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Reduction of Man power, Cost and Power Consumption in Grits plant

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ABSTRACT - *The main objective of this project is to reduce the cost, time, man power and power consumption in a powder producing industry. Our project also involves in satisfying customer demand and also attain the objective in total quality management. Our objective is to reduce all the above parameters without changing the flow of the process and it also involves in increasing the productivity of the powder which the industry produces. The manufacturing process begins with the selection of raw quartz. They are crushed and blended in the ratio of 93% polyester resin and other additives. The mixture of compacted into slab by a vacuum and vibration process of approximately 100 seconds at the pressure of about 100 tons. The slab are then cured in a kiln for 85 degrees for a period of 30 minutes to attain the essential properties of resistance to stain and impact. The curing process may be accelerated by using oven or steam*

Keywords- Reduction of cost, man power, power consumption, total quality management

1 INTRODUCTION

Quartz is a mineral composed of silicon and oxygen atoms in a continuous framework of SiO4 silicon-oxygen tetrahedral, with each oxygen being shared between two tetrahedral, giving an overall chemical formula of SiO2. Quartz is the second most abundant mineral in Earth's continental crust, behind feldspar. It was categorized under oxide mineral form. There are different silica minerals related to quartz. They are Tridymite and cristobslite. They are high temperature of polymorphs of SiO2 that occur in high-silica volcanic rocks. Coesite is a denser polymorph of SiO2 found in some meteorite impact sites and in metamorphic rocks formed at the pressure greater than those typical of the Earth's crust. Stishovite is a yet denser and high pressure polymorph of SiO2 found in some meteorite impact sites. Lechatelierite is a silica glass SiO2 which is formed by lightning strikes in quartz sand. Quartz grits of different shapes and different sizes and with different grades. There are different types of grades were used for producing Artificial marbles. Artificial marbles are producing by the combination of filler material and grit particles.

2 LITERATURE SURVEY

The performance of quartz made with filler materials as a fine aggregate at constant workability and studied the effect of super plasticizer addition on the properties of HSC made of filler materials. Two series of mixtures were prepared with different proportions of filler materials. The water content was adjusted in each mixture in order to achieve the same workability as that of the control mixture. The results indicated that the water demand by almost 22% at 100% slag replacement compared to the control mixture. However the strength and durability of Granite were adversely affected by the absence of filler material. Compared to the control mix there was a slight increase in the density of nearly 5% increase of slag content, whereas the workability increased rapidly with increase in slag percentage. It has been reviewed later that the characteristics and its effect on the engineering property of grit stone, quartz, they concluded that the utilization of slag in filler material and quartz provide additional environment as well as technical benefits for all related industries, particularly in areas where a considerable amount of slag is produced. The result obtained for engineering stones indicates that there is a slight increase in density of nearly 5% as slag content increases. On the other hand, the workability increased compared with the control mixture. A substitute of upto 40-50% slag as a sand replacement yielded comparable strength to that of the control mixture. The more addition of slag resulted in strength reduction due to increase in the free water content in the mix. The result demonstrated that the surface water absorption decreased as slag content increases upto 50% replacement. The absorption rate increased rapidly and the percentage volume of the permeable voids was comparable to the mixture.

3. MACHINES

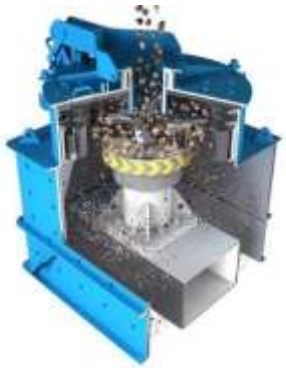
3.1 JAW CRUSHER

Jaw crusher is a machine uses compressive force for breaking of particles. The mechanical pressure is achieved by the two jaw of the crusher of which one is fixed while the other reciprocates. A jaw crusher or a toggle crusher consists of a set of vertical jaws, one jaw is kept stationary and it is called a fixed jaw while the other

jaw called a swing jaw, moves back and forth relative to it, by a cam or a pitman mechanism, acting like a class II lever or a nutcracker.

3.2 VERTICAL SHAFT IMPACTOR

Vertical Shaft Impactor (VSI) is used to crush the quartz particles of size lesser than 18 mm into a finer size. VSI consist of a distribution plate and the plate contains three tipped tool which are used for crushing purpose. The tool used for crushing process was tungsten carbide, which is the strongest material used for crushing for VSI in Industrial purpose.



3.3 SIFTER

Sifter is a mechanical separation process which has different sieving Mesh sizes. When the material is charged into the sifter, the sifter starts to vibrate, due to the vibration the particles are separated and collected. There are different industrial sifter are used. Some of them are simplex basket sifter, duplex strainer, and Y sifter.

4. METHODOLOGY AND PROCESSES

4.1 REDUCTION OF COST

As mentioned before, the central objective of this paper is to generate theoretical knowledge and practical insights on how the firms could use the improvements in their manufacturing processes as a tool to also generate an increase in their Eco efficiency level. To reach that goal, the following research question was established: *The implementation of actions aiming to reduce the manufacturing cost of companies through the utilization of the value analysis technique could also generate, in parallel, improvements in their Eco efficiency level?*

To answer that question this paper investigated the value analysis practices and the Eco efficiency level in a dyeing and washing company belonging to the Brazilian textile sector. The case study method was selected because the research involved questions of the "how and/or why" type and also investigated an actual phenomenon in a real context where the borders between them were not clear Yin (2009).

To select the company considered in the case study, Patton (1990) recommends the utilization of purposeful sampling, i.e., cases from which the researcher could extract relevant information about the subjects that are significant for the research. Among the several strategies proposed by Patton (1990) to choose purposeful samples, this paper considered the typical case sampling in which the organization to be chosen should present a structured method to implement improvements in its manufacturing process.

In line with this assumption, two criteria were established to select the company to be considered in the case study: i) it should have recently implemented cost reduction projects using value analysis, and ii) it should grant the researchers full access to the data and information required to support this research. Following these criteria, it was chosen a small textile company located in the state of Parana in Brazil which dedicated to

dyeing and washing jeans clothes. It is a small national family owned firm employing about 50 people and with a US$ 3.5 million annual net turnover. As a procedure to collect data in the elected company, it was decided to use the semi-structured interview because it is considered the best option when researching through a case study (Bryman, 1995; Collins and Hussey, 2003). Patton (1990) also endorses this recommendation recognizing that this data gathering technique should be employed whenever the researchers need flexibility to obtain information. To conduct the interviews and assure a uniform content in all them, an *aide-memoire* was prepared containing the relevant questions to be asked during the conversations with the interviewees.

As a result of the interviews, it was possible to note that the company under study did not take into account any environmental issues as part of its cost reduction efforts. To evaluate if those actions would also impact the manufacturing process environmental conditions, the researchers measured the Eco efficiency levels of the dyeing and washing area before and after the cost reduction implementation. To do that they initially defined the environmental performance indicators for the process area under evaluation, following the recommendations made by the WBCSD

(VERFAILLE; BIDWELL, 2000).

As product or service value it was decided to use the monthly average net turnover and after a thorough evaluation of the dyeing and washing process the following indicators were selected to describe the environmental influence: electric energy consumption, the firewood consumption (used as heat source to power the boilers) and water consumption.

The value analysis implementation was performed by the company under study following the subsequent steps. As an initial stage, the objectives and goals for the cost reductions were established. As a performance indicator to gauge the reduction intents the some attributes of the manufacturing cost was defined. Also the implementation team was put together comprising one chemist and two manufacturing engineers. Finally an action plan was established considering the products and process to be evaluated.

As a second step, in the information phase, new options for raw material and process suppliers were searched. In parallel all the process sheets were revised and some typical product / process routings were selected to enable the determination of their respective manufacturing costs. Then the analysis phase began with the implementation team developing several meetings to collect process improvement ideas and possibilities of cost reductions as well as to evaluate eventual impacts on the organization resulting from the planned modifications. The time required to implement the changes was also assessed. As a result of this process, the implementation team proposed to replace the current type of chemical products, adopting in parallel a new dyeing and washing process to comply with that adjustment.

In the creativity phase the revised specifications were presented to several chemical product vendors, asking for their comments and suggestions to reduce costs and increase output. The best alternatives according to the value analysis team were tested in real life by means of pilot runs in which all the manufacturing organization took part and emitted their respective comments regarding each alternative tried. As a result, a new set of raw materials and a revised manufacturing process were selected by the implementation team as part of the judgment phase.

Finally, in the implementation stage the selected raw materials were acquired in quantities required to support the production needs and the new process was put in place according to the plans established for that purpose.

Consequently, the aforesaid actions enabled the firm to accomplish significant cost reductions. The gains obtained as a result of the value analysis implementation took into account the monthly average consumption for each resource considering two comparable periods: the second half of 2011 (before the implementation of the value analysis) and the second half of 2012 (after the implementation of the actions described above and allowing some time for the process to stabilize). However, it is important to point out that the volume of dyed and washed products in those two periods were significantly different as the average monthly net turnover increased more than 60% as shown in Table 1 (from US$ 211 thousand in 2011 to US$ 351 thousand in 2012). To consider the effects of such a growth on the gains obtained, it was calculated what the consumption of each resource would be in the second half of 2012, assuming that no improvement actions were implemented. Then, comparing the actual consumption of each item against those latest numbers it was possible to determine the actual amount of cost saved.

As can be seen, cost savings were significant: it was possible to obtain a 42.8% reduction in the raw material cost, 45.7% decrease in the electric energy cost,

43.9% cost improvement in the firewood cost and 10% savings in the cost of water consumption. In total it was possible to save almost 43% in the considered items of the manufacturing cost.

When the output of the jaw crusher is screened and separated into two types. Above grain size is charged into double toggle jaw crusher. At the end of jaw crusher, there is a Vibro screen which remove the below grains and stored into the hopper.

Then the above particles are recycled to single toggle jaw crusher. Then the below particles from both the jaw crusher are fed as the input to the VSI. By the study, the VSI has the capacity to withstand both loads at same time. The output of the VSI is moved to further process.

4.1.1 ADVANTAGES

Due to the storage of materials in additional Hopper, the Washing line has the capability to run for extra 3 hours. The Material for the night shift is stored in the Hopper during Day run and the washing line is stopped during night shift.

The Power consumption of the Washing line is reduced significantly. Man Power is reduced when the washing line is not operated during the night shift.

The Load to the Single toggle Jaw Crusher is reduced due to the screening of material in the outlet of Double toggle Jaw Crusher. The Efficiency of single toggle Jaw Crusher is increased due to reduction of additional load to the Jaw Crusher.

4.1.2 DISADVANTAGES

The Cost of implementation of Additional Hopper and other Equipment such as Vibrating Feeder, Vibro Screener and Rubber Belt Conveyors.

There will be a change in layout of the plant has to be done, when the additional Hopper and other equipment were implemented.

4.2 SATISFYING CUSTOMER DEMAND THROUGH VSI

There is certain amount of demand from the customer which the Industry has to satisfy. In this Industry, the highest demanded grades.

There is large amount of By-Product has been discharged from Trommel Screen with size. Our proposal consists of three equipment Vertical Shaft Impactor, Trommel Screen, Sifter.

The By-Product has been charged into Vertical Shaft Impactor, in which it breaks the particles. The Particles then conveyed to Trommel Screen for screening of grades particles

The Particles are elevated to the Sifter through Bucket elevator The Sifter is the Final process where the output product has been stored in one-ton bags with different grades.

Company should focus on the price so that more customers buy from it. Company should give more effort on product quality to increase the customer and enhance the order. Company should increase some new products so that customer will get more variety of select purchasing. Company should make their order process more convenient for the customer so that they feel comfortable while purchasing.

Company should also provide the detailed information about the product on the packing as maximum customer were mentioned while doing survey. Company can also improve their services in terms of delivering the products and also make it more comfortable to customers. The customer problem should be solved on time as that would ass more value to their assets

4.2.1 ADVANTAGES

Through this process the Customer demand of different grade has been satisfied. In this process, an additional sifter has been added. Since Sifter is the producer of output product, the overall productivity has been increased.

The wastage of By-Product has reduced from 45% to 25% due to the installation Vertical Shaft Impactor and Sifter.

4.2.2 DISADVANTAGES

The Cost for the Installation process was high. The Power Consumption for the Industry will increase due to installation of Additional Vertical Shaft Impactor and Sifter

5. CONCLUSION

Sustainability has currently been a relevant theme in corporate discussions. However, it has not been considered in the vast majority of small companies, where short term survival ends up defining all the strategic and operational priorities. The case study presented by this paper confirmed this statement by showing the utilization of a structured tool to reduce manufacturing costs (value

analysis) that did not consider the environmental impacts resulting from the actions taken.

Nonetheless, by measuring the Eco efficiency level of the manufacturing process under analysis it was possible to demonstrate that the activities defined to reduce costs also generated relevant environmental improvements, representing an important contribution to the sustainability level of the company and giving a favorable response to the proposed research question.

Hence, this paper brings some contributions to the body of knowledge of Production and Operations Management as it demonstrates that cost reduction processes can also bring environmental improvements, even if they have not been formally considered in the cost savings procedures. At the same time, the content presented here brings for the practitioners the idea that the environmental impacts of their manufacturing activities can be reduced without additional costs or investments.

On the contrary, as it was possible to verify in the case presented, the environmental improvement was obtained by simply measuring the respective Eco efficiency indicators and Eco efficiency levels before and after the cost reduction implementation. Usually, actions aimed at reducing the manufacturing costs can also favor an environmental gain.

Sure enough, this work has some limitations. First, as it involves a single case study, the conclusions obtained cannot be generalized. Also, the work developed here in considered only one kind of manufacturing process in the context of the textile industry. It is a fair supposition that the same results could not be obtained in different situations. As a result, to enlarge the possibilities of consideration of the results found by this paper, future research should be developed assuming a bigger number of firms, comprising different manufacturing processes belonging to different industrial sectors.

This project is mainly focused on reducing the man power, time, cost and power consumption of certain equipment. And we calculated the power consumption, cost of equipment and proposed the process of Additional hopper.

By Implementing an Additional Hopper the man power, cost and power consumption was reduced significantly. The implementation of additional Vertical Shaft Impactor and Sifter mainly focused on the improvement of overall productivity and to satisfy the customer demand.

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