COVER PAGE AND DECLARATION

	Master of Business Administration (M.B.A.)
Specialisation:	MBA in Strategy
Affiliated Center:	CEO BUSINESS SCHOOL
Module Code & Module Title:	MGT550 – Managing Operations
Student's Full Name:	Ilyes Benabderrahim
Student ID:	EIU2021636
Word Count:	3831
Date of Submission:	05-06-2023

I confirm that this assignment is my own work, is not copied from any other person's work (published/unpublished), and has not been previously submitted for assessment elsewhere.

E-SIGNATURE: Ilyes Benabderrahim

DATE: 05-06-2023

Table of Content

1. Introduction

Big Green Tractor, or BGT, is an Indonesian tractor manufacturer based in Palembang city and producing tractors to serve their clients and fit their requirements. It was always trying to deliver best practice solutions and products with considerable added value to match customers' needs, assure the expansion of its markets and maintain a constant presence in such strategic business in accordance with industry standards, policies, and guidelines.

The operational phase, which is the main stage responsible for ensuring production continuity, sustainability, and dependability in order to provide environmentally friendly products and services, was organized and controlled by the company.

However, BGT began to see a significant growth slowdown in recent years, which had a detrimental influence on its operations and the revenues it generated. As a result, the corporation established a task force under my leadership to carry out and execute the following key objectives: In order to cut expenses and operate more effectively, the first goal is to create and publish an end-to-end operational streamline procedural guide that includes all necessary recommendations, guidelines, and directions. Also, by enhancing the quality activities, we target to reduce faults and defects throughout the production process. Then, we want to develop a greener process by utilizing emerging technology, tools, techniques, and innovations from the twenty-first century. The second ultimate goal is to create a socially responsible operational manual for BGT pollutants that complies with the most recent benchmarks, environmental best practices, and industrial standards for the disposal of chemical waste on the one hand, and green manufacturing processes that can take the place of currently used concepts and solutions on the other.

We will go into further depth about the chosen recommendations and their anticipated advantages in the following sections so that Big Green Tractor’s entire operational business process can be improved.

2. Streamlined Operation Industrial Procedural Guide

To simplify and arrange Big Green Tractor operation procedures and processes, it is crucial to refer to best practices and international standards. Additionally, it would be quite helpful to break down the correct measures that BGT should take to take off again and ensure a healthy condition by inspiration from global trends and principles.

2.1. Cost-Efficient Manufacturing Process

To achieve a cost-efficient manufacturing process, Big Green Tractor can follow several ways to optimize production processes and reduce costs, here are some suggestions:

❖ **Manufacturing Workflow Optimization**: We need to restructure BGT production process to reduce waste, save time, increase output, and improve product quality by looking at the processes currently employed by BGT and identifying gaps. Numerous elements, including operations, stakeholders, suppliers, and so on, would be examined, and we need to apply the credible methods described below:

- Lean manufacturing: A technique to eliminate unnecessary activities throughout tractors production, optimize process efficiency and reduce costs. Here is its key principle:
  - *Value*: Identify the value that the customer receives from BGT-produced tractors.
  - *Value Stream*: Map out the entire process of tractors manufacturing and delivery from start to finish.
  - *Flow*: Continuously improve the manufacturing flow of activities by eliminating disruptions and delays.
  - *Pull*: Produce only what is needed, based on customer demand to well control the inventory
  - *Perfection*: Continuously strive for perfection by eliminating waste and improving processes.
- Six Sigma: Six Sigma is an efficient data-driven methodology that can be used to improve quality and reduce costs by identifying and removing defects in a process. The basic idea is to measure and analyze data to identify problems, then implement improvements to reduce waste and improve efficiency. Combining Six Sigma and lean manufacturing would result in a superior improvement, and Lean Six Sigma can enable BGT to capitalize on the advantages of both approaches to boost gains and profitability. In this context, DMAIC and DMADV models would be implemented and aim to produce greater quality, improved production, more profit, and more customer satisfaction. Models definitions are explored by the Council for Six Sigma Certification in their released book "*Six Sigma, a complete step-by-step Guide*" P156 in the following reference [1]:
  - *Define*: Define the declining problem using brainstorming and meetings
  - *Measure*: Quantify the slowdown problem via process map, control charts, and tables

- *Analyze*: Identify the cause and reason of the sales decline problem using the fishbone diagram, 5 Why and Pareto
- *Improve or Design*: Solving the problem with the selected solution or new design approved
- *Control or Verify*: Maintain the gains/profits and pursue perfection through checklists and control charts as an example

Lean Six Sigma entails defining the issue, measuring the present process, examining the data to spot issues, putting improvements into place, and finally monitoring the process to sustain the improvements over time.

In summary, lean Six Sigma is considered a powerful technique that can assist Big Green Tractor to drive cost efficiency by identifying and removing defects in the production processes. Therefore, BGT can decrease significantly manufacturing costs and increase customer satisfaction. For lessons learned, we can sit numerous success stories like that one lived by a manufacturing company in the US that succeeded to save $1.7 Million in labor costs using the lean Six Sigma. We may refer to the previously stated reference P788 [1].

❖ **Manufacturing chain Automation**: Automation can be used as well to streamline tractors' production processes, cut waste, and increase productivity to reduce manufacturing costs. There are numerous methods that can support lower manufacturing costs like:

- Robotic process automation (RPA): This involves using robots that can perform repetitive tasks quickly and accurately, such as assembly line tasks or material handling tasks, and then reducing labor costs.
- Artificial intelligence (AI): AI technology can be used to optimize manufacturing processes, improve quality control, and reduce waste.
- 3D printing: 3D printing technology is useful to create prototypes, samples, and parts quickly and inexpensively, reducing the need for expensive tooling and molds.
- Internet of Things (IoT): IoT sensors can be used to monitor equipment and detect issues before they become major problems, reducing downtime and maintenance costs.
- Autonomous vehicles: Autonomous vehicles can serve to transport goods within a manufacturing facility, reducing the need for human labor and improving efficiency.

❖ **Industry chain optimization and modernization**: By improving machine utilization and reducing downtime, BGT can help decrease production costs and improve output. Hereafter are some good practices highly recommended to be implemented:

- Regular maintenance: Conducting regular equipment maintenance can help prevent breakdowns and extend the life of our equipment. Schedule maintenance tasks at convenient times to minimize disruption to operations.
- Monitoring equipment performance: Installing sensors and monitoring equipment performance can help identify potential issues before they become major problems. By monitoring the equipment, we can identify patterns in usage and identify opportunities to improve efficiency.
- Upgrading machines: Consider upgrading the equipment to newer models that offer improved features and better efficiency. While this may require additional investment involving earlier stages like design and planning, it can lead to significant cost savings over time.
- Implementing predictive maintenance: Predictive maintenance uses data and analytics to predict when maintenance will be needed. By using this approach, BGT can schedule maintenance tasks proactively, before a breakdown occurs.

❖ **Manufacturing Outsourcing**: It would be more affordable to outsource some production processes, particularly for operations that may need specialized equipment or knowledge. BGT can also benefit from cheaper labor and manufacturing expenses in other nations/countries, which would lower the overall production costs and is subsequently passed on to the clients in the form of lower prices. Additionally, outsourcing might free up resources that can be employed elsewhere, allowing BGT to concentrate on its key business.

2.2. Defects Minimization

Defects are defined as anything that presents faults and does not meet the customer's requirements, including defective products, manufacturing errors, and deviations from initial designs and plans. Consequently, they can have a severe negative impact on Big Green Tractor's brand image and reputation and then lead to a future sales reduction. Also, as long as they are costing money and time, BGT must have full control to keep them minimum by implementing processes that minimize their likelihood and impact and to better fit final customers' demands. For that, we recommend BGT follow standardized procedures, professional tools, and techniques globally used and proven to minimize them during the manufacturing processes.

Initially, it is valuable to comply with quality standards as defined by ISO9001, published in 2015 by the international standards and reviewed in 2021 [2]. It specifies generically the overall

requirements needed to be met by a quality management system, "QMS", to gain and increase customer satisfaction including processes for improvement and assurance of conformity.

Second, we need to review current quality policies in comparison to the industry standards and set up a successful QMS that incorporates approaches for both quality assurance and quality control that will be used throughout the manufacturing of tractors. BGT can take the "PDCA" technique to establish its high-level end-to-end quality management flow. The below illustration is described in P8 of previously stated reference [2]:

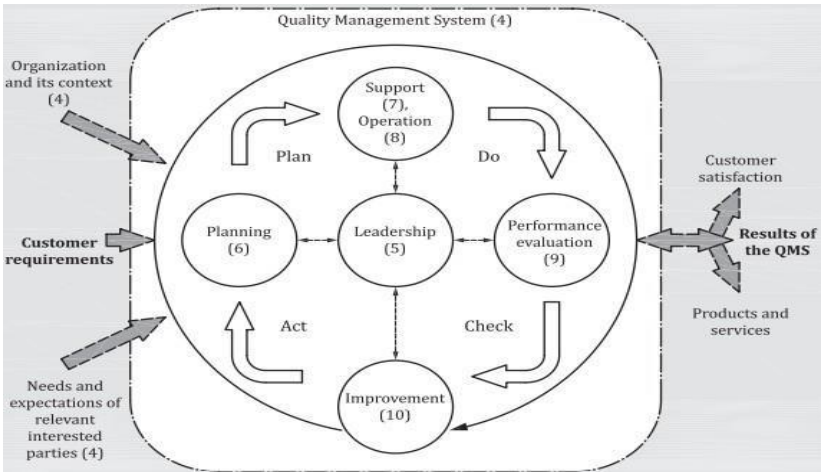

Figure-1: Plan-Do-Check-Act cycle

- Plan: establish the objectives of the QMS and its processes, and the resources needed to deliver results in accordance with customer's requirements and the BGT's policies, and identify and address risks and opportunities.
- Do: implementation and execution of the approved plans/designs
- Check: Monitoring and control of the production process as well as resulting tractors. Evaluations of obtained KPIs and metrics against initial plans and objectives
- Act: perform corrective actions if necessary to fit the plan and enhance the performance

In the Big Green Tractor case study, we will focus on the operational aspect of the quality management system where continuous audits and inspections are implemented alongside the production to ensure tractors' conformity and minimize risks, this is what was standardized as quality assurance "QA" and quality control "QC".

❖ **Quality assurance**: To reduce defects and ensure high-quality end products, quality assurance (QA) is a crucial component of the quality management plan. It uses processes effectively and involves adhering to reassure customers that the final product will meet their needs and expectations. Several tools and techniques can be used are defined and detailed by the Project Management Institute in the PMBOK 6th edition P288 [3] like but not limited to:

- Data gathering (Checklists)
- Data analysis (like Root cause analysis and process analysis)
- Data representation (like flowcharts and scatter diagrams)
- Audits
- Problem-solving
- Quality improvement methods
    - *Audits*: Prime QA technique, it can help to increase overall operational processes' efficiency and productivity by identifying areas where processes can be streamlined and waste can be reduced. Additionally, audits can help to identify potential risks and hazards, which can be addressed before they become larger problems. Finally, audits can ensure BGT compliance and alignment with all relevant regulations and rules.

❖ **Quality Control**: QC is the process of monitoring results of executing the quality management activities in order to assess tractors' production performance and ensure the outputs are complete, correct, and meet customer expectations. Following are some useful tools and techniques as defined by the PMI, P298 (3):

- Data gathering (Check sheets and statistical sampling)
- Data analysis (like Performance review)
- Inspection
- Data representation (like control charts)
    - *Inspections*: As the main QC tool, it can ensure that produced tractors meet predetermined quality plans. The aim of QC inspection is to identify any defects or deviations from the standard, initial plans, and approved designs and to make necessary corrections before tractors are released to the final customers.

Given the above and practically, many methodologies were established based on the defined processes and dealing with quality end-to-end management and improvement. Below are some of them which should be tailored following BGT requirements:

❖ **Statistical Process Control (SPC)**: Useful for monitoring and controlling BGT manufacturing process by tracking data related to key variables and using statistical analysis to identify trends and patterns. This will allow BGT to detect problems early and take corrective actions before defects occur.

❖ **Lean Six Sigma**: As detailed in section 1, it combines the principles of Six Sigma and Lean Manufacturing to assist businesses in improving operational effectiveness and minimizing waste. While the Six Sigma approach tries to reduce variation and process flaws, the Lean strategy is focused on getting rid of non-value-added tasks. Together, they could support BGT businesses in process enhancement and increase customer value.

2.3. Greener process 21st Century Innovative Tools & Techniques

Certainly, BGT must use recent innovations, emerging technologies, and techniques to run a greener operation process. Hereafter, are some recommendations:

❖ **Green Energy Sources**: Many alternative green energy sources would be used by BGT to power its plants including:

- Solar Power: This is the most common and efficient way of harnessing renewable energy. Solar panels can be installed on roofs to produce electricity from the sun's energy.
- Wind Power: By using wind turbines to generate electricity from the wind. These turbines are typically installed in wind farms or offshore locations.
- Hydro Power: This energy source is generated by capturing the energy of falling water and converting it into electricity. Hydroelectric power plants can be built on rivers or dams.
- Biomass Energy: This energy source is derived from organic materials, such as waste and garbage which can be converted into energy through various processes such as combustion, gasification, or anaerobic digestion.

Automated/Closed-Loop Systems: Definitely, Automation and closed-loop systems are key recommended elements for green manufacturing. They would help BGT to minimize waste and maximize resource efficiency by reusing and recycling materials and energy within their production processes. By using closed-loop systems, manufacturers can reduce their environmental impact and lower costs associated with materials and energy consumption.

IoT-based Monitoring Solutions: IoT-based monitoring solutions can support promoting sustainable manufacturing practices. They can be used in monitoring and controlling

manufacturing processes to reduce energy and resource consumption, minimize waste, and decrease environmental impact. Here are a few practical examples:

- Energy monitoring: IoT sensors can be installed to monitor energy consumption in real time and provide insights on areas where energy can be conserved.
- Water management: IoT sensors can be equipped to monitor water usage, detect leaks, and optimize water consumption.
- Waste management: IoT sensors can be used to track waste generation, optimize waste collection, and reduce the amount of waste that goes to landfills.
- Sustainable supply chain: IoT can be used to track products along the supply chain and monitor environmental impact, such as carbon footprint.

3D Printing: 3D printing is a very eco-friendly process since it's a form of additive manufacturing where only the necessary materials are used to create a product and the reducing waste. Also, 3D printing can support green manufacturing by allowing for the creation of complex geometries that may be impossible or very difficult to produce with traditional manufacturing methods. This can lead to more efficient designs, less material usage, and ultimately, less energy consumption.

Lean Manufacturing: lean manufacturing is a great approach that can assist BGT to reduce waste and improve efficiency to reach a greener manufacturing process. This can include excess inventory, overproduction, unnecessary motion, waiting time, over-processing, defects, and unused talent. Then, by reducing waste, BGT can cut down on its energy consumption, reduce its carbon footprint, and minimize the amount of raw materials needed for tractor production. Furthermore, lean manufacturing supports continuously evaluating and refining operational processes to identify areas where we can reduce waste and improve efficiency, leading to long-term sustainability benefits.

3. Socially Responsible Operational Guide

In addition to the information listed above that will support Big Green Tractor in returning to its regular business operations and expanding, the organization needs to place a strong emphasis on social responsibility and compliance with laws pertaining to safety, the environment, and going green. The following sub-sections will examine and outline useful tips and ideas that serve to guarantee a secure and safe manufacturing operational mode.

3.1. Chemical Waste Disposal

In the Big Green Tractor case, the clearance of the chemical waste and pollutants resulting from the tractors' operation represents a big challenge as it can have a significant impact on the environment if not done with proper tools and techniques. Thus, it is essential to adhere to industrial standard rules and follow appropriate disposal practices to minimize their impact.

To do this, it is recommended initially to refer to the policies and guidelines governing the proper management and disposal of this chemical waste based on its specific type. One of the major references is the Environmental Protection Agency (EPA), in the United States, which regulates industrial waste disposal and sets standards for hazardous waste management. Those standards have been well illustrated in the published official guide describing the best practices of Industrial Waste Management [4]. As well, Big Green Tractor needs to comply and adhere to Indonesian governmental laws and rules as this includes all requirements for the identification, handling, storage, transportation, and disposal of hazardous waste.

In this turn, BGT needs to manage waste disposal broadly by establishing establish a green strategy and roadmap to reach a greener environment and high degree of safety. For that, we suggest below major techniques globally implemented and experienced successfully by some worldwide top competitors like "Mahindra" and "John Dree". This disposal can be either performed and led by the BGT EHS department or outsourced to a third-party specialized and certified firm to achieve it. The cost-effective alternative would be selected to proceed further.

- **Recycling**: Many pollutants that arise during tractor manufacturing can be recycled and reused in some other processes. Recycling can help to reduce significantly the amount of chemical waste generated and thus minimize the environmental impact. It is considered a successful approach widely adopted due to the huge benefits resulting from it as well as its direct impact on cost reduction and effectiveness. For more details, we can refer to the EPA published guide, P56 [4]
- **Treatment**: Considered one of the efficient methods that can be used to manage BGT chemical waste. In fact, some pollutants can be treated and made non-hazardous before they are disposed of, such as the wastewater generated during the manufacturing process that can be treated to remove harmful chemicals before being either re-injected in the industrial process or released into the environment. Such practice can reduce costs, decrease environmental risks and increase company profitability.

❖ **Incineration/Boiling**: Used for solid/liquid chemical waste that cannot be recycled or treated. It involves burning it at high temperatures to destruct and convert it into ash and other byproducts. There are two types of combustion units for solid and liquid hazardous wastes:

- Incinerators: Used primarily for waste destruction and it destroys the toxic organic constituents in hazardous waste and reduces the volume of the waste.
- Boilers and Industrial Furnaces (BIFs): Used primarily for energy and material recovery potential

❖ **Landfills**: Unlike municipal waste landfills, Big Green Tractor should properly design and plan its industrial landfills for chemical waste disposal following specific criteria in relation to the waste type and government policies in order to prevent the release of pollutants into the environment. Nowadays global trends and strategies are seeking "Zero Waste to Landfill" as stated by Top leader firm "Mahindra" in its 2022 sustainability report Page 1 [5]. The drawing below shows an example of a secure and effective industrial landfill design that can be used by BGT. More details would be extracted by consulting the published article in the following reference [6]:

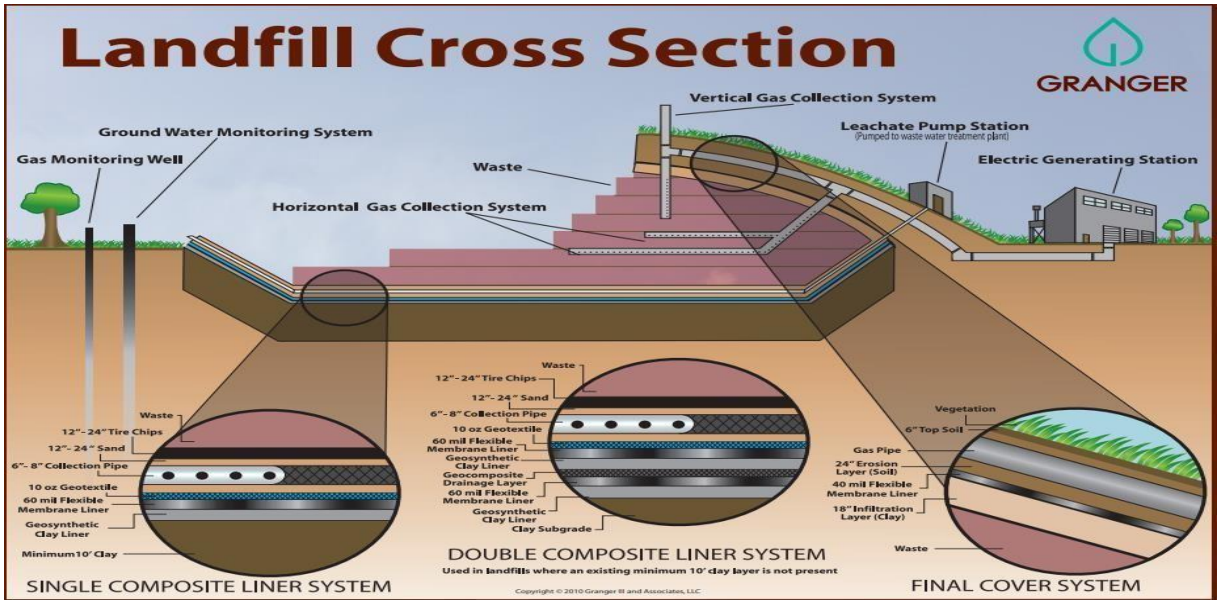

Figure-2: Landfill Cross Section

3.2. Green Alternatives

By adopting recent innovations and technologies, Big Green Tractor can use some environment-friendly techniques to reduce waste and ensure a safe ecosystem. Following are some strategic

methodologies that can be implemented for better sustainable manufacturing processes: renewable energy, biodegradable materials, lean manufacturing, and recycling programs.

❖ **Renewable energy**: It is one of the most viable solutions for Big Green Tractor that would significantly reduce dioxide of carbon emissions, greenhouse gas "GHG" and pollution associated with tractors manufacturing energy production. Named "Green Power", the alternate energy sources, detailed previously, like solar power, wind power, geothermal technologies, landfill gas, and biomass power can supply power to the production facilities following eco-friendly methods.

❖ **Biodegradable materials**: Targeting the same objective of attaining a greener manufacturing operation process, Big Green Tractor can use sustainable materials, such as bamboo, recycled plastics, and bio-based materials for the production of tractors. For example, biofuel (or biodiesel) is derived from renewable biological materials such as ethanol from corn starch, corn stover, perennial grasses, woody biomass, algae, and diesel from soybeans as mentioned by the EPA in their third report through this reference [7]. These constituents can help reduce chemical waste and minimize the use of non-renewable resources.

❖ **Lean manufacturing**: Earlier illustrated, Big Green Tractor should implement lean manufacturing techniques for better sustainability to reduce industrial waste and pollutants. The application of one of these methods like Kaizen, 5S, cellular manufacturing, Just In Time (Kanban), Total Productive Maintenance (TPM), Six Sigma, and Pre-Production Planning (3P) would result in several benefits:

- Eliminating hidden waste, waste-generating activities, and over-production
- Reduce and optimize chemical materials usage
- Optimizing and well-controlling lab resource usage to save energy

❖ **Recycling programs**: As described previously, recycling is considered one of the appropriate tactics that should be implemented by Big Green Tractor to reuse different waste types generated by the production processes. The company should initiate dedicated strategic initiatives dealing with recycling activities. In fact, several materials would be subject to be recycled such as metals, aluminum, wood, painting products, and plastics. As a result, by reintroducing those elements into the manufacturing process, less chemical waste will need to be disposed of, resources will be conserved, and less raw material will be used.

4. Conclusion

Throughout the drafted operational guide, Big Green Tractor would be able to realize lots of benefits to get out of the declining situation that she is in. On one hand, we detailed how it is going to streamline all its operational processes to bring more agility and flexibility to the manufacturing workflow. This can be achieved by implementing tools and techniques that are in line with worldwide standards' guidelines and policies of cost efficiency, defect reduction, and high quality like lean six sigma, quality assurance, and quality control. On another hand, it will decrease inefficiency, optimize end-to-end workflow, and ensure rapid tractors production. Ultimately, given these updates and adjustments, BGT would be able to enhance its standing, expand its market share, and obtain the satisfaction and loyalty of its customers.

Furthermore, Big Green Tractor will also take great care to implement systems and practices that fully adhere to all environment norms, regulations, and governmental laws. which would result in greener operations and production. Additionally, we will always search for smarter, more sophisticated processes, tools, and techniques to lessen environmental impacts for greater sustainability.

Finally, as all of the company's functional departments must be in line with the same vision, mission, and strategic goals, the Big Green Tractor operation unit should be operating in perfect coordination with other company functional departments such as design, planning, implementation, procurement, and HR. To include the end-to-end organization interdependencies and interactions, I therefore strongly advise that the growth-reducing condition encountered by BGT be evaluated at a broader level.

5. References

[1] Council for Six Sigma Certification, (July 2018), *Six Sigma, a complete step-by-step guide*, Retrieved from: https://www.sixsigmacouncil.org/wp-content/uploads/2018/08/Six-Sigma-A-Complete-Step-by-Step-Guide.pdf

[2] International standard, (Sept, 2015), *ISO 9001:2015, Quality management systems - Requirements*, Retrieved from: https://parsegroup.ir/wp-content/uploads/2021/07/ISO9001-2015.pdf.

[3] Project Management Institute, (2017), ISBN: 978-1-62825-184-5, *A Guide to the Project Management Body of Knowledge 6th edition*, Retrieved from: http://faspa.ir/wp-content/uploads/2017/09/PMBOK6-2017.pdf

[4]: Environment Protection Agency, (March 2016), *Guide for Industrial Waste Management*, Retrieved from: https://www.epa.gov/sites/default/files/2016-03/documents/industrial-waste-guide.pdf

[5]: Mahindra, (Jan 2023), *Mahindra Sustainability Report-2021-22*, Retrieved from: https://www.mahindra.com/sites/default/files/2023-01/Mahindra-Sustainability-Report-2021-22_0.pdf

[6]: Gulnihal Ozbay, Morgan Jones, Mohana Gadde, Shehu Isah, and Tahera Attarwala, (Sept 2021), *Design and Operation of Effective Landfills with Minimal Effects on the Environment and Human Health*, Retrieved from: https://www.hindawi.com/journals/jeph/2021/6921607/

[7]: Environment Protection Agency, (2022), EPA/600/R-22/273, *Biofuels and the Environment Third Triennial Report to Congress External Review Draft (ERD)*, Retrieved from: https://cfpub.epa.gov/ncea/biofuels/recordisplay.cfm?deid=353055