



॥ त्वं ज्ञानमयो विज्ञानमयोऽसि ॥

**Indian Institute of Technology Jodhpur**  
**Department of Mechanical Engineering**

## **Production and Operations Management - MEL3030**

### **Problem statement:**

A company feels that it needs to increase the number of produces per working shift without making much impact on the production cost. Design discussion layout for the orientation phase meeting covering all aspects which are necessary to be discussed in the orientation phase. Choose any one product of your choice for this problem. [Value engineering job Plan]

**Instructor:** Dr. Rahul Chhibber

**Date of Submission:** 23-09-2022

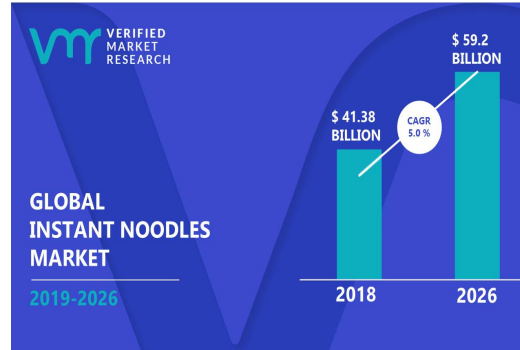
### **Group 3**

Name	Roll No.
Bompelli Om Sri	B20ME024
Deepanshu	B20ME025
Devyani Gorkar	B20ME027
Gandi Venkata Sujay Prabhat	B20ME029
Ganesh A Bachol	B20ME030
Ganteda Harshvardhan	B20ME031
Gaonkar Prathmesh Ratnakar	B20ME032
Garvit Meena	B20ME033



## Introduction

One of the most preferred instant foods consumed in many asian countries is noodles. Instant noodles are a well-known food item on a global scale, and demand for it is continuously growing.



The above graph predicts the growing consumption of instant noodles from 2018 to 2026 with a CAGR (Compound Annual Growth Rate) of 5%. The key reason for the growth of this industry is the growing demand for convenient food products and the increased middle-class population who are the major consumers of instant food. Other reasons include increasing urbanization, per capita income of people and surge in the number of working women. Convenient foods reduce the preparation time for food as it hardly takes less than 5 mins to prepare. Instant noodles are available in different flavors and serve as a quick snack. The affordable price, good taste, convenience in making and offerings in various flavors are increasing the popularity of instant noodles amongst the people.

## Objective of orientation phase meeting

Since the consumption of noodles is increasing in the market. The company decides that it has to increase the rate at which it produces instant noodle products. Also, to maximize the profits, it decides to increase production without affecting the cost.

## Discussion Layout

In the orientation phase meeting, the discussion layout revolves fundamentally around how to increase the rate of production. Some methods that increase production but result in an increase in production cost are

1. Establishing new production sites.
2. Installing new machine lines in addition to the existing ones.
3. Increasing the number of labourers.

But, we have to think of some techniques such that there is not much impact on the production cost.

We can achieve this by:

1. Increasing productivity of existing workflow.
2. Decreasing the cost of production and thus increasing the machines and labourers which in return increases production.
3. Training the existing employees.
4. Lowering the capital spent on raw materials:
  - Reducing the wastage.
  - Purchasing the materials in bulk and keeping the inventory stocked.

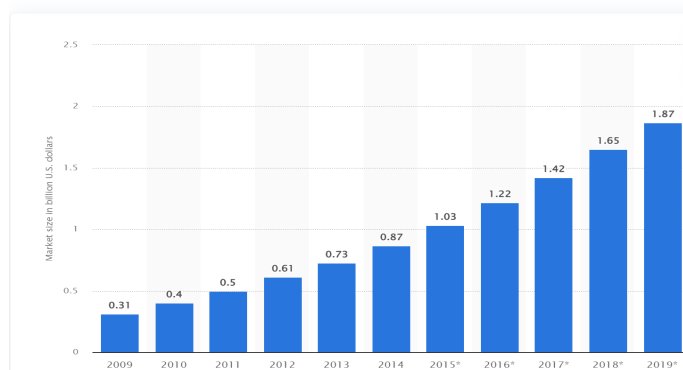
The first step includes the collection of data so that we can consider all the factors that can help us achieve our objective.

### Collect Data:

#### 1. Demand in the market:

A growing millennial population working-class customers are driving the consumption of packaged food products, such as instant noodles, significantly over the years. This can be observed from the graph below:

**Market size of noodles in India from 2009 to 2019**  
(in billion U.S. dollars)



#### 2. Raw materials:

Major contents for manufacturing instant-noodles are wheat flour, water and salt which is a mixture of sodium carbonate, sodium phosphate and potassium carbonate. Additional ingredients which are essential are edible oil(1-3%), starch(0-12%), vital wheat gluten(2%), emulsifiers(0.1-0.2%), polyphosphates(0.1-0.2%), gums(Guar gum - 0.1-0.2%), antioxidants, stabilizers(0.1-0.5%), flavoring and coloring agents(As required). These are mixed to improve the texture, quality and shelf life of instant noodles.

#### Main Ingredients :

Ingredients	Amount
Wheat flour	100 %
Salt(Kansui)	1-3 %
Water	30-38 %

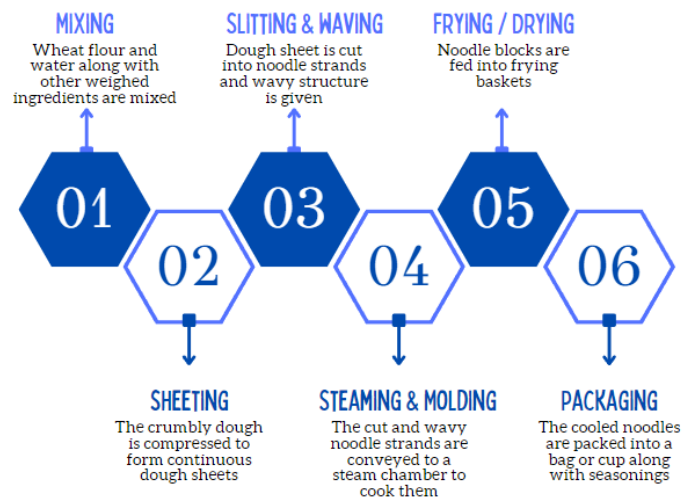
Reference : “Instant Noodles: Processing, Quality, and Nutritional Aspects”(tandfonline.com).

Since a significant portion of the customer base comes from the middle and lower-class, price plays a vital role in the growth and profitability of the instant noodles industry.

Keeping in mind this aspect let us now discuss the various phases involved in manufacturing instant noodles and look at tentative solutions to improve productivity and profitability.

## Phases involved in manufacturing process :

### PHASES IN MANUFACTURING OF INSTANT NOODLES



Now, let us go through each of the phases involved in manufacturing of noodles and discuss the various standards and novel ideas to achieve the various points that we discussed in discussion layout

#### 1. Mixing:

Dough Mixing is a crucial step as it ensures that the ingredients are well mixed. First, the ingredients are dissolved in water and then wheat flour is added and mixed for some time depending upon the machine we use. The number of workers to operate the machine also depends on the mixing device we use. There are different types of mixers used. Eg: horizontal mixers, vertical mixers, high-speed and low-speed mixers, and continuous mixers. Mixing is also affected by the quantity of water, and flour quality.

Companies prefer continuous mixers over batch mixers because of their large capacity and ease of handling. The cost of continuous mixers is slightly higher than batch mixers but the production is increased as we can save time by using continuous mixers. As handling continuous mixers is easy the number of workers required are also less.

Generally, it takes 15-25 min for the mixing process. We can reduce this to some extent by maintaining proper dough temperature and water addition methods. The usual resting time between the mixing and sheeting process is 30-60 mins. This resting time can be significantly reduced by introducing some artificial processes to homogenize the ingredients in the mixture at a faster rate.

#### 2. Sheeting, Slitting & Waving:

Sheeting is done to get the desired dough sheet with a smooth surface and required thickness. Dough sheet properties depend on total no. of passes through the rolls, sheeting speed and roll diameter. Next comes the stage of slicing the noodles into desired length which is done with the help of slitters after which these noodles undergo waving. Since these machines are in a continuous chain, their maintenance is of prime importance. If not maintained properly, any defect in one part will impact the whole production line and thereby it will affect the rate of production

### 3. Moulding and Steaming:

After the noodles are split into cakes, they are molded into circular shapes for cup noodles and rectangular for packet noodles. In the steaming process, boiler-generated steam is introduced to a steam chamber, where it is used to steam the noodle strings.

Time taken for steaming is usually more for hot air dried noodles compared to deep fried noodles, hence we can use the deep frying method so that the time consumed in steaming is less. Thus, this increases the efficiency of production. Also in deep frying, pores are formed in the noodle which facilitate the rehydration process and hence it takes less time to cook the noodle which improves customer satisfaction.

### 4. Frying / Drying:

Frying/Drying is one of the most essential steps among all the phases involved in making instant noodles. It is here where the product undergoes surface drying in-order to become hard enough to provide non sticky handling. Here the moisture of the top surface is removed to facilitate absorption of water throughout the product. Hence, improvement in productivity of this step helps increase production rate significantly.

#### **Current method used:**

Noodle cakes are put into several frying baskets, which are placed over a moving block passing through a frying tunnel. The group of noodle cakes are dipped into hot oil for deep frying. This results in removal of moisture from the exterior surface which creates many holes due to mass transfer. These holes allow the penetration of water for rehydration. This process of generating holes is called puncturing.

#### **Proposed technique:**

##### 1. CO<sub>2</sub> laser puncturing

In this process the dough which is obtained from mixing water, flour and salt in calculated quantities are punctured by CO<sub>2</sub> laser. Experimental results show that this method of puncturing reduces drying time of noodles by around 34% and energy consumption by up to 33%. Since this allows us to save energy, this capital can be invested further in the industry to introduce better techniques like CO<sub>2</sub> laser puncturing technique. Since, this technique reduces the drying time, the overall production per working shift is also increased.

##### 2. Efficient frying

Large amount of oil is used in the frying of noodles. The normal frying temperature is around 140 to 160 °C and it takes around 60 to 120 seconds for one batch to fry. Once a certain temperature of oil is reached we can close the heat source and fry the noodles in it. After temperature decreases to a certain threshold the heat source can be turned on again. This technique reduces the amount of oil required for frying and saves cost of production which can be used either in increasing machines or labourers.

### 6. Seasoning:

The purpose of seasoning is to add flavour to the noodles and provide separate packages for different seasonings like one packet for veggies and another for masala etc. According to reviews of most of the customers, it is found that they use all the content in the seasoning packet and some even crave more in the end. Taking these statistics into consideration, we can break the production line into

two sections, wherein one line manufactures products with separate seasoning packets like all the conventional products and in the other line, we drop the seasonings directly into the noodles.

The second line where the seasonings are served directly along with the noodles helps us to save the packaging of multiple seasoning packets. Thereby, it reduces manufacturing costs and time. This improves the productivity of manufacturing. This will reduce the packaging cost without compromising the quality and taste of the noodles.



## **7. Packaging:**

Increasing the production of sachet noodles compared to that of cup noodles increases productivity as cup noodles take more time for packaging as well as they have to be fried for a longer duration. Apart from the conventional method of packaging we are introducing a efficient way of packaging

Utility model (Double layer packaging):

It is a method of double-packaging that involves using a double-layer packaging bag. Using this method allows the instant noodles to be soaked directly thus increasing the convenience. This kind of packaging consists of a vacuum bag and a self-supported bag.

This type of packaging has a self-seal zipper which is arranged below an upper seal opening of the self-supporting bag. Heat insulation handles are provided on the two sides of the upper portion of such bags. On tearing it exposes the combined zipper inside which the vacuum bag is placed. This vacuum bag is conveniently taken out. Since the edible items are placed inside this vacuum bag, the addition of any preservatives is not required. This vacuum bag is placed in a self-supported bag. This self-supported bag is filled with boiled water via the zipper's opening. The heat insulation handles provided help in conveniently adding hot water without any difficulty.

This double-layered packaging thus solves the problem that conventional instant noodle packaging poses. It reduces the cost of manufacturing by eliminating the necessity of preservatives and also reduces storage and transportation cost.

## **Conclusion:**

Thus, as our aim was to increase production per working shift, we have discussed various methodologies to increase productivity in the existing workflow of the industry. We have also discussed techniques to reduce the manufacturing cost and power consumption which further allows us to hire new labour and invest in new technologies to increase productivity.