



## INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

"KEY ELEMENTS FOR A SUSTAINABLE WORLD: ENERGY, WATER AND CLIMATE CHANGE"

# Cleaner Production Applied in Sealer Process of Paint Shop from an Automotive Company

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### Abstract

In an automotive company, much kind of residues are generated diary. They are of the most variety possible and have to be disposed properly too, according to the specifications that the company has to follow. To study a specific process or residue it took much time and trained people to evaluate the best way to avoid his generation.

Normally, the person responsible to realize this study is a technical or an engineer and as the companies nowadays have greats dimensions and as the work realized in a department may cause impacts in another it was decided and more convenient to create a work group to develop and solve this problem.

The work described in this article was developed in a sealer process of an automotive paint shop and the author's presents here some of the steps adopted in cleaner production to reduce in the process application: quantity of material applied, numbers of operations and quantity of residues generated. A little discussion is elaborated at the end of the article and some considerations are showed to diffuse the best practices identified in this company.

*Keywords: Painting Process, Protection, Residues.*

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### 1. Introduction

The environmental conditions are being degraded day-by-day, especially because of the production facilities and the exploration of the prime-mater in the nature. The major process in an industry must have conditions to be better analyzed and as a consequence of it, obtain better results. Although, the worst scenario is not only related to this condition. The indifference and some times the total quantity of residues generated are very bad situations identified in many companies. The inappropriate disposal of the residues or the consummation of excess material can also make strong effects in the environmental when they are not properly treated or disposed.

In a way to evaluate better the process inside the company and to proportionate better work conditions and better economics values, the results obtained can be major than even thought before.

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The environmental preservation is a wide world preoccupation, and because of that, it demands exchanges to realize a broke environmental paradigms. In this scenario, the companies have to turn their efforts to determine the origin of their problems. News technologies' are presented all the time, but generally the cost of it is too high, and because of that, they are reproved due the financial analysis. There are also technologies that exchange the conventional treatments of end of pipe by modifications in the productive process focused on prevention and pollution control in the point where they were generated.

Some measures that are possible to be implemented can be observed below:

- Necessity to adapt at the new laws exigencies;
- To reduce the environmental impacts;
- Attention to / focus in the process operations;
- Process optimization;
- Materials and energy recycling in the productive process
- To reduce the residues disposed/discharged/emitted in the land, water and air.

The cleaner production is also a concept that must be used in the company as much as possible. His benefits are very important, because it can improve the efficiency in the use of prime-mater, water and energy, and contributes to prorogue them in the nature.

## **2. Work Group in Sealer Application Line**

Considering these measures, and always thinking on a way to reduce residues in process, people from engineering and fabrication decided to join their efforts and create a work group, to propose a study to turn production plus cleaner in this part of the process.

The sector defined to realize the work was the Sealer Line, which is responsible to apply a plastic material (called PVC) in a paste form. To introduce some information about this sector, it is responsible to apply the PVC in the bottom of the car with a function to avoid the stone action and to prevent the body (car) against entrance water and corrosion. These materials are applied as pulverized and extruded forms using specifics painting pistols to realize these operations. As the PVC material is applied in the bottom of the car, is also necessary to protect some screws welded there and some holes against the PVC to be possible to use them in the assembly line. Because of that, they are protected with a small plastic material (polystyrene). The operators put this plastic material in each screw or hole before the PVC application. After that, they have to remove it and assure that the screws or holes were completely cleaned to avoid problems in the assembly line.

This plastic material is also called as an intermediate operation because it does not follow the car in all the process. So if is possible to reduce this operation, it is possible to reduce the quantity of residues and eliminate that operation.

## **3. Activities in Sealer Line**

The main objective of this work group was to develop a study to reduce quantity of material applied, operations and residues generated in the process.

The group decided to analyze the process in the painting shop and define some actions to be followed, as described bellow:

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- The first action was defined as the quantity of screws or holes were necessary to protect and how much time it took to be realized (to put them and to remove them of the screws and holes).
- The second action was to evaluate where were the possible regions (in the bottom of the car) that permit thickness reduction.
- The third one was specified to evaluate the possible gains if an application could be reduced, and.
- The last one was to implement the study in the process.

The initial activities were realized in the Paint Shop Department, and the operations that were realized were measured. The total quantity of screws and holes that needed to be covered was 10 screws and 4 holes. The total time needed and measured to realize the operation of putting them on the car were of 42cmin (the measure unit used is the centesimal part of the minute, it means almost like 25 seconds). If the time needed to put the covered elements is 42cmin, the time needed to remove is also the same. So plus 42cmin were needed, and the total time considered for this application is 82cmin (equal to 50 seconds). The quantity of residue is also necessary to consider in this study, because of the removed material (the plastic that recover the screws and holes with sealer) were send to a company responsible to incinerate it. The total residue generated per day of production was in an order of 30 kg. Considering 22 production days, it makes 660 kg/month. These analyses were realized in week 06/09. Although, this operations were not possible to eliminate because of the quantity of material applied in the region studied. To execute this modification was necessary to consider and to implement the second activity of the action plan.

To realize the second activity, it was necessary to check the bottom of a car totally assembled and after that evaluate the probability of thickness reduction in any car parts. As Brazil is considered a country of heavy stone aggression, according to the international specification of the company, the thickness specified is equal or above of 600 micron (it is a strong exigency, to be in accordance with the exigencies). Observing the assembled car, it was identified on it a region covered by a metal part. It is specified to protect the pipes used to transport the gas and the breaks fluid. As the car region is very well protected by this component, the idea identified permit a reduction of 50% in the amount of sealer applied, only in that part. The total quantity that was reduced was 0,3kg/vehicle. The gains obtained in this case correspond to the financial, ergonomic and environmental. In addition, as a result of this test, there is another situation observed during the tests. The quantity of sealer applied in the screws is almost not perceptible, that permit to eliminate the plastic covered parts from the sealer line, and the gain result is already discussed in the action one. This action was taken on week 07/09.

For the third action, is necessary to consider the quantity total of sealer reduced (0,3 kg/vehicle) and multiple by the total quantity of vehicles to be produced in a month (almost 240vehicles a day versus 22 days of production), that represents 1.584 kg of sealer reduced in a month. To identify the approximate quantity of money reduced is necessary to multiply the result obtained by R\$ 4,0/kg (the price of the product, approximately), and it will give a monthly reduction of R\$ R\$ 6.336,00. This analysis was realized in week 08/09.

After analyzed the obtained results, the decision to implement the idea was positive. The results of the study represent a good opportunity according to specified in the beginning of the work, principally because it will reduce: residues generated in the process and quantity of sealer material applied and will bring better ergonomic

conditions in a work unit, by reducing the time to put and remove the little plastics parts. However, to validate this condition, the engineering of assembly line needed to give his opinion, and of course test some vehicles in a condition to that he will receive them, according to the studied modifications. To evaluate this situation, five cars were manufactured in the Paint Shop in week 09/09 and were sent to the Assembly Line. The test in this step was to observe how the conditions of the screws and holes were when arrived in the point to assembly the components. One more time, the result obtained was positive, it means there were no problems to fix the components in the part of the car where the modifications were done, and the opinion of the internal client was positive.

#### **4. Discussion**

To work with cleaner production is not an easy task, because of the hours necessary to study the process, evaluate operations and ergonomic conditions and principally, the impact of the process in the environmental.

Some times is also necessary to submit the ideas to the mother company approbation. The distance and principally the priorities are also different, that can make the process more and more lent and borrow.

One important condition that was taken in this work was to inform the line supervisor and the assembly engineer about the modifications that the Paint Shop was intended to implant. If it were not realized, the result would not be as good as obtained. Perhaps any restriction could be posed and because of that, a good idea could be not implemented.

The documents to realize a test in a process were filled and submitted to everyone that had impact in this work, where the principals involved sectors were, anticorrosion, sealer supervisor, paint shop manager, supplier, engineering, quality and assembly line in a figure of the line supervisor and also assembly engineering.

The specification of the car will not affect the final client, because the area where was reduced the thickness is not visible and will not suffer the impact of corrosion and other external agent. This condition was not mentioned in the whole work, but it was an intrinsically condition that the anticorrosion sector develop and assure in the company.

#### **5. Conclusion**

The results obtained in this work were very good. The activities seemed to be simply but the quantities of discussions, essays and measures realized demanded a lot of time. The work was also possible to be realized because of the discussions realized in the beginning of the studies. The objective proposed for the work was also important, because after it was defined everyone was focused and had no doubts about it.

The reduction of residues obtained represents a little contribution for the environmental, but if it is taken in time, the impact can take large scale. The total amount of residues reduced in a month is of 660kg, but in a year, it represents 7.260kg. One important consideration the group has identified was that all process in a company must be analyzed, independent of his size or dimension, because they are

always possibilities to be cleaner than they are, and the registered benefits could bring good results to the company.

The quantity of material reduced in a process brought goods results for the company. It permits to him to reduce costs in process and improve his free cash flow. The benefits generated in this work is of R\$ 6.336,00 per month or, R\$ 69.696 per year.

An another important point to be consider was the work conditions, that permit to the worker a better place to live with a better ergonomic and health conditions too.

To conclude this article, an important point observed to the success of this work group was the synergy existent between fabrication and engineering. All the analyses and measures realized in the line were very well discussed and treated, and at the final of the process, after the implementation of this work, all documentation was up dated and distributed for all involved sector.

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