

Term Project

Production Facility Revamp

By

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Revision History

2/14/2021	Draft #1: Original proposal
3/7/2021	Draft #2: Included – WBS – Project Organization – Financial Plan
4/4/2021	#10: Completion of the Project Report
4/12/2021	#11: Project Report
4/16/2021	Final Project Report

1. Purpose & Objective

The Company we are working for is a Contract Manufacturing firm which takes up maintenance and fresh construction projects for businesses in Steel, Pharma and Energy Sectors. The company currently purchases most of the materials it uses for these projects in bulk, while the other materials are manufactured in house. They are stored in the storehouse of the production facility. These materials are then either sold to customers or it is used in one of the construction projects. Epoxy Flooring/Lining is one of the most profitable service provided by the company. The company currently buys Epoxy in bulk from one of its competitors, which is affecting its profits. The other materials required for Epoxy lining are produced in house. They want to increase their profit margin by 40% by cutting of the middleman and manufacturing their own epoxy. They already have an established market where they can use their own Epoxy and they can also sell it to their existing customers.

The purpose of the project is to establish an Epoxy production and testing facility. The current manufacturing facility must be upgraded to accommodate the new Epoxy manufacturing unit and the storage facility will need expansion. We will be required to set up a packing/boxing facility for the manufactured epoxy. We will also be required to set up a testing facility for this epoxy.

2. Scope

The Scope of my project can be subdivided into 3 projects. The first project will be to expand the current production facility of the company. The second project is to establish a manufacturing/production unit for Epoxy. The third Project is to set up an assembly for the packaging of our Epoxy. We can divide the total scope of the project into the following bullet points:

- Set up Epoxy manufacturing unit.
- Training of personnel to operate the machine and to test the product.
- Set up an assembly line for packaging of our Epoxy.
- Set up Epoxy testing facility.
- Renovate the production facility to include increased storage space and accommodate the testing facility. This includes expanding the size of the pre-existing facility.

3. Investing Stakeholder(s)

This project is a private undertaking which will be entirely funded by the company. The completion of this project will be very beneficial to the company in the long run.

4. Critical Success Factors

- Completing project in scheduled time.
- Experienced team.
- Staying within project budget.
- Specifications and objectives for the project are clear to everyone involved.
- The developed product meets all industry standards and is cost-efficient for production.
- The developed product is readily accepted by the clients and the industry.

5. Assumptions

- The PMs approach the Procurement team to fulfill their need for supplies/equipment.
- The Customer Requirements for Epoxy is known.
- There is minute difference if any between the actual Project costs and the estimated budget cost.
- The Equipment and Material Testing can be done while the Facility Expansion is taking place.
- Our Product will be accepted by our existing customers.
- The company already has an established sales, procurement and marketing department which could directly be used.
- We have sufficient resources for the completion of the project and only need to hire skilled labor.

6. Project Organization

I plan to use a Projectized organization approach for my project. This is because the entire project has the potential to be split up into separate projects and using a Projectized Organization approach will be suitable. There will 4 project managers each handling a sub-project as described in the Project Organization chart and there will be a Functional Manager which the PMs can approach for technical advice.

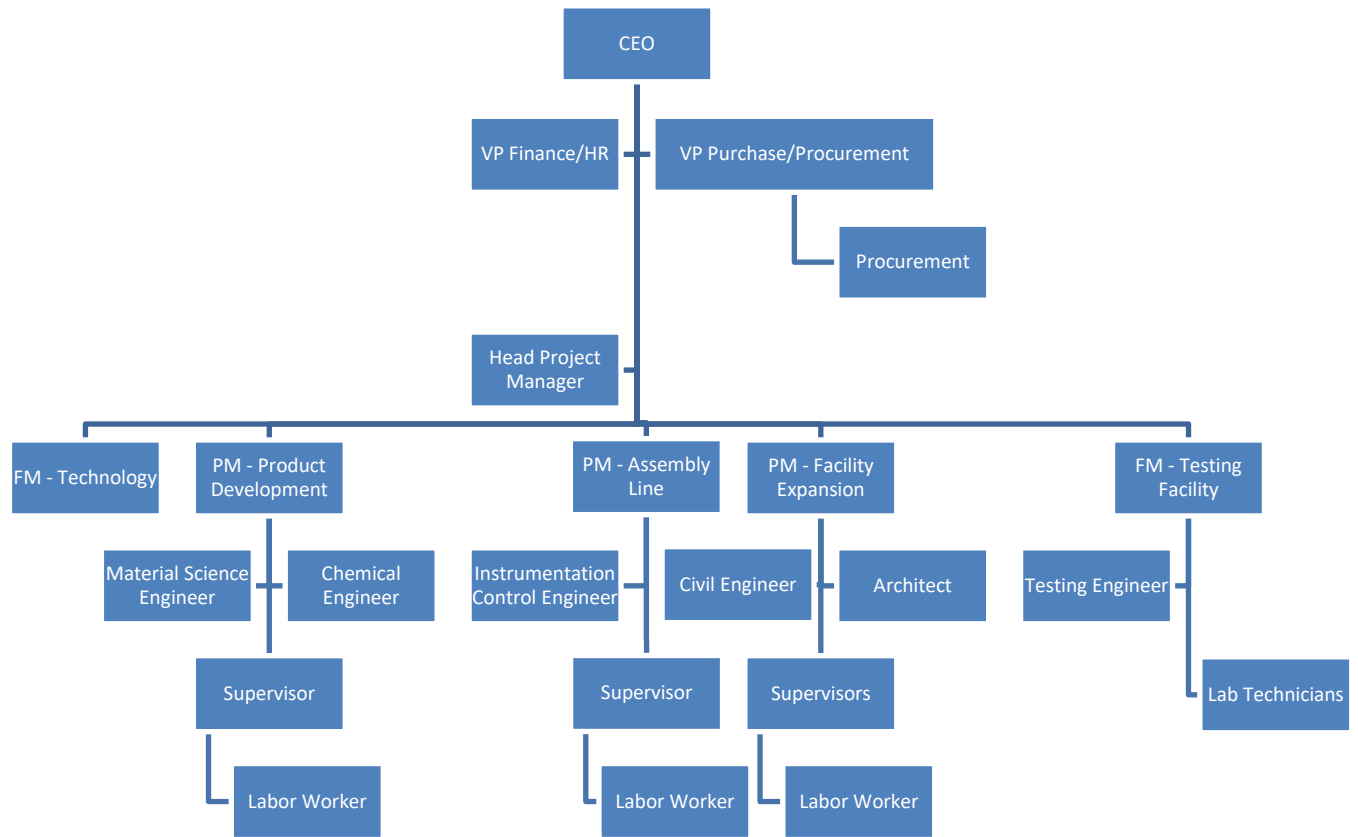


Figure 1: Project Organization Chart

7. Implementation Plan

a. Technical Approach

I need to reach out to an Equipment Manufacturer and create a plan to produce the machine which has a production capacity of 1 metric ton with the option of upgrading. The production facility must be renovated to make space for this machine and an assembly line for the packing of this epoxy must be built.

The renovation plan will include the construction of a storage space for our products. The condition of this storage space must be regulated to preserve the quality of our goods.

Finally, an in-house testing facility must be set up to check the quality of each batch of Epoxy produced. Things like viscosity, tensile strength, chemical resistance etc. needs to be tested. For this we need will need to buy testing equipment's. We must ensure that our product is of high quality each time.

We will set our budget to be 1.2 million dollars. In essence, our budget can be allocated into 4 areas i.e., machinery, renovation, testing facility and manpower. 41.66% of our budget will go towards buying the manufacturing machines, testing equipment's and the machines for packaging. 16.66% will go into the materials required for the renovation of our production facility, assembly line, testing facility and storage space. 31% of our budget will amount for the salary of the employees and the skilled labor which we will hire. The remaining budget will go into miscellaneous costs and for unexpected expenses which we might encounter throughout the project duration.

b. Work Breakdown Structure

The Work Breakdown Structure (WBS) is a breakdown of all activities in a project from start to finish.

1. Initiating:
 - 1.1.1. Hold a project kick-off meeting
 - 1.1.2. Identify the key stakeholders and their requirements
 - 1.1.3. Prepare Project Deliverables
2. Planning:
 - 2.1.1. Defining Scope
 - 2.1.2. Prepare a Project Plan
 - 2.1.3. Discuss the plan with the Stakeholders
 - 2.1.4. Determine the Product Pricing
3. Defining Project Requirements:
 - 3.1.1. Business Requirements
 - Determining Equipment Specifications.
 - Designing the new production facility.
 - 3.1.2. Hiring Team Members
 - 3.1.3. Estimating Project Cost
 - 3.1.4. Determine Project Timeline/Schedule
4. Execution:
 - 4.1.1. Reporting Progress
 - 4.1.2. Facility Expansion
 - 4.1.3. Order Necessary Equipments.

- 4.1.4. Set up Manufacturing Unit
 - 4.1.5. Equipment Testing
 - 4.1.6. Train Personnel
 - 4.1.7. Monitoring quality of work
 - 4.1.8. Material Testing
 - 4.1.9. Assembly Line Set up
5. Completion:
- 5.1.1. Prepare Project Report
 - 5.1.2. Launch
 - 5.1.3. Finish Project closing phase

c. PERT Chart

A PERT chart is a useful tool used by Project Managers to evaluate the resources and the time required to manage a project. This evaluation allows the PM to track the required assets during any stage during the course of the project. It is an important tool because it allows the PM to schedule and organize the tasks in a scheduled order. MS Project has been used to create the chart and from the chart the estimated completion time of the project is 190 days.

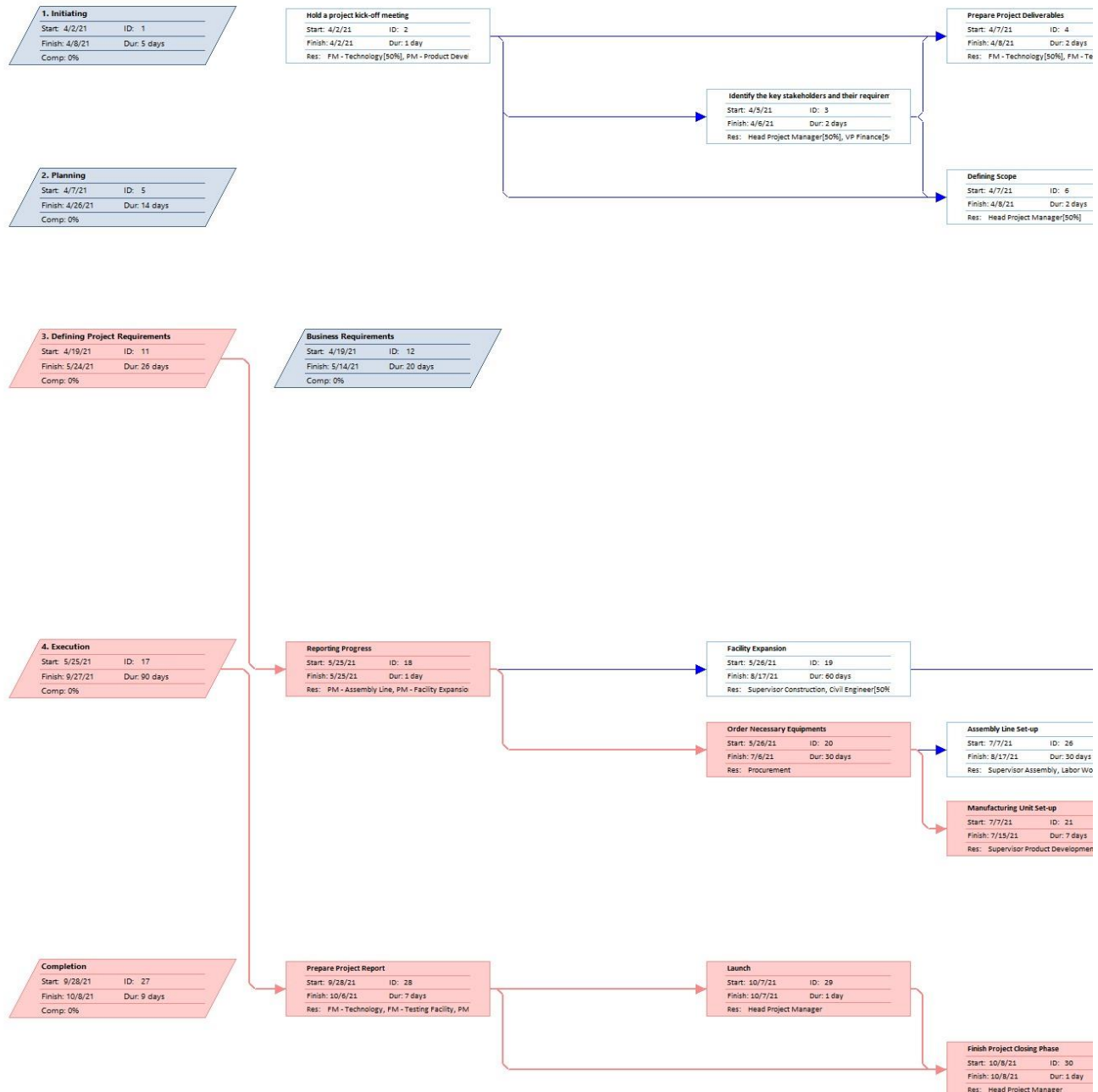


Figure 2: Pert Chart - 1

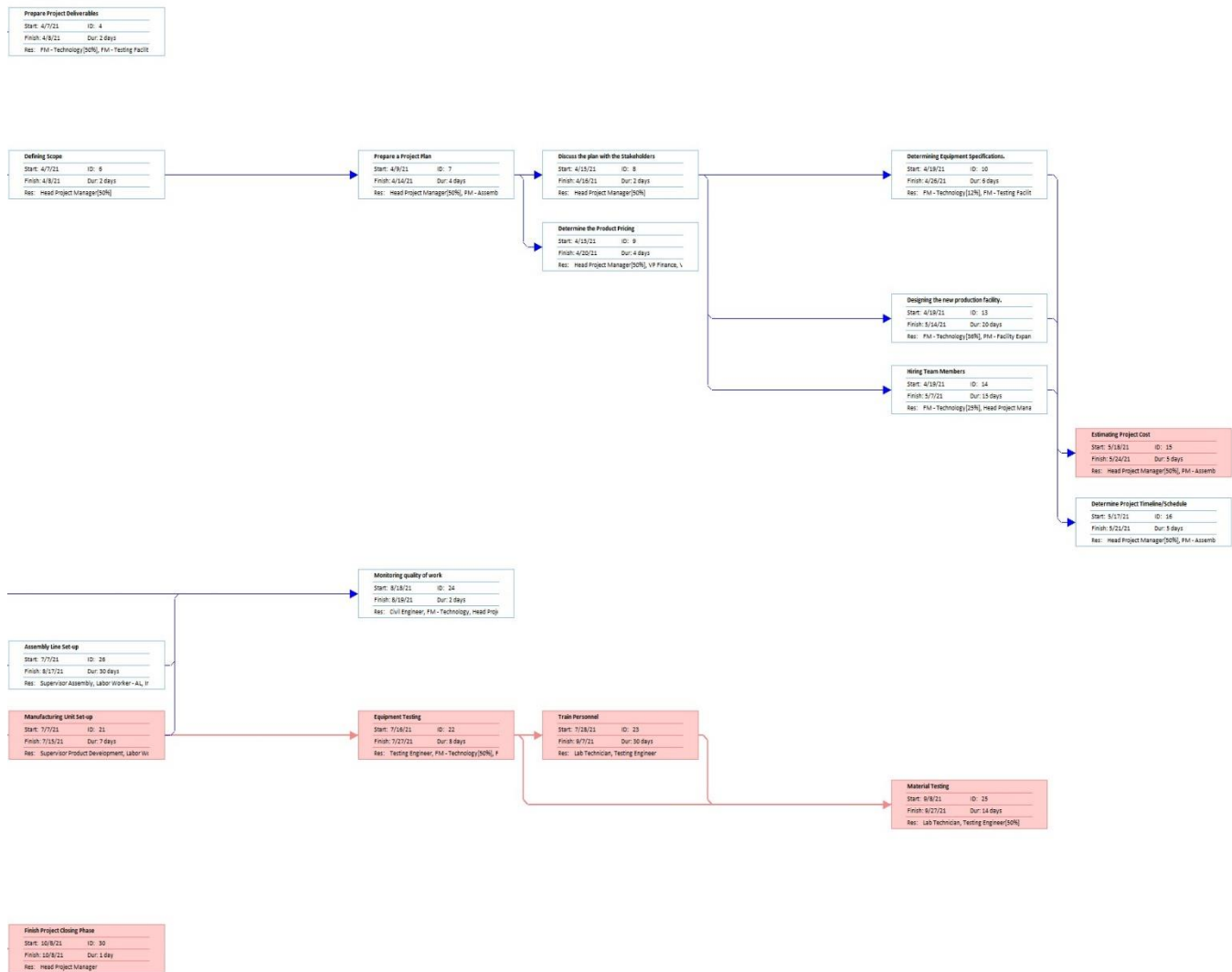


Figure 3: Pert Chart - 2

d. Gantt Chart

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		1. Initiating	5 days	Fri 4/2/21	Thu 4/8/21	
2		Hold a project kick-off meeting	1 day	Fri 4/2/21	Fri 4/2/21	
3		Identify the key stakeholders and their requirements	2 days	Mon 4/5/21	Tue 4/6/21	2
4		Prepare Project Deliverables	2 days	Wed 4/7/21	Thu 4/8/21	2,3
5		2. Planning	14 days	Wed 4/7/21	Mon 4/26/21	
6		Defining Scope	2 days	Wed 4/7/21	Thu 4/8/21	2,3
7		Prepare a Project Plan	4 days	Fri 4/9/21	Wed 4/14/21	6
8		Discuss the plan with the Stakeholders	2 days	Thu 4/15/21	Fri 4/16/21	7
9		Determine the Product Pricing	4 days	Thu 4/15/21	Tue 4/20/21	7
10		Determining Equipment Specifications.	6 days	Mon 4/19/21	Mon 4/26/21	8
11		3. Defining Project Requirements	26 days	Mon 4/19/21	Mon 5/24/21	
12		Business Requirements	20 days	Mon 4/19/21	Fri 5/14/21	
13		Designing the new production facility.	20 days	Mon 4/19/21	Fri 5/14/21	8
14		Hiring Team Members	15 days	Mon 4/19/21	Fri 5/7/21	8
15		Estimating Project Cost	5 days	Tue 5/18/21	Mon 5/24/21	10,13,14
16		Determine Project Timeline/Schedule	5 days	Mon 5/17/21	Fri 5/21/21	10,13,14
17		4. Execution	90 days	Tue 5/25/21	Mon 9/27/21	
18		Reporting Progress	1 day	Tue 5/25/21	Tue 5/25/21	11
19		Facility Expansion	60 days	Wed 5/26/21	Tue 8/17/21	18
20		Order Necessary Equipments	30 days	Wed 5/26/21	Tue 7/6/21	18
21		Manufacturing Unit Set-up	7 days	Wed 7/7/21	Thu 7/15/21	20
22		Equipment Testing	8 days	Fri 7/16/21	Tue 7/27/21	21
23		Train Personnel	30 days	Wed 7/28/21	Tue 9/7/21	22
24		Monitoring quality of work	2 days	Wed 8/18/21	Thu 8/19/21	19,26,21
25		Material Testing	14 days	Wed 9/8/21	Mon 9/27/21	22,23
26		Assembly Line Set-up	30 days	Wed 7/7/21	Tue 8/17/21	20
27		Completion	9 days	Tue 9/28/21	Fri 10/8/21	
28		Prepare Project Report	7 days	Tue 9/28/21	Wed 10/6/21	17
29		Launch	1 day	Thu 10/7/21	Thu 10/7/21	28
30		Finish Project Closing Phase	1 day	Fri 10/8/21	Fri 10/8/21	28,29

Figure 4: Gantt Chart - 1

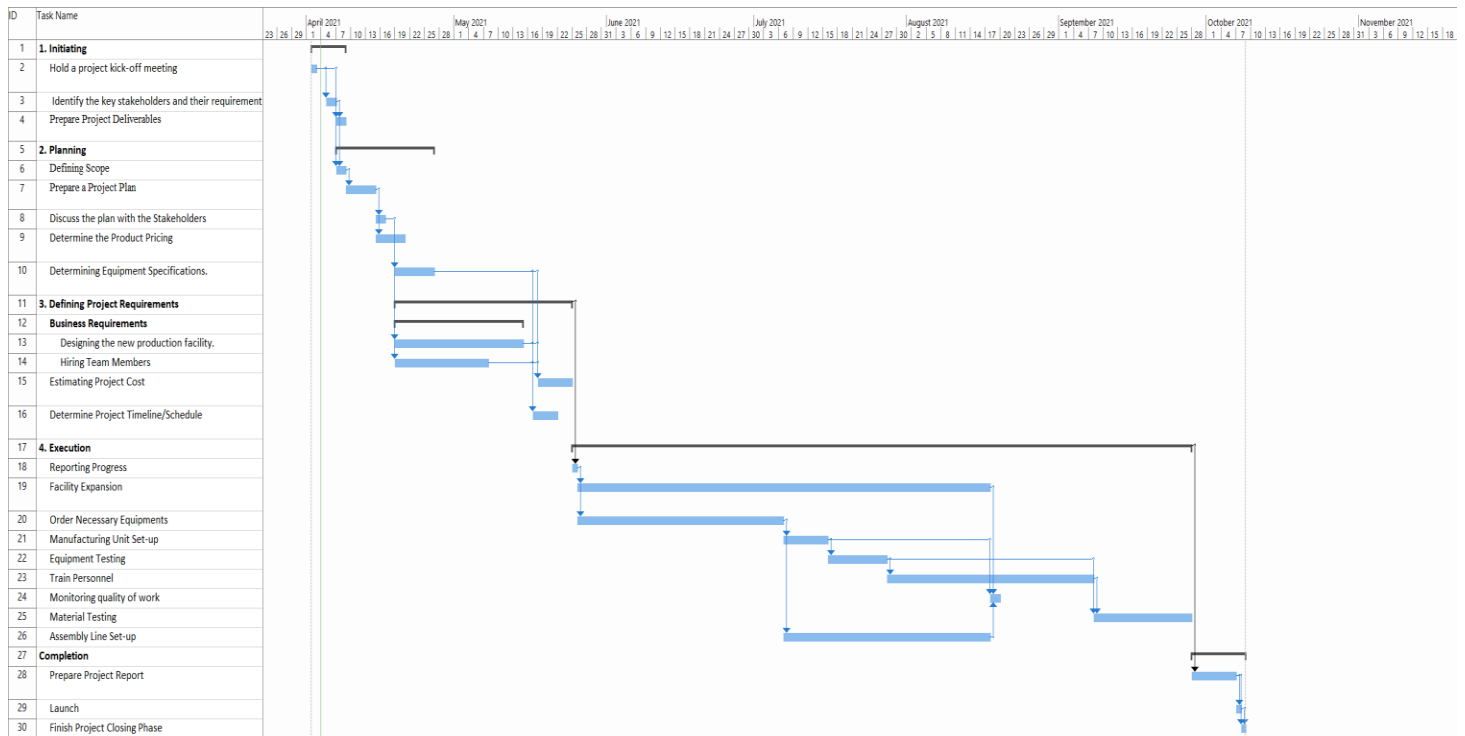


Figure 5: Gantt Chart - 2

e. Resource Allocation

In projects it is important to do resource allocation. This is because it helps to show the amount of work and the kind of responsibility each member of the project team has. This helps the executives to track the progress of the project, which in turn will help then efficiently manage the project. The chart below was created in MS Project and it shows the resources allocated to each item in our WBS. The work distribution is balanced, and it has been ensured that the team members are not overloaded.

Task Name	Duration	Start	Finish	Predecessors	Resource Names
1. Initiating	5 days	Fri 4/2/21	Thu 4/8/21		
Hold a project kick-off meeting	1 day	Fri 4/2/21	Fri 4/2/21		FM - Technology[50%],PM - Product Development,PM - Assembly Line,PM - Facility Expansion,FM - Testing Facility,Head Project Manager[25%]
Identify the key stakeholders and their requirement	2 days	Mon 4/5/21	Tue 4/6/21	2	Head Project Manager[50%],VP Finance[50%]
Prepare Project Deliverables	2 days	Wed 4/7/21	Thu 4/8/21	2,3	FM - Technology[50%],FM - Testing Facility,Head Project Manager[50%],PM - Assembly Line,PM - Facility Expansion,PM - Product Development
2. Planning	14 days	Wed 4/7/21	Mon 4/26/21		
Defining Scope	2 days	Wed 4/7/21	Thu 4/8/21	2,3	Head Project Manager[50%]
Prepare a Project Plan	4 days	Fri 4/9/21	Wed 4/14/21	6	Head Project Manager[50%],PM - Assembly Line,PM - Facility Expansion,PM - Product Development
Discuss the plan with the Stakeholders	2 days	Thu 4/15/21	Fri 4/16/21	7	Head Project Manager[50%]
Determine the Product Pricing	4 days	Thu 4/15/21	Tue 4/20/21	7	Head Project Manager[50%],VP Finance,VP Procurement,PM - Product Development,FM - Technology[25%]
Determining Equipment Specifications.	6 days	Mon 4/19/21	Mon 4/26/21	8	FM - Technology[12%],FM - Testing Facility[33%],Head Project Manager[8%],PM - Product Development[33%],Chemical Engineer[33%],Material Science
3. Defining Project Requirements	26 days	Mon 4/19/21	Mon 5/24/21		
Business Requirements	20 days	Mon 4/19/21	Fri 5/14/21		
Designing the new production facility.	20 days	Mon 4/19/21	Fri 5/14/21	8	FM - Technology[36%],PM - Facility Expansion,Architect,Civil Engineer
Hiring Team Members	15 days	Mon 4/19/21	Fri 5/7/21	8	FM - Technology[25%],Head Project Manager[25%],VP Human Resources
Estimating Project Cost	5 days	Tue 5/18/21	Mon 5/24/21	10,13,14	Head Project Manager[50%],PM - Assembly Line[50%],PM - Facility Expansion[50%],PM - Product Development[50%],VP Finance[50%],VP
Determine Project Timeline/Schedule	5 days	Mon 5/17/21	Fri 5/21/21	10,13,14	Head Project Manager[50%],PM - Assembly Line[50%],PM - Facility Expansion[50%],PM - Product Development[50%]
4. Execution	90 days	Tue 5/25/21	Mon 9/27/21		
Reporting Progress	1 day	Tue 5/25/21	Tue 5/25/21	11	PM - Assembly Line,PM - Facility Expansion,PM - Product Development
Facility Expansion	60 days	Wed 5/26/21	Tue 8/17/21	18	Supervisor Construction,Civil Engineer[50%],PM - Facility Expansion[12%],Labor Worker - FE
Order Necessary Equipments	30 days	Wed 5/26/21	Tue 7/6/21	18	Procurement
Manufacturing Unit Set-up	7 days	Wed 7/7/21	Thu 7/15/21	20	Supervisor Product Development,Labor Worker - PD
Equipment Testing	8 days	Fri 7/16/21	Tue 7/27/21	21	Testing Engineer,FM - Technology[50%],FM - Testing Facility[50%]
Train Personnel	30 days	Wed 7/28/21	Tue 9/7/21	22	Lab Technician,Testing Engineer
Monitoring quality of work	2 days	Wed 8/18/21	Thu 8/19/21	19,26,21	Civil Engineer,FM - Technology,Head Project Manager,PM - Assembly Line
Material Testing	14 days	Wed 9/8/21	Mon 9/27/21	22,23	Lab Technician,Testing Engineer[50%]
Assembly Line Set-up	30 days	Wed 7/7/21	Tue 8/17/21	20	Supervisor Assembly,Labor Worker - AL,Instrumentation Control Engineer
Completion	9 days	Tue 9/28/21	Fri 10/8/21		
Prepare Project Report	7 days	Tue 9/28/21	Wed 10/6/21	17	FM - Technology,FM - Testing Facility,PM - Assembly Line,PM - Facility Expansion,PM - Product Development
Launch	1 day	Thu 10/7/21	Thu 10/7/21	28	Head Project Manager
Finish Project Closing Phase	1 day	Fri 10/8/21	Fri 10/8/21	28,29	Head Project Manager

Figure 6: Resource Allocation

The below diagrams show the detailed usage of our resources, it can be noted that none of our resources are overloaded:

Resource Name	Work
Head Project Manager	171.84 hrs
Identify the key stakeholders and their requirements	8 hrs
Defining Scope	8 hrs
Prepare a Project Plan	16 hrs
Discuss the plan with the Stakeholders	8 hrs
Determine the Product Pricing	16 hrs
Estimating Project Cost	20 hrs
Determine Project Timeline/Schedule	20 hrs
Launch	8 hrs
Finish Project Closing Phase	8 hrs
Hold a project kick-off meeting	2 hrs
Prepare Project Deliverables	8 hrs
Determining Equipment Specifications.	3.84 hrs
Hiring Team Members	30 hrs
Monitoring quality of work	16 hrs
VP Finance	44 hrs
Identify the key stakeholders and their requirements	8 hrs
Determine the Product Pricing	16 hrs
Estimating Project Cost	20 hrs
VP Procurement	36 hrs
Determine the Product Pricing	16 hrs
Estimating Project Cost	20 hrs
VP Human Resources	120 hrs
Hiring Team Members	120 hrs
Chemical Engineer	48 hrs
Determining Equipment Specifications.	48 hrs
Material Science Engineer	48 hrs
Determining Equipment Specifications.	48 hrs
Architect	160 hrs
Designing the new production facility.	160 hrs
Civil Engineer	416 hrs
Monitoring quality of work	16 hrs
Designing the new production facility.	160 hrs
Facility Expansion	240 hrs
Supervisor Construction	480 hrs
Facility Expansion	480 hrs
Procurement	240 hrs
Order Necessary Equipments	240 hrs
Testing Engineer	360 hrs
Equipment Testing	64 hrs
Train Personnel	240 hrs
Material Testing	56 hrs

Resource Name	Work
FM - Technology	217.36 hrs
Prepare Project Deliverables	8 hrs
Determining Equipment Specifications.	5.76 hrs
Designing the new production facility.	57.6 hrs
Hiring Team Members	30 hrs
Prepare Project Report	56 hrs
Hold a project kick-off meeting	4 hrs
Determine the Product Pricing	8 hrs
Equipment Testing	32 hrs
Monitoring quality of work	16 hrs
PM - Product Development	192 hrs
Hold a project kick-off meeting	8 hrs
Prepare Project Deliverables	16 hrs
Prepare a Project Plan	32 hrs
Determine the Product Pricing	16 hrs
Determining Equipment Specifications.	16 hrs
Estimating Project Cost	20 hrs
Determine Project Timeline/Schedule	20 hrs
Reporting Progress	8 hrs
Prepare Project Report	56 hrs
PM - Assembly Line	176 hrs
Reporting Progress	8 hrs
Hold a project kick-off meeting	8 hrs
Prepare Project Deliverables	16 hrs
Prepare a Project Plan	32 hrs
Estimating Project Cost	20 hrs
Determine Project Timeline/Schedule	20 hrs
Monitoring quality of work	16 hrs
Prepare Project Report	56 hrs
PM - Facility Expansion	377.6 hrs
Hold a project kick-off meeting	8 hrs
Prepare Project Deliverables	16 hrs
Prepare a Project Plan	32 hrs
Designing the new production facility.	160 hrs
Estimating Project Cost	20 hrs
Determine Project Timeline/Schedule	20 hrs
Reporting Progress	8 hrs
Facility Expansion	57.6 hrs
Prepare Project Report	56 hrs
FM - Testing Facility	128 hrs
Hold a project kick-off meeting	8 hrs
Prepare Project Deliverables	16 hrs
Determining Equipment Specifications.	16 hrs
Equipment Testing	32 hrs
Prepare Project Report	56 hrs
Lab Technician	352 hrs
Train Personnel	240 hrs
Material Testing	112 hrs
Supervisor Product Development	56 hrs
Manufacturing Unit Set-up	56 hrs
Labor Worker - PD	56 hrs
Manufacturing Unit Set-up	56 hrs
Labor Worker - FE	480 hrs
Facility Expansion	480 hrs
Supervisor Assembly	240 hrs
Assembly Line Set-up	240 hrs
Labor Worker - AL	240 hrs
Assembly Line Set-up	240 hrs
Instrumentation Control Engineer	288 hrs
Determining Equipment Specifications.	48 hrs
Assembly Line Set-up	240 hrs

Figure 7: Resource Usage

f. Financial Plan

The estimated financial plan is as follows:

Table 1: Estimated Budget

Category	Cost
Equipment	\$ 500,000
Labor	\$ 174,592
Staff	\$ 198,364
Construction Material	\$ 200,000
Miscellaneous	\$ 25,000
Total	\$ 1,097,956

Detailed break-up of Manpower Cost:

Resource	Hourly Wage (each)	Estimated Hours (each)	Total Cost (\$)
FM - Technology	56	218	12208
PM - Product Development	60	192	11520
PM - Assembly Line	60	176	10560
PM - Facility Expansion	60	378	22680
FM - Testing Facility	56	128	7168
Head Project Manager	95	172	16340
VP Finance	114	44	5016
VP Procurement	102	36	3672
VP Human Resources	87	120	10080
Chemical Engineer	45	48	2160
Material Science Engineer	40	48	1920
Architect	100	160	16000
Civil Engineer	40	416	16640
Supervisor Construction	38	480	18240
Procurement	26	240	6240
Testing Engineer	25	360	9000
Lab Technician	20	352	7040
Supervisor Product Development	35	56	1960
Labor Worker – PD * (2 nos)	16	56	1792
Labor Worker – FE * (20 nos)	16	480	153600
Supervisor Assembly	35	240	8400
Labor Worker – AL * (5 nos)	16	240	19200
Instrumentation Control Engineer	40	288	11520
Total			\$ 372,956

Table 2: Manpower Cost

The Miscellaneous Cost includes the following items:

- Utilities
- Administration Cost
- Office Supplies
- Medical Aid

We have set \$100k of our budget for emergency scenarios. Our return on investments depends on the new orders we receive after the project completion. Taking the Unit Cost of epoxy is \$120, the profit for the company per unit of Epoxy sold is \$80 after the overhead cost for manufacturing \$40/unit is accounted for. Assuming the company uses 3000 units of its Epoxy Material for selling and for its projects, the company can hit break-even in 5 years. The contract for renting out storage space to customers and taking orders for material testing will be drawn up at a later stage.

8. Monitoring and Control

The Head PM is responsible to keep track of the timely progress of the projects scope, schedule, and budget. He is responsible to make sure the project is completed within the scheduled period. Tools such as WBS, PERT Chart and Gantt chart will be used to confirm the timely progress of the project. The Head PM has the authority to overrule the decisions of the PMs to ensure the timely completion of the project. The Head PM receives weekly reports of the progress of the individual projects from their respective PM.

The PMs for the sub-projects are responsible to track the weekly progress of their own project and report it to the Head PM. They are answerable to the Head PM and they must ensure their task is progressing smoothly. They have the authority to control the various aspects of their projects, unless overruled by the Head PM.

Further, the supervisors under these PM's will check the progress of the task and give their detailed report to the PM in their weekly meetings.

CONTROL	DUE	RESPONSIBILITY
Initial Stage Report	Start of Project	HPM
Prepare Project Deliverables	After Holding Kick-Off Meeting	HPM
Prepare Project Plan	After Defining Scope	All PMs and HPM
Determine Product Pricing	After Discussing Plan with Stakeholders	All VPs, HPM, PM- PD
Defining Project Requirements	After Determining Product Pricing	HPM Gives Go/No-go
Determine Project Cost	After Finalizing Business Requirements	All VPs, HPM, PM-PD, FM-Technology, Architect
Determine the Schedule	After Determining Project Cost	All PMs and HPM
Execution Stage	After Planning and Defining Requirements	HPM Gives Go/No-go
Facility Expansion	After Reporting Progress	PM - FE
Set-up Manufacturing Unit	After Ordering Necessary Equipment	PM - PD

Set-up Testing Facility	After Manufacturing Unit Set-up	FM - TF
Set-up Assembly Line	After Ordering Necessary Equipment	PM - AL
Launch Stage	After Execution Stage	HPM Gives Go/No-go
Prepare Project Report	After Assembly Line Set-up	All FMs and PMs
Launch	After Project Report is Prepared	HPM

Table 3: Monitoring and Control

9. Risk Assessment

In the below diagram we can see the possible sources of risk and kinds of risks which can arise during the project lifetime. These risks could be mitigated by creating a back-up plan to handle them.

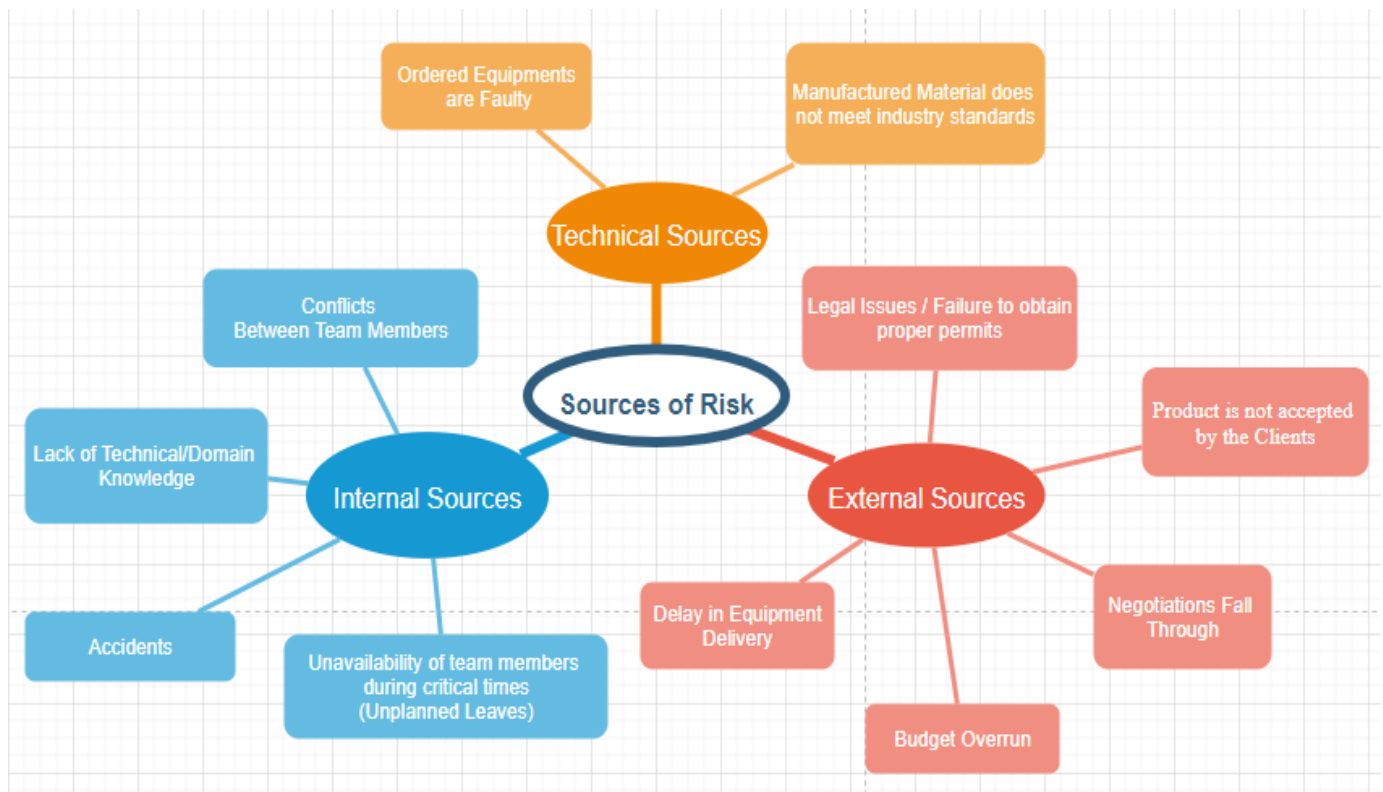


Figure 8: Risk Identification Diagram

SWOT Analysis is a useful tool for analyzing the organization's strengths, weakness, opportunities, and threats. This enables the organization to work on what they do well, to properly address the things they are lacking, minimize the risk and to take advantage of the opportunities to succeed. By collecting this knowledge about the company, it will be easier to guard against risks. Hence, it is one of the important tools used for Risk Management.

Strength: <ol style="list-style-type: none"> 1) Material can be optimized as per the client requirements. 2) Quality of the product. 3) Speed in construction. 4) Affordability. 5) Optimal Storage space for our products. 6) Good quality of workmanship. 	Weakness: <ol style="list-style-type: none"> 1) Proper communication between PMs of each individual project. 2) The schedule and the deadlines could make it a stressful workplace.
Opportunity: <ol style="list-style-type: none"> 1) New Product Line for the Company. 2) Ability to add Material Testing as one of the services provided by the company 3) Increased storage space makes it possible for the company to earn revenue for storage of material. 4) The Epoxy Manufacturing Equipment has the option to be upgraded. 	Threat: <ol style="list-style-type: none"> 1) The Pandemic might disrupt the planned schedule and delay the project. 2) The product is not easily accepted by the industry / customer i.e. they want to use name-brand product. 3) Approval for building permits for expansion is not granted by the local government.

Table 4: SWOT Analysis

10. Summary

In essence, the prime goal of the company is looking to expand its existing business and grow in the industry. The goal of the project is to increase the future revenue by at least 40%. The scope of the project was finalized after consulting the stakeholders and the information collected from that was used to determine the various aspects of the project. The estimated duration of the project is 190 days according to the project plan. Equipment and the construction cost make up for 75% of the project budget. To ensure the smooth progress of the project, the schedule, budget, technical approach to be implemented and risk assessment has been carried out. This helps to minimize and prepare for the unforeseen events that can occur during the lifetime of the project.

11. Appendix

a. MindMap



Figure 9: Mind Map

b. Activity Diagram

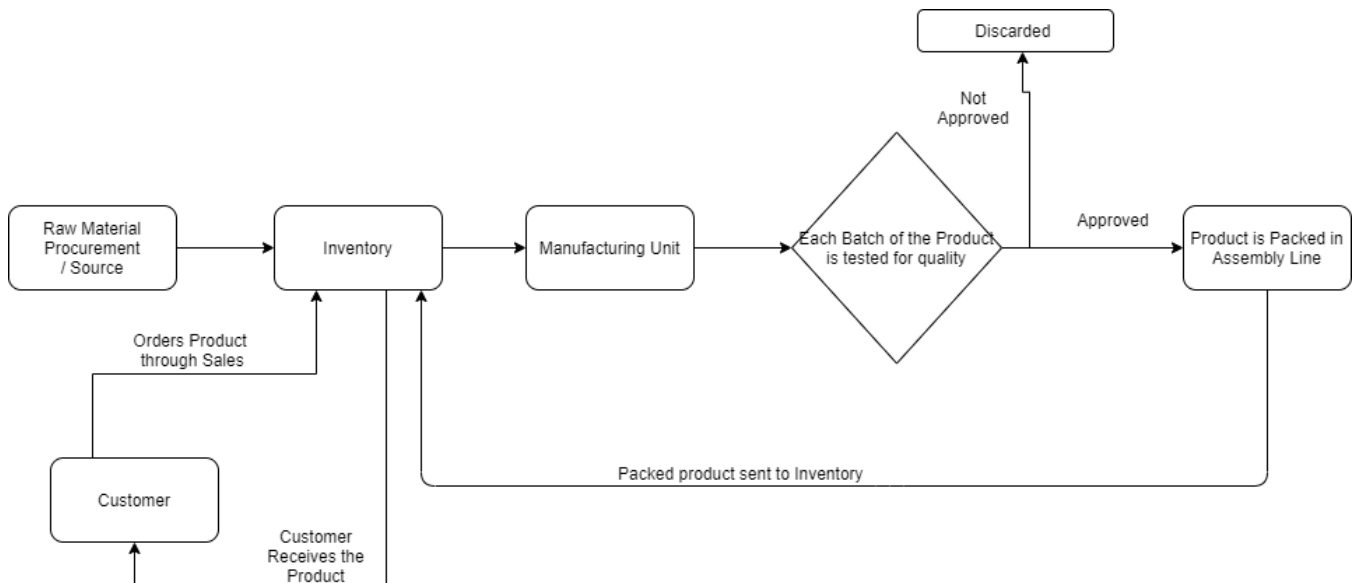


Figure 10: Activity Diagram

c. Sequence Diagram

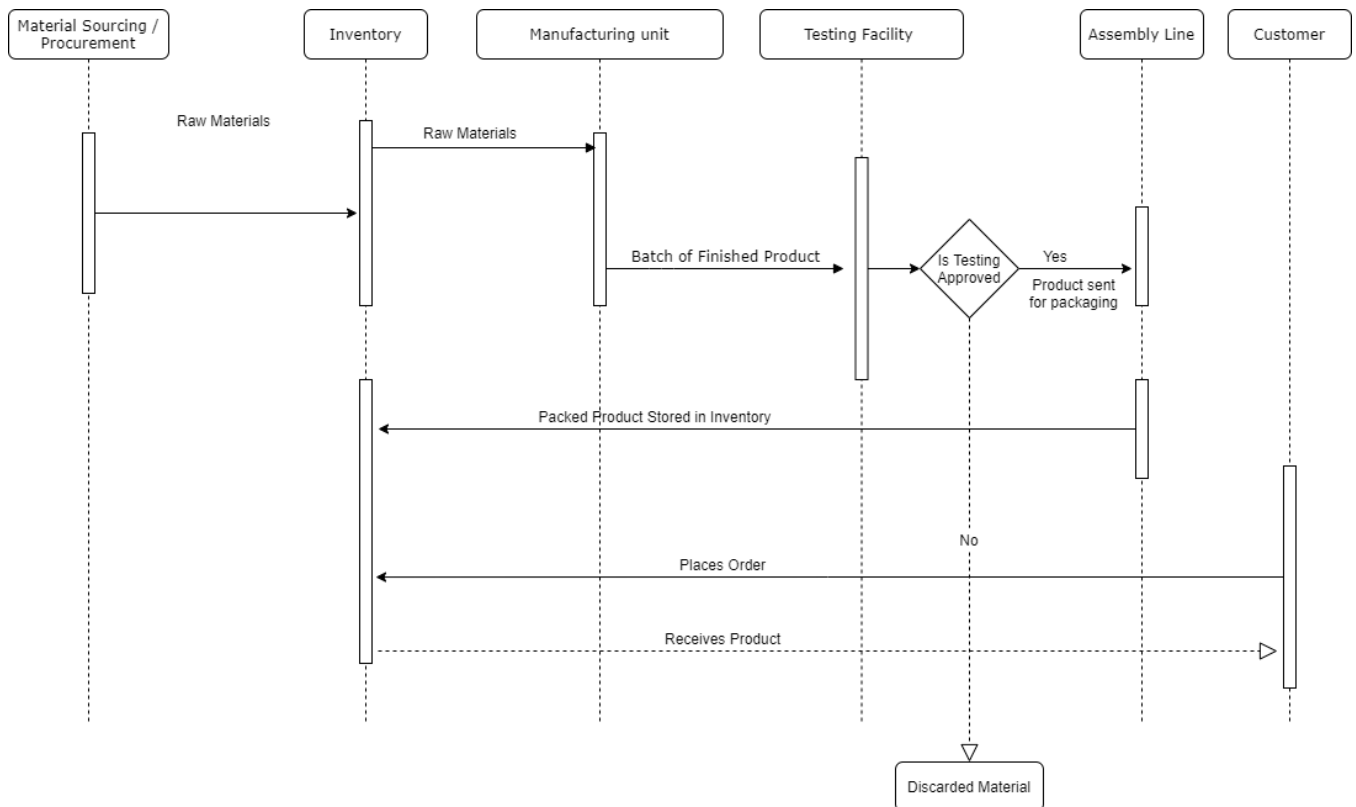


Figure 11: Sequence Diagram

Abbreviations Used:

Abbreviation	Definition
FM	Functional Manager
PM	Project Manager
FE	Facility Expansion
TF	Testing Facility
PD	Product Development
AL	Assembly Line
HPM	Head Project Manager
VP	Vice President
nos	Number of people

Table 5: Abbreviations Table

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