

IMPROVEMENT THE PROCESS OF PAINTING CAR COCKPITS' ELEMENTS

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Abstract: The article presents an example of the improvement of the process of painting car dashboard components in one of the selected manufacturing companies. The article describes the painting process and provides figures indicating its initial low efficiency due to the fact that most of the painted details had paint defects in the form of material inclusions. The main part of the article is a description of causes of the high level of defect in the coating process. The study describes the actions taken in the investigated enterprise to improve the undesirable situation. The results achieved in the period of 2 months thanks to the implementation of a set of solutions improving the painting process is described in the last part of the study.

Keywords: quality, quality improvement, Ishikawa chart

1 Introduction

Improving the efficiency and effectiveness of the company's processes has now become a major task of managers nowadays. Continuous improvement became not only a function of normative management systems [1,2,3,4,5], it is also a condition of competitiveness and existence of enterprises on the market [6,7]. This article is an example of a process of improvement in the area of manufacturing, in particular the elimination of problems with defects in production. The company in which the research was carried out was a company in the automotive sector, which manufactures elements of cars' cockpits. The first part of the article describes problems with the quality of the process of painting plastic car dashboard elements. The following is a description of the main reasons for the unacceptable quality level with the implemented improvement measures. The effectiveness of these measures is assessed in the last section of this paper.

2 Problems in the painting process

The company specializes in manufacturing parts for the automotive industry. In the given case, they are interior fittings - cars' cockpit. The company has a hall producing moldings made of melted granules, plastic paintshop, assembly hall and auxiliary departments. This article describes the situation in the paintshop department, where problems with the quality of the coating applied to the

plastic parts have been identified. The painting process is carried out in a three shifts system, and its schematic diagram is simplified in fig. 1. Preparation of the lacquered parts starts with degreasing them, setting them on a special rack. Then, by means of an automatic belt, the element is transported through blowing compressed air chamber. The next step is manual lacquering, automatic lacquering and baking in the oven at 90 ° C for about 1.5 hours. After this process, assessment of the quality of paint occurs.

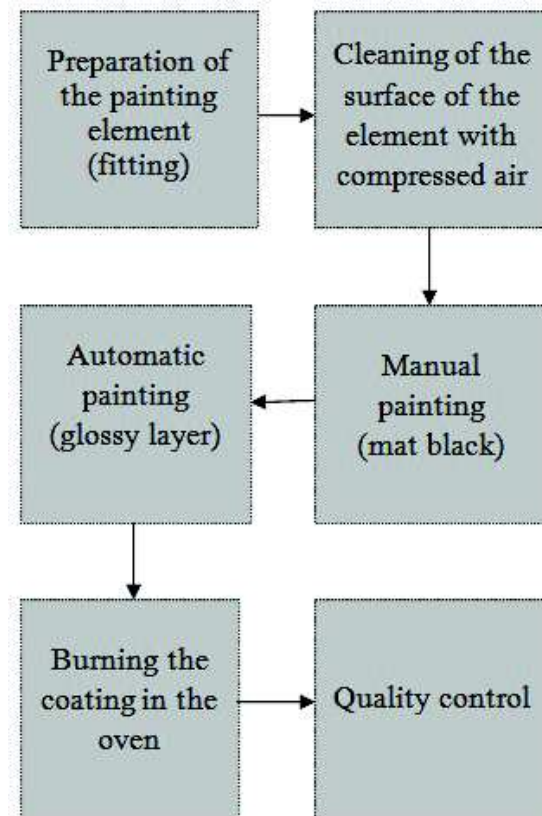


Fig. 1. Lacquering process

Source: Own study

During the inspection after the lacquering process a significant number of paint defects were identified - material inclusions. Due to the low effectiveness of lacquering, it was decided to analyze the causes of lacquering defects in order to improve the effectiveness of this process.

For this purpose, a special interdisciplinary task force was set up at the paintshop department, which consisted of: the manager, the controller of paint assembly line process, the foreman and the experienced painters. The team also included a specialist in quality assurance and accounting, the process controller in the assembly department and a specialist of the accounting department.

The team analyzed the quality control cards for each shift made in one month. Cards were the primary source of information on the number of incongruent items that required repair or re-paint. Figure 2 shows the effectiveness of lacquering - percentage of congruent elements in one month for each shift.

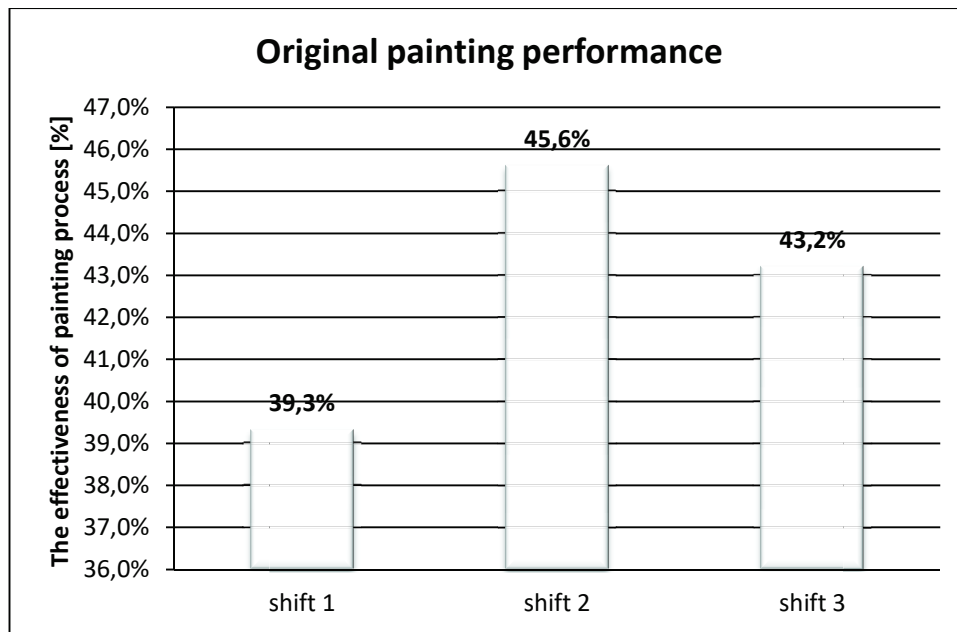


Fig. 2. Original painting performance

Source: Own study

The graph shows a highly adverse image of the painting process. Effectiveness of process in the range of 39.3% - 45.6% was rated by the management as highly unsatisfactory. The objective of the team in the first stage was to increase the efficiency of the varnishing process on each shift to a level of 60%.

A number of main causes and necessary corrective actions have been identified through the use of causal analysis. The causes of the defect of the painting process are shown in the Ishikawa diagram - Fig. 3

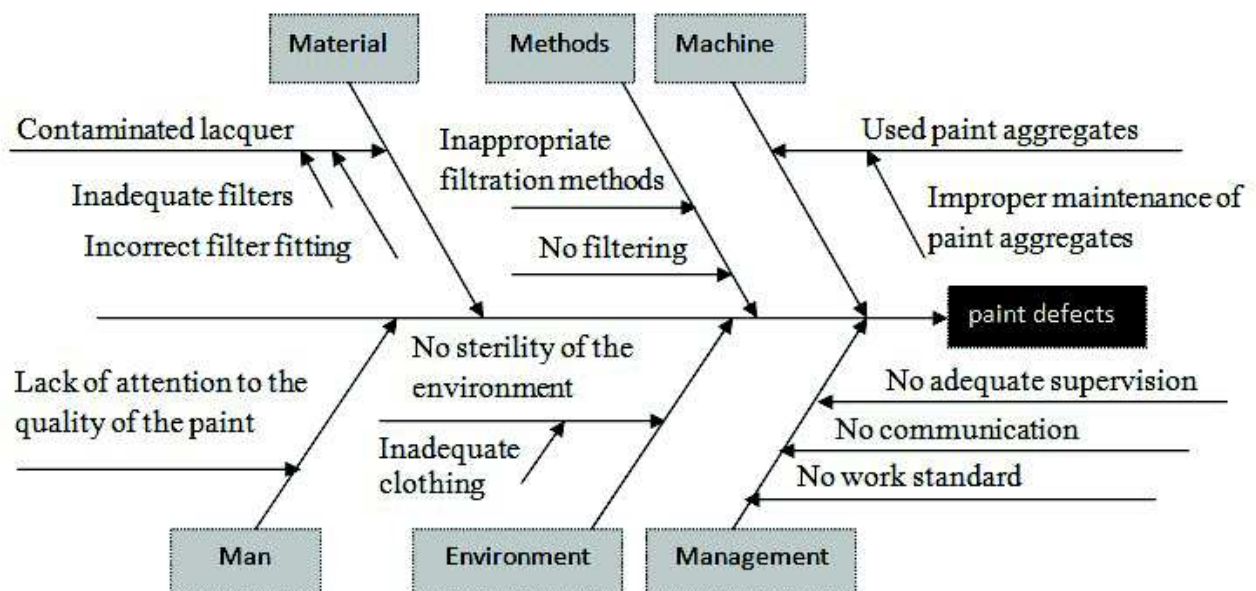


Fig. 3. Ishikawa chart for defect of the lacquering process

Source: Own study

The contaminants contained in the lacquer were the main cause of the inclusions. They were due to the improper and poorly installed filter, the material through which the lacquer was poured in the first phase of painting preparation. It was necessary to change the filter. The filter used initially had fibers with a density of 400µm and is currently 100µm. The new filter stops most contaminants. In addition, the filter was loosely mounted on the paint container, which caused the paint to float outside the filter. Thanks to the special stand the filter is stable and easy to clean. Many of the problems stemmed from the fact that rigorous lacquer filtering standards have not been established. The filters were repeatedly used, what is worst, ignoring the direction of pouring. The problem was solved using a new filter design. Currently there is no possibility of confusing the direction of filtration.

On the pump for the paint to the aggregates have also been changed filters with the method of installation. The same density as with the paint filter is 100µm, the filter is double, and the assembly is more professional and durable.

Another cause of paint contamination was the lack of standards in the maintenance of equipment - guns (spray guns). It was necessary to replace the spray guns with the introduction of compulsory maintenance. Each cleaning of the equipment is currently listed in a special sheet under which the person responsible for cleaning is signed.

The next identified cause of the inclusions in the paint was the contaminated work clothes of the painters. Before applying corrective measures, 2-piece garments, i.e., trousers and lacquer blouse were used. The improvement in this case is the introduction of a workwear anti-static one-piece suit. As a result, it is no longer a source of contaminants in the form of textile fibers that get directly to the lacquer sprayed or floated in the air, settling on freshly lacquered elements.

As a consequence of the problems with the efficiency of the lacquering process, errors in communication and information flow were also recognized. Painters did not receive quality control feedback on the types of inclusions identified during quality control of painted items. Daily conferences were held to discuss current results of the lacquering process.

3 Effectiveness of corrective actions

During the next 2 months, the effectiveness of the lacquering process was analyzed. Based on the data collected in the control sheets, the indicators were compared for a total of 3 months. The results are shown in Figure 4.

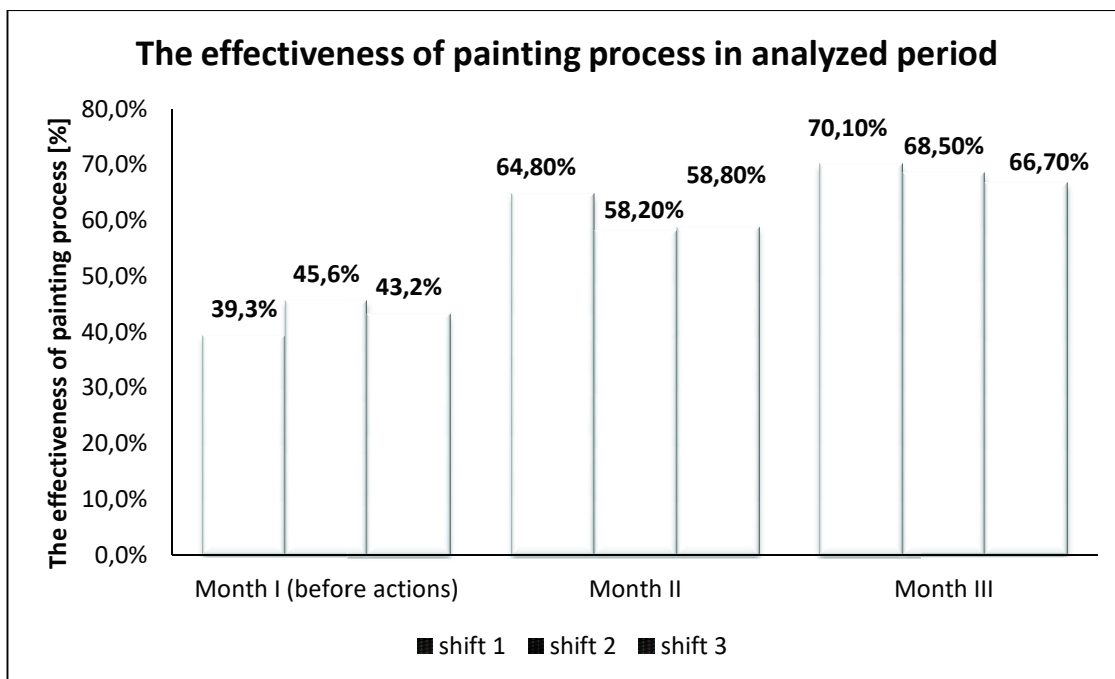


Fig. 4. The effectiveness of painting process in analyzed period

Source: Own study

Thanks to the introduction of a number of activities described in the article, the painting process has been improved. The improvement was noted already in the following month. The effectiveness of the lacquering process has reached the assumed level of 60% in all 3 shifts after 2 months. Not to mention the obvious benefits of less lacquer usage. The benefits of corrective actions are increasing the amount of space available in the product store where incongruent items are stored. Organizational benefits have also been gained, thanks to the mixing of the number of repainting has facilitated the planning of production of other elements.

Conclusion

The article is a good example of the process of improvement. Due to data obtained from quality control and well-chosen statistical methods, the scale of problems occurring in the process of painting in the examined production plant has been characterized. Teamwork and an analytical approach in the form of Ishikawa Diagram have identified the real causes of problems - inclusions, particles in the lacquer coating that disqualify the product. Analyzes of the causes by the specially appointed team identified the irregularities in all causal areas of the Ishikawa Diagram. Among other things, variations in lacquer filtering, changes in lacquer wear, and improvement of equipment maintenance standards, in addition to changes in communication, have resulted in significantly improved lacquering efficiency (60%) compared to the original. Although this value is far from what is expected, the improvement process should be considered effective as it has reached its original target.

The causes of defects in the lacquering process described in this paper and the described improvement actions may provide a useful source of knowledge for managers, who solve similar problems in the lacquering process.



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DOSKONALENIE PROCESU MALOWANIA ELEMENTÓW KOKPITU SAMOCHODOWEGO

Streszczenie: W artykule przedstawiono przykład doskonalenia procesu malowania elementów samochodowej deski rozdzielczej w jednym z wybranych przedsiębiorstw produkcyjnych. W artykule opisano proces lakierowania oraz podano dane liczbowe wskazujące na jego pierwotną niską skuteczność związaną z faktem, iż większość z malowanych detali posiadała wady lakiernicze w postaci wtrąceń materiałowych. Główna część artykułu stanowi opis zidentyfikowanych przyczyn wysokiego poziomu wadliwości procesu lakierowania. W opracowaniu opisano działania jakie podjęto w badanym przedsiębiorstwie w celu poprawy niepożądanego stanu. Efektów jakie osiągnięto w okresie 2. miesięcy dzięki wdrożeniu zestawu rozwiązań doskonalących proces lakierowania opisano w ostatniej części opracowania.

Słowa kluczowe: jakość, doskonalenie jakości, diagram Ishikawy