COVER PAGE AND DECLARATION

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Executive Summary

Big Green Tractor is a Palembang-based Indonesian industrial tractors manufacturer. The enterprise is dealing with diminishing expansion amidst rivalries in the agricultural equipment industry which was valued at around $700 million in the year 2022. This report details a streamline operational procedural and a socially responsible operating procedure that will increase efficiency and reduce the defect as well as pollution from production.

The operational leader for Big Green will be delivered by Lean manufacturing techniques like Just in Time (JIT), Kaizen and Six sigma (will be delivered JO). This will help in achieving cost-effective processes. It will also Integrate with automotives and energy efficient machines from John Deere and Caterpiller. The objective of defect reduction can be achieved with the help of TQM (Total Quality Management) and various other tools like Control chart, Pareto chart, root cause, etc. Using technologies of industry 4.0 (like IoT and AI), renewable energies (like solar and wind), and green materials, more environment-friendly processes must be created to minimize waste.

One way could be to dispose of the chemical waste according to ISO 14001 standard. One green action you can take is switching to biodegradable material, which may not always be practical; however, do try to recycle them. Think of CCircularity, essentially what you can do with your chemical waste. Visualization of the process map provides you a good idea of benefits which may be bottleneck identification, improvement and others.

Introduction

The Big Green Tractor, an industrial tractor manufacturer. The company based in Palembang has specialized heavy-duty tractors. agricultural and industrial use. Established over two decades ago, it focuses. Presently, Isuzu’s Godzilla truck box has diesel power. Such as paddies and palm oil plantations. With a workforce of about 500 employ. This new 50,000-square-metre plant strengthens the company's mid-tier position. emphasizing affordability and durability. Indonesia's agricultural machinery. The value of the global market is expected to reach USD 4.19 billion by 2025, growing at a CAGR of 5.5%. mechanization initiatives and food demand. Key competitors include. Popular brands like Caterpillar, Komatsu, John Deere, Yanmar, and Kubota. In collaboration with local corporations such as PT Trakindo Utama and PT Traktor Nusantar The company has a 10 to 15 per cent share of the market, but they have been stagnant due to:

obsolescence. processes. Challenges include declining growth due to inefficient. High fault rates in production and rising costs Production generates. NOx and PM, that occur due to industrial units hurting our environment. to air quality problems in Palembang, haze-prone. Environmental concerns. There is a growing demand for electric tractors and similar technologies. promote green farming. Goals involve streamlining operations for efficiency and Using green tech to curb pollution levels in Indonesia 40- 50%. Paris Agreement commitments. Earnings cut down by 15% to IDR(Indonesian rupiah) 1.2 trillion. The estimated amount of (80 million) for 2022 current IDR 1.02 trillion 2025. Margins are 8% lower owing to defects and energy expenses. Green investments could yield enhance profits between 20 and 30% as market grows.

2.1 Company Overview and Market Position

The Big Green Tractor, headquartered in Palembang,. Indonesia is a mid-tier producer of industrial tractors. Tractors that are diesel-powered and durable applications. The 20-year-old company employs 500 workers in a 50,000 square foot production unit. Indonesia has tropical forests, towering mountains, and rice fields. plantations and rugged landscapes. The company holds a 10-15% share of the Market for farm machinery in Indonesia worth $700 million. Sales volume of tractors was noticed as more than 50% in the year 2022. The market is ever-increasing. This is because of population, food demands, and other things that are rising. government schemes supporting farm mechanization must be encouraged But this sector is fragmented due to low average landholdings. Smaller and easier access to credit often favors those with under 1 hectare and restricted. Farmers prefer smaller models because bigger units are more costly. The Big Green Tractor competes with global giants like John Deere and fierce rivals. Caterpillar gets help from local distributors like United Tractors. Like PT Hexindo Adiperkasa domestic players. Despite its emphasis on Cheapness and sturdiness, this does not contribute to the growth of the business, but obsolete technology does. Production processes that need innovation are important in the market.
Jumping in and catching the windows of opportunity as the situation in Indonesia evolve in the agricultural sector.

2.2 Challenges and Goals for Environmental Impact

The company is grappling with declining growth, attributed to inefficient production procedures, high defect rates and increasing Expensive operational costs without financial stability. Production involves Process creates the final product through various stages. Included are key pollutants like VOCs. When paints are applied, it releases particulate matter (PM), nitrogen oxides (NOx) and other chemicals. and lubricants. These emissions cause severe air and water pollution.

Bad soil conditions are already afflicting Palembang, in Sumatra mist originating from factory activities, especially in dry seasons the local Ecosystem and public health have more signs of urgency for changes. The primary goals are to streamline operations for greater Green methods will greatly reduce environmental pollutants. This change of strategy is in line with The Paris agreement aim to improve agricultural sustainability Agreement, reflecting a commitment to global climate goals. By integrating Some sustainable practices include embracing renewable energy like(solar, wind) and sustainable materials. In order to comply with the regulations, the company wants to reduce their carbon footprint.

2.3 Financial Performance

Financially, The Big Green Tractor has experienced a 15% decline over the last three years, it has dropped from IDR 1.2 trillion. from an estimated $80 million in 2022 to a forecasted IDR 900 million in 2025 Following the market troubles like fluctuating commodity price, new tax implementations, and intensified competition. Operating margins have shrunk to. Just 8% because of high wastage levels, a 15% defect rate and energy prices. which accounts for 20% of total expenditure putting some pressure on the. company's bottom line. Net profit has also declined, standing at IDR 80 billion. Reflecting the financial strain, it predicts a 2024 drop to IDR 120 billion. from inefficiencies. However, strategic investments in green technologies, such. Cost savings may result from energy-efficient machinery and sustainable practices. savings of 20-30% annually. These savings would enhance profitability, and reduce operational expenses, and offer the financially flexibility required for market. Expansion, positioning the company to recover its competitive advantage. Indonesia's evolving agricultural machinery sector.

Part One: Operational Industrial Streamline Procedural Guide

This section provides a detailed, step-by-step procedural. A useful field guide for the Big Green Tractor to prevent its production from being messy . Involving everything from getting raw materials to putting things together and delivery. This guide is designed to help improve the operational efficiency and reduce costs. The workflow is simple enough to meet today's industry standards. Make delivery cost-effective with live tracking. The process of combining ideas and factors a method that produces a product or gives the result to maintain quality processes to lessen environmental impact. These objectives are informed. Any insight from industry best practices obtained through actual learning. Leading manufacturers that successfully harnessed it for efficiency. efficient production methods. By adopting these strategies, the guide aims to. Address the

company's existing challenges such as declining growth and massive loss. It makes this project cheap while positioning it for success in future competitiveness market. Each stage of production corresponds with an economic or ecological target under this approach.

3.1 Cost-Efficient Manufacturing Processes

To achieve cost-efficient manufacturing, The Big Green. Tractor Should Accept Lean Manufacturing Principles Incorporating Advanced Implement energy-efficient processes with automation technologies. its production line. Lean manufacturing is a proven methodology that maximizes and Increase productivity while minimising waste and focussing on value addition for the customer. Through optimizing resources and eliminating unimportant activities. This process can bring down operational costs considerably. and improving overall efficiency. Integrating automation, such as robotic. Automation makes a task easier but does not makes a hassle. In line with competitors like john deere and others in the industry. Use energy-efficient processes, such as upgrading Equipment that saves energy, lowers utility costs and helps sustainability goals. By combining these strategies, the company can certainly Improve its current financial challenges and the 15% revenue decline. And increase profitability. By going this route savings will be achieved. What can we not position The Big Green Tractor forthe in order to not compromise product quality? stronger market presence in Indonesia's competitive agricultural machinery sector.

Step 1: Implement Lean Principles – Just-in-Time (JIT), Kaizen, and Six Sigma.

JIT involves producing goods only when needed, reducing and Cuting costs by half and less waste by optimizing Inventory For tractor. This means buying steel, components, and other things on demand. with assembly lines. Kaizen promotes continuous improvement through small Team huddles held daily to discuss and identify inefficiencies in welding processes. Six Sigma, integrated with lean, uses data to reduce variations which aimed for a defect rate of 3.4 per million opportunities. You can use the DMAIC (Define, Measure, Analyze, Improve, Control) framework to enhance the engine. assembly and possibly reducing costs by 20%.

Step 2: Explore Automation and Technology Integration.

Tractors are manufactured by John goes through automation. Deere's application of AI and robotics for precision agriculture can significantly Improve accuracy of assembly and cut manpower costs, solve… The Big Green Tractor Implementing robotic welding arms for chassis building will be 30% faster and will have more consistent output. Caterpillar uses semi-automated tractor equipment with an appropriate GPS Algorithms, in conjunction with digital tools and technology, offer smart solutions for

incorporating sensors into the painting process and more. to prevent errors and improve quality control. These advanced Technologies will streamline operations, reduce human error and will align with the industry standards, positioning the company for greater production and. competition in the agricultural machinery sector in Indonesia.

Step 3: Adopt Energy-Efficient Machinery and Processes.

Get more proper machines like variable-speed drives for compressors which save energy by 20-40% and reduce operational costs effectively. Processes like optimized resource utilization . AI and robotic using can reduce downtime via predictive maintenance streamlining. Other sustainable activities, including lower emissions through efficient engines when the design is new for its culture reuse and renovation projects. manufacturing facilities at The Big Green Tractor. These upgrades align with the industry. We support compliance and improve carbon footprint performance suitable for the production needs in Indonesia's sustainability goals. By adopting such technologies in the company.it Can give your company agility and the right market positioning in the agricultural machinery sector.

Step 4: Benchmark Other Company Practices.

Emulate Caterpillar's supply chain optimization for. JIT Delivery Guarantees Timely Inventory and Minimum Cost of Inventory. Components easily obtainable to up production. Additionally, adopt John Deere's emphasis on modular designs to cut down on material waste by Developing parts of a tractor that supports reuse and reconfiguration sustainability. These strategies can be adapted to Indonesia's context. Where small farms demand versatile, compact tractors. Appropriate for a range of places like rice fields and plantations. By integrating. The Big Green Tractor can solve local issues with modular designs and JIT delivery. down operational costs, responsiveness to custumer, and market needs. Regional competitiveness by strengthening demand fluctuations.

3.2 Minimizing Defects Throughout the Manufacturing Process

A thorough plan to minimize defects involves implementing Twelve tools of quality control are used to make total quality management. To make sure faults fall below 1% in all productions. TQM fosters a culture for improvement which involves all employees in identifying and eliminate errors. The Big Green combines various tools and methodologies. Tractor can improve product reliability, minimize rework costs, and fulfill customer aligned by industry standards

Step 1: Explain and Implement Total Quality Management (TQM).

TQM is a customer-focused approach that engages all. We include all employees in finding and eliminating mistakes in continuous improvement throughout the manufacturing process. For The Big Green Tractor, TQM begins The training process should use a top-down approach. The implementation of a comprehensive training program assists employees in mastering quality. feedback loops woven into the assembly line according to strict standards. to address issues promptly By fostering a culture of accountability and innovation,. TQM can cut rework costs by about 25 percent According to this strategy is in conformance with. Use best practices to improve the quality of products and operations. In Indonesia's tractor manufacturing thrust sector.

Step 2: Apply Six Sigma Methodology.

Six Sigma employs advanced statistical methods to minimize defects in a product, to achieve near perfection by reducing variations in manufacturing. processes. The DMAIC Method is used by For The Big Green Tractor. Use the [DMADV] framework to identify root causes and analyses systematically. This is of defects, especially during the painting process of VOC emissions and uneven paint coats are common problems. By analyzing data and. By implementing targeted improvements, Six Sigma can greatly lower that problem. We want to drop the 15% defect rate to under 3.4 defects in a million opportunities. This Enhancements to the approach initiated. Reliability monitoring, improved efficiency, and compliance with standards. placing the corporation to be more competitive tractors in Indonesia manufacturing market.

Step 3: Research and Use Quality Control Tools.

- **Pareto Chart:** Identifies the 20% of causes responsible for 80% of defects, enabling The Big Green Tractor to prioritize critical issues like welding flaws over minor assembly problems, optimizing resource allocation effectively.
- **Control Chart:** Monitors process variations over time, ensuring engine testing remains within specified limits, thus maintaining consistent quality and reliability in production.
- **Root Cause Analysis:** Utilizes techniques like the 5 Whys to trace defects, such as oil leaks, back to supplier quality issues, facilitating targeted corrective actions.

Regular audits will be conducted to assess the effectiveness of these tools, ensuring ongoing compliance with industry standards. Additionally, comprehensive employee training programs will be implemented to embed these quality control methods into daily operations. This training will enhance staff skills, foster a culture of quality awareness, and support continuous improvement across all manufacturing stages. By integrating these tools and practices, the company can reduce defects systematically, improve product integrity, and strengthen its position in Indonesia's competitive agricultural machinery market.

3.3 Use of 21st Century Tools for a Greener Process

Use technology 4.0 for Sustainable Development Choose an eco-friendly production line The Big Green Tractor's practices. One is the usage of advanced tools like IoT, AI, and robotics to optimize the production process. And minimize the employees' error and manual Laber which will in time lead to decrease manifestoing accidents. sustainable practices including Use of renewable energy like (solar and wind) and environment-friendly materials will lower the carbon impact. improve efficiency and comply with Indonesia's environmental policies. the company as a leader in environmentally friendly farming technology machinery sector.

Step 1: Describe Industry 4.0 Technologies and Sustainable Practices.

Industry 4.0 combines IoT, AI, and robotics for smart systems. making decisions and minimizing waste in real-time. For The energy utilization in assembly is overseen by IoT sensors on tractors; Maintenance forecasts are aided by AI. Prevent breakdowns through technology and robots avoid toxic painting.

Step 2: Investigate Industry 4.0 Technologies (IoT, AI, Robotics).

IoT networks connect machines for data exchange, optimizing resource use. AI analyzes production data to minimize energy spikes, while robotics in welding reduces human exposure to fumes.

Step 3: Research Renewable Energy Sources for Manufacturing.

Install solar panels and wind turbines to power facilities, potentially covering 30-50% of energy needs. In Indonesia, abundant sunlight makes solar viable, reducing reliance on fossil fuels.

Step 4: Explore Sustainable Materials and Waste Reduction Techniques.

Use recycled steel and biodegradable lubricants to lower environmental impact. Waste reduction via circular economy practices, like remanufacturing parts, and recycling old martials, can divert 80% of waste from landfills.

Part Two: Socially Responsible Operational Guide for Pollutants

This resource focuses on how pollutants are managed and compliance with environmental protection through green alternatives. The Big Green Tractor is a Sustainable Impact Assessment on air and water quality in Palembang, a hazy area Seeks to innovative emissions and waste reduction methods in the area. The project is in line with Indonesia's sustainability goals and enhances The Big Green Tractor's reputation among green consumers in the agricultural machinery market.

4.1 Industrial Standards on Disposal of Chemical Waste

Adhere to ISO 14001, which provides a framework for environmental management, including waste handling. Steps include:

1. Evaluate waste (hazardous vs. non-hazardous).

2. Segregate and store chemicals safely.

3. Use licensed disposers for incineration or recycling.

4. Monitor and audit compliance to reduce risks. Other standards like Indonesia's PROPER program complement ISO 14001 for pollutant control.

4.2 Green Alternatives to Traditional Manufacturing Processes

Suggest eco-friendly options for paint and lubricant materials. cut down VOC emissions considerably to mitigate. environmental impact. Implement robust recycling programs

for metals to lower waste and encourage resource efficiency Adopt circular economy. Employing sharing and remanufacturing practices to prolong product life cycle and reduce landfill contributions. Additional focuses include integrating solar and wind energy into the company practices. Using sustainable materials for structures and facilities to provide energy. And implementing employee education programs that promote a culture. environmental responsibility. Effective water management through recycling. Using eco-friendly systems and getting green certifications will make customers happier and more drown to buy from the company. And it will be align with Indonesia's sustainability goals . Making this changes will certainly strengthen market image of Big Green Tractor company.

Process Map Visualization

A process map illustrates how something is made at The. Big Green Tractor, illustrates each step from the raw materials to the final. By the reference of delivery. Visual representation of the manufacturing process, highlighting the key steps. Steps such as welding assembly and testing. By mapping out these workflows,. The business will be able to pinpoint critical junctions, streamline operations, and assure seamless coordination across departments.
The process map serves as a strategic. It provides a roadmap for management to identify weaknesses and deploy resources effectively, and keep an eye on quality of the product. It will also give everyone a voice. and because everyone will get a voice at the table it will lead to achieving more operational goals. In the context of Indonesia’s competitive. Visualization Aids Company’s Agricultural Machinery Market Attempt to help firms boost productivity to better serve clients. The process map will improve with the advance of technology. The Big Green Tractor adapts to client and market demands. Dealing with environmental efficiency challenges and being competitive

5.1 Key Benefits of Process Map

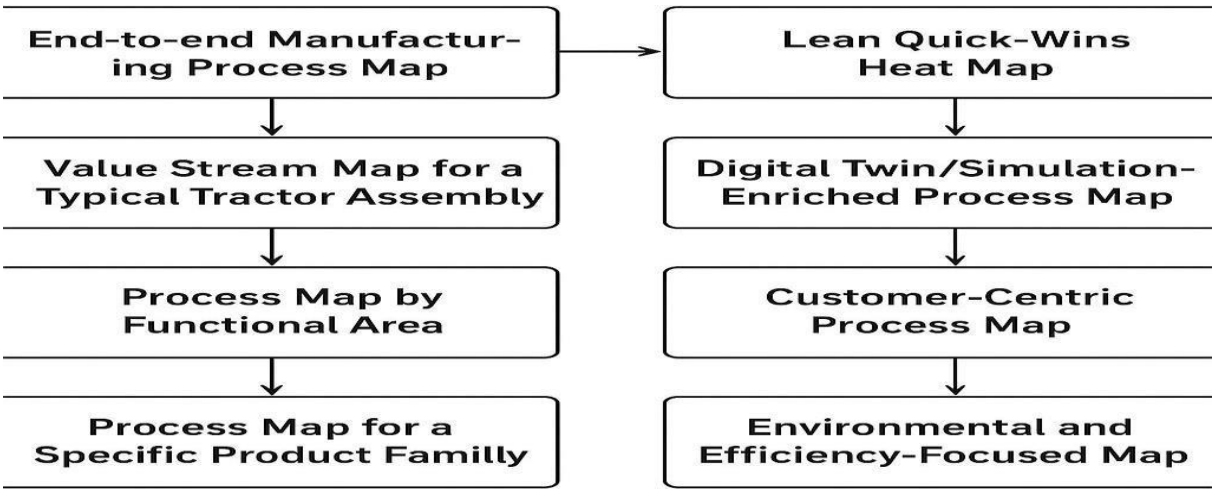
- **Visual Representation:** Provides a clear, comprehensive overview of workflows, aiding understanding and facilitating decision-making at The Big Green Tractor
- **Identify Bottlenecks:** Highlights delays, such as those in assembly, enabling targeted improvements to enhance production flow.

- **Improve Efficiency:** Streamlines steps, reducing time and costs by 15-20% through optimized resource use and process alignment.
- **Quality Control:** Integrates regular checks to minimize defects, ensure compliance with industry standards, and maintain product reliability in Indonesia's competitive market.

This structured approach supports operational excellence, helping the company address inefficiencies and uphold quality across its manufacturing stages.

5.2 Example of Process Map

1. End-to-end Manufacturing Process Map (from raw materials to delivery)
2. 2-Value Stream Map for a Typical Tractor Assembly
3. 3-Process Map by Functional Area (Cross-Departmental Coordination)
4. 4-Process Map for a Specific Product Family (e.g., 40-HP Tractor)
5. 5-Lean Quick-Wins Heat Map (Process Improvement Radar)
6. 6-Digital Twin/Simulation-Enriched Process Map (Conceptual)
7. 7-Customer-Centric Process Map (Order-to-Delivery Experience)
8. 8-Environmental and Efficiency-Focused Map



Conclusion

A streamlined operational guide is recommended in this report Incorporates TQM, Six Sigma and lean principles method, Industry 4.0, and green practices to deal effectively. The Big Green Tractor has certain problems at

it is expected that costs will be reduced by 25%, defect Rates below 1%, cuts of pollutant 50%, and revenue growth to IDR 1.5. By 2030, a trillion presents a strong improvement. By focusing on sustainable. Use of things like solar energy and eco-materials. thorough orientation of bearer employees, efficient management of water, and improving envier will lead to Having happy and supportive customers will help the company to succeed in the long run. These efforts. will strengthen its position in Indonesia's competitive agricultural machines market boosting environmental

stewardship and operational excellence

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