of any new inputs, new technology, or a change in the production process.

SIPOC

One of the tools of the definition phase in the DMAIC methodology in Lean Six Sigma that , Big Green Tractor can use to understand and define the process flow from start to finish before starting work. It summarizes the inputs and outputs of one or more processes in the form of a table.

- It emphasizes putting the customer's needs first.
- Useful as a tool to ensure that the project manager and the project sponsor have the same understanding of the process.
- A simple tool that provides an overview of a process or product (all elements associated with the project) in a visual form and knows exactly what is currently happening and what needs to be done from a facilities management perspective in continuous process improvement.

S	I	P	O	C
SUPPLIERS	INPUTS	PROCESS	OUTPUTS	CUSTOMERS
Who supplies the materials / inputs?	What resources are needed or provided by the supplier? Can be materials or information.	What steps or activities are carried out to create value for the customer?	What products or services are created by (or result from) the process?	Who are the customers?

The SIPOC diagram abbreviation consists of:-

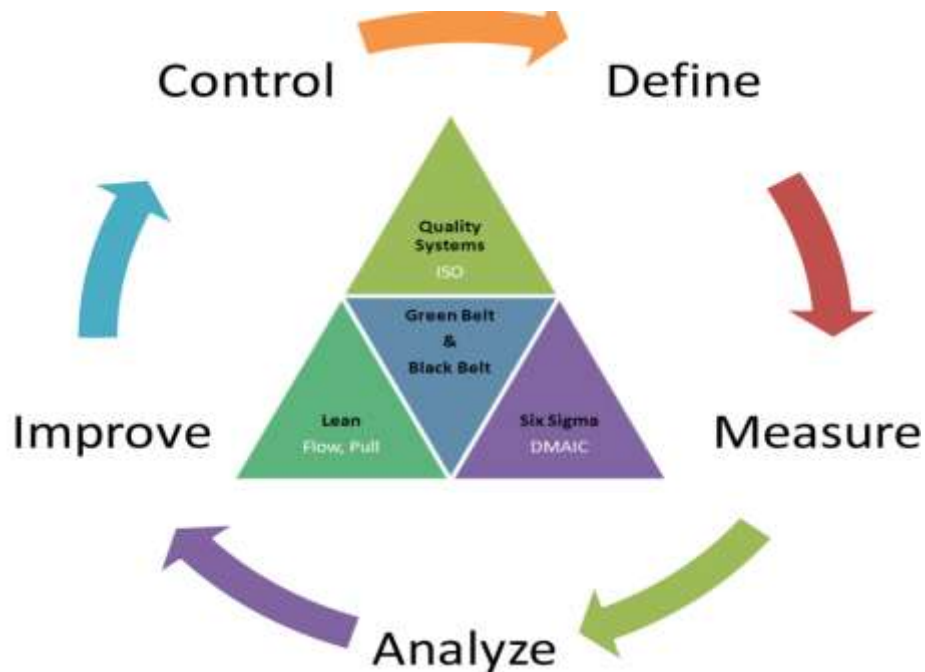
- SUPPLIERS: internal or local, such as the relevant departments such as engineers, technicians, and administrative departments.
- INPUTS: information and resources that the customer needs, such as raw materials, machines.
- PROCESSES: the means or methods that transform inputs into outputs to meet the customer's needs.
- OUTPUTS: the result of the customer's needs (service or product).
- CUSTOMERS: internal or external customers (the end user) of this process.

SIPOC uses in continuous improvement in facility management include:

- Space planning in the workplace.
- Change management (strategies) in general.
- Project management (including renovation and construction projects).
- In simple terms, such as rationalizing spending efficiency or rationalizing energy consumption by changing fluorescent bulbs to LED bulbs in the facility.
- Implementing a sustainable facility design plan.

SIX SIGMA

Six Sigma is a powerful methodology for process improvement and quality management in Big Green Tractor.



- Define :
 - The team define each process.
 - Focus on, project goals, scope, and deliverables.
 - The problem and how to solve.
 - Develop a high-level process map.
- Measure
 - Conducting process observations.
 - Collect data to quantify the current state of the process.

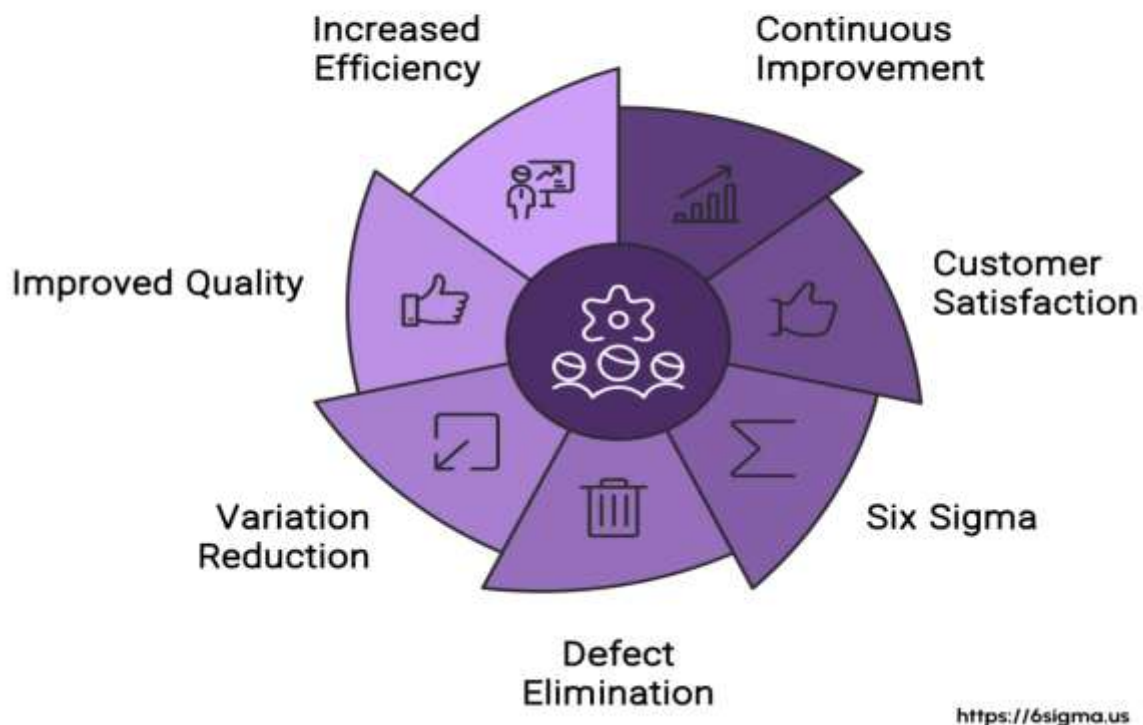
- Measurement of process performance.
- Analyze
 - Identifying root causes of defects or variations in the process.
 - Analyze data and pinpoint areas for improvement.
- Improve
 - The improvement phase is the phase in which solutions are developed and implemented.
 - Teams brainstorm potential solutions.
 - Implement changes that will result in significant process improvements.
- Control
 - Ensures that gains are sustained over time.
 - Process documentation.
 - Standard operating procedures (SOPs).
 - Performance metrics.
 - Continuous monitoring and auditing
- Verify, Final step
 - Validate the success of the project by comparing post-improvement data to pre-improvement data.
- By Implementing six Sigma the Big Green Tractor will have great benefits including:-
 - **IMPROVED QUALITY:** By reducing defects and variations, Six Sigma helps improve product and service quality.
 - **INCREASED EFFICIENCY:** Streamlining processes leads to increased efficiency and reduced waste.
 - **COST SAVINGS:** Fewer defects and higher efficiency translate to cost savings for organizations.
 - **CUSTOMER SATISFACTION:** Delivering high-quality products and services leads to increased customer satisfaction and loyalty.
 - **EMPLOYEE ENGAGEMENT:** Involving employees in process improvement initiatives fosters a culture of continuous improvement and engagement.

TOTAL QUALITY MANAGEMENT (TQM)

It is a system that is an administrative framework that will lead Big Green Tractor to long-term success by raising the efficiency of all employees and improving quality at all stages, starting from raw materials to the final product and even after-sales services.

Minimize defects throughout the manufacturing process.

Total Quality Management Tools





Prevention Activities (Costs)		Appraisal Activities (Costs)	
Design Prevention		Supplier Management Appraisal	
Design Qualification Testing	FTA, FMEA & FMECA	Receiving Inspection	Source Inspection
Market Research	Field Evaluation or Testing for New Products	Routine Supplier Audits	Routine Supplier Surveys
Prototype Testing & Iteration	New Product Design Review & Analysis	Operations Appraisal	
Design Review Meetings	Design Validation & Verification	In-Process Testing	Finished Goods Inspection
Equipment Fixture Design	Defect Proofing (Poke-Yoke)	Laboratory Testing	Equipment Setup Inspection & Testing
Supplier Management Prevention		Measurement Equipment Costs	Destructive Testing Material Costs
Supplier Evaluation	New Supplier Qualification	Quality Appraisal	
Supplier Capability Surveys	Supplier Reviews, Ratings & Quality Planning	Product Audits	Periodic Review of Documentation
Supplier Scorecard	Supplier Quality Agreements	Control Charts & SPC	Maintenance & Calibration of Test Equipment
Operations Prevention		Review of Inspection Data	Process Monitoring & Control
New Employee Screening	New Employee Training & Education		
Controlled Storage	Internal Process Capability Evaluations		
Developing a Process Control Plan	Predictive Equipment Maintenance		
Quality Prevention			
Quality Planning	Quality Education & Training		
Quality Improvement Projects	Process Qualification, Validation & Verification		
Procedure Writing	Implementation of a Quality Data System		
Quality System Audits	Development of Quality Control Plans		
Internal Failure Costs		External Failure Costs	
Scrap or Sorting	Rebuilding or replacing Equipment tooling	Warranty Costs	Customer Complaints & Investigation
Re-work or re-processing	Scrap or Rework due to Design Change	Repair Costs	Product Liability & Legal Fees
Re-inspection or re-testing	Root Cause Investigation Support Costs	Customer Returns or Rejects	Overhead Cost of Field Service Team
Extra Material Handling	Lost Equipment capacity due to downtime	Lost Sales & Customers	Product Recalls & Market Actions
Excess Inventory Costs	Labor losses due to equipment downtime	Product Service Calls	Loss of Reputation or Goodwill
Excess Capacity Needs	Rejected or Downgraded Raw Material		
Supplier Corrective Actions	Internal Corrective Actions		
Material Review Board	Employee Turnover		

The total cost of quality can be categorized in one of four Cost of Quality Categories.

- Two of the four categories, PREVENTION & APPRAISAL COSTS, are called the Cost of GOOD QUALITY because they are costs that ensure that the product is built right the first time.
- The other two cost categories, INTERNAL & EXTERNAL FAILURE COSTS, are called the COST OF POOR QUALITY are a penalty companies pay when they don't build product right the first time. These are called the Cost of Poor Quality. The optimum cost situation is when the Cost of Poor Quality is zero.
- Total cost of quality is reduced through the reduction of variation, even if that variation is within the specification.
- Once the optimal point is reached, the cost of increased quality programs far outweighs the incremental benefit realized.
- The quality programs of Big Green Tractor should be implemented in the order of most effective to least effective. Graphically, it can look like this:



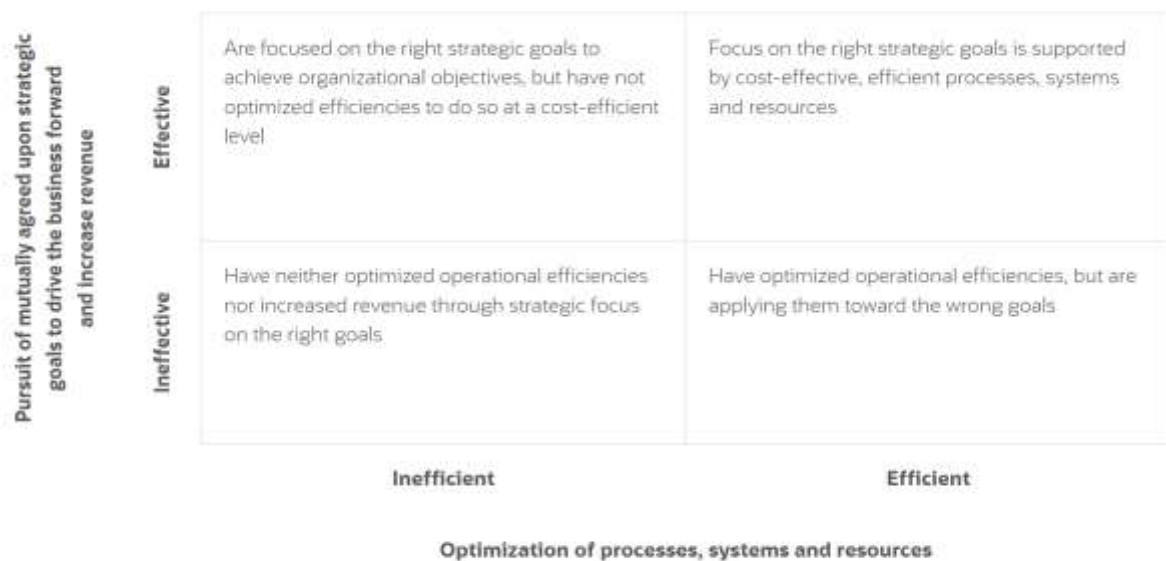
IMPROVING EFFECTIVENESS INCREASES EFFICIENCY

Professionally, effectiveness and efficiency should be improved and developed at the same time. The end result is a more efficient and productive management and team with professional communication that leads to everyone working to improve processes.

Management should follow up on processes and simplify them to the point that simple processes are produced that are far from complex.

Efficiency and effectiveness are two terms that are most commonly used in management.

- Efficiency: is a broader concept than efficiency and is related to the extent to which work is done in order to achieve the desired or targeted results. In other words, we can say that it is the extent to which someone or something is successful in achieving the desired result.
- Effectiveness It is the extent to which the work or employee is accomplished in order to achieve the desired or targeted results, regardless of other measurements.
- Efficiency Effectiveness & are used for assessing the performance of the employees in Big Green Tractor .



This graphic shows how to map efficiency and effectiveness in a matrix.

Criteria	Efficiency	Effectiveness
Implication	Producing the same results with fewer resources	Pursuing and achieving strategic goals that drive business success
Focus	Optimizing processes and systems to streamline operations	Mutually agreeing on goals and communicating strategic objectives to the entire organization
Example	Sales team has a low close rate but a high call volume	Sales team has a high close rate but a low call volume

Increasing the Machine Productivity.

Machine Productivity (MP) = Total Parts Created / Total Machines Hours.

Optimizing the Equipment Productivity.

- Machine quality selection.
- Machine layout.
- Machine maintenance programs / periodical / onetime.
- Selection of operators / workers.
- Improve Training.
- Conduct Process Reviews.
- Develop Condition-Based or Predictive Maintenance Strategies.
- Focus on Machine Utilization.
- Improve Communication.

Efficiency	Effectiveness
Definition	
Efficiency refers to the act of performing activities with minimum wastage of time and optimum usage of resources, so that the work done is faster and in an error free manner.	Effectiveness is the extent to which someone or something is successful towards meeting the desired outcome.
Focuses on	
Doing the assigned task in a correct way	Doing the assigned task accurately
Focuses on	
Efficiency is focused on the inputs and outputs	Effectiveness is focused on the extent to which work is done and the end result achieved
Effort oriented	
Efficiency is effort oriented	Effectiveness is not effort oriented
Oriented towards	
Efficiency is more operation oriented	Effectiveness is more strategy oriented
Time oriented	
Efficiency is time oriented	Effectiveness is not time oriented

COST-EFFICIENT MANUFACTURING PROCESS

Reduction in material cost:

- One of the most important steps that Big Green Tractor will take is to reduce the final costs of materials (raw materials - equipment - spare parts) as well as the prices of supply contracts with subcontractors as well as the prices of services.
- This is done through professional negotiators and bidding and choosing the lowest with the highest quality and ensuring that there are no common interests between negotiators and suppliers.

Automation:

- One of the recommendations that can be implemented by Big Green Tractor Company that can be integrated into the manufacturing and assembly processes , painting even if it is not in a large percentage, but its application, even gradually, reduces costs, reduces errors, increases quality and ensures similarity of the final products . (Gallman, 2011).

Implementing lean manufacturing:

- Among the recommendations are lean manufacturing practices to control manufacturing cost as mentioned earlier, which is to eliminate Non-Value add and not essential (Lee, Speight & Loyalka, 2014).

Selling scrap to sellers

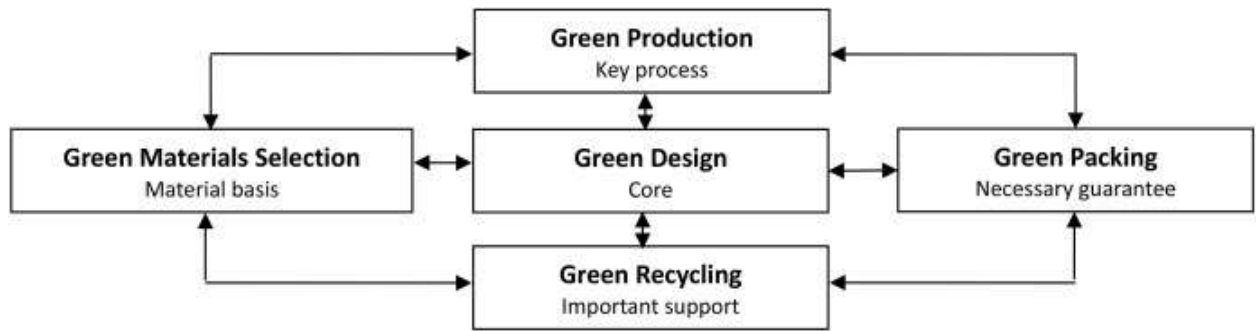
- One of the important recommendations that may be considered a source of benefit for Big Green Tractor is to make the most of the scrap. It is first sorted by specialized individuals and retrieve what can be manufactured before storing it.
- Separate the types of scrap and auctions are held to sell scrap and supervised by professional negotiators and choose the highest price and ensure that the negotiators and those in charge of the sale are not benefited by the buyers.

Reducing energy consumption:

- Among the recommendations are the use of
- Modern electrical systems that reduce the rate of energy use through smart panels
- Using a modern lighting system
- You used energy alternatives such as solar energy(Davim, 2012).

USING 21st CENTURY TOOLS TO CREATE GREENER OPERATIONS

There are several 21st century technologies and tools that could be of great benefit to Big Green Tractor and enable greener operations. Examples include the following:-



Use renewable energy

- Using renewable energy sources to power production will reduce emissions during production processes of Big Green Tractor .
- Using energy from renewable sources, such as wind, solar, geothermal or hydroelectric power, to power green manufacturing plants.

Reduce energy use

- Use different strategies to reduce overall energy use and improve energy efficiency.
- Use efficient equipment alternatives, such as installing smart LED lighting or insulation, to reduce usage and save energy costs.
- Use energy management software Tracking software to monitor energy consumption and predict future energy use.

Use lean manufacturing and green technology

- Focus on efficiency and waste reduction.
- Green technologies, which reduce the impact of industry on the environment, can support

flexible manufacturing.

- The use of smart sensors to collect data and analytics software can provide key insights into preventing equipment failures, managing inventory, and general ways to streamline production.

Source sustainable materials

- Further reduce your carbon footprint.
- Produce sustainable products using environmentally friendly resources, such as non-toxic or plant-based raw materials.
- Packaging uses responsibly sourced materials, such as recycled or reused paper instead of pulp made from virgin wood chips.

Design for the full product life cycle

- Reduces waste by designing products for reuse or recycling.
- Keeps usable resources out of landfills.

Process Mass Density Calculator:

- One of the tools that can be used to ensure greener processes in production.
- It is a highly efficient tool during the manufacturing of tractors within the production areas.
- The analysis of the process mass density index provided by the tool will indicate the need for investment for the organization to purchase a particular item (Sharma & Bandichhor, 2017).
- Big Green Tractor can benefit from it in the specifications of tractors and reduce the purchase of materials and thus reduce the emission of toxic substances and energy consumption.

Robotics and Software:

- The use of robots is one of the most important technologies used in modern manufacturing.
- The use of robots is an indicator of green practice.
- Robots can assess carbon emissions.

- The use of robots and machines and the use of smart programs in the organization's production and assembly lines to address waste management issues and implement greener practices. (Couto, Plansky & Caglar, 2017).

Reagent Guides and Solvent Selection Tools:

- Big Green Tractor can modernize its manufacturing processes and use Reagent Guides and Solvent Selection Tools.
- There are many materials in the manufacture of tractors such as paints, acids, bases and many others (Neu, 2013) that always need different measurements and with high accuracy the outputs of these tools can be analyzed to select the chemicals that may have the lowest toxicity level and the least harmful effects on the environment and people.
- The use of modern reporting and software can help in the application to create greener processes.

ENVIRONMENTAL MANAGEMENT SYSTEM

For greener industries, Big Green Tractor shall have an ENVIRONMENTAL MANAGEMENT SYSTEM to promote knowledge, awareness and competence for protection of the environment of their staff through education and training. They shall ensure training for emergency preparedness and response in case of environmental incidents. Big Green Tractor responsibilities:-

- Establish, maintain and communicate an environmental policy that is consistent with the environmental policy established by Ministry of Environment (Indonesia) programme.
- Document their environmental management in SOPs or other relevant documents and ensure that all personnel are trained and aware of relevant environmental requirements;
- Maintain records of environmental nonconformities and incidents and manage nonconformity.
- Environmental Management System, including the minimum requirements as followings:-
 - Environmental Policy.
 - Planning (Environmental Aspects, Legal and Other Requirements, Objectives, Targets and Programme(s)).

- Implementation and Operation (Resources, Roles, Responsibility and Authority, Competence, Training and Awareness, Communication, Documentation, Control of Documents, Operational Control & Emergency Preparedness and Response).
- Checking (Monitoring and Measurement - Evaluation of Compliance - Nonconformity, Corrective Action and Preventive Action - Control of Records - Internal Audit
- Act / Management Review.
- Environmental Manual.
- Environmental Aspects & Impacts.
- Environmental Procedure.

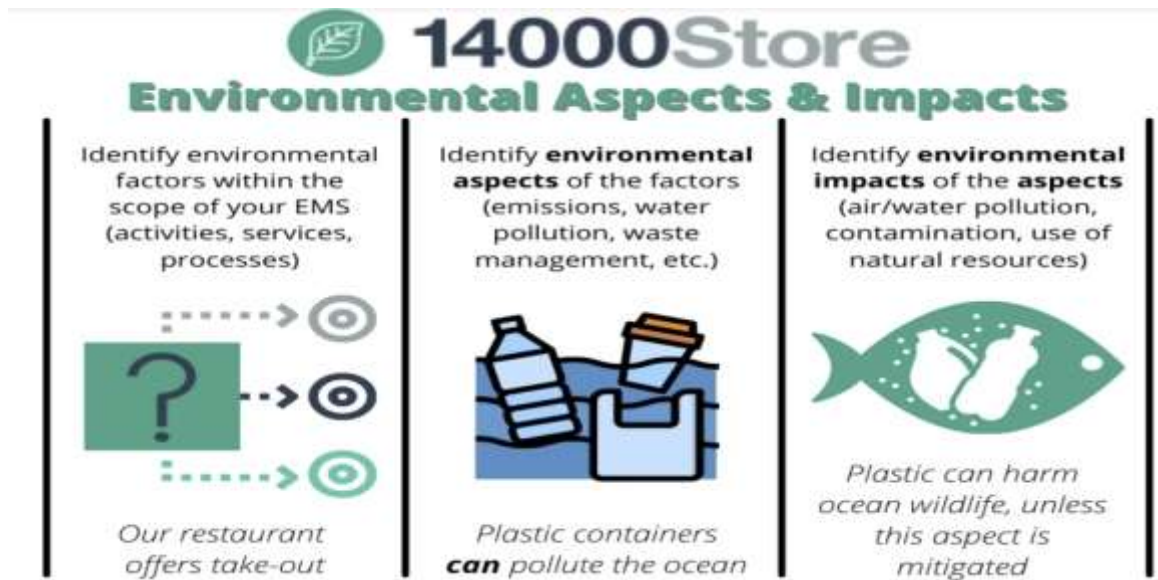
ENVIRONMENTAL ASPECTS & IMPACTS TO CREATE GREENER OPERATIONS

An environmental aspect :

is defined in ISO 14001:2015 as an element of an organization's activities, products or services that may impact, or does impact, the environment.

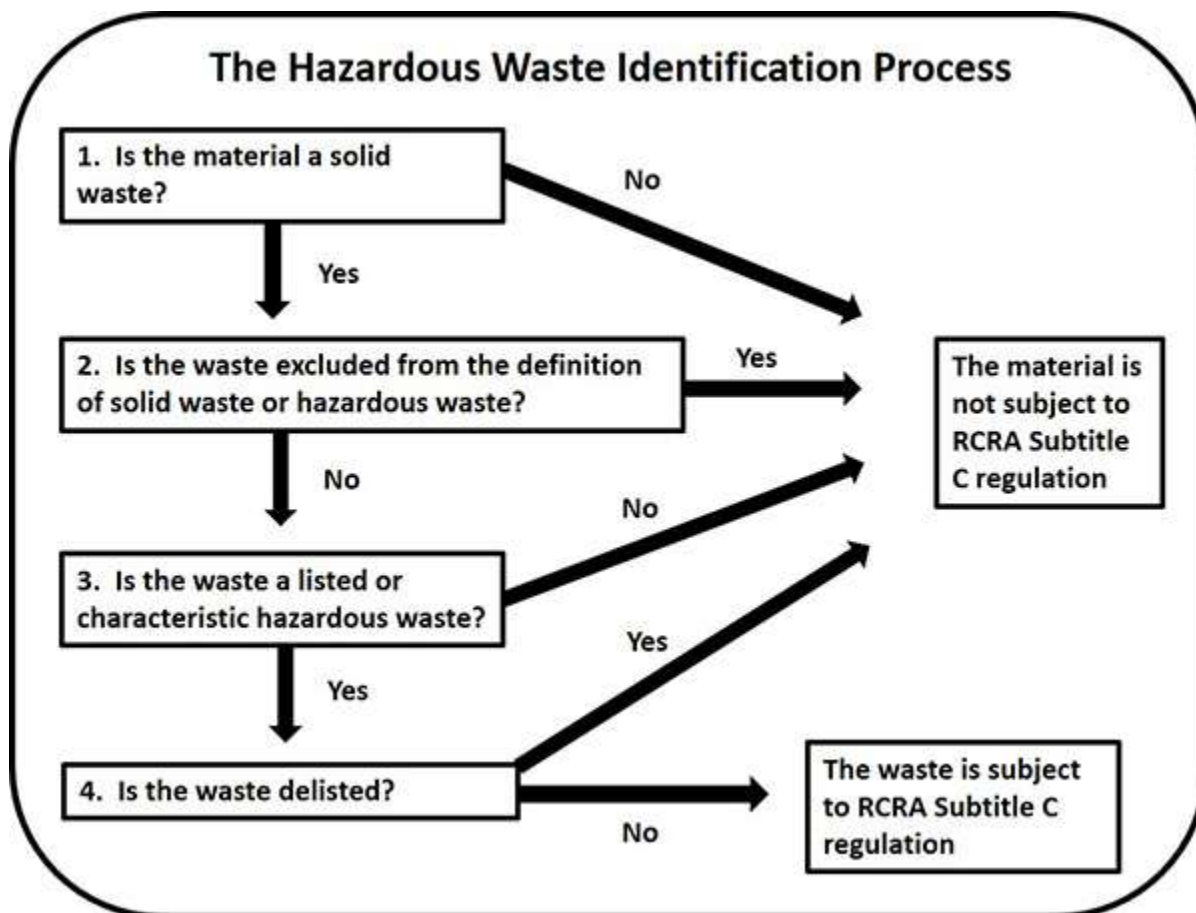
An environmental impact

- is a result of an environmental aspect.



	Aspects	Impacts
1	Welding process	Releases several toxic emissions
2	Metal cutting	Harmful fumes and gases may be emitted
3	Paining process	High VOC content that are hazardous air pollutants
4	Sand blasting process	Air pollution
5	Energy use (e.g. Heating and cooling system)	The burning of fossil fuels releases carbon dioxide (CO2) and other pollutants into the atmosphere, contributing to climate change and air pollution
6	Transportation	Emission of polluting gases,

INDUSTRIAL STANDARDS ON DISPOSAL OF CHEMICAL WASTE.



CHEMICAL WASTE DISPOSAL

Definition Chemical Waste

- Regulation of the Ministry of Environment and Forestry of the Republic of Indonesia no. P.12/menlhk/setjen/plb.3/5/2020 concerning storage of hazardous and toxic waste. 2020-05-14
- Chemical waste includes solids, liquids or gases containing or contaminated with any of the following:-
 - Flammable solvents (e.g., acetone, alcohols, acetonitrile);
 - Leachate toxic materials (e.g., heavy metals, pesticides);
 - Corrosives (e.g., hydrochloric acid, potassium hydroxide pellets);
 - Reactive such as oxidizers, cyanides, sulphides, explosives, unstable materials and

water-reactive materials (e.g., sodium metal, benzoyl peroxide).

- Toxic materials including mutagenic, carcinogenic, acute or chronic toxicity materials (e.g., chloroform, ethidium bromide).
- Polychlorinated biphenyls (> 50 ppm concentration).
- Non-returnable gas cylinders.

**REGULATION REGARDING
HAZARDOUS AND TOXIC WASTE MANAGEMENT
Government Regulation Number 19 of 1994**

THE PRESIDENT OF THE REPUBLIC OF INDONESIA

Treatment

- Using various processes, such as incineration or oxidation, to alter the character or composition of hazardous wastes. Some treatment processes enable waste to be recovered and reused in manufacturing settings, while other treatment processes dramatically reduce the amount of hazardous waste.

Disposal

- Permanently containing hazardous wastes. The most common type of disposal facility is a landfill, where hazardous wastes are disposed of in carefully constructed units designed to protect groundwater and surface water resources.

Incinerators

- Incinerators are enclosed devices that use controlled flame combustion for the thermal treatment of hazardous waste. When performed properly, this process destroys toxic organic constituents in hazardous waste and reduces the volume of waste that needs to be disposed.

Packaging

- In addition to the general packaging requirements (Never mix incompatible materials together, Wastes must be stored in containers compatible with the chemicals stored, chemicals must not be stored in metal containers, Solvent safety cans should to be used to

collect and temporarily store large volumes (10-20 litres) of flammable organic waste solvents, providing these cans to the laboratory, Do not package solid chemical waste into biohazard bags& Buildings with Central Waste Storage will have drums for contaminated glass and plastic where lab staff can empty their containers into).

Labelling

- In addition to the general labelling requirements (Attach a Chemical Waste label directly to the waste container, All information requested on the Chemical Waste Label should be provided, Must have a list of Chemical generic & No acronyms , trade mark names or abbreviations, are to be used).

Storage

- Waste chemicals should be stored in the central waste-holding facility of the building.

Chemical Compatibility

- When preparing chemical waste for disposal, it is the generator's responsibility to ensure that incompatible chemicals are not stored in the same container. Waste containers should be stored according to their compatible chemical reactivities. A few general examples are:

Special Cases

- The preceding procedure dealt with common teaching and research chemical wastes generated by the University. Occasionally chemical wastes are generated that require additional or special handling, as discussed below.

Asbestos

- Asbestos-containing materials such as bunsen burner pads

Batteries

- Household batteries should be placed into battery recycling containers placed around campus.

Empty Drums

- Empty drums (20 to 205 litre capacity) will be removed by Sub-contractor.

Paint Cans

- Expired or spent paint cans are normally disposed of as chemical waste.

CONCLUSION

- In the end, we can say that the issue of sustainability is a global requirement and may cost Big Green Tractor in the short term but is effective in the long term.
- Big Green Tractor focuses on reducing its costs by simplifying operational processes.
- Big Green Tractor must focus on modern scientific studies as we have mentioned and training on them and applying them as they are the safe haven for reducing costs as well as total quality management.
- Big Green Tractor must focus on the optimal use of working hours - productivity - raising quality and reducing defects and recycling and exploiting scrap through professional auctions as well as purchasing through tenders.
- Big Green Tractor Utilizing twenty-first century tools such as (renewable energy, Reduce energy use, Use lean manufacturing and green technology, Robotics and Software.
- Big Green Tractor, must have a Big Green Tractor shall have an Environmental Management System to promote knowledge, awareness and competence for protection of the environment.
- Big Green Tractor, must have Waste Management Plan to ensure that the chemical Waste disposed as per the regulation .

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