HS301 - Industrial Management

Assignment - 01

By

Anchal Gupta (2019chb1038)

Arpita Singh (2019chb1042)

Department of Humanities & Social Sciences

Under the Guidance of Dr. Amritesh

Indian Institute of Technology, Ropar

Ropar – 140001

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Contents

Problem Statement: Decision Making Scenario

You have been given the responsibility of establishing a manufacturing/production unit of that company as a part of its expansion strategy inside India. You are supposed to collect information about the company from search engines and other online platforms in addition to its homepage to address the following questions:

Task-1: Assuming you have adequate availability of finances, technology and equipment, please suggest which location in India will be appropriate and why?

We've chosen "**Nestle India Limited**", the Indian subsidiary of Swiss based Nestle, world's largest food and beverage company. In food manufacturing it comes under the FMCG sector or the fast moving - consumer goods sector. It is headquartered in Gurgaon, Haryana with four branch offices in Delhi, Mumbai, Chennai and Kolkata. Products ranging from various brands commonly known in Indian households like Massala Maggie, Nescafe, Milkybar, Kit-Kat, Milkmaid, Nestea etc are all manufactured by Nestle. For this particular course on Industrial Management we have chosen to study **Nestle Maggie**.

Currently, Nestle has 9 manufacturing plants across the country:

1. Moga, Punjab
2. Samalkha, Haryana
3. Nanjangud, Karnataka
4. Choladi, Tamil Nadu
5. Ponda, Goa
6. Bicholim, Goa
7. Pantnagar, Uttarakhand
8. Tahliwal, Himachal Pradesh
9. Sanand, Gujarat

Given enough financial, technological, and equipment resources, the following aspects are taken into consideration while selecting a location for the production unit.

1. Proximity to Raw Material

The two main ingredients of maggi noodles are wheat flour and palm oil. It would only make sense to establish a new production/manufacturing unit in proximity to these raw materials so that there isn't an unnecessary build up in transportation costs.

1. Wheat:
   - India is the second largest producer of wheat across the globe with an average productivity of 3371 kg/ha. Wheat is a major staple food crop and amounts to 36% of total food grains produced in India.
   - As per recent reports, around 30.54 million hectares of land is under cultivation in India. The top wheat producing states of India are as shown in the table below along with the production in million tonnes.

Fig 01: Largest Producing States of Important Crops

4.2: Three Largest Producing States of Important Crops during 2019-20*

Production : Million Tonnes

Group of Crops	Crops	States	Production
(1)	(2)	(3)	(4)
I. Foodgrains	Rice	West Bengal	15.57
		Uttar Pradesh	15.52
		Punjab	11.78
		All - India	**118.43**
	Wheat	Uttar Pradesh	32.59
		Madhya Pradesh	19.61
		Punjab	17.57
		All - India	**107.59**
	Maize	Karnataka	3.9644
		Madhya Pradesh	3.91
		Telangana	3.00
		All - India	**28.64**
	Total Nutri/ Coarse Cereals	Rajasthan	7.29
		Karnataka	6.45
		Madhya Pradesh	4.82
		All - India	**47.48**
	Total Pulses	Rajasthan	4.49
		Maharashtra	4.03
		Madhya Pradesh	3.80
		All - India	**23.15**
	Total Foodgrains	Uttar Pradesh	55.03
		Madhya Pradesh	33.03
		Punjab	30.02
		All - India	**296.65**

- As shown in the above table, Uttar Pradesh, Madhya Pradesh and Punjab are the major contributors of wheat production in India. Uttar Pradesh has a share of around 30%, followed by Madhya Pradesh and Punjab with a share of 18% and 16 % respectively.
- Within Uttar Pradesh, the prominent wheat producing districts are Meerut, Agra, Kanpur and Mathura.
- Within Madhya Pradesh the prominent wheat producing regions are Bhopal, Malwa and Hoshangbad.

These districts in Uttar Pradesh and Madhya Pradesh are potential sites for a new manufacturing unit of Nestle Maggi.

2. Palm Oil

- Nestle imports a significant amount of palm oil from oil mills in Indonesia and Malaysia. This again adds to the total cost of production.
- Rather than importing, it's better to establish the manufacturing units in proximity to areas producing palm oil. The major palm oil producing states are as shown in the map.

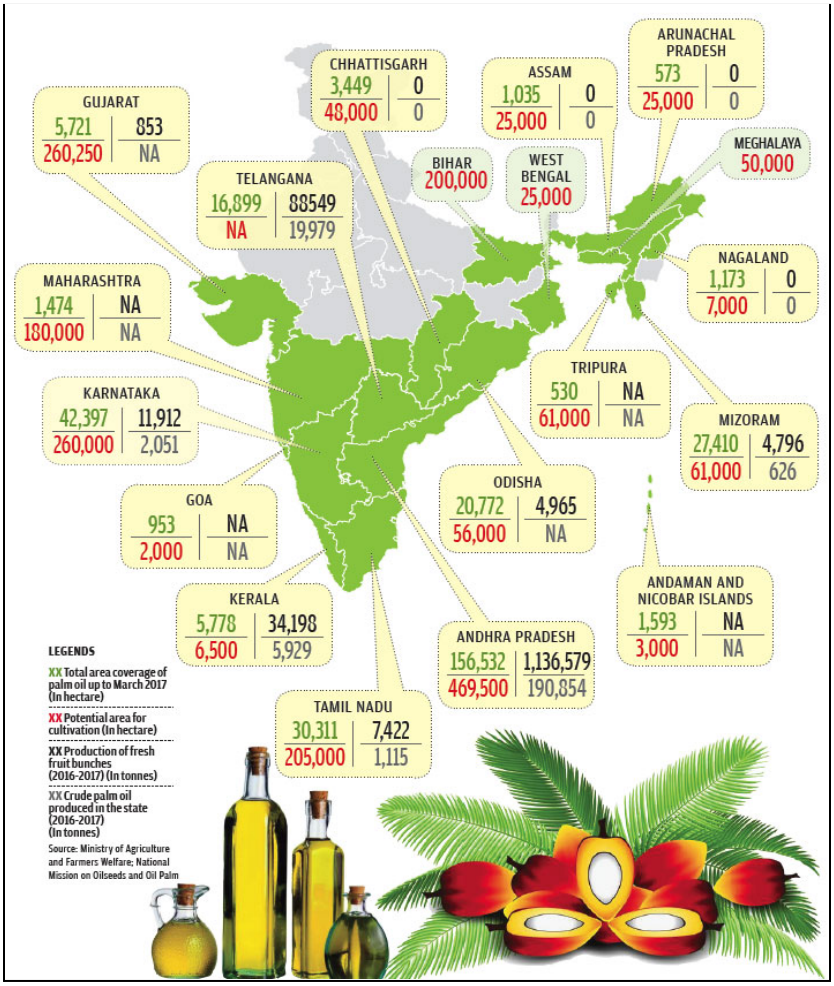

Fig 02: Palm Oil Production in India

In comparison to Uttar Pradesh, Madhya Pradesh seems to be closer to palm oil producing states like Chhattisgarh, Gujarat and Maharashtra. Hence, considering proximity of raw materials, Madhya Pradesh seems like a more viable option as palm oil can easily be obtained from the palm oil mills in Chhattisgarh.

2. Labor Cost & Availability:

Besides land and raw materials, we need laborers to start the production of goods and services. Nestle India has about 1500 workers who are directly involved in Maggi production across the existing plants in the country.

- Madhya Pradesh is the second largest state in India. It has a population of around 8.58 crore. As per reports, Madhya Pradesh falls amongst the top 5 states along with Uttar Pradesh in terms of availability of labor in the secondary sector.

T 00-009: Distribution of workers by category of workers

T 00-009: Distribution of workers by category of workers (e.g., cultivators, agricultural laboures, household indusries workers and other workers by sex

State Code	State / UT	Total workers	Cultivators		Agricultural labourers		Household industry workers		Other worker	
			Number	%	Number	%	Number	%	Number	%
00	India@									
	Persons	402,234,724	127,312,851	31.7	106,775,330	26.5	16,956,942	4.2	151,189,601	37.6
	Males	275,014,476	85,416,498	31.1	57,329,100	20.8	8,744,183	3.2	123,524,695	44.9
23	Madhya Pradesh									
	Persons	25,793,519	11,037,906	42.8	7,400,670	28.7	1,033,313	4.0	6,321,630	24.5
	Males	16,194,368	6,882,776	42.5	3,518,368	21.7	519,127	3.2	5,274,097	32.6
	Females	9,599,151	4,155,130	43.3	3,882,302	40.4	514,186	5.4	1,047,533	10.9

Fig 03: Distribution of workers by category across India and in Madhya Pradesh

Keeping these statistics in mind, it would not be wrong to say that there is ample availability of labor in Madhya Pradesh. Besides labor availability it's also equally important to look at labor cost.

The figure below highlights the different states in India based upon the minimum wage rate.

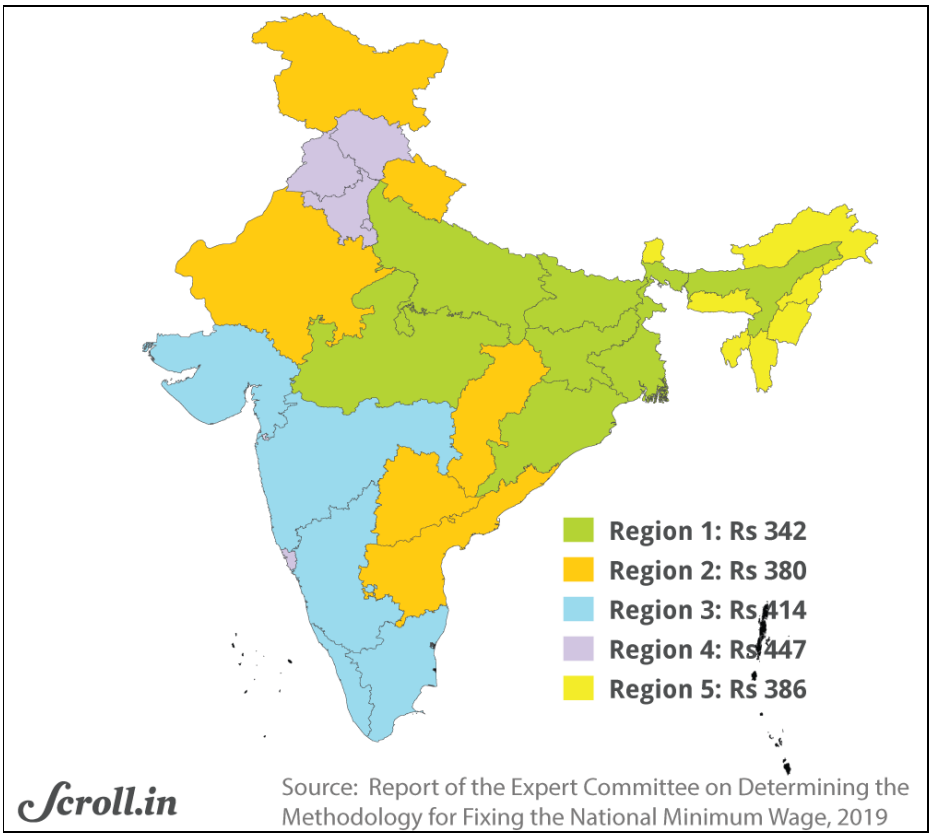

Fig 04: Minimum Wage Rates Across India

From the figure we can clearly see that Madhya Pradesh has a low minimum wage rate and the exact amount is shown in the table below.

Effective from Date: **1st Oct, 2021** Updated As On: 4th Oct, 2021

Class of Employment	Basic Per Day	Basic Per Month	VDA Per Day	VDA Per Month	Total Per Day	Total Per Month
Unskilled	250.00	6500.00	88.46	2300.00	338.00	8800.00
Semi-skilled	271.42	7057.00	100.00	2600.00	371.00	9657.00
Skilled	324.42	8435.00	100.00	2600.00	424.00	11035.00
Highly Skilled	374.42	9735.00	100.00	2600.00	474.00	12335.00

Fig 05: Minimum Wage Rate in Madhya Pradesh

The above two factors combined show that Madhya Pradesh is a decent location with plenty of labor availability at a relatively lower wage rate.

3. Proximity to Markets

The instant noodles, Maggi, is the most widely consumed food product of Nestle. Its target audience includes a wide range of people, from young children to working individuals.

- Madhya Pradesh is accessible to significant consumer markets and large cities such as Delhi, Mumbai, Kolkata, and Chennai due to its central location. Hence, it serves as a good manufacturing base for various consumer goods companies.

  The strategy of distribution followed by Nestle is,

  Producers -> Distributors -> Wholesalers -> Retailers -> Consumers

- **Distribution cost:**
  - ➢ Maggi products are sent directly from the manufacturer to carrying and forwarding agencies, who store them in large warehouses and then supply them to wholesalers as per their need.
  - ➢ These products are then distributed to retailers or the end customers.
  - ➢ If these small businesses in retail or warehouses are located within the vicinity of densely populated areas, then the transportation cost can be minimized.

According to the FCI, State-wise storage capacity data, Madhya Pradesh has the largest storage capacity of 210.73 lakh metric tonnes.

Table 11.3(a): State-wise Storage Capacity

(In Lakh Metric Tonnes)

S.No	State/UTs	March, 2014	March, 2015	March, 2016	March, 2017	March, 2018
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Bihar	11.50	10.49	15.10	15.56	25.81
2	Odisha	14.09	13.57	11.63	13.57	12.10
3	West Bengal	19.64	14.68	16.72	18.64	18.67
4	Sikkim	0.11	0.00	0.00	0	0.00
5	Jharkhand	2.11	2.95	2.53	2.91	3.68
	Total East Zone	**47.46**	**41.69**	**45.98**	**50.68**	**60.26**
6	Assam	6.25	5.76	6.29	3.98	4.68
7	Arunanchal Pradesh	0.23	0.28	0.23	0.41	0.27
8	Tripura	0.83	0.37	0.83	0.43	0.44
9	Manipur	0.31	0.32	0.32	0.32	0.32
10	Nagaland	0.46	0.33	0.45	0.44	0.48
11	Mizoram	0.26	0.25	0.67	0.25	0.93
12	Meghalaya	0.42	0.28	0.23	0.23	0.22
	Total N.E Zone	**8.77**	**7.59**	**9.02**	**6.06**	**7.34**
13	Delhi	5.14	3.67	3.67	3.67	3.67
14	Haryana	64.78	107.77	116.11	101.73	99.17
15	Himachal Pradesh	0.45	0.51	0.49	0.35	0.51
16	Jammu & Kashmir	1.75	2.10	2.49	2.59	2.79
17	Punjab	182.66	240.00	252.56	250.13	201.43
18	Chandigarh	4.09	0.00	0.00	0	0
19	Rajasthan	39.88	25.49	23.24	21.42	19.9
20	Uttar Pradesh	91.59	57.53	64.43	58.28	58.72
21	Uttarakhand	2.84	3.67	3.80	0.21	3.93
	Total North Zone	**393.18**	**440.74**	**466.79**	**441.93**	**390.12**
22	Andhra Pradesh	68.47	27.31	24.02	28.71	26.8
23	Telangana	-	19.79	20.88	17.52	27.37
24	Kerala	9.00	5.89	5.89	5.55	7.17
25	Karnataka	25.02	29.24	29.62	13.87	11.56
26	Tamil Nadu	24.41	17.58	16.99	26.97	43.17
27	Puducherry	0.84	0.00	0.00	0	0
28	A&N Islands	0.10	0.00	0.00	0	0
29	Lakshadweep	0.00	0.00	0.00	0	0
	Total South Zone	**127.84**	**99.81**	**97.40**	**92.62**	**116.07**
30	Gujarat	18.33	9.86	9.26	8.82	9.28
31	Maharashtra	53.43	31.79	31.55	31.98	34.19
32	Goa	0.50	0.20	0.20	0	0
33	Madhya Pradesh	68.63	59.17	129.66	124.29	210.73
34	Chhattisgarh	23.70	23.58	24.98	19	15.04
35	Daman & Diu	0.00	0.00	0.00	0	0
36	D&N Haveli	0.00	0.00	0.00	0	0
	Total West Zone	**164.58**	**124.60**	**195.65**	**184.09**	**269.24**
	Grand Total	**741.83**	**714.43**	**814.84**	**775.38**	**843.03**

Source: Department of Food & Public Distribution.

"Note: Storage capacity pertains to FCI, CWC and SWC. It includes Owned and Hired, Covered and Cap Storage"

Fig 06: State-Wise Storage Capacity

4. **Government Policies and Tax Concessions:**

Suitable tax policies and tax concessions mean more profit to the company. Madhya Pradesh has been a forerunner in supporting industrial expansion by providing numerous incentives to encourage rapid industrialization.Various state policies in Madhya Pradesh and incentives part of the Industrial Promotion Policy 2014, make it an even more desirable spot.

- Mandi Fee Exemption: For a period of 5 years or a maximum of 50% of investment in plant and machinery, whichever is lower, all food processing plants that purchase agricultural produce from the state are exempt from the mandi fee.
- Entry tax Exemption: Mega Industrial units are given an exemption in entry fees for a period of 7 years for an investment of more than INR 500 crores in plant and machinery.
- Medium, large and Mega Industrial units are provided 50% assistance (subject to maximum INR 1 crore) for developing power, water and road infrastructure for private lands or undeveloped government land.
- In order to harness human capital, various block level training centers and skill development programs targeted towards meeting the industry needs have been introduced.
- Electricity duty exemption : All industrial units having a HT connection with any DISCOM are exempted from electricity duty for 220 KV connection for a period of 10 years.

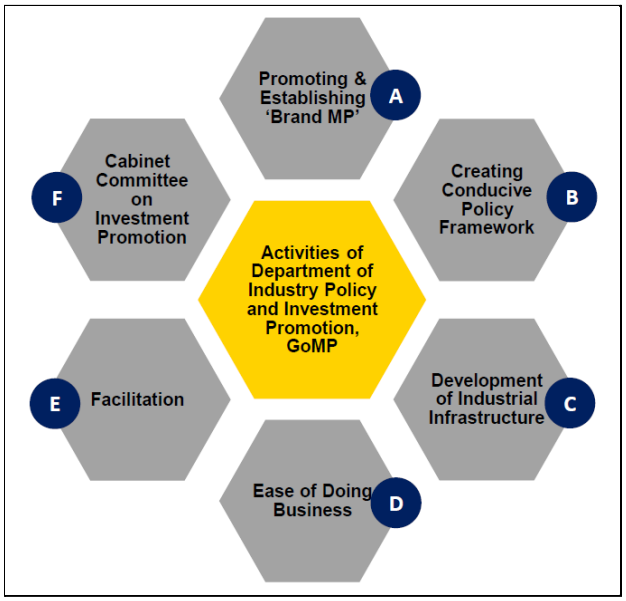

Fig 07: Activities of GoMP

Considering the above points, we have chosen **Madhya Pradesh** for setting up a new manufacturing unit of Nestle Maggi. After deciding a region, we need to decide a specific location/plot of land for the construction of the production unit.

We have narrowed down the location site to **Bhopal** for the following reasons:

- Within Madhya Pradesh, Bhopal is one of the **prominent wheat producing regions**. Ample supply of raw materials makes it an ideal location for construction of a production unit.
- **Transportation Infrastructure:** While setting up a manufacturing unit, transportation is a critical factor. Raw materials must be transported to the manufacturing site, and the final products should be transferred from the production site to the demand location. Efficient transportation helps in mass production.
    - ➢ Bhopal is well connected with major cities of the country by both airport and rail connectivity. The National Highway, NH12 and NH86 connects the city to several big cities.
    - ➢ The city's local transportation is supported by extensive bus and highway services. Around 100 buses run on a daily basis, throughout the city and to the neighboring districts.
    - ➢ Buses, rickshaws, and cabs are all important components of the city's transportation network.

    The finished products can therefore be efficiently transported to the storing depots or warehouses in less time.

- **Water & Power Supply:**
    - ➢ Bhopal has two water resources, the Upper lake and the Kolar reservoir. The industrial areas of the city receive adequate water supply from these two reservoirs and the Narmada water supply project.

- ➢ Furthermore, the Asian Development Bank (ADB) has provided funding for 16 projects in Bhopal, including water supply, sewage and sanitation, storm-water drainage, and industrial solid waste management.
- ➢ Electricity in Bhopal is derived from nearby thermal power plants.

Table 2.5 Type and number of connections of piped water in Bhopal

Customer category Domestic in mm (inch)	No. of connections
(½")	95298
(¾")	409
(1")	101
Non-domestic	
(½")	1110
(¾")	44
(1")	130
Industrial	
(1-1/2")	17
(2")	65
(3")	34
(4")	31
Public standposts	**4618**
Religious places	
(½")	738

Fig 08: Piped Water Connections in Bhopal

- **Land :** States like Madhya Pradesh, Karnataka, Assam, Gujarat, Rajasthan Maharashtra have cheaper lands compared to other states. In Madhya Pradesh, Bhopal has about 8% land area for Industrial purposes. Out of this 8%, 704.7 Hectares of land in developed Industrial areas and 28.68 hectares in developing Industrial areas is available for manufacturing the plant.

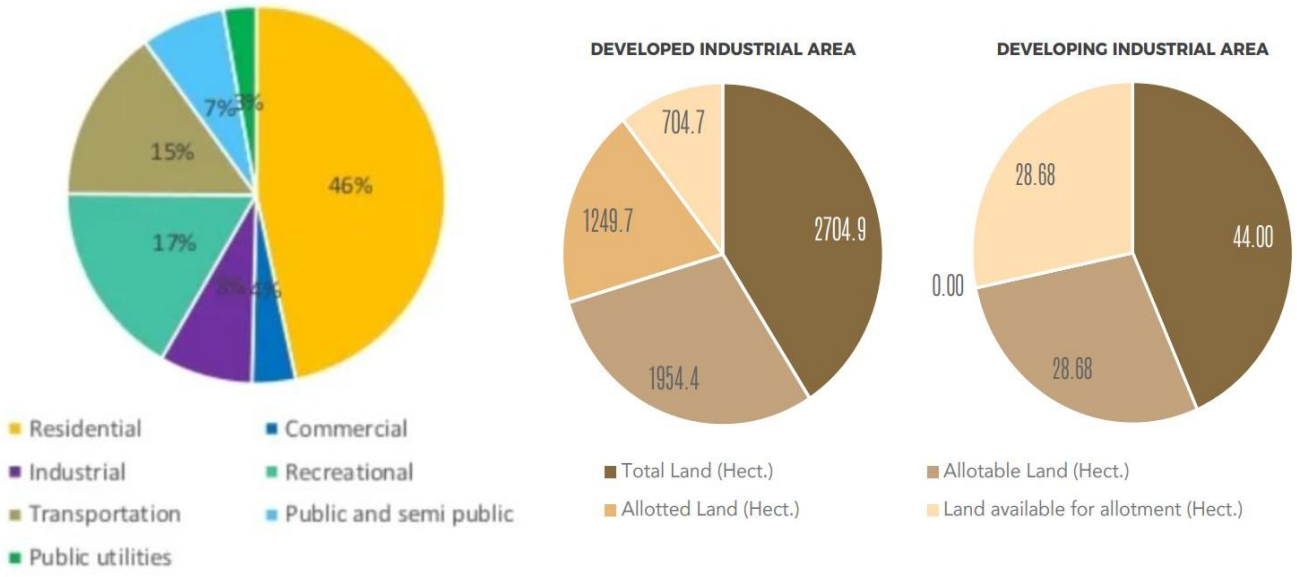

Fig 09-10: Percentage land distribution in Bhopal

Task- 2: What could be the possible issues related to process selection and facility layout at your chosen location and how do you plan to address them?

Process refers to a set of activities which transform inputs to outputs. Before moving on to process selection and facility layout, the first and foremost step is to identify the type of production system out of the job shop system, batch production, Repetitive production and continuous flow system.

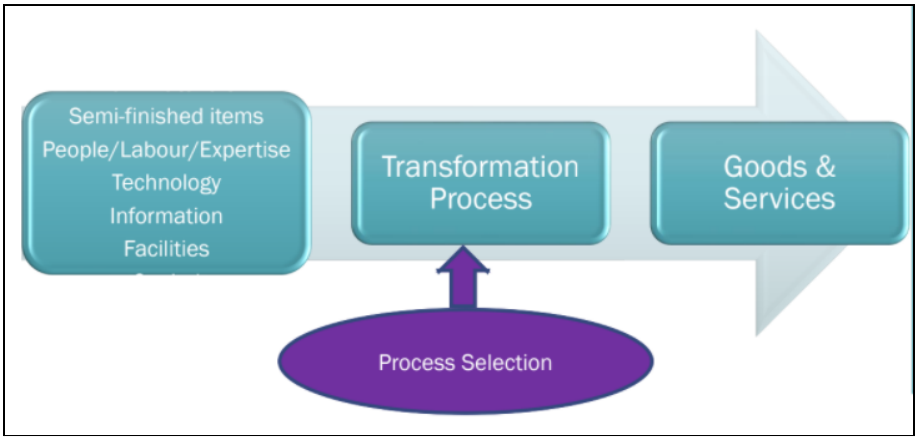

Fig 11: Process and Process Selection

The type of production system depends largely on the volume of production and variety.

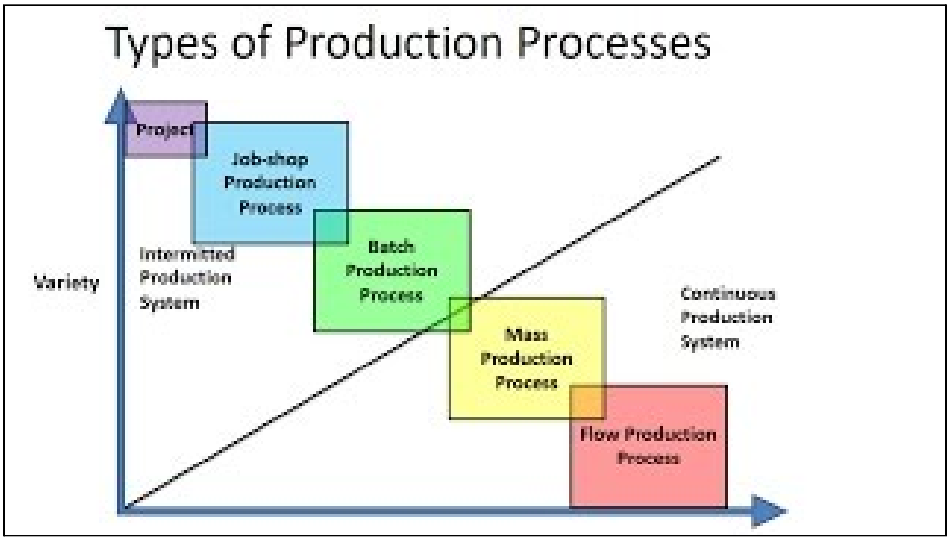

Fig 12: Types of Production Processes

For the new manufacturing plant in Bhopal:

- We are targeting high production volume as we plan to distribute the goods not only in Madhya Pradesh but also in the consumer markets of neighboring states such as Uttar Pradesh, Chhattisgarh and Maharashtra.
- As a new plant, we have chosen to focus on production of classic Maggi Masala which has the highest consumption and thereby, limit the variety of production.

Selection of Production System:

In the factory, Maggi is manufactured in a large stretched noodle making machine. It consists of a feeder system, mixing, cutting and packing units. The feeder system uses a vacuum distributor to move the input feed (Wheat flour + water) to the mixing unit. Here, the mixer prepares the dough using the motor drive gear. After that, the dough is shifted to the machine belt. It is then evenly spread into the compounding part of the machine with the help of a distributor.

Then it is passed through the packing machine which separates it into two pieces. Next, is the slitter or the rotating cutter which cuts down the dough sheet. After that the noodles are steamed in a multi layer steam box embedded in the machine. The noodles are then cut into required lengths and fried. At last, they are properly sealed and sent to the packaging area using conveyor belts.

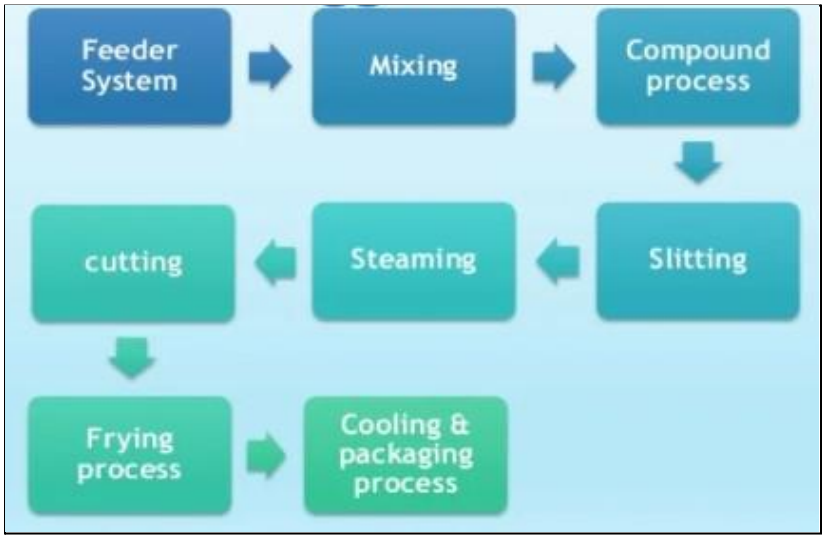

Fig 13: Manufacture of Maggi Noodles

With the help of only a single noodle making machine, maggi is manufactured in the factory. The production process is divided into a series of standardized tasks arranged as per the sequence of processing requirements. The whole arrangement is in the form of a production line.

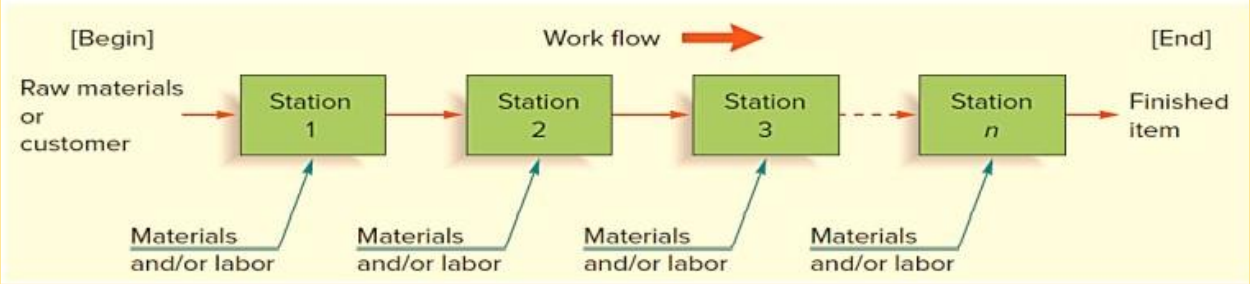

Fig 14: Production Line or Assembly Line

After studying each production system we come to the conclusion that the **Repetitive production system** is most suitable for the manufacturing plant in Bhopal with the following key aspects:

- Process is well organized and there are ordered sequences of work stations spread across a straight line.
- Manufacturing plants are aimed at producing a high volume of standardized goods.
- In such systems equipment flexibility is slow and low skilled workforce is required.

Facility layout design:

Facility layout refers to the way production processes, workstations and equipment are organized. It is closely linked to the production process. A good facility layout is one which minimizes bottlenecks, handling cost, production time, eliminates unnecessary movement of workers and materials, ensures safety, etc.

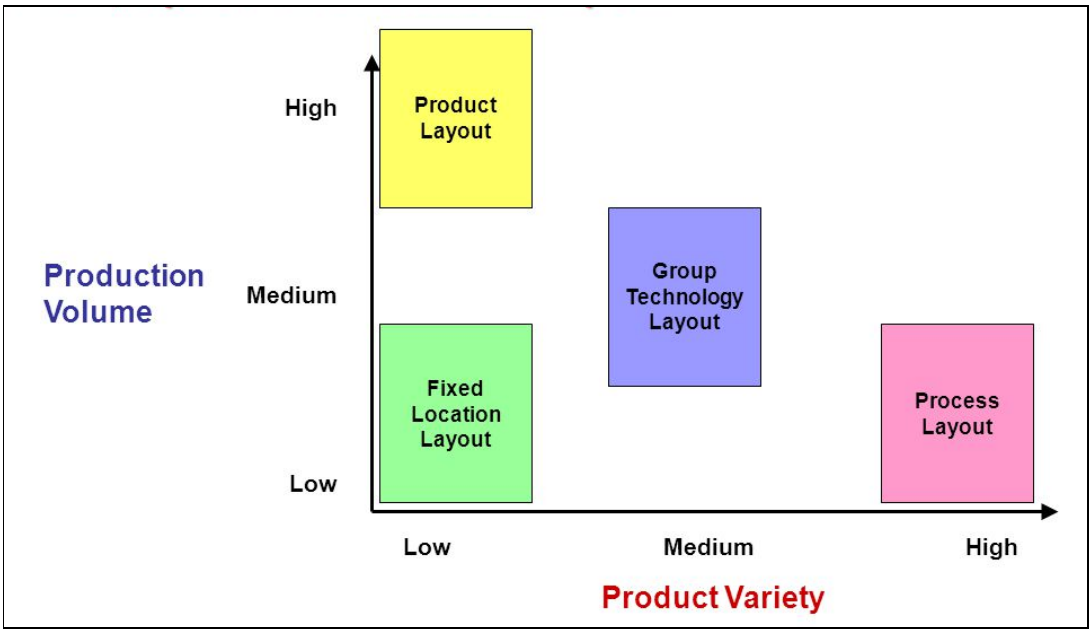

Fig 15: Relation Between Production Volume, Variety and Production System

Out of the three facility layouts namely product, process and fixed-position layout , **Product layout** is the most conducive to repetitive processing and hence is most suitable for the manufacturing unit in Bhopal. In product layout the entire layout is arranged as per the sequence of processing requirements and the resulting arrangement is known as production line or assembly line.

Availability of low skilled, semi-skilled and skilled labor is not an issue in Bhopal as there are various block level training centers and skill development programs targeted towards meeting the industry needs in action. Moreover, the location of the plant has already been analyzed for availability of labor at low wage rates. Hence, labor availability is not a huge challenge in Bhopal.

As mentioned before, 704.7 Hectares of land in developed Industrial areas and 28.68 hectares in developing Industrial areas is available in Bhopal. Hence, the availability of land in Bhopal is not an issue for our manufacturing plant. Moreover, the topography of Bhopal does not pose any problem in process selection or facility layout.

Some of the possible issues which may arise in the product layout design and the respective measures to tackle them are as follows:

- **Minimizing Production time**

  ➢ The movement of the work-in-process is almost in a straight line in the production units. There could be possible bottlenecks in the packaging phase where the noodle blocks are filled into the packages, due to difference in the production/working/output time of the different subsystems in the machine line.

  ➢ To address this issue, we can place multiple lines in the conveyor belt connected to the Packaging unit. This will ease out the pressure of the incoming work-in-process.

- **Material handling cost:**

  ➢ While setting up a production facility, material handling equipment can consume a vast amount of money.

  ➢ To minimize these costs, unnecessary manual labor should be reduced. This can be done by using conveyors for transportation of goods to and from a picking area to packaging for shipping.

  ➢ These conveyors can move large volumes of material through a process plant with minimal or no labor required. As a result, labor costs will be reduced and the overall material handling cost will be minimized.

- **Ensuring Safety in the Workplace:**

One common problem across the nation is lack of safety awareness amongst low skilled and semi skilled workers. Slips, trips and falls are the leading causes of injury amongst the secondary sector. Moreover, injuries due to powered industrial trucks or other material handling equipment is another serious manufacturing hazard.

The only way this can be overcome is by educating, training and equipping workers to

perform their tasks safely and respond rapidly to unexpected events. Each employee should be made aware of safety protocols and be urged to follow them at all times. Also, proper machine guards should be installed in machines with rotating parts in order to protect the workers who operate these heavy machinery.

- **Efficient Space Utilization:**

  ➢ Connecting multiple subsystems to the main machine line may leave insufficient space around the machinery. It would be difficult to do maintenance as the system will become congested.

  ➢ To address this issue, we suggest a U-shaped layout design. It is more compact, allows flexibility and is useful in space constraints.

  ➢ Since the U-shaped layout requires less floor space compared to the straight assembly line, there is less movement of product and workers. This saves time and hence increases productivity.

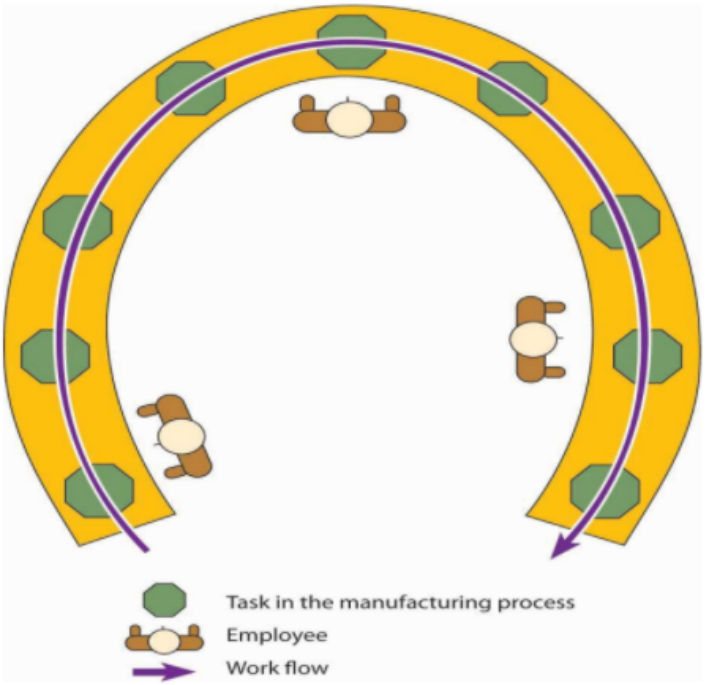

Fig 16: U-shaped Layout Design

References

1. Nestle Website. https://www.nestle.in/. (Accessed: 28.01.22)
2. Agricultural Statistics At Glance ,2020 Fig 01: Largest Producing States of Important Crops. (Accessed: 1.02.22)
3. Classification of Workers. Distribution of workers by category across India and in Madhya Pradesh. (Accessed: 2.02.22)
4. Minimum Wage Rates Across India. Minimum Wage Rate in Madhya Pradesh. (Accessed: 3.02.22)
5. Industrial Promotion Policy. http://www.mpindustry.gov.in/upload/files/002702595443.pdf. (Accessed: 3.02.22)
6. Transportation Infrastructure of Bhopal https://www.yourarticlelibrary.com/geography/transportation/what-are-the-important-functions-of-transport/42137.(Accessed: 5.02.22)
7. Manufacture of Maggi. ig 13: Manufacture of Maggi Noodles.(Accessed: 6.02.22)
8. U shaped layout design. https://operationsinsider.com/the-language-of-lean/u-shape-layout#:~:text=The%20U%2Dshape%20layout%20describes,of%20the%20letter%20%22U%22.&text=This%20comes%20mostly%20from%20maximizing,space%20(%E2%82%AC%2Fsqm).(Accessed: 6.02.22)
9. Nestle maggi.https://www.slideshare.net/SupriyaBoruah/nestle-maggi-249606577. (Accessed: 7.02.22)