Keurig Dr. Pepper: Reducing Scrap off Production Lines

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Introduction

Keurig Dr. Pepper (KDP) is a leading producer and distributor of hot and cold beverages with a 24/7 production plant in Knoxville, TN. Our team has been working with KDP to determine

- Processes
- Practices
- Equipment

needed to reduce and sustain their **overall** scrap rate from **1.8% down to 1.0%**

Definition

KDP has a five-step production process that most loads are subject to once they enter the facility (**Figure 1**).

To reduce the overall average scrap rate, our team evaluated each of the processes to locate which area is significantly contributing to this high scrap rate. Using several tools and techniques, including value stream mapping and process flow charts, we determined the highest impact area in the process to be in the **packaging sector.**

Production Process Flowchart

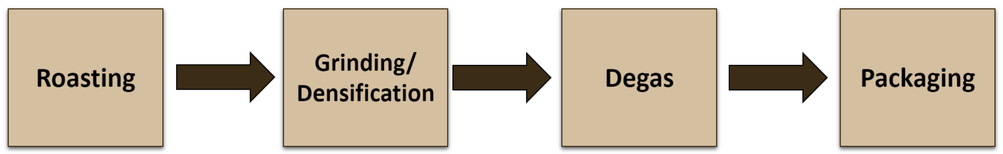
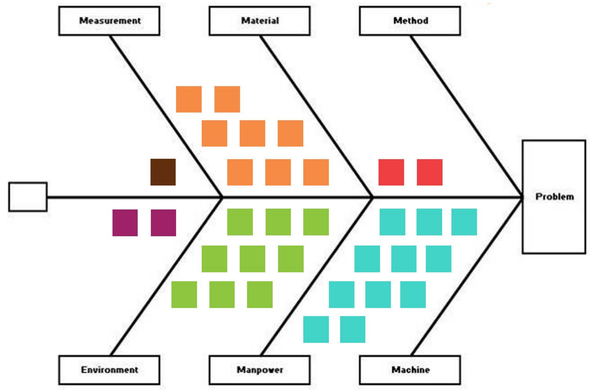


Figure 1- Production Process Flow Diagram

Initiation

Our team used a fishbone diagram as a brainstorming technique to determine the root causes of waste. Alongside this diagram, we used the 5 WHYS investigative technique. At the end, our discussion ended with the heaviest content in: **Machine, Material,** and **Man/Brain Power.**



Planning

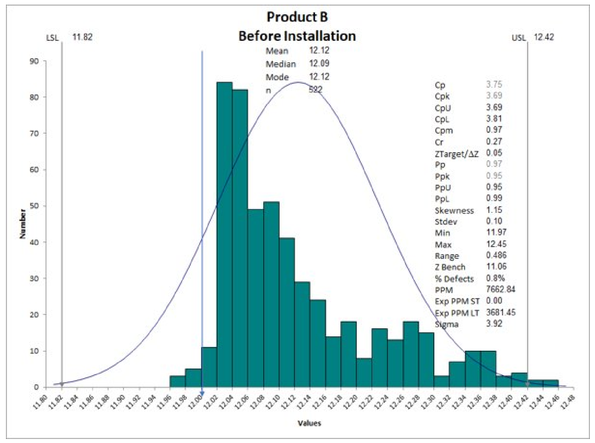
Given the results of our fishbone diagram, we then established quantifiable action items that would provide improvement to the identified areas and their intersection within the packaging process.

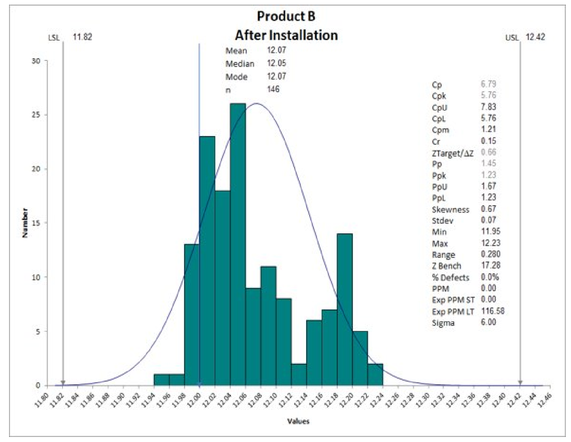
Machine	Auger Tubes	DOE	Weight Data Analysis
Material	Dark Roast/ Starbucks Coffee	Stainless Steel, Lipless Auger Tubes	Weight Data Analysis
Man/Brain Power	Scheduling	Production Scheduling Data Analysis	

Execution

➢ Weight Control Data Analysis

Our team was able to analyze weight data pertaining to one of the most problematic lines within the process. We compared the data of five brands before and after the installation of the new auger tubes. After analyzing, we were able to determine the standard deviation **decreased by at least 29%** for every product with one product even experiencing a 70% decrease. Thus, confirming the new auger tubes are helping control the weights of the pods.

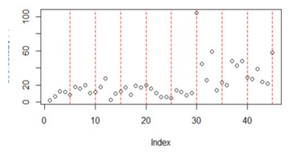




➢ Design of Experiments (DOE)

Our team devised a series of experiments to determine the optimal settings for KDP's installation of new lipless auger tubes. The experimentation was executed in two separate series. In the first series, we tested 8 runs of high/low setting combinations with an added 9th run considering the center points. These 9 runs were replicated 5 times, and the results of the 45 experiments are shown in the table and graph below**.**

			Rejects @					
x1	x2	x3	2000	4000	6000	8000	10000	Total Rejects
1	1	1	20	48	43	48	29	188
0	0	0	27	39	24	22	58	170
1	1	-1	45	26	59	14	23	167
1	-1	1	14	12	8	11	104	149
-1	1	1	17	9	19	17	20	82
-1	-1	1	18	16	20	11	12	77
-1	1	-1	18	28	3	10	13	72
1	-1	-1	16	11	6	6	5	44
-1	-1	-1	2	7	13	12	9	43
			177	196	195	151	273	992



After analyzing the results of our first experimentation, we were able to create a linear model for the response surface and use the steepest decent minimization technique to calculate the setting intervals for our second run of experiments. Upon running the second run, we were able to determine the optimal settings for the auger tubes.