Design Studies and Intelligence Engineering
L.C. Jain et al. (Eds.)

doi:10.3233/FAIA250326

Quantitative Analysis of Production Planning and Material Management-Take Anjing as Example

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Abstract. In recent years, the market of prepared food and frozen food has developed and changed rapidly, and Anjing is facing the urgent problem of maintaining competitiveness. In order to enhance the competitiveness of Anjing in the market, it is necessary to analyze the operation management of the enterprise and evaluate its potential operation management problems. The quantitative analysis of the production plan and material management of Anjing Company is put forward. Using the official website and some recruitment website information, according to the sales forecast and inventory records in the company's annual report.the results show that:the Pure chase: Vary workforce in the aggregate planning and LTC and Least Unit Cost in material management are the most cost-effective methods for well installation. For aggregate planning, Anjoy can consider the implementation of a pure chase strategy, equipped with the corresponding employee system, effectively saving unnecessary personnel costs. Anjoy can also consider introducing emerging technologies to improve productivity through automation and process improvements, as well as reducing its reliance on human resources. For material management, Anjoy can look for more cost-effective supply chain partners, looking for more competitive prices and procurement terms. Anjoy can also explore technological innovations to improve production processes and reduce the waste and use of materials. And adopt more reasonable inventory management, avoid excessive backlog of raw materials, reduce inventory costs, and reduce capital occupation.

Keywords.production plan, material management, Anjing Company, prefabricated vegetable industry

1 Introduction

In 2020, affected by the epidemic, the traditional catering industry is severely damaged. Driven by many factors such as the housing economy and the lazy economy, the demand for prefabricated vegetables is rising, and China's prefabricated vegetable industry has entered a historical node of relatively rapid development and booming production and sales. At the beginning of 2022, prefabricated dishes were also placed on the table of the Winter Olympics. During the Winter Olympics, the two Winter Olympics villages provided nine varieties of prefabricated vegetables, with a total supply of more than 30 tons, and the brand and product quality were recognized. In the first half of 2022, the prefabricated vegetables industry became a big fire, and the concept of prefabricated

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vegetables was very popular in the market, attracting capital to enter [1]. According to the data released by the catering big data research and evaluation agency, the scale of China's prefabricated vegetable industry showed a growing trend from 2015 to 2021, with a six-year compound growth rate of 30%, much higher than the overall growth rate of the catering industry. The 2022 prefabricated industry quality upgrading research report, according to the 2022 China prefabricated market scale will reach 419.6 billion yuan, up 21.3% year on year, market size in 2026 is expected to reach 10720, one hundred million yuan, the next six to seven years, our country prefabricated industry is expected to achieve 3 trillion yuan of above scale, become "the next trillion catering market" [2]. Referring to the development path of the United States, Japan and other developed countries, prefabricated vegetables are an inevitable product of social development, and China's prefabricated vegetables industry will enter an important stage of development.

In a theoretical sense, it is rare for [3] to analyze and study the financial statements of listed enterprises in the prefabricated vegetable industry by using the method of corporate financial statements and data analysis of recruitment websites. Secondly, in practical significance, the normalization of epidemic prevention and control has further changed the dining habits of consumers, and the prefabricated food with stable and assured quality has become a new substitute for in-store food, and the prefabricated food industry has ushered in rapid development.

2 Literature review

The traditional method of financial statement analysis is to scientifically and systematically collect the relevant data in the accounting reports of enterprises, and then make a comparative analysis to obtain the relevant situation of enterprises. Shue Li-Yen believes that the financial statements provide historical information about the company's financial position and performance, which could be an important source of achievement in four major business activities: planning, financing, investment and operating activities [4]. Planning activities describe the company's goals, strategies, and activity strategies that can help managers focus and identify anticipated opportunities and barriers. H.Pokki,J.Virtanen We believe that the economic and financial analysis of the capital value estimate and the capital cost are different in definition, so these two analysis models are bound to produce completely different results [5]. When people are interested in long-term sustainability, it is reasonable to use economic analysis when evaluating performance, while financial analysis describes the actual profitability and the current financial situation of that segment. Lu Wang Believe that the Harvard analysis framework is based on strategic analysis, and then lays a solid foundation for the subsequent accounting analysis and financial analysis [6]. Accounting analysis is mainly used to evaluate the company's asset structure, debt ratio and profit quality, to have a basic understanding of the company's financial situation. Marion Tharrey We believe that in recent years, the economic and social development and changes have made the food consumption habits more convenient, and these changes have also led to the increase in the consumption of processed food, and reduced the number of fresh products prepared at home [7]. In particular, current domestic prepared dishes are increasingly replaced by industrial processing dishes.

Although China's prefabricated vegetable industry has been significantly accelerated in recent years, there are still few studies on the value evaluation of

prefabricated vegetable enterprises in the field of enterprise evaluation. Food processing enterprises mainly profit from the production and sales of processed food[8-9]. This paper refers to part of the research on the evaluation of food processing enterprises, hoping to provide corresponding guidance for the research of Anjing Food Group Co., LTD.Anjoy Foods Group Co., Ltd. was established in 2001. The company currently has 12 production bases in different places. Anjoy stands out in the food industry with its high yield, new technology and good product quality, and has become the pioneer of China's frozen food industry. In 2017, the company was listed on the Main Board of the Shanghai Stock Exchange (6003345).

Anjoy Food has "Anjoy", "Frozen Products", "Anjoy Small Kitchen" three brands, mainly engaged in frozen hot pot ingredients, frozen noodles and rice products and frozen dishes products three kinds of frozen food R & D, production and sales.

Anjoy adopts an asset-light operating model. The channel is positioned as "C be the main, BC both",which means the prefabricated dishes industry B to do sales, C to do the brand, while developing the B and C market together. The company is divided into self-management, distribution and franchise model. Distribution is the main channel of Anjoy, with a revenue of 9.804 billion yuan in 2022, accounting for more than 80% of the revenue. Anjoy has deeply expanded the e-commerce channels of Jingdong and other platforms. In 2022, the revenue of special direct selling, new retail and e-commerce channels increased by 116.79%, 146.69% and 98.33% year-on-year [10].

While the development momentum is excellent, Anjoy is also facing pressure from other competitors in the market and many operational challenges. In this report, a brief description of the problem and a quantitative analysis using data collection methods are presented. Finally, the relevant suggestions and the conclusion of Anjoy's operation management practice are put forward.

3 Research method

3.1 Description of the Anjoy's operation problems

Anjoy, as an enterprise integrating research and development, production and sales, is committed to providing consumers with better products and more efficient services. In recent years, the market for prepared dishes and frozen foods has developed and changed rapidly, and Anjoy is faced with the urgent problem of maintaining competitiveness. In order to strengthen Anjoy's competitiveness in the market, it is necessary to analyze the enterprise's operation management and evaluate its potential operation management problems.

In this report, the following two aspects will be analyzed:

1. Aggregate production plan
2. Materials management

3.2 Methodology

In the report, the annual report and quarterly report for 2022 published on Anjoy's official website will be used as the main data source. Use these data to conduct quantitative analysis of operations management, analyze the actual operating conditions of the company, and find out the aspects that may be improved in the future.

In terms of aggregate planning and materials management, the selection of dishes as representatives. According to the official website, recruitment website :BOSS collected the average monthly salary of employees in 2022, multiple costs, the number of days worked per quarter, and the overtime pay policy of employees. Based on these data and the results, three chase strategies and 4 Lot-Sizing techniques are proposed to provide a more cost-effective approach [11].

4 Result analysis

As shown in Table 1, the raw material cost of the quick-frozen industry accounts for a high proportion, and more than 90% of the cost of prefabricated dishes comes from raw materials. Therefore, the fluctuation of raw material price has a greater impact on the gross profit margin of Anjoy . The gross margin of Anjoy's prefabricated dishes business is not ideal. According to past financial reports, from 2020 to 2022, the gross profit margin of Anjoy prefabricated dishes was 21.97%, 14.21% and 11.42%,showing a continuous downward trend. At the same time, the gross margin of Anjoy Food's dish products in 2022 was 11.42%, lower than other products.(eg:Noodle products:23.53%) [12]. Therefore, it is important for Anjoy to develop a plan for operating capacity in a cost-effective manner.

In this case, we chose the production situation of prefabricated dishes with the lowest gross profit margin in 2022 to forecast 2023 as shown in Table 2. In the aggregate plan, there are four schemes: chase strategy, stable labor-variable working hours, level strategy and subcontracting [13]. The production mode of Anjoy is mainly made by the production departments of each subsidiary company to make monthly production. Therefore, no subcontracting is involved.

Table 1. The number of employees related to the cost of producing food products in Anjoy in 2022

Cost：	
Materials cost	15000 per t
Inventory holding cost	125 per t per month
Stockout cost	250 per t per month
Hiring cost	2,000 per worker
Layoff cost	5,500 per worker
Number of tons one worker produce	0.05 per day
Straight-time cost	4,000 per month
Overtime cost	250 per day
Initial inventory	3,494 t
Number of workers	6,000

Table 2. The official working days for the four quarters of 2022

	2023 1st quarter	2023 2nd quarter	2023 3rd quarter	2023 4th quarter	Total
Demand forecast(t)	21,494	29,272	36,985	38,145	125,896
Working days	60	62	65	62	249

Three chases are used to create different overall plans for Anjoy. The first is pure chase. In Table 3, adjust the number of workers only through hiring and layoffs to meet customer order rates. The amount actually produced is roughly equal to the amount needed, keeping the ending inventory as close to zero as possible [14]. This strategy needs the ability of firms to flexibly change the size of the workforce is more demanding.

Table 3. Plan 1: Pure chase:Vary workforce

	2023 1st quarter	2023 2nd quarter	2023 3rd quarter	2023 4th quarter	Total
Demand forecast(t)	21,494	29,272	36,985	38,145	125,896
Working days	60	62	65	62	249
Beginning inventory	3,494	0	1	1	
Production requirements	18,000	29,272	36,984	38144	
Worker required	6,000	9,443	11,380	12305	
-New workers hired	0	3,443	1,937	925	
-Workers laid off	0	0	0	0	
Unit production	18,000	29,273	36,985	38145	122403
Ending inventory	0	1	1	1	
Cost					
Material cost	270,000,000	439,095,000	554,775,000	572,175,000	1,836,045,000
Hiring cost	0	6,886,000	3,874,000	1,850,000	12,610,000
Layoff cost	0	0	0	0	0
Straight time cost	72,000,000	113,316,000	136,560,000	147,660,000	469,536,000
Inventory carrying cost	0	375	375	375	1125
Total					2,318,192,125

As show in Table 4, the second is a pure level strategy, maintaining a steady number of employees and working at a constant rate of output. Adjust inventory (backlog, lost sales) each quarter to meet fluctuating customer demand.

Table 4. Plan 2: Pure level:vary inventory and stockout

	2023 1st quarter	2023 2nd quarter	2023 3rd quarter	2023 4th quarter	Total
Demand forecast(t)	21,494	29,272	36,985	38,145	125,896
Working days	60	62	65	62	249
Beginning inventory	3,494	11,493	12,697	7662	
Production requirements	18,000	17,779	24,288	30,483	122402
Worker required	9,831	9,831	9,831	9,831	
-New workers hired	3,831	0	0	0	
-Workers laid off	0	0	0	0	
Unit production	29,493	30,476	31,950	30,476	
Ending inventory	11,493	12,697	7,662	0	
Cumulative inventory	11,493	24,190	31,852	0	
Cost					
Material cost	442,395,000	457,140,000	479,250,000	457,140,000	1,835,925,000
Hiring cost	7,662,000	0	0	0	7,662,000
Layoff cost	0	0	0	0	0
Straight time cost	117,972,000	117,972,000	117,972,000	117,972,000	471,888,000
Inventory carrying cost	4,309,875	9,071,250	11,944,500	0	25,325,625
Total					2,340,800,625

The third is the stable workforce and variable working day strategy in Table 5. Keep the same number of employees and change working hours through flexible work schedules or overtime.

Table 5. Plan 3: Constant workforce with variable working time

	2023 1st quarter	2023 2nd quarter	2023 3rd quarter	2023 4th quarter	Total
Demand forecast(t)	21,494	29,272	36,985	38,145	125,896
Working days	60	62	65	62	249
Beginning inventory	3,494	0	0	0	
Production requirements	18,000	29,272	36,985	38,145	
Worker required	6000	6000	6000	6000	
-New workers hired	0	0	0	0	
-Workers laid off	0	0	0	0	
Unit production	18,000	18,600	19,500	18,600	
Overtime production	0	10,672	17,485	19,545	
Overtime days	0	36	59	66	
Ending inventory	0	0	0	0	
Cost					
Material cost	270,000,000	439,080,000	554,775,000	572,175,000	1,836,030,000
Hiring cost	0	0	0	0	0
Layoff cost	0	0	0	0	0
Straight time cost	72,000,000	72,000,000	72,000,000	72,000,000	288,000,000
Inventory carrying cost	0	0	0	0	0
Overtime cost	0	54,000,000	88,500,000	99,000,000	241,500,000
Total					2,365,530,000

The final results in Table 6 show that pure chase strategy is the most cost-effective method compared with the three production strategies. Anjoy should choose to adjust the number of workers to meet the needs of customers at the lowest cost.

Table 6. The cost of three chases

Pure chase:Vary workforce	2,318,192,125
Pure level:vary inventory and stockout	2,340,800,625
Constant workforce with variable working time	2,365,530,000

5 Conclusion

5.1 For aggregate plan

Anjoy can consider implementing the pure chase strategy by equipping the corresponding employee system and flexibly filling it. For example, strengthen employee training so that people within the company can quickly move from one project to another. This does not require a large number of urgent recruitment of employees or temporary termination of employee relations, effectively saving unnecessary personnel costs.

Anjoy could also consider introducing emerging technologies such as artificial intelligence, using machinery to share workloads, increasing productivity through automation and process improvements, and reducing reliance on human resources. This results in less labor costs and increased standardization of goods.

5.2 For materials management

Typically, the supplier is the overall controller of the supply chain (Mentzer et al., 2001). Therefore, Anjoy can find more cost-effective supply chain partners, and establish good supplier relationships, actively negotiate with suppliers on prices, delivery terms and contract terms, and find more competitive prices and procurement terms.

In addition, Anjoy can explore technological innovations to improve the production process and reduce the waste and use of materials. For example, improving product design, optimizing production processes, reducing waste and loss of raw materials, thereby reducing costs.

Finally, adopt more appropriate inventory management, avoid excessive raw material backlog, reduce inventory costs, and reduce capital occupation. From the calculations in this report, Anjoy can consider two batch technologies, LTC and Least unit cost. Anticipate demand reasonably, avoid over-purchasing.

5.3 Limitation

For the aggregate planning, using data from 2022 as a forecast for 2023 is not accurate. Also consider the overall sales environment in 2023 and other influencing factors.

In terms of material management, due to the word limit of the report, only three months of demand was used for calculation. The first quarter is the one with the lowest demand for Anjoy. Therefore, it may not persuasive to calculate the Annual demand quantity of EOQ. The results also represent only the selection of Lot-Sizing Techniques in the first quarter.

In general, more comprehensive data in recent years should be considered in future detailed analysis of some company operation problems, so as to make the report more authentic and convincing.

With the continuous development of the market and the intensification of competition, Anjoy needs to continuously optimize its operation and management in order to face the competitive pressure and ensure sustainable and stable development. This report analyzes the aggregate planning and material management. Through in-depth analysis of operational problems, we help Anjoy find practical solutions. For the aggregate scheme, three different types of strategies are given. Finally, it is concluded that pure chase is the most cost-effective method of Anjoy. For material problems, Anjoy should establish a good relationship with suppliers and carry out technological innovation to solve the problem of expensive materials. By improving these issues, Anjoy can better survive in a highly competitive market.

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