



## Abstract

An increase in the number of events associated to AQL failure that resulted on partial batch rejections was observed in 2020 for Tablets/Caplets formulations due to cosmetic conditions such as bump on coating, color blotches, pits on tablets, rough coating, lack of gloss, and odd shape tablets/caplets appearance. This report summarizes the coating improvements and recommendations identified to reduce the amount of pans inspected/rejected caused by aesthetical conditions. To improve the quality of process outputs identified the team selected a quality management method DMAIC (Define, Measure, Analyze, Improve, and Control). After using the methodology, the purpose of improving the cosmetic appearance of the product and decreasing the impacted pans was achieved. Data presented a significant reduction of pans inspection and rejection. Tablets pans impacted was reduced from 2.8% to 1.7%. Caplets pans impacted was reduced from 1.7% to 0.2%.

## Introduction

An increase in the number of events associated to AQL failure that resulted on partial batch rejections was observed in 2020 for Tablets/Caplets formulations. In addition, data provided reflects an increment in inspections related to cosmetic conditions such as bump on coating, color blotches, pits on tablets, rough coating, lack of gloss, and odd shape tablets/caplets appearance. A total of 21 investigations were generated between January and August 2020 in the coating area related to the cosmetics conditions previously mentioned. As results of this situation, project was initiated to investigate the cause for the events reported and address them accordingly.

## Background

The Sugar-Coating process is a process for the application of thick coating layers, primarily for masking taste and enhances product appearance. This process is performed in the Drug Products Rooms 40A, 40D and 40G and during the process, syrup is sprayed onto the tablets. The introduction of process air evaporates the fluid and dries the sugar coating [1]. An increase in the number of events associated to AQL failure that resulted on partial batch rejections was observed in 2020 for Tablets/Caplets formulations. As results, process Inspections and/or material rejection decision are taken based on the severe tablets/caplets appearance. This situation increases the manufacturing cost, and process cycle time for Advil Tablets and Caplets formulations. Tablet coating defects and remedies are the crucial concern of a pharmaceutical formulation scientist. Unfortunately, several defects can arise with coatings. The following project provides helpful remedies for common issues that may be encountered.

## Methodology

To improve the quality of process outputs identified, maintain cosmetic conditions at acceptable levels, and minimize variability in the manufacturing processes, the team selected a quality management method (DMAIC). DMAIC consists of five (5) phases of a process improvement project and is defined as: Define, Measure, Analyze, Improve, and Control [2].

## Results and Discussion

### Define Phase

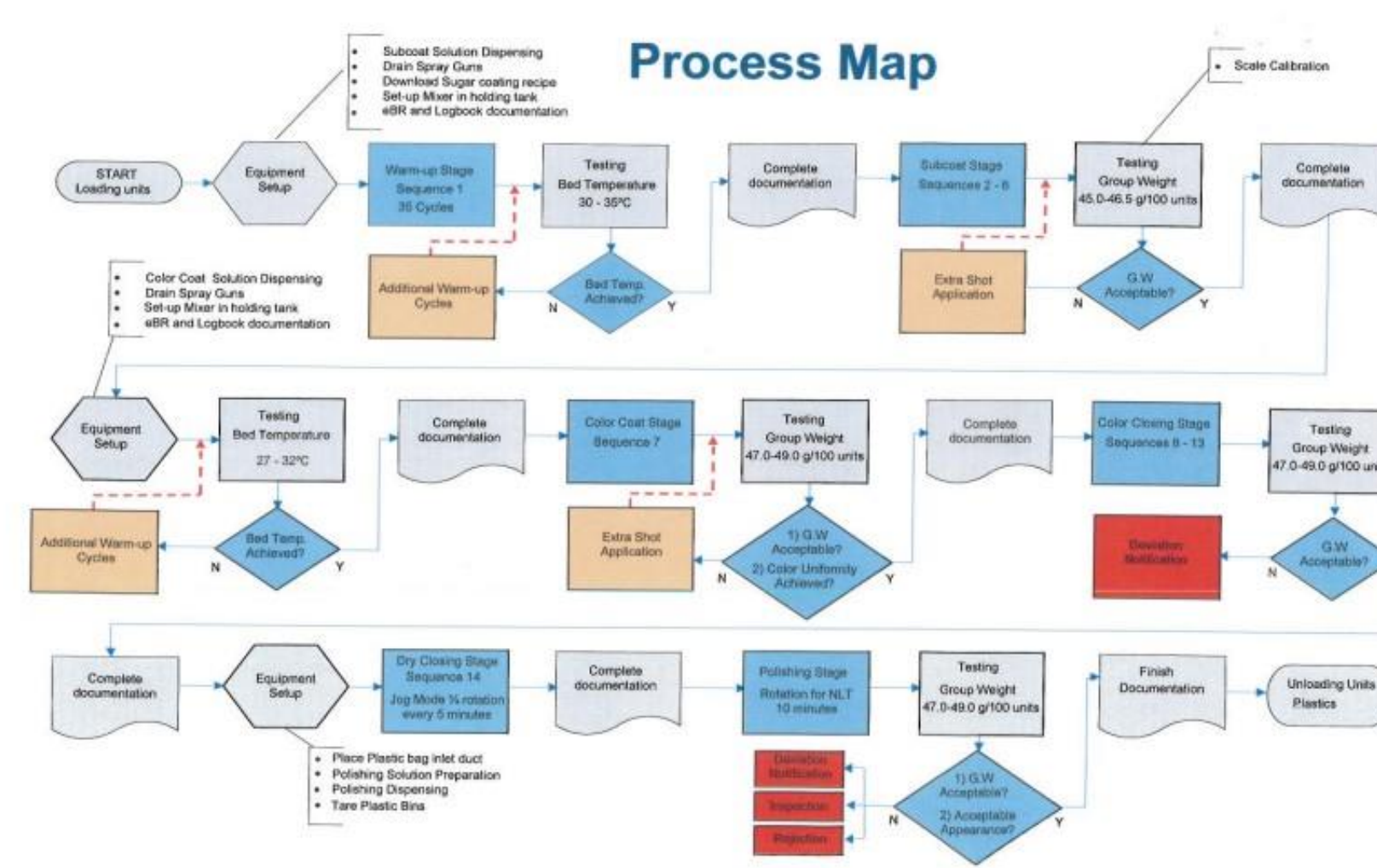
During the define phase the boundary of the project was limited to the cosmetic defect categorized as color blotches, rough coating, lack of gloss, pits on tablets, and bump on coating.

SIPOC (Suppliers, Inputs, Process, Outputs, and Customer) [3] - This tool provided the team a broad view of the coating processes for sugar coating products identifying boundaries, customers, supplier relationship, input, and outputs to evaluate the process needs and identify the points most likely to collect data that will lead us to root causes and check points

Voice of the Customer (VOC) tool identifies who the customers are, and what they need, and why they need it [4]. The customers identified were the manufacturing area and the patients. The manufacturing area requirement is to reduce the inspection and rejection of pans. Meanwhile the patients require tablets with acceptable appearance.

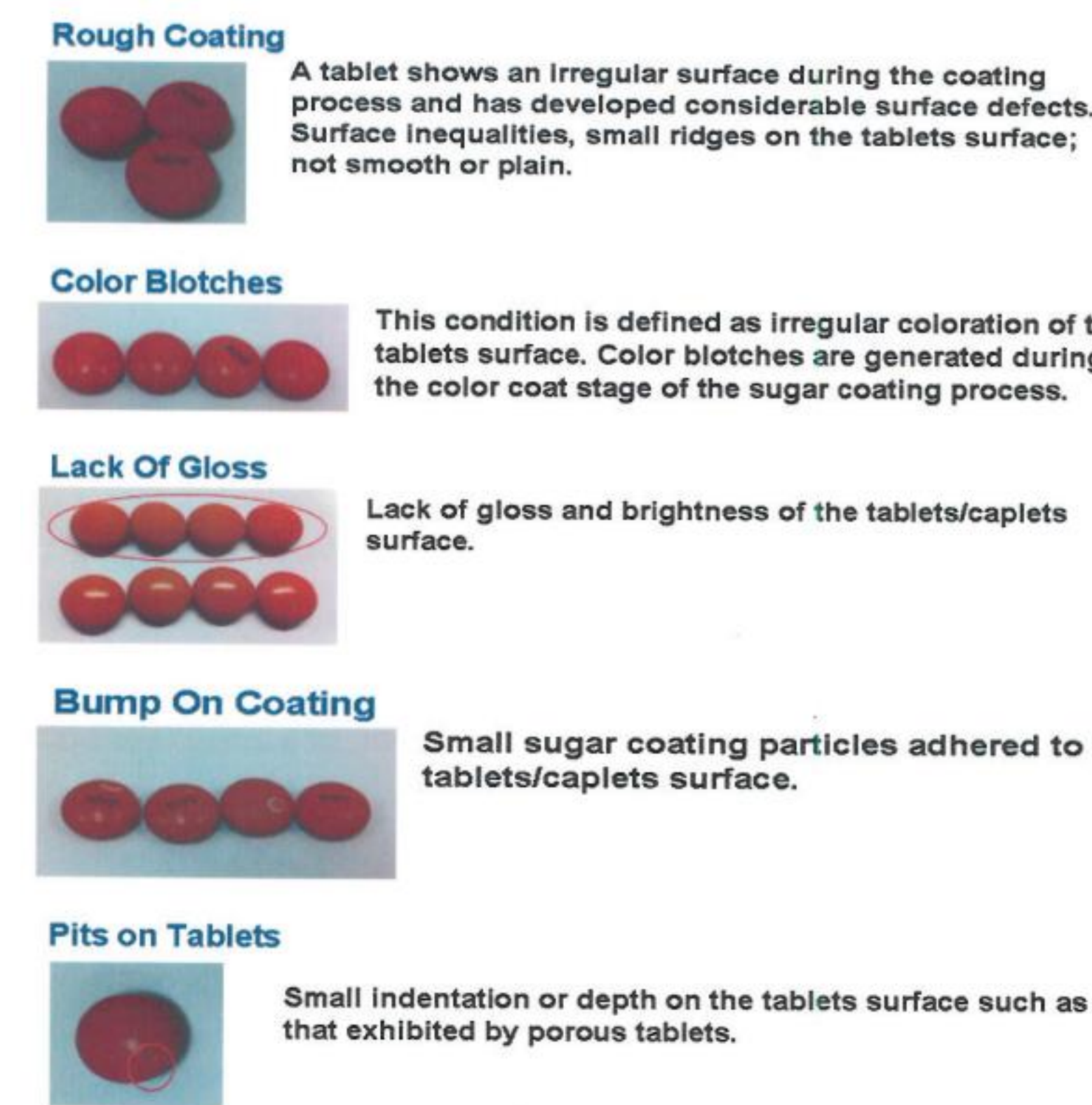
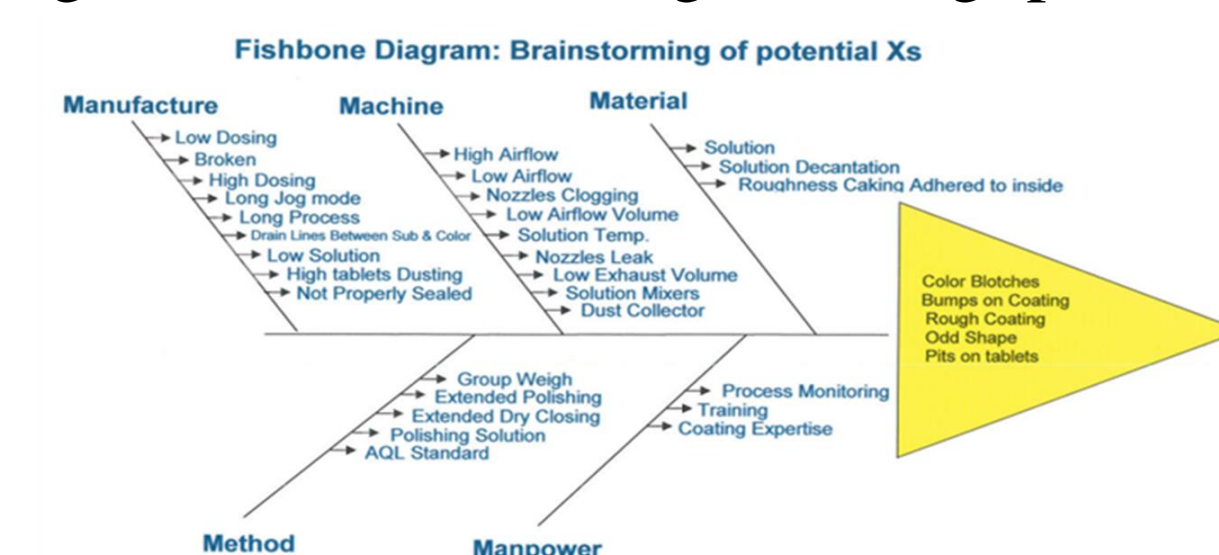
### Measurement Phase

During the measurement phase the team determined the information required to evaluate the magnitude of pans rejections and/or inspection for all sugar-coating products. The goal was to get enough information from the process and product to understand the most probable causes that create or influence cosmetic conditions such as bumps on coating, color blotches, rough coating, pits on tablets, and lack of gloss. Data from the equipment logbooks (Inspection machine), AQL results, and room logbooks were evaluated. Process Map displays steps to illustrate how sugar-coating processes are managed in the coating area.



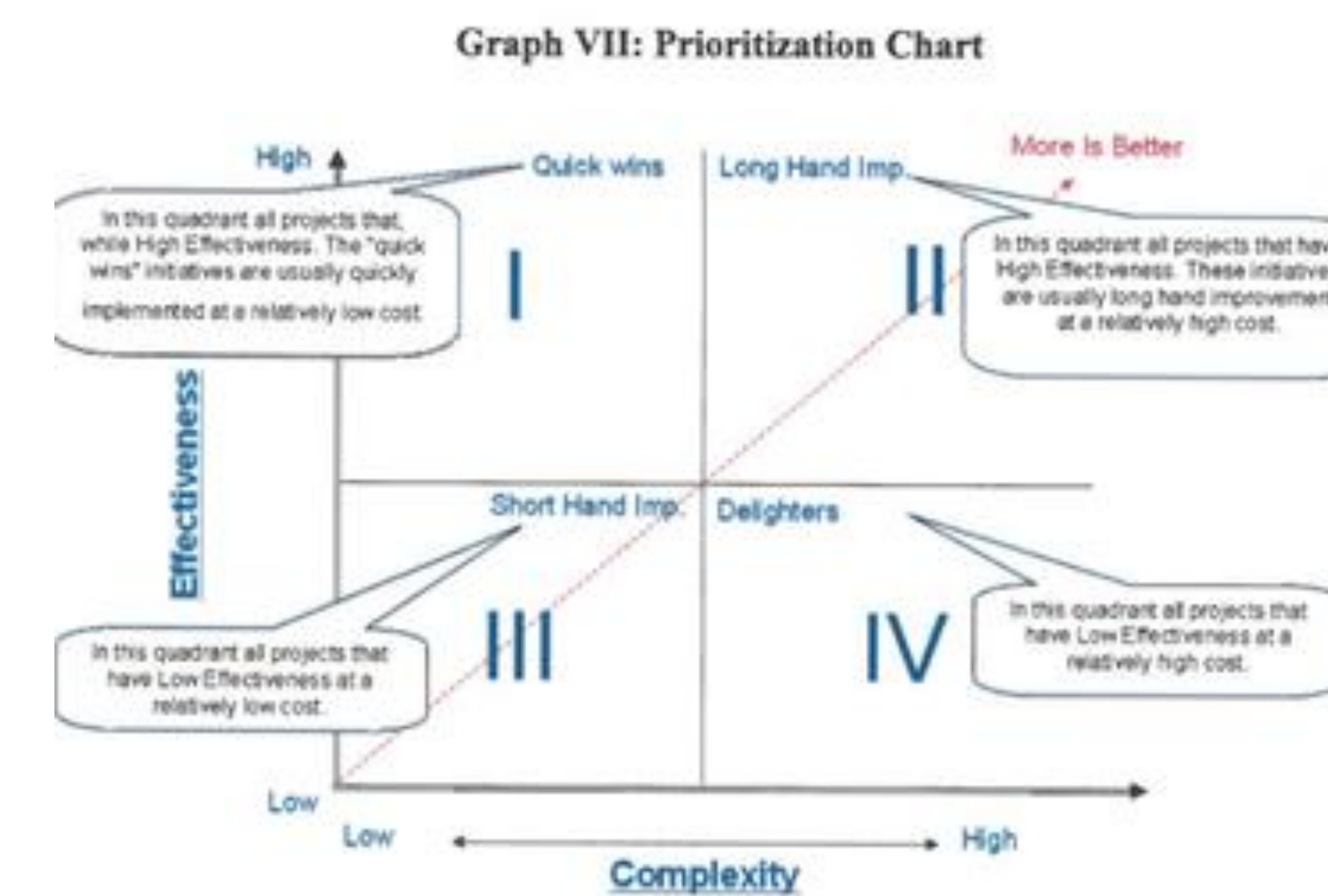
### Analyze Phase

During the Analyze step the team identified root causes that may be attributed to cosmetic tablets/caplets conditions previously mentioned. Cause and Effect Diagram (Fishbone) tool was used to determine the most probable causes. The goal was to get enough information from the process and product to understand the most probable causes that create or influence cosmetic conditions such as bumps on coating, color blotches, rough coating, pits on tablets, and lack of gloss.



### Improve Phase

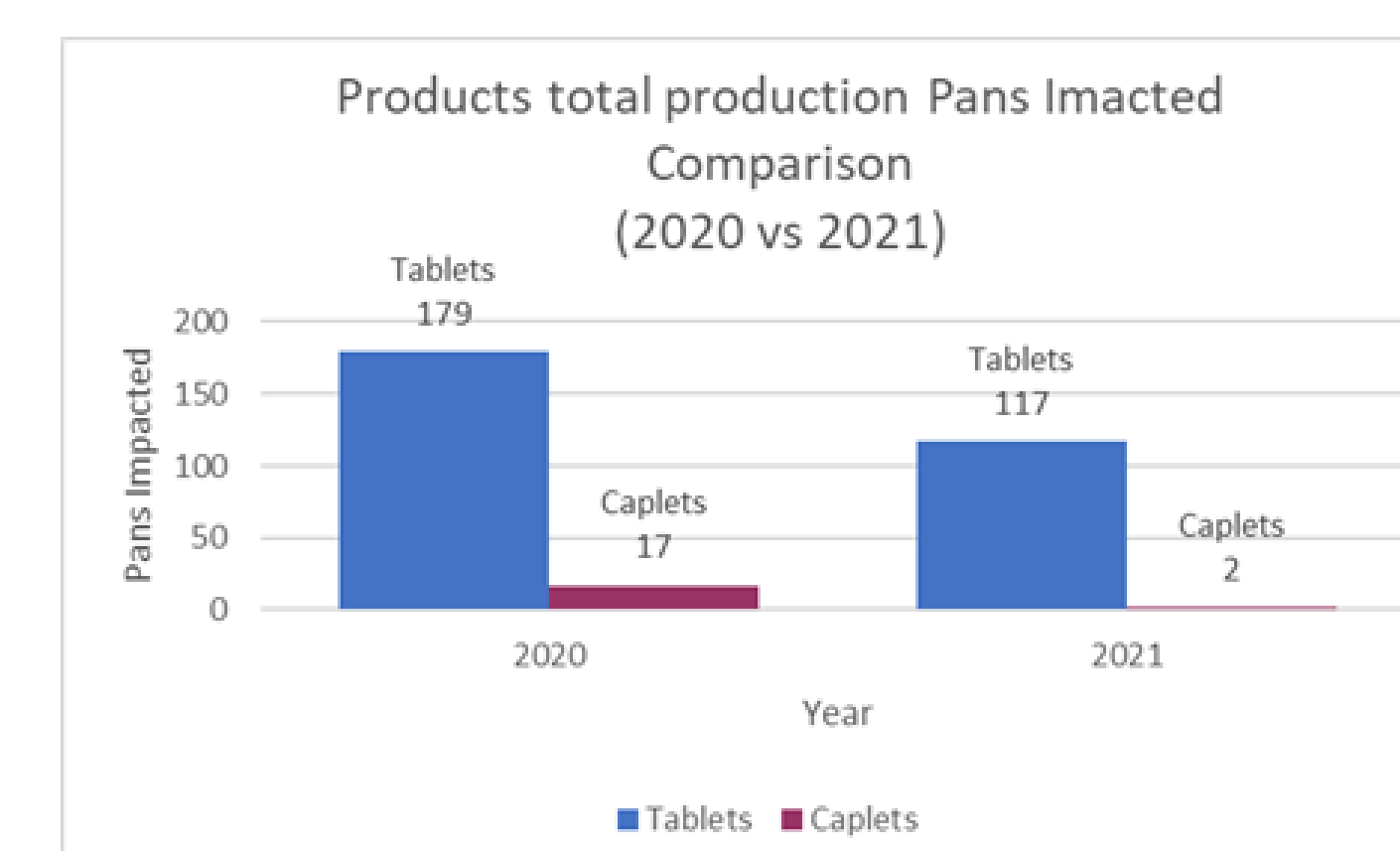
To implement actions for optimizing process control to consistently produce tablets/caplets with acceptable appearance the recommendations were classified using prioritization chart



Equipment Improvements: Variability on the solution application, air flow and air temperature can influence the quantity of cosmetic conditions. Therefore, the equipment improvements were focused in these three major areas: solution application, temperature and air flow related devices.

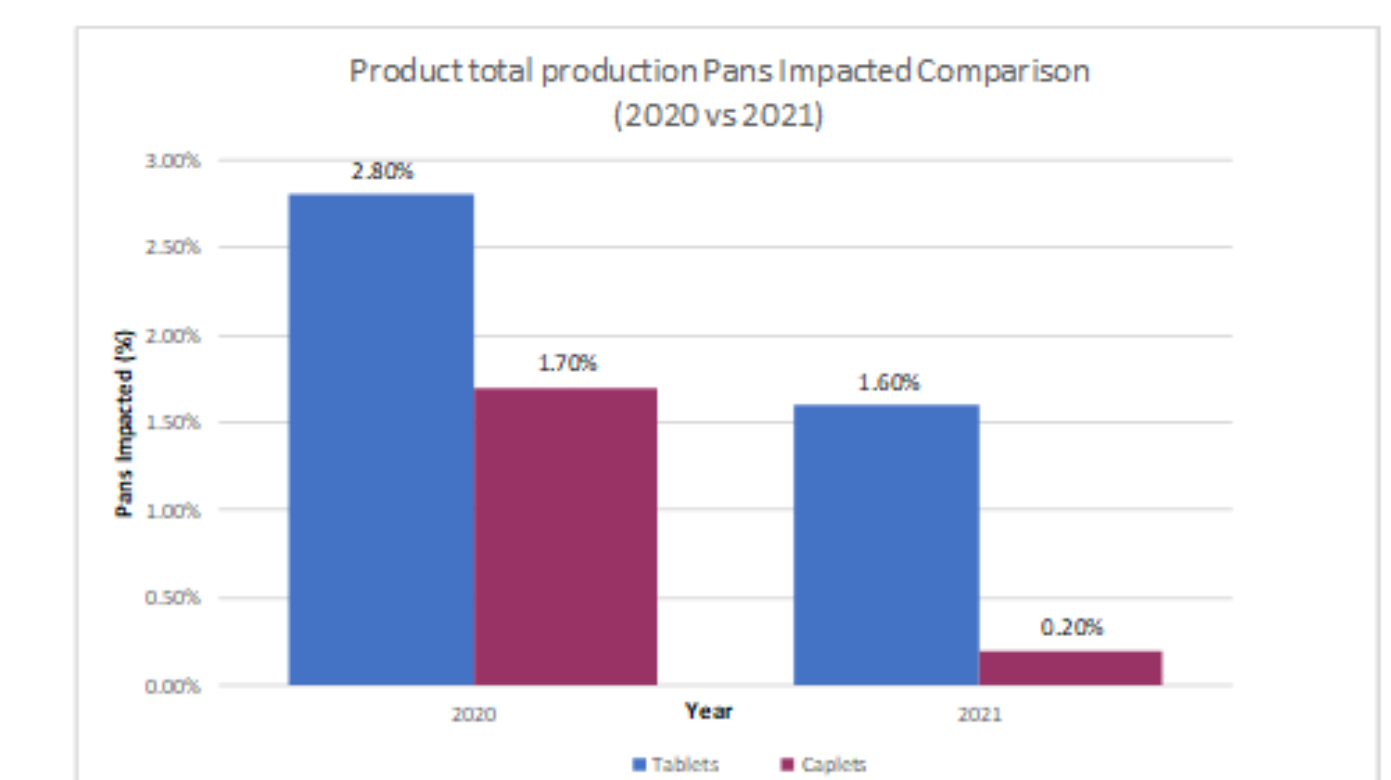
### Control Phase

The coating process has been monitored to assess the effect of these actions the amount evaluates the amount of pans inspected and/or rejected in the analgesics area. The following graphs compare the results obtained from the 2020 against the data generated during 2021.



Even though the production increased in approximately 10% for Tablets the actual count of pans inspected was reduced.

The data was normalized with the total batches produced and presented as percent of pans impacted in the following figure. The pans impacted (inspected and/or rejected) for Tablets was reduced from 2.8% to 1.7%. For Caplets the pans impacted was reduced from 1.6% to 0.2%.



## Conclusions

After using the DMAIC methodology, the purpose of improving the cosmetic appearance of the product and decreasing the impacted pans was achieved. The data presented show a significant reduction of pans inspection and rejection for sugar-coated products. For Tablets the pans impacted was reduced from 2.8% in 2020 to 1.7% in 2021 (Jan-Sept 2021). For Caplets the pans impacted was reduced from 1.7% to 0.2%. As a result of these improvements, the rejection of pan produced was reduced and the goal of the project was attained.

## Acknowledgements

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## References

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