COVER PAGE AND DECLARATION

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Introduction:

The Big green tractor is one of the leading tractor companies in Asia, concerned with developing the farming field using the newest technologies that increases the efficiency of the cultivation process while keeping into consideration preserving the surrounding environment. This is our top priority

Big green tractors has developed its global vision to expand its operation out side Asia, using the competitive advantage of the green manufacturing of the tractors produced by the company.

In order to achieve this vision, Big green tractors started to pay great attention to the operational efficiency of the company as it has been noticed that this has caused a lot of damages and losses to the company over the past few years.

Executive Summary

Operations Management focuses in producing quality machines. The objective of this report is to provide solutions to create effective and efficient business operations. There is a severe competition these days not only between companies or industries, but also within the operational environments as well of companies even from different industries. Operations Management aims at enhancing the manufacturing performance through different techniques.

Any manufacturing organization best wishes is to achieve its objectives by adopting effective operations strategy. Any organization would expect to decrease the production cost while maintaining or increasing a quality level of production to gain customer satisfaction and increase the credibility in the market.

In order to achieve these objectives, several initiatives and techniques should be adopted such as:

- Lean Manufacturing.
- Just in time.
- Total quality management.
- Six Sigma.
- Supply chain management.
- Risk based thinking.
- Kaizin.
- Statistical processes.

Simultaneously, several actions should be taken into consideration, such as adopting a type of organizational structure that facilitates the decision making and chain of commands as well as a smooth integration between the different functions specially those that affect the operation.

In this report, we are going to analyze and recommend the operational efficiency of Big Green Tractor Company, defining its operations strategy in strategic, operational and tactical levels. Furthermore, we will illustrate the steps taken to promote the green process which was introduced in the whole manufacturing process starting from the materials purchased through the processing and supply chain, and ending with the final product.

First Question

1- A) in order to increase the efficiency of the operations, several tools and practices should be applied to the operational process such as:

I- Lean Manufacturing:

Lean management is the approach of managing the organization thru promoting the idea of concept improvement, a long-term strategy to achieve systematically incremental changes in the operational processes and improve the quality and efficiency.

The primary objective of lean management is to achieve resources optimization and maximize the output products with maximum efficiency by eliminating any waste of time, waste of effort, waste of natural resources,..etc, by identifying every step inside the process, then testing and revising it, then evaluate it.

Lean management focuses on:

- Achieves customer satisfaction.
- Eliminates all the waste in the business processes.
- The Continuous improvement of all work processes, purposes and people.

We will apply a mix of lean management tools in order to reach our aim:

A- *Jidoka (Automation)*
Jidoka is a Japanese term refers to "semi- automation" or "automation with a human touch" and is considered a way to maintain quality control in the operation
Jidoka involves the introduction of automated technology in the manufacturing process, so that machines can automatically detect defects when they happen, and stop so that human can interfere in that case and resolve it.

B- *Continuous Flow:*
Continuous flow is a Lean tool that involves using smaller batch sizes to boost the efficiency and speed of production.

C- *Five S (5S)*
5S is another Lean manufacturing tool concerned with workstations. It meanskeeping the work environment clean, tidy& organized in order tomaximize the efficiency, improve safety, and reduce waste.

- Sort (get rid of any unnecessary materials)
- Set in order (keep material available and accessible always)
- Shine (keep the workspace clean)
- Standardize (make this process a standard routine)
- Sustain (revise regularly)..

D- *Total Quality Management (TQM):*

Total Quality Management tool refers to the effort an organization put on, in order to set the work environment in a state that motivate the employees to produce the most quality possible output and to set this level as a standard level.

The word "total" refers to the fact that other departments other than production (such as marketing, Sales, accounting, HR, and design) are equally responsible for actively managing and improving quality in their operations as same quality level as those inside the production department.

E- *Total Productive Maintenance (TPM):*

it is a Lean tool that aims to increase operational efficiency of the production equipment and safety of workers. While TQM focuses on the continuousimprovement of the quality of the production, TPM focuses on increasing the production thru maintaining the reliability and effeciency of equipment

The objectives of TPM are to achieve a state of ideal production, which means:

- No breakdowns
- No small stops
- No defects
- No accidents.

F- *Mistake proofing:*

Mistake proofing focuses on identifying the mistakes as they happen (either automatically through technology or manually through auditing) and thenalarming the workers accordingly. Like all Lean tools, it helps reduce and eliminate waste and increase efficiency.

G- *Leveling the workload*

Leveling the workload means maintaining a sequential level of productions regardless the demands of customers. That means even though customers might order 100 units per week, the workers should produce a consistent units over a set period of time. This consistency helps workers remain active and productive as they will be requested to keep on their production lines to achieve the production target. .

2- Six Sigma:

Lean Six Sigma is the tool preferred by the top businesses around the globe to streamline, develop, and optimize any and every part of their organization.

What sets this tool apart from anything else is its combination of waste-reduction methods from Lean Manufacturing tool combined with the output product defect-reducing methods of 6 Sigma.

While you might know what Lean Six Sigma is, it's sometimes hard to recognize what it will look like once you apply it.

- ***What is Six Sigma?***

6 Sigma is a data-driven process that aims at reducing product defects down to 3.4 defects out of 1 million product.

In other words, the objective is to manufacture almost perfect products for the customers.

By using the statistical models, 6 Sigma users will methodically develop and improve the company's manufacturing process until they hit the level of 6 Sigma.

In all 6 Sigma projects, there are two main ways of achieving the same zero defects objective. Below, we will mention these 2 ways:

The first and most-used method in Six Sigma is a 5-step process called DMAIC:

1. Define

2. Measure

3. Analyze

4. Improve

5. Control

The DMAIC process uses information, data and measured objectives to initiate a series of continuous improvement in the manufacturing methods.

While DMAIC is helpful for developing the current processes, DMADV is used to develop a new product, process or service.

DMADV stands for:

1. Define
2. Measure
3. Analyze
4. Design
5. Verify

The DMADV process uses information, data and comprehensive analyses to facilitate creating an efficient process or improve a high-quality product or service.

At their core, Lean and 6 Sigma both seek out to optimize the manufacturing process so as to offer the top quality products to the customers. They simply use different ways and focus on different activities.

3- Value Stream Mapping:

Another tool used in the Analyze stage of DMAIC as well as in Lean Manufacturing – making it ideal for Lean 6 Sigma – is value stream mapping.

A value stream map shows the stream of materials and information in one of the processes and was developed to assist you develop and optimize flow throughout the organization.

There are three things value stream mapping helps you define:

1. Value-enabling activities

2. Value-adding activities

3. Non-value adding activities

The whole reason of this map is to remove all of the non-value adding functions and rid of wait times between successive steps in the processes so that the processes become more solid, accurate, and quick.

4- Regression Analysis

A regression analysis is a statistical process for assessing and recognizing the relationship between variables.

we would use it to identify the numerical relationship between an output variable (y) & any number of input variables (x1, x2,x3,x4 etc.)

Drawing graphs for these inputs and outputs helps you imagine patterns or deviancy from desired patterns in your workflow.

We have to be careful when applying a regression analysis, though, if you need to avoid statistical delusions. Here are a few things to take into consideration when applying a regression analysis:

When 2 variables are found to be related, it is tempting to presume that this shows that 1 variable causes the other, resulting in the logical delusion known as correlation does not indicate causation.
2 or more variables in the regression model could be highly related, making it hard to separate their individual impact on the dependent variable, referred to as Multicollinearity.
When the error term in 1 time period is positively linked with the error term in the precedent time period, we will clash with the problem of (positive first-order) autocorrelation.

5- Pareto Chart:

The Pareto chart graphically shows the variations between sets of data, allowing Lean Six Sigma teams to define the greatest issues facing the process.

The y-axis represents an aggregate percentage and a deficiency frequency, while the x-axis represents the sets of response variables displayed as bars, such as machinery design or machinery parts.

This chart is usually mentioned as one of the most essential tools in the Lean Six Sigma toolbox for assisting teams reveal the 20% of sources that cause 80% of troubles in their processes.

6- FMEA

The Failure Modes and Effects Analysis (FMEA) assists businesses define and get rid of weakness points in the very early phases of any product or process.

Developed in the 1950s, The Failure Modes and Effects Analysis "FMEA" was used to evaluate components, assemblies, and subsystems to define the failure modes & their causes and effects.

Lean Six Sigma experts use The Failure Modes and Effects Analysis (FMEA) to develop the quality of their processes, services, and products by discovering and resolving the problems before they occur.

7- Kaizen (Continuous Improvement)

Kaizen is the process of continually monitoring, detecting, and executing gradual improvements in the manufacturing process.

It inspires all managers and employees to be engaged in the process of manufacturing improvements.

Kaizen guarantees that any waste will be gradually decreased through the combined talents and knowledge of everybody in the company working together to adjust the smallest deficiencies daily.

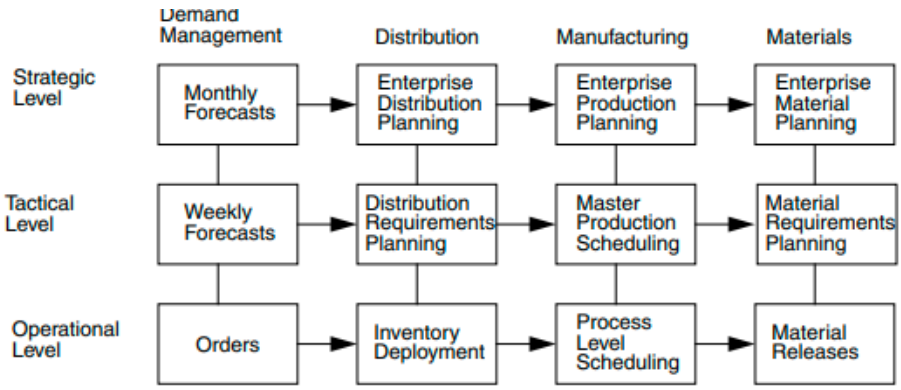
8- Poka-yoke (Mistake Proofing)

Poka-yoke is a Japanese phrase which means mistake proofing. It's a process by which all employees work to detect and wipe out the sources of human mistakes throughout the manufacture and production processes.

For example, a poka-yoke could be changing the wording on machine buttons to reduce worker uncertainty or it could be adding up a safety hand brake to mobile equipment to avoid accidents.

9- Supply chain Management

The supply chain is a group of activities which includes several chain of functions starting from the ordering, then receiving of raw materials, passing through the manufacturing of the products, after then through the distribution and finally, the delivery to the customer. In order to run efficiently, these functions should operate in an integrated cycle. Providing fast and quality reactions to supply chain events needs the coordination of multiple cross functions across the company.
Supply chain management functions runs on three levels: strategic level, tactical level, and operational level.



Each level is recognized by the period of time over which decisions are taken, and the roughness of decisions during a certain period.
The strategic level focuses on subjects like: where to allocate production, & what is the best sourcing strategy.
The tactical level focuses on subjects like: estimating, scheduling, and ordering of the short lead time materials, and do we plan overtime to meet production requirements.
The operations level focuses on subjects like: inventory utilization, detailed scheduling, and what to do with the order when a machine disrupt.
Supply chain management also needs coordination between customers and suppliers. The rapid changes of the market make this hard. Customers often request changes or cancel orders. Suppliers may deliver incorrect materials or deliver late. Systems that can quickly react to market dynamics while decreasing lead times and inventory are necessary.
Likewise the market, the production floor is dynamic as well. Unplanned events happen and cause divergences from scheduled activities. To accomplish planned production, it is important for the production control system to dynamically react to these cases in ways that enhances production goals. In dew cases, events cause problems that are not "locally contained".

10- Process Design

It is useful to categorize processes as either make-to-order or make-to-stock.

A- **Make-to-order business**, in this business method, the customer's order is manufactured according to the number of orders requests. This allows the company to customize the products according to the customer's specifications and requirements. This type of production is referred to as a pull type system. The manufacturing is "pulled" through the process according to the customer demand.

The Cons of this type of system is that it takes some time for the company to recieve any materials and needed components, and then to schedule & produce the customers order. Goods are produced in small amounts, and might be more expensive.

While the pros of this type of process is that available stock is much lower than in a regular make-to-stock system. There is not any doubts about what the customer needs and there is no outdated inventory to get rid of.

B- M**ake-to-stock process**, in this business method, Products are produced in estimation of customer demand, usually from a driven sales forecast. These goods are generally produced in larger amounts and put into storage area to wait for the receipts of customer orders. Although the unit cost may be cheaper due to huge production volumes, there might be failures due to forecast error, extra stocks, obsolescence and theft. Lead times yet are small because the products are available when the customer places the order. These products are not customized, but standardized.

However, we believe that Make to stock method is the most suitable for our industry according to several inputs that was taken into consideration.

11- Facility Layout

Layout refers to the shape in which companies set their equipment, departments, or work centres. Having an effective layout can reorganize production activities, reduce wasted or unneeded movement, and enhance safety. The general categories of layouts are: a fixed position layout, a (functional) process layout, a (line) product layout, and a cellular layout, which is called a hybrid. Other common layouts include office layouts, warehouse layout and retail layouts.

Fixed Position Layout:

When producing a good that is not simply able to be moved, it may be needed that the worker, their kits, and equipment are moved to the site where the production is taking place. This is a common layout in manufacturing a building, a ship or performing repairs to major equipment.

Second Question

In the 12-step movement, they declare that admitting you already have a problem is the first step toward fixing it.

And when it comes to the usage of energy usage and the wastes in supply chains, we have a major issue here.

We offer 12 suggestions for how companies can make their supply chains "greener," more efficient and more cost-effective. These apply to virtually any industry – electronics, food and beverage, retail, industrial, consumer packaged goods, etc.

1. Redesign the product

Even minor changes to product design – starting from decreasing weight to making it easier to disassemble — can easily reduce energy consumption & waste all the way through the product life cycle. In several cases, introducing new technologies may make it probable to remove components or ingredients completely and thus shorten the supply chain.

We will start converting our tractors to electrical operating in stead of petrol operating tractors which will decrease the pollutants to the max as well as the cost in the other side.

2. Reconfigure manufacturing

Streamlining production process, decreasing energy use, and restricting the usage of pollutants & toxic substances can have a big effect on how green the supply chain is. Adopting a product lifecycle management process that takes into consideration green considerations is the master key. We can reduce greenhouse gas emission by 70 percent thru reusing waste products and switching to natural gas.

3. Shifting to green vendors

Even Though some may have greater fees, green providers can have a high impact on the carbon consequences of getting products to the market. An analysis of different suppliers may discover probable advantages that justify making a change, such as assisting you comply with new government guidelines or asking for new categories of consumers.

4. Shorten distances

By enhancing sourcing, fabrication, and distribution with regard to markets, travel distances, and consequent fuel use can be decreased. For some manufactured goods, working with vendors or providers who are more near to the key markets can considerably decrease energy use.

5. Materials & Substances recycling

One of the most necessary actions that could be taken by any manufacturing company is recycling resources and substances used. That's why we should take this into consideration with the plastics used during the production phase, in addition to iron and woods materials, in order to recycle them and re-use them again in another production cycle which will help in reducing the pollutants resulting from the dismissal of these substances.

6. Take a life-cycle view

When we re-consider the whole operational cycle of the manufacturing process and look at it from a helicopter view, we will be able to identify the loops in the process that we can avoid to prevent or reduce the pollutants as much as possible.

7. Disposal of dangerous & Pollutants material:

The way we get rid of the dangerous material is the most important thing when we talk about green environment, as it could cause a lot of damages to the environment and people as well.

Therefore, we decided to hire a specialized chemical company to advise us on a regular basis on the components involved in our production process, and what is the possible reactions that could happen and cause harm to the surrounding environment so that we can dispose these materials in the safest possible way

Conclusion:

Overall, it would be reasonable to say that The big green tractor company already adopt a very efficient and comprehensive operations management strategy and that to their credit they only needed some final tunings in specific areas.

The big green tractor company already implements lean manufacturing initiatives in most of their activities. And also there is waste management system already implemented.

But The big green tractor company can utilize these techniques in blended manner in case the company can implement the lean manufacturing model in combination with 6 sigma or other techniques it will generate more effective outcomes in business.

As there are some comments on this technique, the 6 sigma system can be utilized together with the lean manufacturing technique.

As a result , The company can manage waste management system and quality with the same process & management team. This will not only stop waste & enhance quality but also will guarantee that the operations team is running it smoothly

The recommendations provided in this assignment will achieve concrete and testable accomplishment in the performance of the manufacturing process of the company.

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