Scrap Reduction in Printing Area

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Abstract *— The New Solutions Manufacturing Line consists of the following areas: Mixing, Printing, Filling, Pouching, Sterilizing and Packing. Its first commercial lot was manufactured in March 2017. Data trends identified that the Printing area had more scrap than any of the other areas. Therefore, a scrap reduction project in the Printing area was started to identify the major offender of scrap and implement actions to mitigate it. Data showed that the major offender was illegible bar code. After an analysis of the process, three possible root causes were identified: foil alignment on printing machine, printing machine breaks foil, and foil moves from position. Two sensors were installed in the bar code station of the Printing machine to stop the bar code station if it detects that the foil moves from position and to stop the Printing machine if there is no presence of foil. After implementation, data showed that the illegible bar code defect was reduced.*

Key Terms *— bar code station, foil, illegible bar code, major offender*

INTRODUCTION

The Printing area is part of the New Solutions Manufacturing Line. The facility has dedicated many years in Medical Devices products and now it is adding Solutions products. The construction of this line began back in 2012 and on March of 2017 the first commercial lot was manufactured. The New Solutions Manufacturing Line consist of different areas; Mixing, Printing, Filling, Pouching, Sterilizing and Packing. In Mixing the solution is prepared. The Printing machine prints PVC bags with the product information. In the Filler machine bags are filled with the solution. In Pouching bags are placed and sealed in an over pouch. Pouched bags are steam sterilized in a sterilization chamber. Sterilized pouches are packed in boxes and shipped to customers.

The New Solutions Manufacturing Line is the future of the facility, therefore a lot of resources and a lot of effort is being placed in the area for continuous improvements. On the quality monthly meetings presented data trends showed that the Printing area was producing more defects than any other area in the New Solutions Manufacturing Line.

The objective of this project was to reduce the scrap major offender of the Printing area by at least 5%. To do so, the major offender of scrap defect from the Printing area needed to be identified as well as it potential root cause so it could be mitigated. The scope of this project was limited to only mitigating the major offender of scrap defects in the Printing area, any other defect found was not being considered.

LITERATURE REVIEW

Scrap reduction projects looks to improve efficiency, increase profit, reduce waste, improve customer service and gain competitive advantage [1]. To perform a scrap reduction project the most useful tool is the Define, Measure, Analyze, Improve and Control (DMAIC) methodology [2]. This is because DMAIC is design to be used for process improvements. To perform the Measure and Analyze phase of the project other different tools are used like, Minitab (to perform process capability analysis, boxplot, hypothesis test etc.) Fishbone diagrams, FMEAs, Why-Why analysis, Risk Management, Statistical Process Controls among others [3]. Incorporating all of these tools and disciplines into a project will prevent reduce scrap from occurring.

ANALYSIS APPROACH

To determine the major offender defect of the Printing area data was collected from all of the lots manufactured to the date. On 24-Aug-2017 data was collected from March 2017 to July 2017. On March 2017 the first commercial lot was manufactured in the New Solutions Manufacturing Line that is why the data starts from this day, and by the time the data was collected the information from the August lots was not yet tabulated. From the collected data only five offenders were found in the printing area, as showed in Figure 1, even though not all defects were seen in every month. From Figure 1 it can be seen that the mayor offender of scrap in the printing area is illegible barcode. Therefore, the project is focused on solving the illegible barcode defect.

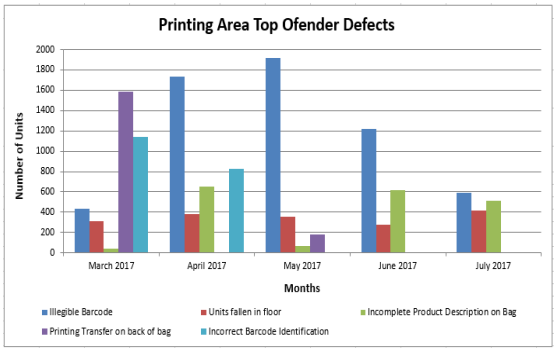

Figure 1
Printing Area Scrap Data

A fish bone diagram was created to identify the possible root causes for the defect of illegible barcode. Figure 2 shows the results of the Fish Bone and Table 1 details every possible root cause identified in the Fish bone diagram.

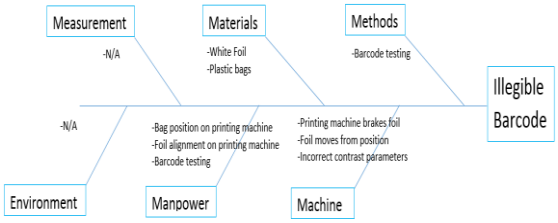

Figure 2
Fish bone Diagram

Table 1
Identification of possible root causes

Category	Possible root cause
Measurement	No possible root cause was identified
Environment	No possible root cause was identified
Material	White foil:
	Plastic bags: during in-process inspections, as per AQL, bags are being inspected for their dimension. Lot is release according to the results of the inspections. This is ruled out as a possible root cause.
Manpower	Bag position on printing machine: bags loading station of the machine provides a visual aid on where to place the bags. This is ruled out as a possible root cause.
	Foil alignment on printing machine: the only control here is the procedure, machine does not have a guide on where exactly placed the foil it depends completely on the operator. This is considered a possible root cause.
	Barcode testing: the bar code testing is performed automatically by a bar code scanner. The bag is placed on this bag shape space so the scanner reads without any problem. This is ruled out as a possible root cause.
Methods	Barcode testing: the bar code testing is performed automatically by a bar code scanner. The bag is placed on this bag shape space so the scanner reads without any problem. This is ruled out as a possible root cause.
Machine	Printing machine breaks foil: it was observed that the foil broke often on the machine. This is considered a possible root cause.
	Foil moves from position: It was observed that the foil moves from position every time it prints on the bag. This is considered a possible root cause.
	Incorrect contrast parameters: Validated parameters were challenged at the low, nominal and high settings and all of the passed acceptance criteria. This is ruled out as a possible root cause.

From the Fish Bone it was concluded that the possible root causes of an illegible bar code are: (1) foil alignment on printing machine, (2) printing machine breaks foil, and (3) foil moves from position. All of these three possible root causes are related to one another, therefore actions were implemented to mitigate these three possibilities.

RESULTS

To correct the three possible root causes two sensors were installed in the bar code station of the Printing machine. Figure 3 shows the position of the sensors installed. Sensor 1 stops the bar code station if it detects that the foil moves from position. This avoids an incomplete bar code on the bags. Sensor 2 stops Printing machine if there is no presence of foil. This avoids no bar code on the bags.

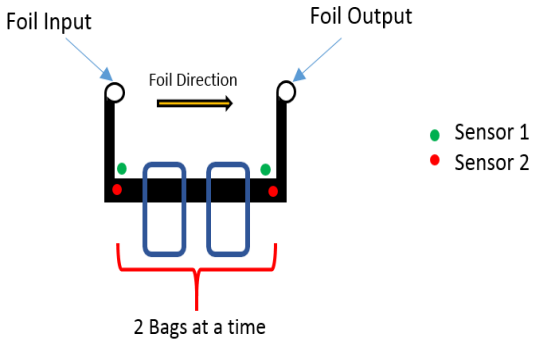

Figure 3
Bar Code Station on Printing machine

The implementation of these sensors provided an improvement on the illegible bar code defect. The sensors were implemented in mid-October and by mid-November a reduction of 9% was observed on the scrap for illegible bar code defect.

DISCUSSION

Because the Solutions area is new and this line is the future of the facility any scrap reduction project is more than beneficial to the process. The core team of the Solutions line is looking to continuously improve the process, and this project, even though it sound simple, brought a lot of benefit. The output of the Printing machine is slower compared to input of the Filling machine, therefore any improvement to the output of the Printing machine will help to keep up with the filling process. Also, the core team is committed to keep improving the process so in the future more lines and more products can be added to the facility.

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