

Process Analysis and Improvement in Coffee Production: A Case Study of First Pasha Coffee

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Abstract-The coffee industry is growing rapidly, particularly in the Gulf Cooperation Council (GCC) region. First Pasha Coffee, a premium coffee producer in Oman, seeks to enhance its production efficiency while maintaining product quality. This study analyzes the production process of First Pasha Coffee, identifying key inefficiencies and proposing improvements using Six Sigma (DMAIC), Value Stream Mapping (VSM), and Lean Manufacturing. The findings indicate that implementing automation in mixing, filling, and packaging significantly enhances efficiency, reduces costs, and ensures product consistency. A financial analysis demonstrates the feasibility of automation investments, showing a strong return on investment (ROI). The study also explores sustainability initiatives to align with environmentally responsible coffee production.

Keywords – Coffee Production, Process Optimization, Six Sigma, Lean Manufacturing, Value Stream Mapping, Automation, Sustainability.

I. INTRODUCTION

1.1 Background

Coffee production plays a crucial role in the global beverage industry, and the demand for high- quality coffee is increasing significantly. First Pasha Coffee, based in Oman, specializes in 3-in-1 coffee mixes and aims to optimize its production efficiency while maintaining premium product standards.

1.2 Problem Statement

Currently, First Pasha Coffee faces inefficiencies in the mixing and filling stages of production, leading to inconsistent ingredient distribution, weight variations in filling, and increased material waste. These inefficiencies limit scalability and profitability. Implementing automation and process optimization methodologies can enhance production capacity and financial performance.

1.3 Objectives

- Identify bottlenecks in the production process.
 - Implement Six Sigma and Lean Manufacturing to optimize operations.
 - Evaluate financial feasibility of automation investments.
 - Explore sustainability initiatives to enhance environmental responsibility.
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II. LITERATURE REVIEW

Several studies highlight the impact of process optimization on manufacturing industries. Six Sigma methodologies and Value Stream Mapping (VSM) have been successfully used in the food and beverage industry to eliminate waste and enhance efficiency. Prior research also emphasizes the financial benefits of automation in reducing operational costs and improving product quality.

III. METHODOLOGY

3.1 Production Process Overview

The production of First Pasha Coffee involves six key stages:

1. Green Coffee Sourcing: High-quality beans sourced from Yemen and Brazil.
2. Roasting: Conducted using an Öztürkbay 15kg roaster imported from Türkiye.
3. Grinding: Processed with a specialized grinder for consistency.
4. Mixing: Coffee is blended with creamer and flavors using an AHF 250 kg Horizontal Powder Mixer.
5. Filling & Packaging: Semi-automatic filling machines are used, followed by manual packaging.
6. Storage & Distribution: Final products are stored in a warehouse and supplied to distributors.

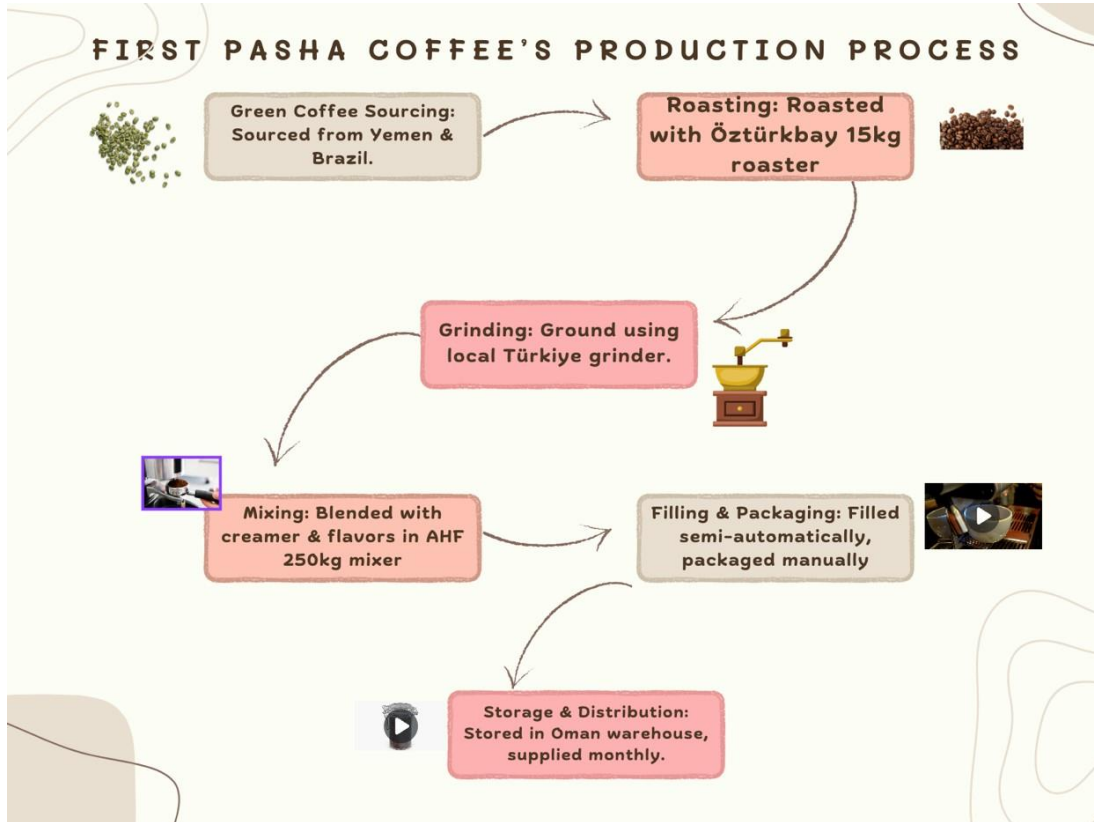


Figure 1 Production Process Flow-Chart

3.2 Process Improvement Techniques

- Six Sigma (DMAIC): Applied to optimize production efficiency by identifying root causes of inefficiencies and implementing improvements.
- Value Stream Mapping (VSM): Used to visualize the production workflow and eliminate non-value-added activities.

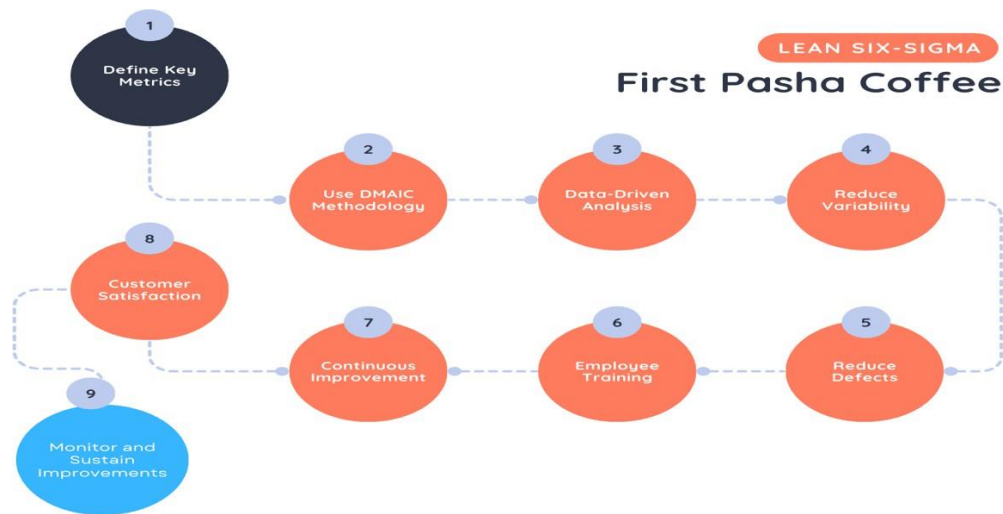


Figure 2 Six Sigma Process

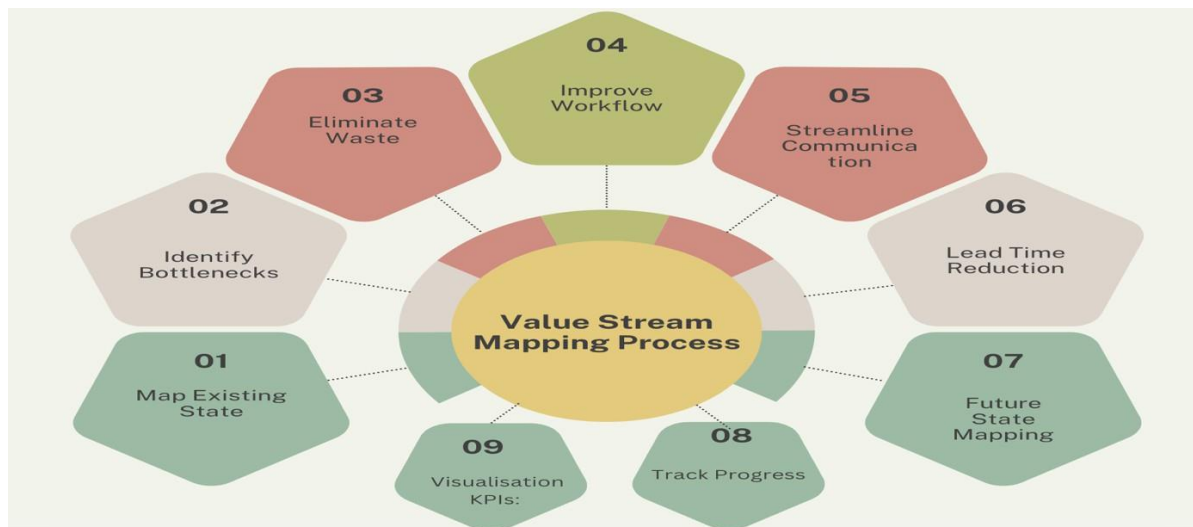


Figure 3 VSM Process

IV. RESULTS AND ANALYSIS

4.1 Cost Breakdown and Financial Analysis

Table 1: Key Component Cost per kg of Coffee

Component	Cost (USD)
Raw Materials	\$8 - \$10
Labor Costs	\$1 - \$2
Packaging	\$0.5 - \$1
Overheads	\$0.5 - \$1
Total Cost	\$10 - \$13

4.2 Return on Investment (ROI) Calculation

Investment in automation includes:

- Automated Mixing System: \$30,000 - \$50,000.
- Precision Filling Machine: \$40,000 - \$60,000.
- Conveyor Belt System: \$20,000 - \$30,000.
- Upgraded Grinder: \$15,000 - \$25,000

Table 2: ROI Calculation for Automation Investments

Investment	Cost (USD)	Annual Savings (USD)	Payback Period
Total Investment	\$105,000 - \$165,000	\$36,000 - \$40,000	2.6 - 4.5 years

V. SUSTAINABILITY INITIATIVES

5.1 Environmental Impact Reduction

- Eco-Friendly Packaging: Implementing biodegradable materials and recyclable packaging.
- Energy Efficiency: Installing high-efficiency roasting machines and LED lighting systems to reduce electricity consumption.

5.2 Ethical Coffee Sourcing

- Direct trade partnerships with Yemeni coffee farmers to ensure fair wages and ethical sourcing.
 - Supporting sustainable farming techniques to minimize environmental impact.
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VI. CONCLUSION

This study demonstrates that implementing Lean Manufacturing and Six Sigma methodologies significantly enhances efficiency in coffee production. Key takeaways include:

- Optimizing production through automation reduces labor costs and increases precision.
- Financial feasibility analysis confirms a strong return on investment.
- Sustainability initiatives strengthen brand positioning and environmental responsibility.

Future research should explore driven monitoring systems to further optimize real-time production control.

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