

Optimisation of Production at Incipono Frozen Food Company using the Lean Manufacturing Method

Hadi Kurniawan^{1✉}, David Sukardi Kodrat², Eric Harianto³, Wendra Hartono⁴

¹²³⁴Magister Manajemen Universitas Ciputra Surabaya

hadikurniawan39@gmail.com

Abstract

Competition in the food industry compels companies to enhance productivity and production process efficiency to meet consumer demands. One strategy involves implementing Lean Manufacturing concepts to identify and minimize waste occurring during production. This study aims to analyze the current state of the INCIPONO dim sum production process using Value Stream Mapping, identify types of waste using Value Stream Analysis Tools, schedule machinery maintenance, and design improvement proposals to boost production efficiency. A descriptive research method with a qualitative approach was employed. Data collection involved direct observation, interviews, documentation, and production process time measurements. The analysis began with a Time Study to measure process times, followed by mapping information and material flows using Miro, and identifying Value-Added, Necessary Non-Value-Added, and Non-Value-Added activities via Process Activity Mapping. Subsequently, improvement proposals based on Lean Manufacturing principles were formulated, covering a Kaizen Blueprint, 5S implementation, Standard Operating Procedures, Daily Activity planning, Preventive Maintenance, and Manpower Planning. The results indicate that the INCIPONO dim sum production process still contains waste predominantly waiting, motion, transportation, and inventory preventing optimal production flow. The proposed improvements enhance production effectiveness by reorganizing work activities, balancing the workforce, implementing work standards, and establishing periodic machine maintenance. Furthermore, implementing these proposals resulted in a reduction of Direct Labor Costs from IDR 78,300,000 to IDR 42,450,000, representing an efficiency gain of 45.79%. The study demonstrates that applying Lean Manufacturing can improve production efficiency, reduce waste, and support increased productivity for INCIPONO dim sum.

Keywords: Lean Manufacturing, Value Stream Mapping, Kaizen, Waste, Dimsum INCIPONO.

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1. Introduction

The frozen food industry in Indonesia has experienced rapid growth in line with rising public demand for convenient, high-quality food products [1]. This situation has prompted companies to improve productivity and the efficiency of their production processes in order to meet market demand whilst maintaining their competitiveness [2]. Dimsum Incipono is one such company specialising in the production of frozen dim sum [3]. Based on observations, the production process still faces several challenges, including waiting times, inefficient material handling, a build-up of Work in Process (WIP), and operator activities that do not yet provide optimal added value [4]. These conditions result in waste, thereby reducing the efficiency of the production process [5].

Lean Manufacturing is an approach that focuses on eliminating activities that do not add value (non-value-added activities) [6] [7]. Through the application of Value Stream Mapping (VSM), the company can map the flow of materials and information so that sources of waste can be systematically identified [8]. This study aims to Analyse the Current State Value Stream Mapping of Dimsum Incipono's production process. Identify types of waste using VALSAT. Formulate improvement proposals based on Lean Manufacturing.

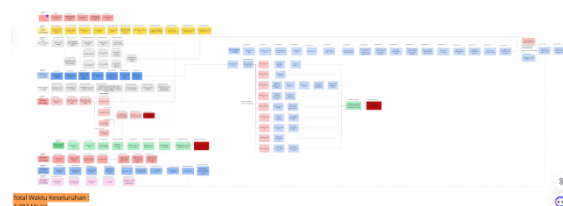
2. Research Method

The research employed a descriptive method with a qualitative approach. The research stages comprised Problem Identification; Initial Observation; Problem Analysis; Designing a Lean Manufacturing Intervention; Implementation; Before-and-After Evaluation; Conclusions and Recommendations. The data were analysed using the Lean Manufacturing approach to identify Value-Added (VA), Necessary Non-Value-Added (NNVA) and Non-Value-Added (NVA) activities [9].

3. Result and Discussion.

Process Activity Mapping; Production activities are classified as follows Value-added; Necessary non-value-added; Non-value-added. The proportion of non-value-added activities in some processes is quite high, so improvements are needed [10]. Next Process Flow Before and After the Intervention on Figure 1.

Process Flow Before Intervention



Process Flow Following the Intervention

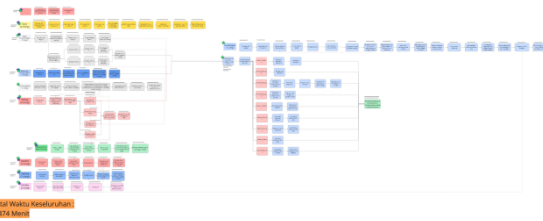


Figure 1. Process Flow Before and After the Intervention

Identification of Waste. The results of the VALSAT analysis show that the predominant forms of waste are on Table 1.

Table 1. Summary of the Proportions of Production Activities at INCIPONO Dimsum (pre-implementation conditions)

Tahap Proses	Total Waktu (menit)	VA (%)	NNVA (%)	NVA (%)	Tenaga Kerja	Produktivitas
Penimbangan (preparing)	540	53,85%	46,15%	0%	4	0,06
Pengupasan dan serut	540	90,93%	9,07%	0%	4	7,51
Penggilangan	540	25,37%	63,52%	11,11%	4	0,93
Chopper	540	29,44%	65%	5,56%	1	13,50
Mixing	540	82,04%	5%	12,96%	3	0,77
Pencetakan Produk	510	81,57%	6,27%	12,16%	16	0,02
Steamer	540	94,08%	2,22%	3,70%	3	1,99
Packing	540	94,63%	5,37%	0%	9	0,69
Checker (finishing)	540	97,22%	2,78%	0%	2	0,69
Total Keseluruhan	4.303	72,18%	22,84%	4,98%	43	-

According to Table 2, Value-Added (VA) activities account for 72.18 per cent, indicating that the majority of processes have generated added value [11]. However, there remains 22.84 per cent of Necessary Non-Value-Added (NNVA) activities that need to be optimised, and 4.98 per cent of Non-Value-Added (NVA) activities, which are predominantly made up of waiting time in the grinding, chopping, mixing, moulding and steaming processes [12]. The proposed improvements include on Figure 2.

[illegible]

Figure 2. KAIZEN INCIPONO Blueprint

Area	Penerapan 5S
Gudang Bahan Baku	Bahan diberi label, disusun berdasarkan jenis dan tanggal masuk (FIFO/FEFO), serta area penyimpanan diberi tanda
Mixing	Semua alat mixing memiliki tempat penyimpanan khusus, area dibersihkan setelah setiap batch selesai.
Pencetakan Dimsum	Cetakan dan alat bantu disusun pada shadow board atau rak khusus agar mudah diambil dan dikembalikan.
Packing	Plastik kemasan, label, dan kardus disusun sesuai urutan penggunaan sehingga proses pengemasan lebih lancar.

Figure 3. Implementation in Each Area of the Production Hall

KONTRIBUSI RUMAH SAKIT PER KELUHAN															
Tanggal		14 Februari 2020													
				Observasi											
				1	2	3	4	5	6	7	8	9	10	Total	Rate Ratio
Demografi															
Demografi 1: English, American and Arabic														193.15	193.15
Demografi 2: English, American and Arabic														193.15	193.15
Demografi 3: English, American and Arabic														193.15	193.15
Demografi 4: English, American and Arabic														193.15	193.15
Demografi 5: English, American and Arabic														193.15	193.15
Demografi 6: English, American and Arabic														193.15	193.15
Demografi 7: English, American and Arabic														193.15	193.15
Demografi 8: English, American and Arabic														193.15	193.15
Demografi 9: English, American and Arabic														193.15	193.15
Demografi 10: English, American and Arabic														193.15	193.15
Demografi 11: English, American and Arabic														193.15	193.15
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Demografi 89: English, American and Arabic														193.15	193.15
Demografi 90: English, American and Arabic														193.15	193.15
Demografi 91: English, American and Arabic														193.15	193.15
Demografi 92: English, American and Arabic														193.15	193.15
Demografi 93: English, American and Arabic														193.15	193.15
Demografi 94: English, American and Arabic														193.15	193.15
Demografi 95: English, American and Arabic														193.15	193.15
Demografi 96: English, American and Arabic														193.15	193.15
Demografi 97: English, American and Arabic														193.15	193.15
Demografi 98: English, American and Arabic														193.15	193.15
Demografi 99: English, American and Arabic														193.15	193.15
Demografi 100: English, American and Arabic														193.15	193.15

Figure 4. Daily Production Activities for INCIPONO Dim Sum

Current State Value Stream Mapping. The Current State VSM shows that the production process consists of: Weighing; Peeling and Shredding; Milling; Chopping; Mixing; Dimsum Moulding; Steaming; Packaging; Inspection. VSM for INCIPONO Dim Sum Production on Figure 5.

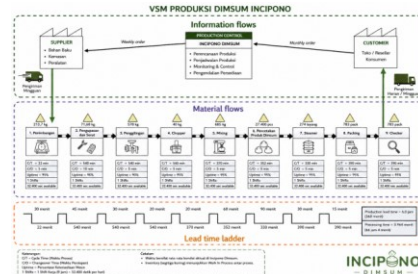


Figure 5. VSM for INCIPONO Dim Sum Production

The mapping shows that there is still a build-up of work-in-process at several workstations, resulting in relatively long waiting times [13]. Manpower Planning Analysis. The results of the manpower planning indicate a theoretical workforce requirement of 7 operators [14]. However, in the company's current operations, 23 operators are employed, comprising: Weighing: 1 operator; Peeling and Shredding: 2 operators; Grinding: 2 operators; Chopper: 1 operator; Mixing: 2 operators; Dimsum Moulding: 4 operators; Steamer: 2 operators; Packing: 7 operators; Checker: 2 operators. This discrepancy indicates that there is still scope to optimise the workforce allocation for greater efficiency [15]. Preventive Maintenance. In an effort to minimise machine downtime, a Preventive Maintenance schedule has been drawn up for the following machines Grinder; Chopper; Mixer; Moulding machine; Steamer; Vacuum machine; Sealer.

JADWAL MENYEMANGAT MARIKUS STEADMAN (INSTRUMEN)																																
JULAI 1			JULAI 6															JULAI 11														
No.	Item Persebaran	Frekuensi	Ketepatan																													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Menyebutkan jenis-jenis	3 Batuan	Tegap dan tepat dalam menjawab																													
2	Menjelaskan pengertian	3 Batuan	Ketepatan dalam menjawab																													
3	Indikator unsur	1 Magma	Memahami konsep dengan rumus																													
4	Kandungan gas	1 Magma	Tidak salah, akurat, tidak kasar																													
5	Kandungan gas magma	1 magma	Berikut dari kalsium, besi, dan silika																													
6	Kandungan unsur kimia	1 magma	Tidak ada unsur, mineral, dan logam																													
7	Kandungan unsur kimia	1 Magma	Tidak lengkap																													
8	Kandungan unsur kimia	1 Batuan	Memiliki hasil dan rumus ditulis																													
9	Kandungan regulator	1 Magma	Tidak benar																													
10	Kandungan unsur kimia	1 magma	Tidak lengkap																													
11	Kandungan unsur kimia	1 Magma	Tidak benar																													
12	Perbedaan antara magma dan batuan	1 Batuan	Berbeda																													
13	Perbedaan magma dan batuan	1 Batuan	Tidak ada perbedaan																													
14	Tipe magma	1 Batuan	Tidak terdapat perbandingan antar magma																													
15	Penjelasan magma	1 Batuan	Tidak benar																													

Figure 6. Preventive Maintenance Schedule for One of the INCIPONO Machines

The maintenance schedule is expected to improve machine reliability and ensure the smooth running of the production process [16]. The implementation of the proposed improvements has led to a reduction in Direct Labour Costs. Next Comparison of Direct Labour Costs before and after implementation on Table 2.

Table 2. Comparison of Direct Labour Costs before and after implementation.

Komponen	Sebelum	Sesudah	Penjelasan
Jumlah Karyawan	43 orang	23 orang	Pengurangan 20 orang karena adanya tambahan mesin cetak otomatis
Total gaji/bulan	Rp. 77.400.000	Rp. 41.400.000	Gaji per orang tetap Rp. 1.800.000
Hari kerja/bulan	26	26	Tetap
BTKL per hari	Rp. 2.976.923	Rp. 1.592.307	Perhitungan berdasarkan total gaji 26 hari
Biaya Servis Mesin per bulan	Rp. 900.000	Rp. 1.050.000	Ada tambahan biaya servis untuk mesin dimsum

A cost efficiency of 45.79 per cent. This demonstrates that the implementation of Lean Manufacturing is capable of improving the efficiency of labour utilisation. Comparison Before and After Implementation. An assessment of the results of implementing the Lean Manufacturing strategy in INCIPONO's production process was carried out by comparing operational conditions before and after the improvements were implemented [17] [18]. This evaluation was used to measure the effectiveness of applying Lean Manufacturing principles in improving production performance through increased time efficiency, productivity and production capacity, as well as a reduction in operational costs [19]. The results of the comparison are presented in Figure 3.8 below. Next Comparison of Pre- and Post-Implementation Evaluations of Lean Manufacturing on Figure 7.

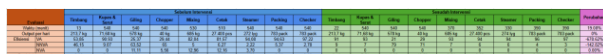


Figure 7. Comparison of Pre- and Post-Implementation Evaluations of Lean Manufacturing

The results of the analysis at each stage show that the implementation of improvements successfully increased process efficiency, labour productivity and overall production capacity [20]. The proportion of activities indicates an improvement in the performance of the production system following the implementation of Lean Manufacturing. Value-Added (VA) activities increased from 8.02 per cent to 8.73 per cent, whilst Non-Value-Added (NVA) activities fell to 0 per cent and Necessary Non-Value-Added (NNVA) activities decreased from 2.54 per cent to 2.38 per cent. Next Comparison of the Proportions of VA, NVA and NNVA Activities on Table 3.

Table 3. Comparison of the Proportions of VA, NVA and NNVA Activities.

Tahap Proses	VA sebelum (%)	NNVA sebelum (%)	NVA sebelum (%)	VA sesudah (%)	NNVA sesudah (%)	NVA sesudah (%)
Penimbangan (preparing)	53,85%	46,15%	0%	90,91%	9,09%	0%
Pengupasan dan Serut	90,93%	9,07%	0%	92,59%	7,41%	0%
Chopper	29,44%	65%	5,56%	28,52%	71,48%	0%
Penggilingan	25,37%	63,52%	11,11%	20,74%	79,26%	0%
Mixing	82,04%	5%	12,96%	92,70%	7,30%	0%
Pencetakan Produk	81,57%	6,27%	12,16%	94,32%	5,68%	0%
Steamer	94,08%	2,22%	3,70%	93,94%	6,06%	0%
Packing	94,63%	5,37%	0%	96,15%	3,85%	0%
Checker (Finishing)	97,22%	2,78%	0%	97,44%	2,56%	0%
Rata-rata Proses Inti	8,02%	0,55%	2,54%	8,73%	2,38%	0%

Furthermore, the impact of improved time efficiency and the optimisation of value-added activities is reflected in the increase in daily production output. Prior to the implementation of the improvements, production capacity was limited to one batch per day, yielding 685 kg of dim sum dough, or approximately 783 packs of product. Next Increase in Productivity and Production Output on Table 4.

Table 4. Increase in Productivity and Production Output

Indikator Produksi	Sebelum Implementasi	Sesudah Implementasi	Perubahan	%tase Peningkatan
Output Per Hari	27.400 pcs	27.400 pcs	0%	0%
Total Waktu Produksi	4.303 menit	3.474 menit	-829menit	-19,26%
Aktivitas Bernilai Tambah (VA)	72,18%	78,59%	+6,41 %	+8,8%
Aktivitas Penting Namun Tidak Terlalu Diperlukan (NNVA)	22,84%	21%	-1,84%	-8,05%
Aktivitas Tidak Menambah Nilai (NVA)	4,98%	0%	0%	-100%
Kapasitas Mesin Digunakan	Tenaga manual	1 mesin dimsum FX-800 Automatic Double-type Machine Heavypro	Penambahan mesin cetak dimsum 1 unit	+100%

The implementation of Lean Manufacturing improves process efficiency and production throughput, thereby doubling production capacity whilst utilising the same resources.

4. Conclusion

Based on the research findings, the following conclusions were drawn. The Current State Value Stream Mapping indicates that there is still waste in the production process at Dimsum Incipono. The predominant types of waste include waiting, motion, transportation and inventory. The implementation of Lean Manufacturing through the Kaizen Blueprint, Standard Operating Procedures (SOPs), 5S, Daily Activities, Preventive Maintenance and Manpower Planning has improved the effectiveness of the production process. Direct labour costs fell by 45.79

per cent, indicating an improvement in production process efficiency. This study demonstrates that the implementation of Lean Manufacturing through Value Stream Mapping (VSM) and Process Activity Mapping (PAM) is effective in identifying waste and formulating proposals for improvements to the production process at Dimsum Incipono. The findings confirm that waste is influenced by the work system, layout, operational standards and the management of production activities. A limitation of this study is the lack of a long-term evaluation of the implementation of the proposed improvements. Therefore, it is recommended that future research evaluate Future State Value Stream Mapping and measure the impact of the improvements on productivity, efficiency and product quality. The company is advised to implement the proposed improvements on an ongoing basis, carry out regular evaluations of production performance, and develop a Future State Value Stream Map as a basis for improving productivity in the coming period.

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