PROJECT CHARTER DOCUMENT

Student Name

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22663281

“An Approach of a Scalable Production System for Sustainable Furniture from Reclaimed Pallet Wood”

Document Version Control

Revision	Change Description	Approval Date	Author
1.0	Initial Draft	25th August 2024	Dhrubo Jouti Das Troyee
1.1	Completion of Section 1	26th August 2024	Dhrubo Jouti Das Troyee
1.2	Starting Section 2	26th August 2024	Dhrubo Jouti Das Troyee
1.3	Finish up to deliverables in section 2	29th August 2024	Dhrubo Jouti Das Troyee
2	Finish Section 2	1st September 2024	Dhrubo Jouti Das Troyee Dhrubo Jouti Das Troyee
2.1	Begin section 3	2nd September 2024	Dhrubo Jouti Das Troyee
2.2	Finish WBS tree	3rd September 2024	Dhrubo Jouti Das Troyee
3.0	Finish WBS Dictionary	5th September 2024	Dhrubo Jouti Das Troyee
4.0	Revised Budget Section	7th September 2024	Dhrubo Jouti Das Troyee
5.0	Final Version for Submission	7th September 2024	Dhrubo Jouti Das Troyee

Table Of Contents

List of Figure

List of Tables

References

[1] “Wood recycling: Process, benefits, and innovations,” Swiss-ipg.com. Accessed: Aug- 22-2024. [Online]. Available: https://swiss-ipg.com/en/insights/item/591-wood-recycling-process,-benefits,-and-innovations.html.

[2] R. Hans, "Wood manufacturing process: A complete guide,” Deskera Blog,31-Mar2023.[Online].Available:https://www.deskera.com/blog/wood-manufacturing-process [Accessed: 22-Aug-2024].

[3]“SWISS IPG PARTNERS GROUP,” *Swiss-ipg.com*, 2020. Accessed: 07-Sep-2024. The Wood Manufacturing Process: From Forest To Finish (duffieldtimber.com)

[4] M. N. Sakib, G. Kabir, and S. M. Ali, “A life cycle analysis approach to evaluate sustainable strategies in the furniture manufacturing industry,” *Science of The Total Environment*, vol. 907, p. 167611, Jan. 2024, doi: https://doi.org/10.1016/j.scitotenv.2023.167611

[5] Aurelija Rimkienė, Agnė Kairytė, Sigitas Vėjelis, Arūnas Kremensas, S. Vaitkus, and Jurga Šeputytė-Jucikė, “Structure Formation in Engineered Wood Using Wood Waste and Biopolyurethane,” Materials, vol. 17, no. 16, pp. 4087–4087, Aug. 2024, doi: ; **https://doi.org/10.3390/ma17164087**

[6] G. Daian and B. Ozarska, “Wood waste management practices and strategies to increase sustainability standards in the Australian wooden furniture manufacturing sector,” Journal of Cleaner Production, vol. 17, no. 17, pp. 1594–1602, Nov. 2009, doi: https://doi.org/10.1016/j.jclepro.2009.07.008

[7] Golu, “A Deep Dive into the Wood Manufacturing Process,” *Timber Explore*, May 13, 2024. https://timberexplore.com/wood-manufacturing-process. [Accessed: 07-Sep-2024]

Section 1 - Project Registration

I. **Project Name / Title**

An approach of a Scalable production system for sustainable furniture from reclaimed pallet Wood

II. **Project #:** ECO-FURN-001

III. **Creation Date: 6th September 2024**

IV. **Project Manager**

- **Name: Dhrubo Jouti Das Troyee**
- **Email: d.troyee@student.curtin.edu.au**
- **Phone number: 0481567404**

V. **Sponsor/Client**

- **Name: Dr. Zahra Jabiri**
- **Email: zahra.jabiri@curtin.edu.au**
- **Phone number:**

VI. **Brief Project Description**

Production of sustainable customisable furniture by using waste wooden pallet as feedstock material [1].

VII. **Recommendation**

As the project manager**,** I would like to provide a strong recommendation of approval for the proposed project of converting end of life wooden pallet into high- quality, customisable furniture. There are multiple advantages to this initiative that correspond with market demand for eco-friendly products and environmental sustainability.

Key justifications for approval are given below:

Environmental Sustainability: The project significantly reduces waste by using rejected wooden pallet, which ends up as a landfill [1] . Utilizing recycled resources reduces the need for virgin wood, contributing to the protection of forests and the reduce deforestation.

Resource Efficiency: The project guarantees proper utilization of resources and reduces material waste through putting in an effective manufacturing system that makes use of CNC machining and other automated operations [2]. As a result, expenses are reduced, and processes are more productive.

Scalability: The production system that can change according to growing market demand without sacrificing sustainability or quality because of the project's scalability-focused design.

Economic Benefits: The proposed project holds significant benefits for the development of local economy, by creating employment opportunities in collecting, processing of waste wood recycling and stimulating the local market [1].

Market Demand and Consumer Preference: Sustainable production process will allow the capitalization of the growing demand for eco-friendly products in today's market[3].

In consideration of the above mentioned positive environmental, economic, and social outcomes, I believe approving the proposed project is a worthy investment with far-reaching benefits.

VIII. Approval and Sign-off

- ❑ Approved
- ❑ Postponed
- ❑ Cancelled
- ❑ Review

Project Sponsor

- **Name in Full: Dr. Zahra Jabiri**
- **Signature:** _____
- **Date:**

Project Manager

- **Name in Full: Dhrubo Jouti Das Troyee**
- **Signature:** *Dhrubo Troyee*
- **Date: 06/ 09/2024**

Section 2 - Project Scope

Described below is the project scope, a comprehensive overview of the objectives, deliverables, and strategies essential for successfully implementing the project plan

Project Goal

The goal of this project is to establish a scalable production system that transforms reclaimed pallet wood into sustainable, high-quality, customisable furniture through Manufacturing process.

Objectives

No.	Description
1)	Development of a detailed project plan for the manufacturing system.
2)	Allocation of necessary resources including skilled labour, machinery, eco-friendly finishing materials [1]
3)	Construction of production facility to process reclaimed wooden pallets into furniture [2].
4)	For effective cutting and shaping, install and configure machinery, such as CNC machines and other automated instruments [3].
5)	Setting up utilities and infrastructure.
6)	Collecting and transporting recycled wooden pallets to the manufacturing site [4].
7)	Waste management to effectively handle leftover wood and reduce environmental impacts [5].
8)	Processing the recycled wood for production by cutting, shaping, and kiln drying, eco-friendly coating [6]
9)	Utilizing customisable designs and environmentally safe materials for the furniture's assembly and finishing [7].
10)	Establish checkpoints for durability and safety at different phases of production to guarantee quality control
11)	Establish a reliable supply chain for sourcing waste wood

Table 1: Objectives of the project

Deliverables

No.	Description
1)	Sustainable high-quality wooden furniture (Specific deliverables are broken down in the WBS table 0).
2)	Close out project report: A complete documentation of project process, challenges and result.

Table 2: Deliverables of the project

Key Benefits

No.	Sector/ Field	Description
1.	Environmental Impact	Lower greenhouse gas emission through recycling [1]
2.	Environmental Impact	Reducing environmental pollution by diverting end of life tires from landfills [1] .
3.	Environmental Impact	reducing the need of virgin raw material for furniture production [1].
4.	Economic Growth	Development of local economy, by creating employment opportunities and stimulating the local market.

Table 3: Key benefits of the project

Exclusions

No.	Description
1.	Making full usage of all waste wooden products (the project may not be able to reuse leftover wood pieces that were not used for furniture, for example).
2.	Production of items other than furniture, such as toys, storage, and construction items.
3.	Pallet waste that is not made of wood should be recycled or disposed of (such as nails or fasteners removed from the pallets) [3].
4.	Transformation of wood waste (such sawdust or chips) into secondary goods like mulch [4]
5.	processing waste materials other than recycled hardwood pallets, such as plastic or metal [5]

Table 4: exclusions of the project

Key Risks

No.	RISK	DESCRIPTION	RISK MANAGEMENT STRATEGY
1.	Machine Failure	Breakdown of equipment causes delays in the production process.	Mitigation
2.	Budget overrun	Unplanned expenses cause problems with the budget.	Mitigation
3.	Waste disposal problem	Improper handling of other materials, such as wood.	Mitigation

4.	Safety hazards	Risks to production-related staff security.	Mitigation
5.	Shortage of skilled labour	Not enough skilled workers for task	Mitigation
6.	Delays to supply chain	A shortage in the supply of recycled wood.	Share
7.	Different quality recycled wood	Poor quality pallets may affect final production.	Mitigation
8.	Supply Prices increase	Increase cost of raw materials	Mitigation
9.	Customer demands changing	Increases demand for environmentally friendly furniture in the market.	Acceptance
10.	Technology Destruction	Risk of machinery becoming outdated or useless.	Avoidance
11.	Project Schedule Postponements	Delays in project milestones causes late finish	Mitigation

Table 5: Key Risk of the project

Section 3 - Project Plan

General Comments
The production plant focuses on recycling discarded wood pallets to create fine, customized furniture.

To do this, the pallets must be disassembled, the wood is checked for rot and pests, and the wood must be shaped and put together into strong furniture parts using advanced methods like CNC machining [3] To ensure they satisfy structural and decorative requirements, the final goods are tested with high quality control tests, eco-friendly coatings, and sanding [5].

Diagram below shows the fundamental steps in the production process.

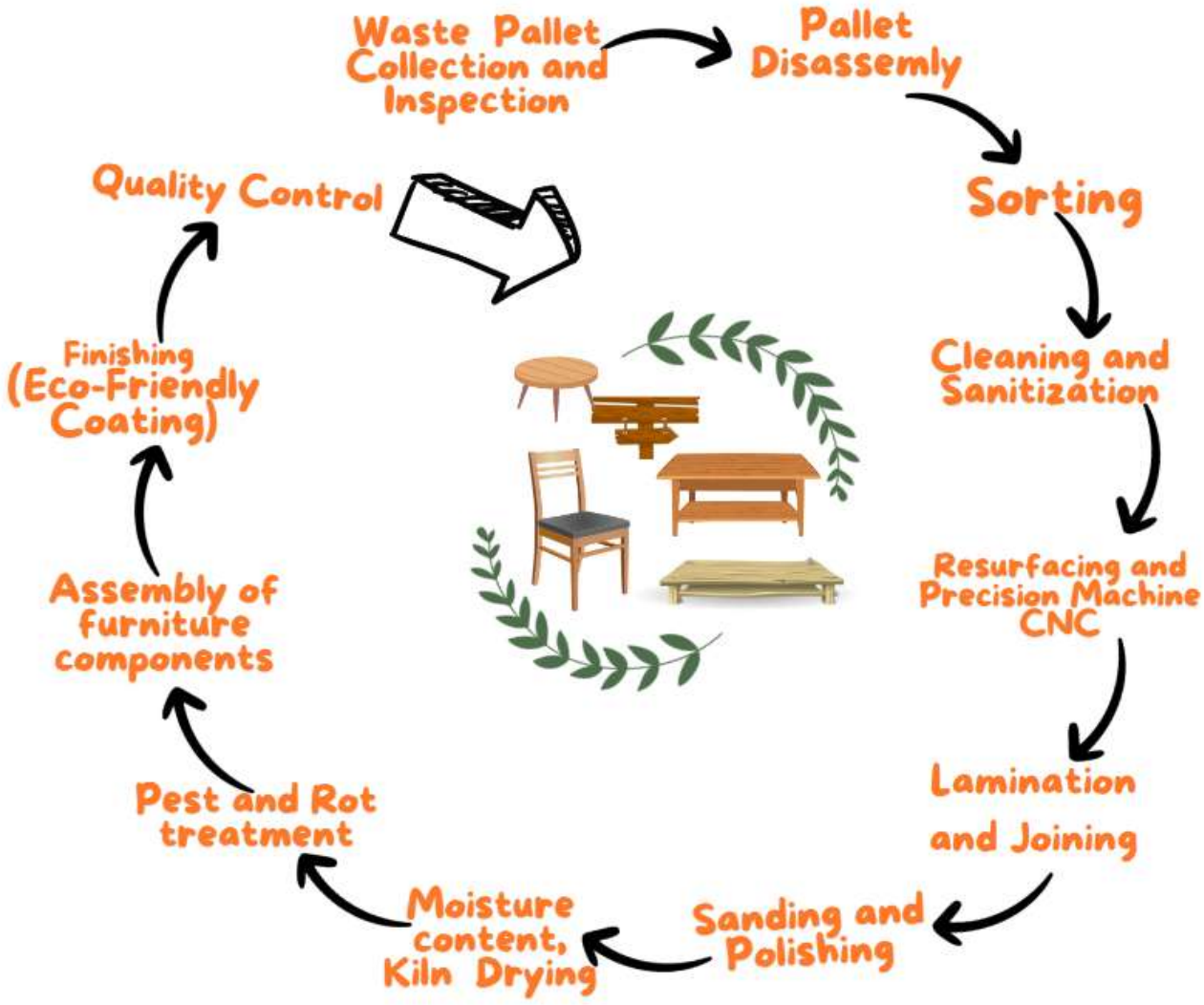


Figure 1: process of reclaimed wood turning into sustainable furniture

Indicative Schedule (*Work Breakdown Structure Table)*

WBS No	Activity/ Task	Dependencies	Duration (t) days	Earliest start (ES) days	Earliest Finish (EF) EF= ES + t days	Latest Start (LS) LS= LF - t days	Latest Finish (LF) days
1.0	**Initial planning and setup**		**30**				
1.1	Resource Allocation	------	10	**0**	**10**	**10**	**10**
1.2	Purchasing optimum Materials and Pallets	1.1	20	**10**	**390**	**30**	**410**
2.0	**Production plant design and construction**		**245**				
2.1	Choosing and purchasing a site, getting the necessary permissions	1.1	30	**10**	**10**	**40**	**40**
2.2	Designing and risk analysis	2.1	20	**40**	**40**	**60**	**60**
2.3	Selection and procurement of tools and material for plant construction	2.2	80	**60**	**60**	**140**	**140**
2.4	infrastructure development	2.2	50	**60**	**360**	**110**	**410**
2.5	Procurement and installing production tools and machinery (CNC).	2.2	30	**60**	**345**	**90**	**375**
2.6	Safety and environmental training	2.5	35	**90**	**375**	**125**	**410**
3.0	**Production Process Setup**		**290**				
3.1	Waste Pallet collection and inspection	2.3	100	**140**	**140**	**240**	**240**
3.2	Run production plant	3.1	20	**240**	**390**	**260**	**410**
3.3	Test finishing process - dying, painting, coating	3.1, 3.2	120	**240**	**240**	**360**	**360**
3.4	Quality checking and	3.3	50	**360**	**360**	**410**	**410**

	analysis of final product						
4.0	Final product delivery	3.4	100	**410**	**410**	**510**	**510**

The preliminary schedules for the various tasks that must be completed as part of the project plan are displayed in the WBS table below. An additional document containing the relevant Gnatt chart is included.

Table 6: Work Breakdown Structure Table

Indicative Budget

The following table shows a rough estimate for the overall budget for the proposed project.

				SCHEDULE		**BUDGET**			**TEAM**
WBS No	Activity/ Task	Dependencies	Duration (t) days	Earliest Start (ES) days	Latest Finish (LF) days	HR Budget Internal ($)	HR Budget External ($)	Equipment and material consumables ($)	Human Resources
1.0	**Initial planning and setup**		**30**						
1.1	Resource Allocation	------	10	**0**	**10**	$40,000	$11,000	$6,000	Project manager, Logistics manager
1.2	Purchasing optimum Materials and Pallets	1.1	20	**10**	**410**	$23,600	$2,000	$3,000	Project manager Process engineer
2.0	**Production plant design and construction**		**245**						Autodesk factory design, Project Manager, Process engineer, Civil engineer
2.1	Choosing and purchasing a site, getting the necessary permissions	1.1	30	**10**	**40**	$5,000	$6,000	$3,000	Project Manager, Construction Lawyer, Civil engineer
2.2	Designing and risk analysis	2.1	20	**40**	**60**	$4,000	$27,999	$6000	Autodesk factory designer,

									Project Manager, Process engineer, Civil engineer, Construction lawyer
2.3	Selection and procurement of tools and material for plant construction	2.2	80	**60**	**140**	$23,600	$60,000	$40,000	Industrial transport company, Project manager, Process engineer, Civil engineer, Electrical engineer, Store manager
2.4	infrastructure development	2.2	50	**60**	**410**	$10,500	$45,000	$5,000	Project manager, Civil engineer, Structural engineer, Construction engineer, Electrical engineer, Store manager, construction company
2.5	Procurement and installing production tools and machinery (CNC).	2.2	30	**60**	**375**	$10,000	$7,000	$20,000	Industrial transport company, Project manager, Process engineer, Electrical engineer, Store manager
2.6	Safety and environmental training	0 2.5	35	**90**	**410**	$1,200	$6,500	$6,000	Project manager Safety instructor Construction lawyer
3.0	**Production Process Setup**	**290**							
3.1	Waste Pallet collection and inspection	2.3	100	**140**	**240**	$4,500	$5,600	$13,000	industrial transport company, Project manager, Store manager

3.2	Run production plant	3.1	20	**240**	**410**	$10,000	$34,000	$40,000	Project manager, Process engineer Head of production, Head of Human Resources, Safety instructor, Factory workers
3.3	Test finishing process - dying, painting, coating	3.1, 3.2	120	**240**	**360**	$5,000	$7,000	$50,000	Head of production, Finishing supervisor, Factory workers
3.4	Quality checking and analysis of final product	3.3	50	**360**	**410**	$2,000	$6,000	$5,000	Wood testing company. Head of Quality control
4.0	Final product delivery	3.4	100	**410**	**510**	$1,400	$50,000	$1,200	Logistics Manager, Laborers, Truck drivers,

Table 7: WBS table with estimated overall budget per task

Resource Lists

Procurement and allocation of resources is vital for the implementation of the project plan. The following tables offer a breakdown of the budget for human resources, material and equipment, factory and storage space and the estimated cost of the pilot product run which includes one production cycle of wooden furniture production from waste wood.

Role	**Hourly Rate (USD $)**	**Estimated Hours**	**Total Labor Cost (USD $)**
Project manager	85	800	$68,000
Process engineering	85	600	$ 51,000
Structural engineering	70	800	$56,000
Construction Engineering	60	500	$30,000
Production supervisor	80	520	$41,600
Logistics manger	70	710	$49,700
Finance manger	80	1200	$96,000
Maintenance technicians	80	900	$72,000

Skilled Labor	50	1300	$65,000
construction lawyer	60	1000	$60,000
Safety instructor	70	600	$42,000
Store manager	75	790	$59,250
Truck drivers	80	890	$71,200
		Total:	**$761,750**

Table 8: Human resource Budget

Factory Space Type	Area (sq meters)	Unit cost (USD/sq meters)	Total Cost (USD $)
Factory Floor space	900	750	$675,000
Storage space for reclaimed pallets	500	440	$220,000
Storage space for Materials and tools	300	250	$75,000
Storage space for finished product	340	400	$136,000
Total:			**$1,106,000**

Table 9: - Factory space and storage space Budget

Resource name	Supplier	Fixed	Quantity	Unit cost (USD $)	Total Cost (USD $)
Waste pallet Wood	Warehouse	Variable	100	$800	$80,000
Lamination Equipment	Smart Machinery	Fixed	60	$ 3,000	$180,000
Polishing Tools	Smart Machinery	Fixed	2	$ 2,000	$4,000
Quality Control Devices	Smart Convey	Fixed	4	$ 15,000	$60,000
CNC Machine [6]	Local Store	Fixed	4	$2,000	$8,000
Fasteners (Screws, nails)	Alibaba	Fixed	30	$ 15,000	$450,000
Wood Filler (Eco-Friendly)	Smart Machinery	Variable	6	$17,000	$102,000
Wood Sanding Belts[6]	Alibaba	Variable	20	$ 300	$6,000
Packaging Materials (Cardboard)	Ubay Australia	Variable	40	$1,000	$40,000
Eco-Friendly Coating Spray for finishing	Ubay Australia	Fixed	5	$ 3,000	$15,000
Eco – friendly Wood Glue[6]	Smart Machinery	Variable	60 Liter	$ 600	$36,000

Pallet Disassembly Tools	Smart Machinery	Fixed	5	$ 1,500	$7,500
Kiln for Sanitization	Smart Machinery	Fixed	7	$1,000	$7,000
Drills and Clamps	Smart Machinery	Fixed	8	$ 500	$4,000
Wood Sealer (Eco-Friendly)[6]	Smart Machinery	Fixed	20 Liter	$500	$10,000
				TOTAL	**$1,0005,900**

Table 10: Equipment Budget

Cost Type	**Description**	**Cost (USD$)**
Variable Cost		
Materials	400 reclaimed pallets at $40/ pallets	$16,000
Processing (Cutting)	150 units/hr at $600/hr	$4
Processing (assembly	250 units/hr at $500/hr	$2
Fixed Cost		
Machinery	$3,800,000/ production line at 10 M units (lifeline)	$0.38/ unit
Tooling	$140,000 for CNC tools (lifetime at 500k Units)	$0.28/ unit
Total Direct Cost		$16,006.66
Overhead Charge		$3201.332
Total unit Cost		$19,207.992

Table 11: Pilot production run estimate Budget

Serial No	**Item**	**Cost (USD$)**
1.	Equipment / material	**$1,0005,900**
2.	Project labour	**$7,61,750**
3.	Factory and warehouse Space	**$1,106,000**
4.	Total direct cost (1-3 serial no)	**$11,873,650**
5.	Total indirect cost (20% of direct cost)	**$2,374,730**
6.	Total Cost	**$14,248,380**
7.	Contingency (10% total cost)	**$1,424,838**
	Total project Budget	**$15,673,218**

Table 12: Cost estimate Budget

Milestones

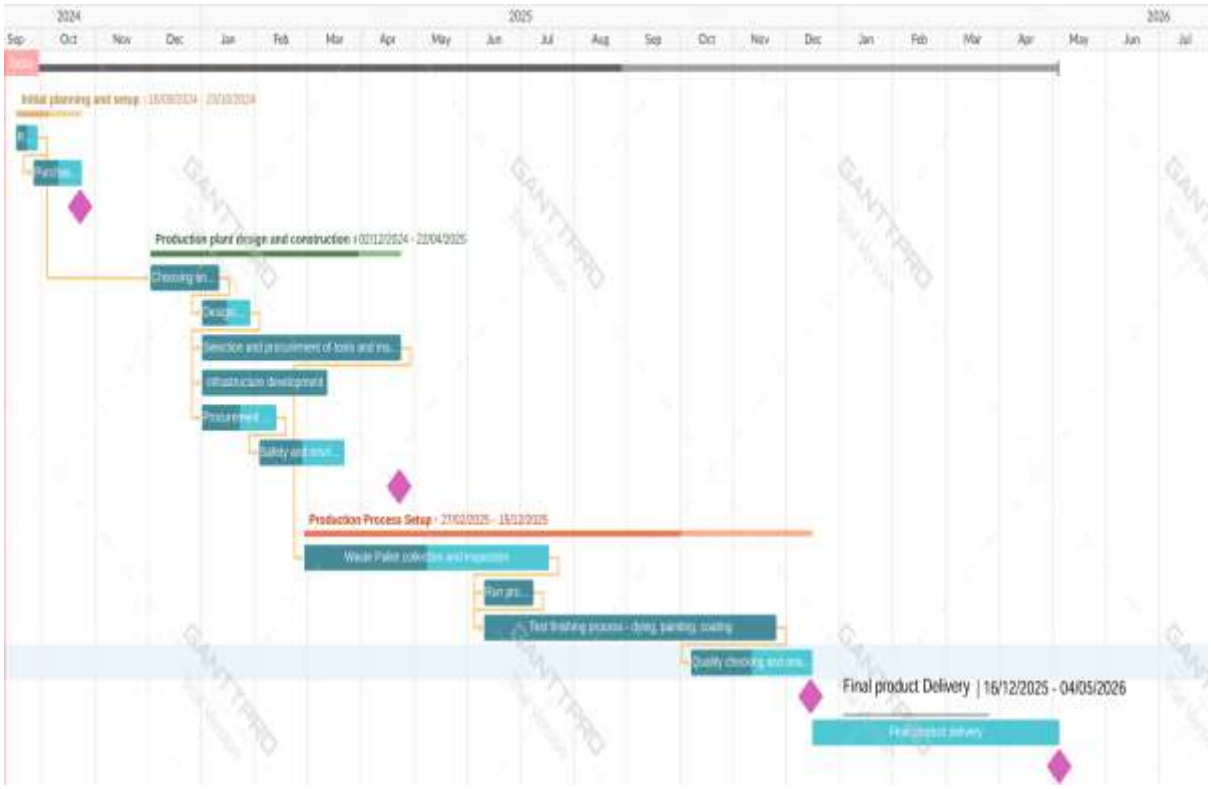
WBS NO	MILESTONE	TARGET DATE
1.0	Initial planning and setup	23/10/2024
2.0	Production plant design and construction	22/04/2025
3.0	Production Process Setup	15/12/2025
4.0	Final product delivery	5/5/2026

Table 13: Milestone Table

Evidence

	Task name	Duration	Start date	Status	Predecess	End date
			16/09/2024			**05/05/2026**
1	**Initial planning and se...**	30 d	**16/09/2024**			**23/10/2024**
1.1	Resource Allocation	10d	16/09/2024	In progr		27/09/2024
1.2	Purchasing optimu...	20d	26/09/2024	In progr	1.1	23/10/2024
1.3	milestone 1		23/10/2024	Open		23/10/2024
2	**Production plant desig...**	245d	**02/12/2024**			**22/04/2025**
2.1	Choosing and purc...	30d	02/12/2024	Done	1.1	10/01/2025
2.2	Designing and risk ...	20d	01/01/2025	In progr	2.1	28/01/2025
2.3	Selection and proc...	80d	01/01/2025	Done	2.2	22/04/2025
2.4	infrastructure devel...	50d	01/01/2025	Done	2.2	11/03/2025
2.5	Procurement and i...	30d	01/01/2025	In progr	2.2	11/02/2025
2.6	Safety and environ...	35d	03/02/2025	In progr	2.5	21/03/2025
2.7	milestone 2		22/04/2025	Open		22/04/2025
3	**Production Process Se...**	290 d	**27/02/2025**			**15/12/2025**
3.1	Waste Pallet collec...	100d	27/02/2025	In progr	2.3	16/07/2025
3.2	Run production pla...	20d	10/06/2025	Done	3.1	07/07/2025
3.3	Test finishing proce...	120d	10/06/2025	Done	3.1, 3.2	24/11/2025
3.4	Quality checking a...	50d	07/10/2025	In progr	3.3	15/12/2025
3.5	milestone 3		15/12/2025	Open		15/12/2025
4	Final Product Delivery	100d	16/12/2026	Open		04/05/2026
5	milestone 4		05/05/2026	Open		05/05/2026

Table 14:Table for Gant chart



Figur2: Gant chart

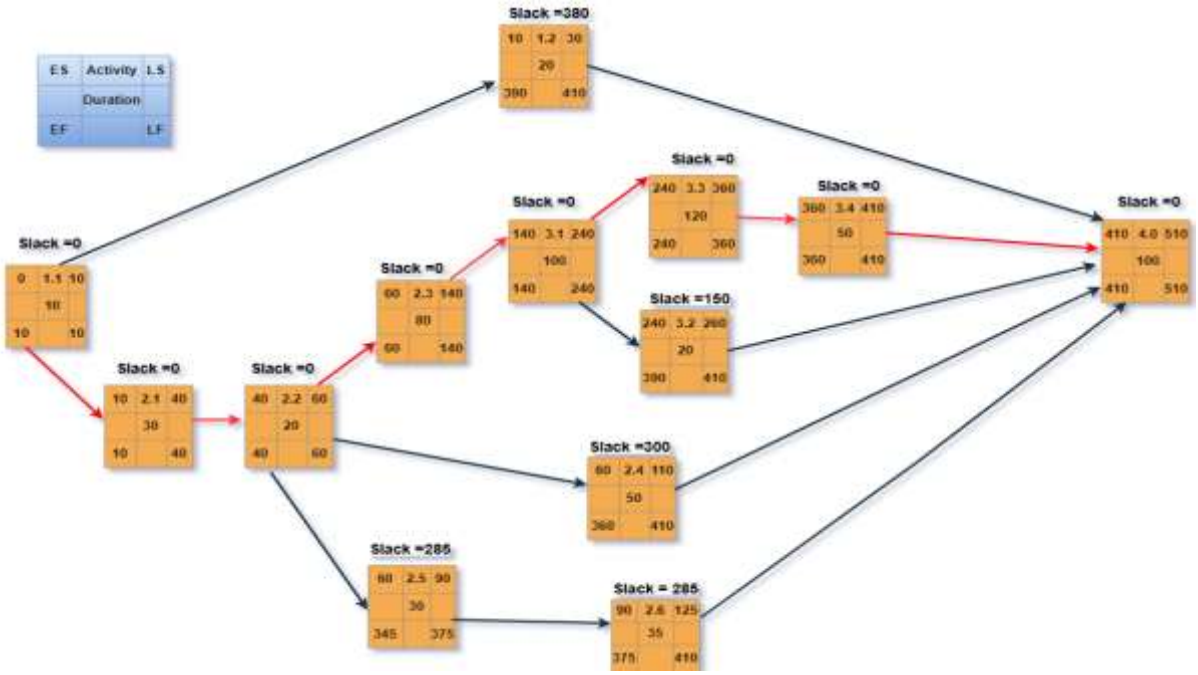


Figure 3: Critical Path Method (CPM) Network Diagram

According to the graph above, the project's completion time is 510 days.

CRITICAL PATH METHODS IN PROJECT MANAGEMENT:

ACTIVITY	TIME(t) Days	EARLY START (ES)	EARLY FINISH(EF) EF = ES +t	LATE START(LS)L S=LF-t	LATE FINISH (LF)	SLACK TIME	CRITICAL PATH
1.1	10	0	10	10	10	0	yes
1.2	20	10	390	30	410	380	No
2.1	30	10	10	40	40	0	yes
2.2	20	40	40	60	60	0	yes
2.3	80	60	60	140	140	0	yes
2.4	50	60	360	110	410	300	No
2.5	30	60	345	90	375	285	No
2.6	35	90	375	125	410	285	No
3.1	100	140	140	240	240	0	yes
3.2	20	240	390	260	410		No
3.3	120	240	240	360	360	0	yes
3.4	50	360	360	410	410		No
4.0	100	410	410	510	510	0	yes

Table 15: Critical Path method calculation Table

Here, activities with zero slack make up the critical path and are highlighted in blue.

In project management, the critical path consists of the tasks, having zero slacks, that must be completed to finish the project within the shortest possible time frame. Any delay in any of the tasks on the critical path will cause a delay in the overall project completion. Besides, tasks that are not on

the critical path might start and conclude at any time, therefore delays in these tasks may not necessarily affect the project's final finishing schedule.

Calculation of expected time: Program Evaluation and Review Technique (PERT):

ACTIVITY	Estimated Duration (WEEK)			Optimistic + (4 ×Most Likely) +Pessimistic Expected Time = 6
	Optimistic Time Estimate	Most likely Time Estimates	Pessimistic Time Estimate	
1.1	10	40	60	38.333
1.2	50	10	50	23.333
2.1	30	70	90	66.666
2.2	20	70	40	36.555
2.3	80	40	10	41.666
2.4	30	50	70	50
2.5	20	50	10	38.333
2.6	40	30	12	28.666
3.1	50	70	80	68.33
3.2	60	40	70	48.33
3.3	70	80	10	66.66
3.4	90	100	11	83.5
4.0	60	120	50	98.33

Table 16: Program Evaluation and Review Technique (PERT) of expected time Calculation

Expected project duration
= (38.333 + 66.66 + 36.555 + 41.666 +68.33 +66.66 +98.33) Days
= 417.53 days

The expected project duration is 417.53 days
The project completion time is 510 days.