

# Injection Moulded Industrial Gears Using Recycled Zip Tie and Carbon Fibre Offcuts

MGMT3000 – Engineering Management and Professional Practice

Assignment 3 - Group Assignment

Prepared By:

Excellence Sustainable Engineering (G7)

|                 |          |
|-----------------|----------|
| Corran O'Brien  | 20065636 |
| Dhrubo Troyee   | 22663281 |
| Harry Nguyen    | 20157601 |
| Mayur Purmessur | 21604263 |
| Nicolas Vidal   | 20154288 |
| Nooha Budullah  | 21627639 |
| Tashi Lhadon    | 22155746 |
| Thomas Inwood   | 20212429 |

Date Submitted:

20/10/2024

### Document Version Control

| <b><i>Revision #</i></b> | <b><i>Change Description</i></b>                              | <b><i>Approval Date</i></b> | <b><i>Author</i></b> |
|--------------------------|---|-----------------------------|----------------------|
| v0.1                     | Initial release of draft                                      | 01/10/2024                  | NV                   |
| v1.1                     | Project team and selection reports added                      | 11/10/2024                  | CO                   |
| v1.2                     | Communications, document, and schedule management plans added | 11/10/2024                  | HN, CO               |
| v1.3                     | Product and organisation report added                         | 13/10/2024                  | MP, TL, NB, DT       |
| v1.4                     | Sales and revenue report added                                | 14/10/2024                  | NV, TI               |
| v1.5                     | Income, assets, and liabilities statement added               | 13/10/2024                  | NV, TI, HN           |
| v1.6                     | Financial analysis report added                               | 17/10/2024                  | TI                   |
| v1.7                     | Section 4 written and finalised                               | 18/10/2024                  | NV                   |
| v1.8                     | Close out report written and finalised                        | 18/10/2024                  | NV, HN, TI           |
| v2.0                     | Formatting and editing of document prior to submission        | 19/10/2024                  | CO                   |

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# Section 1

## 1.1. Project Team Report

The team initiated communication through WhatsApp on the 19<sup>th</sup> of September 2024 where initial introductions were made and the time for the first meeting was decided. Prior to the meeting each member sent through their individual project proposals so that each member could review it to ease the project selection process that would take place in the first meeting.

The first meeting was conducted on the 27<sup>th</sup> of September 2024 through the medium of a WhatsApp call. The meeting started with member introductions, where each member would introduce themselves and their project.

The next item discussed was the election of the DTR, proxy, and Secretary. This was done by asking for nominations and all the team members voting based on the nominations. Through this project the team elected Nicolas Vidal as the DTR, Thomas Inwood as the Proxy, and Harry Nguyen as the Secretary. These roles were later decided by the team to remain fixed, to avoid potential confusion between member's roles. Decisions were determined to be made via a voting system where a simple majority is required to enact any decisions, and in cases of an even split in voting the DTR would have the deciding vote. For additional roles Corran O'Brien was elected as the document editor.

## 1.2. Project Selection Report

Table 1 depicts projects that were proposed by each team member in assignment one. Of the eight proposed projects, one was to be selected for the team to proceed with.

| Team Member     | Proposed Project   |
|-----------------|--|
| Nicolas Vidal   | Injection Moulded Industrial Gears Using Recycled Zip Tie and Carbon Fibre Offcuts   |
| Mayur Purmessur | Conversion of Ocean Plastic Waste into Sustainable Clothing & Packaging: An Innovative Approach to Mitigating Marine Pollution |
| Harry Nguyen    | Scrap rubber bumper plate with steel disk core   |
| Dhrubo Troyee   | Eco-Friendly Furniture Made from Reclaimed Pallet Wood   |
| Nooha Budullah  | Upcycled Body Butter from Multiple Food Wastes   |
| Tashi Lhadon    | landfills into furniture   |
| Thomas Inwood   | Bike Frames from Recycled Carbon Fibre   |
| Corran O'Brien  | Walking frames from recycled bicycles  |

*Table 1 - Team members and their proposed projects*

Selection of a project was based on a numerical voting system where each member was granted two votes to vote on two different proposed projects. Through this method Nicolas Vidal's and Harry Nguyen's project polled the most votes, after a further discussion highlighting these two projects, a second vote was held on these two projects. Through this method Nicolas Vidal's project, Injection Moulded Industrial Gears, was selected as the group project.

### 1.3. Communications Management Plan

In Table 2, a summary of how inter team communication was conducted throughout this project is provided.

| Item | Description                | Objective  | Format        | Delivery Method                                | Frequency    |
|------|----------------------------|--|---------------|--|--------------|
| 1    | Weekly meeting             | Complete meeting task.                                   | Online        | WhatsApp                                       | Weekly       |
| 2    | Meeting Minutes            | Summarise meeting outcomes.                              | PDF           | Google Drive                                   | Weekly       |
| 3    | Progress Report            | Project progress updates.                                | PDF           | Upload: Google Drive<br>Submission: Blackboard | Weekly       |
| 4    | Final technical report     | Submit to the project sponsor.                           | Word Document | Upload: Google Drive<br>Submission: Blackboard | 20/10/2024   |
| 5    | Deliverable Draft          | Provide draft to shared document for review and editing. | As needed     | Upload: Google Drive                           | Per schedule |
| 6    | Asynchronous communication | Contact team for queries.                                | Online        | WhatsApp                                       | As needed    |

Table 2 – Communication methods within the project

## 1.4. Document Management Plan

A poll was conducted to allow team members to vote for the file storage system they would like the team to utilise for the project. The option of using either OneDrive or Google Drive to host the project documents was proposed to all team members. Through a majority vote, Google Drive was chosen to be used for document management.

The file storage system would store and hold backups of relevant documents. It was determined that Google Document was unsuitable for managing the technical report therefore, an extension allowing for members to produce and edit on a shared Microsoft Word document was implemented. Members chose to either produce on the shared Word document or transfer work developed on a local document.

| Item | Document                  | Assigned Member | Format |
|------|---------------------------|-----------------|--------|
| 1    | Meeting Minute            | Secretary       | .doc   |
| 2    | Weekly progress report    | DTR or proxy    | .doc   |
| 3    | Technical report          | Editor          | .doc   |
| 4    | Deliverable Draft         | All             | .doc   |
| 5    | Assignment 1 Part 1 and 2 | All             | .pdf   |

*Table 3 – Project documents and the assigned responsible members*

## 1.5. Schedule Management Plan

Through team meetings, the team has identified several risks to the project. These risks are:

- There is no set time where all members of the team are consistently able to attend a meeting.
- Members not meeting agreed deadlines to have their tasks completed, leading to potential delays in the project. This could be the result of members having other commitments, personal issues arising causing delays in individual work, or other extraordinary circumstances.

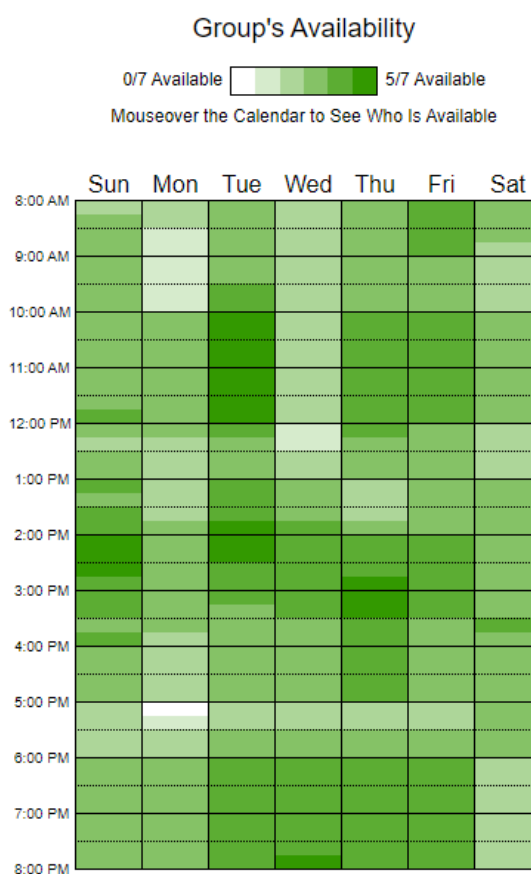


Figure 1 - Group Member's Availability

Table 4 lists all project deliverables along with the team members responsible for their completion and their expected due date. All these are expected to be completed by the 18<sup>th</sup> of October at the latest to give time for the technical report to be compiled and edited for submission by the 20<sup>th</sup>.

| <b><i>Deliverable</i></b>                   | <b><i>Members Responsible</i></b>          | <b><i>Due Date of Completion</i></b> |
|---|--|--------------------------------------|
| <i>S1: Project Team Report</i>              | Corran O'Brien                             | 12/10/2024                           |
| <i>S1: Project Selection Report</i>         | Harry Nguyen                               | 12/10/2024                           |
| <i>S1: Communications Management Plan</i>   | Harry Nguyen                               | 12/10/2024                           |
| <i>S1: Document Management Plan</i>         | Harry Nguyen                               | 12/10/2024                           |
| <i>S1: Schedule Management Plan</i>         | Corran O'Brien, Harry Nguyen               | 12/10/2024                           |
| <i>S2: Product Report</i>                   | Tashi, Troyee, Nooha, Mayur                | 12/10/2024                           |
| <i>S2: Organisational Report</i>            | Tashi, Troyee, Nooha, Mayur                | 12/10/2024                           |
| <i>S3: Sales and Revenue Report</i>         | Thomas Inwood                              | 12/10/2024                           |
| <i>S3: Income Statement</i>                 | Nicolas Vidal, Thomas Inwood, Harry Nguyen | 12/10/2024                           |
| <i>S3: Assets and Liabilities Statement</i> | Nicolas Vidal, Thomas Inwood, Harry Nguyen | 12/10/2024                           |
| <i>S3: Financial Analysis Report</i>        | Nicolas Vidal                              | 11/10/2024                           |
| <i>S3: Scenario Report</i>                  | Thomas Inwood                              | 18/10/2024                           |
| <i>S4: Consult Report</i>                   | Nicolas Vidal                              | 18/10/2024                           |
| <i>S5: Close Out Report</i>                 | Harry Nguyen, Nicolas Vidal                | 18/10/2024                           |

*Table 4 – Project deliverables with their assigned members and due dates*

## Section 2

### 2.1. Product Report

#### 2.1.1. Project description

Our product, "Injection Moulded Industrial Gears Using Recycled Zip Tie and Carbon Fibre Offcuts," is a sustainable and innovative alternative for manufacturing high-performance gears for industrial machinery. These gears are manufactured through combining recycled zip ties composed of Nylon 6/6 with carbon fibre offcuts, which are frequently discarded as waste in the manufacturing industry. This combination results in a reinforced composite material that is lightweight, robust, and durable. The production process involves compounding these materials in a tumbler, proceeded by shaping them into gears by injection moulding, allowing for complicated designs to be manufactured with high precision. The high-level production process begins with processing recycled materials by cutting them to the appropriate size and removing contaminants.

These materials are then compounded and melted through a heated extrusion process before being injected into moulds to form gears. The injection moulding technique is a more energy-efficient and ecologically beneficial alternative to traditional manufacturing methods such as Wire EDM, making our product a superior, eco-friendly choice in the industry.

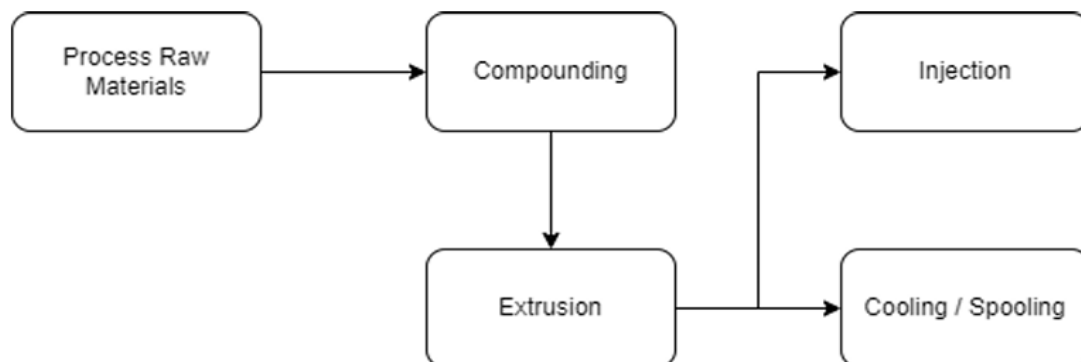


Figure 2 - Process Flow Diagram for Carbon Fibre Reinforced Nylon

#### 2.1.2. Unique value proposition

This product is both innovative and environmentally friendly, thanks to the utilization of recycled materials in its creation. By combining the durability of nylon with the lightweight strength of carbon fibre, the resulting composite material outperforms standard metal gears in terms of wear resistance and cost-effectiveness. Unlike metal gears, which are energy-intensive to manufacture and generate large waste, our device eliminates waste through recycling and is manufactured using a more energy-efficient

injection moulding technique. Furthermore, at the end of its lifecycle, the material can be remelted and recycled, fostering a circular economy, and lowering environmental effect.

### 2.1.2. Market segment and customer

Our main market segment consists of sectors like automation, aerospace, and manufacturing, where industrial gears are widely utilized in devices like robotic systems and conveyor belts. The solution will first be offered to business-to-business (B2B) clients, focusing on organizations that place a high value on cost-effectiveness and sustainability. Manufacturers of renewable energy and businesses in the green technology industry are examples of industries that are likely to be early adopters because of their strong emphasis on environmentally beneficial solutions.

### 2.1.3. Competitor Analysis

| Criteria                       | Our Product                  | <b>hGears</b>                         | <b>Mill - Gears</b>                         | <b>Siemen AG</b>                          | <b>SEWEURO DRIVE</b>                    | <b>Bonfiglioli</b>                           | <b>Intech power core</b>                  |
|--------------------------------|------------------------------|---------------------------------------|---|---|---|--|---|
| Material                       | Recycled nylon/ carbon fibre | Powder metal, recycled metal          | Recycled plastics, biodegradable lubricants | Various metals and lightweight composites | Recyclable materials, green machining   | Recycled materials, lightweight composite    | Self-lubricating composite (power - core) |
| Sustainability                 | High                         | High                                  | High  | High                                      | High                                    | High   | High                                      |
| Production Cost                | Low                          | Moderate                              | Moderate                                    | High                                      | Moderate                                | Moderate                                     | Low                                       |
| Manufacturing Process          | Injection moulding           | Powder metallurgy, cutting technology | Green machining, additive manufacturing     | Energy efficient machining                | Green machining. additive manufacturing | Energy-efficient processes, renewable energy | Green manufacturing, self lubrication     |
| Durability and Wear Resistance | High                         | Very high                             | High  | Very high                                 | High                                    | High   | High                                      |
| End-of-Life Recyclability      | Yes                          | No                                    | Yes   | No  | Yes                                     | Yes  | Yes                                       |

Table 5 – Comprehensive comparison of our product and competitors

## Summary of table 5:

**hGears**[1][2] uses a combination of powder metallurgy and cut metal technologies, focusing on material recycling and energy consumption reduction. They employ renewable energy and efficient use of water in their production, contributing to a high sustainability rating. However, production costs are moderately high due to their processes involving advanced materials and technology.

**Mill-Gears**[3] focuses on green manufacturing techniques such as cryogenic and dry machining, minimizing the environmental impact by avoiding harmful cutting fluids.

**Siemens AG**[4][5] is known for producing gearboxes with a focus on high efficiency and a longer lifespan. They use various metals and lightweight composites to enhance durability, but they do not emphasize recyclability at the end of product life. Their energy- efficient machining processes result in higher production costs but contribute to a high- quality, durable product.

**SEW-EURODRIVE**[6] uses recyclable materials and focuses on energy efficiency during production. Their green machining and additive manufacturing processes provide a sustainable and efficient alternative to traditional methods, with moderate production costs.

**Bonfiglioli**[7] integrates sustainable practices by utilizing renewable energy sources and focusing on energy-efficient processes. They use lightweight composites and recycled materials, and their entire production process aims at reducing energy consumption and waste.

**Intech Power Core**[8] employs a unique self-lubricating composite material called Power- Core, which is designed to reduce wear, eliminate contamination, and operate without external lubrication.

### 2.1.4. Intellectual property (IP) protection:

To protect our product's competitive advantage, we will pursue the following IP protection mechanisms:

- **Patents:** Apply for a patent on the composite material formula and the specific injection moulding process used.
- **Design Registration:** Protect the design of the gears, ensuring competitors cannot replicate the exact designs.
- **Trade Secret Protection:** Keep the specific material preparation and compounding techniques as a trade secret to prevent reverse engineering.

### 2.1.5. Unit pricing:

The unit price is determined based on the following cost components, with figures sourced from **Section 3: Income Statement** and the **project charter values** and a **cost-plus pricing approach**, ensuring that all production costs are covered with an added profit margin.

1. **Material Cost:** \$100 per unit
2. **Tooling Cost:** \$8 per unit
3. **In-Freight Cost:** \$3 per unit
4. **Out-Freight Cost:** \$8 per unit
5. **Human Resources:** \$100,000 per annum per staff member

With these components considered, the unit price is set at **\$300**, ensuring a sufficient profit margin while covering all production and operational costs.

## 2.2. Organisation Report

To commercialize the product, we are establishing a subsidiary company, named ESE PTY LTD, under the parent engineering company. The structure of this subsidiary will include the following roles:

| Position               | Assigned Team Member |
|------------------------|----------------------|
| CEO                    | Nicolas Vidal        |
| CFO                    | Thomas Inwood        |
| COO                    | Harry Nguyen         |
| Engineering Manager    | Corran O'Brien       |
| Marketing Manager      | Nooha Budullah       |
| General Manager        | Dhrubo Troyee        |
| Manufacturing engineer | Tashi Lhadon         |
| Project manager        | Mayur Purmessur      |

Table 6 – Company position assignments

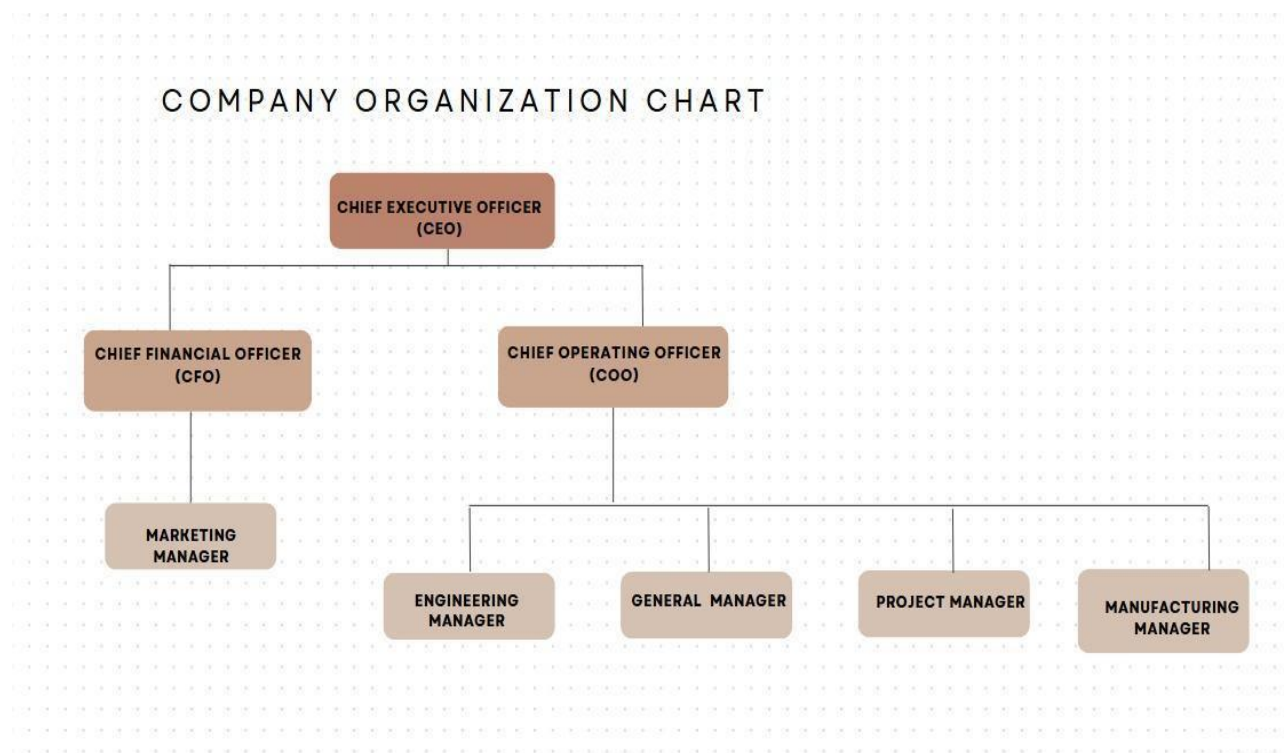


Figure 3 – Company Organizational Chart

**Company trading name**

ESE LTD. (verified as available through <https://abr.business.gov.au> )

**Company Domain Name and Logo:**

- **Domain Name:** [www.ese.com.au](http://www.ese.com.au). (verified as available through <https://www.godaddy.com/en-au> )

- **Logo and Trademark:** We need to register our company logo with IP Australia, to ensure it is unique and represents our eco-friendly approach (verified as registerable).



*Figure 4 – Company Logo*

**Company slogan:**

‘Driving Innovation with sustainability.’

**Company vision:**

To revolutionize industrial manufacturing by leading the way in sustainable and innovative gear production, transforming waste into high-performance materials that contribute to a greener future.

**Company mission:**

Our mission is to create long-lasting, premium industrial gear by designing and producing it with carbon fibre offcuts and recycled zip ties. By combining cutting-edge technology with environmentally responsible practices, we seek to reduce industrial waste and carbon footprints while providing cost-effective solutions which exceed conventional performance standards.

**Company values:**

**Sustainability:** We upcycle industrial waste to minimize environmental impact.

**Innovation:** We foster creativity and leverage cutting-edge technology to deliver smarter, more efficient solutions.

**Quality:** We deliver durable, high-performance products for critical applications.

**Customer Focus:** We offer tailored solutions that meet client needs while supporting sustainability.

**Progress through collaboration:** We innovate by working together, valuing diverse perspectives, and fostering teamwork.

**Cost effective:** We aim in manufacturing cost effective gears, where anyone can afford it.

**Empowering:** We focus on educating, inspiring and promoting waste management to people.

**Uniqueness:** We manufacture gears that are unique from others in the way it is created and the way it helps nature.

**Commercial Product Name:**

The commercial product will be marketed as EF gears (eco-friendly gears), leveraging the company name to reinforce brand identity.

**Company Name and Alignment:****Why ESE:**

It is called Excellence Sustainable Engineering because we believe producing sustainable products makes our nature safe and non-toxic. The way the products are

engineered and shaped are done so by utilizing experts and experienced engineers. We focus on manufacturing high quality products which are sustainable, and the raw materials used are from industrial waste, promoting waste reduction. This transformation comes from the brains of excellent engineers, who are determined in producing eco-friendly products with no difference from the ordinary ones. Where the product equally serves with the same effect.

**Why EF gears?**

The name EF gears is inspired from the concept that the gears produced are ecofriendly if we go by the letters themselves. But diving in, one can understand that the gears used in industrial areas are not sustainable and use excessive amounts of metal in preparation. The gear that will be manufactured will not use any metals or alloys such as iron or steel, but instead will use industrial waste like zip ties and carbon fibre offcuts. With EF gears being in equilibrium between saving our planet and fulfilling customer needs.

## Section 3

### 3.1. Sales and Revenue Report

This product is expected to have a rapid growth in the first couple of years before stabilising to a more linear growth. The market size as of 2022 for industrial gears was valued at US\$28.15 billion with the 2030 market forecast to be US\$39.86 billion. This represents a compound annual growth rate (CAGR) of ~4.44% per year [9]. This growth rate reflects the increasing introduction of new and efficient gears, including materials. Globally, Asia-Pacific was the leading revenue generator for industrial gears in 2022.

| Estimated Global TAM (AUD)                            |                 |
|---|-----------------|
| Global Industrial Gear Market (2024)                  | \$32.07 billion |
| Market % of Global Industrial Products and Services   | 0.072%          |
| Estimated Australia TAM (AUD)                         |                 |
| Australia's Global Industrial Gear and Services %     | 1.5%            |
| Australia's Global Industrial Gear and Services Sales | \$481 million   |
| Estimated Australia SAM (AUD)                         |                 |
| Environmentally Conscious Consumers (50%)             | \$240.5 million |
| Business wanting unknown brand (40%)                  | \$96.2 million  |
| Units (Unit Cost \$300)                               | 320700 units    |
| Estimated Australia SOM (Units)                       |                 |
| 1% 1st Year   | 3,207           |
| 2% 2nd Year   | 6,414           |
| 3% 3rd Year   | 9,621           |
| 4% 4th Year   | 12,828          |

|  |             |        |
|--|-------------|--------|
|  | 5% 5th Year | 16,035 |
|--|-------------|--------|

Table 7 – Industrial gear market overview

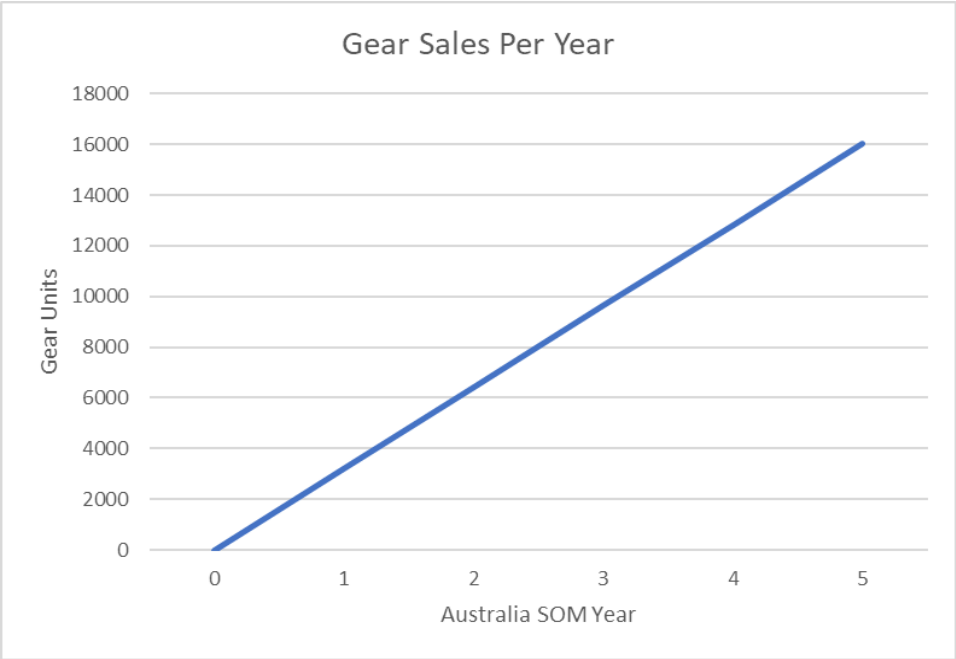


Figure 5 – Annual Gear Sales

## 3.2. Income Statement

|  | Units per year                 | 3027          | 6414           | 9621           | 12828          | 16035          |
|--|--------------------------------|---------------|----------------|----------------|----------------|----------------|
| <b>Income Statement</b>                |                                |               |                |                |                |                |
|  |                                | <b>2023</b>   | <b>2024</b>    | <b>2025</b>    | <b>2026</b>    | <b>2027</b>    |
| <b>Net Revenue</b>                     |                                | \$908,100     | \$1,924,200    | \$2,886,300    | \$3,848,400    | \$4,810,500    |
| <b>Direct Costs (COGS)</b>             |                                |               |                |                |                |                |
|  | Materials                      | \$302,700.00  | \$641,400.00   | \$962,100.00   | \$1,282,800.00 | \$1,603,500.00 |
|  | Tooling                        | \$24,216.00   | \$51,312.00    | \$76,968.00    | \$102,624.00   | \$128,280.00   |
|  | In-Freight                     | \$9,081.00    | \$19,242.00    | \$28,863.00    | \$38,484.00    | \$48,105.00    |
|  | Out-Freight                    | \$24,216.00   | \$51,312.00    | \$76,968.00    | \$102,624.00   | \$128,280.00   |
|  | Inventory Storage              | \$20,000.00   | \$30,000.00    | \$40,000.00    | \$50,000.00    | \$60,000.00    |
|  | Machinery Maintenance          | \$250,000.00  | \$250,000.00   | \$250,000.00   | \$250,000.00   | \$250,000.00   |
|  | Human Resources                | \$200,000.00  | \$400,000.00   | \$600,000.00   | \$800,000.00   | \$1,000,000.00 |
|  | Total (Direct)                 | \$830,213.00  | \$1,443,266.00 | \$2,034,899.00 | \$2,626,532.00 | \$3,218,165.00 |
| <b>Gross Profit</b>                    |                                | \$77,887.00   | \$480,934.00   | \$851,401.00   | \$1,221,868.00 | \$1,592,335.00 |
| <b>Gross Profit Margin</b>             |                                | 8.58%         | 24.99%         | 29.50%         | 31.75%         | 33.10%         |
| <b>Indirect Costs</b>                  | (Admin, legal, insurance, etc) |               |                |                |                |                |
|  | Total (Indirect)               | \$166,042.60  | \$288,653.20   | \$406,979.80   | \$525,306.40   | \$643,633.00   |
| <b>EBITDA</b>                          |                                | -\$88,155.60  | \$192,280.80   | \$444,421.20   | \$696,561.60   | \$948,702.00   |
| <b>Depreciation &amp; Amortisation</b> |                                | \$27,298.70   | \$27,298.70    | \$27,298.70    | \$27,298.70    | \$27,298.70    |
| <b>EBIT</b>                            |                                | -\$115,454.30 | \$164,982.10   | \$417,122.50   | \$669,262.90   | \$921,403.30   |
|  | Interest                       | \$40,948.05   | \$40,948.05    | \$40,948.05    | \$40,948.05    | \$40,948.05    |
|  | Investments                    | \$50,000.00   | \$50,000.00    | \$50,000.00    | \$50,000.00    | \$50,000.00    |
|  | Tax                            | \$28,863.58   | \$41,245.53    | \$104,280.63   | \$167,315.73   | \$230,350.83   |
| <b>Net Profit</b>                      |                                | -\$235,265.93 | \$32,788.53    | \$221,893.83   | \$410,999.13   | \$600,104.43   |
| <b>Net Profit Margin</b>               |                                | -25.91%       | 1.70%          | 7.69%          | 10.68%         | 12.47%         |

Figure 6 - Income Statement FY2023-FY2027

Units per year value based on the SOM calculation above. The below assumptions are taken:

- Unit price: \$300
- Material cost: \$100 per unit
- Tooling cost: \$8 per unit
- In-Freight cost: \$3 per unit
- Out-Freight cost: \$8 per unit
- Human resources: \$100,000 p.a. per staff member

### 3.3. Assets & Liabilities Statement

|   |                     |             |             |             |             |             |
|---|---------------------|-------------|-------------|-------------|-------------|-------------|
| <b>Assets &amp; Liability Statement</b> | <b>\$409,480.50</b> |             |             |             |             |             |
| Assets                                  |                     | \$27,298.70 | \$27,298.70 | \$27,298.70 | \$27,298.70 | \$27,298.70 |
|   |                     |             |             |             |             |             |
| Liabilities                             |                     | \$40,948.05 | \$40,948.05 | \$40,948.05 | \$40,948.05 | \$40,948.05 |
|   |                     |             |             |             |             |             |

*Figure 7 - Assets & Liability Statement FY2023-FY2027*

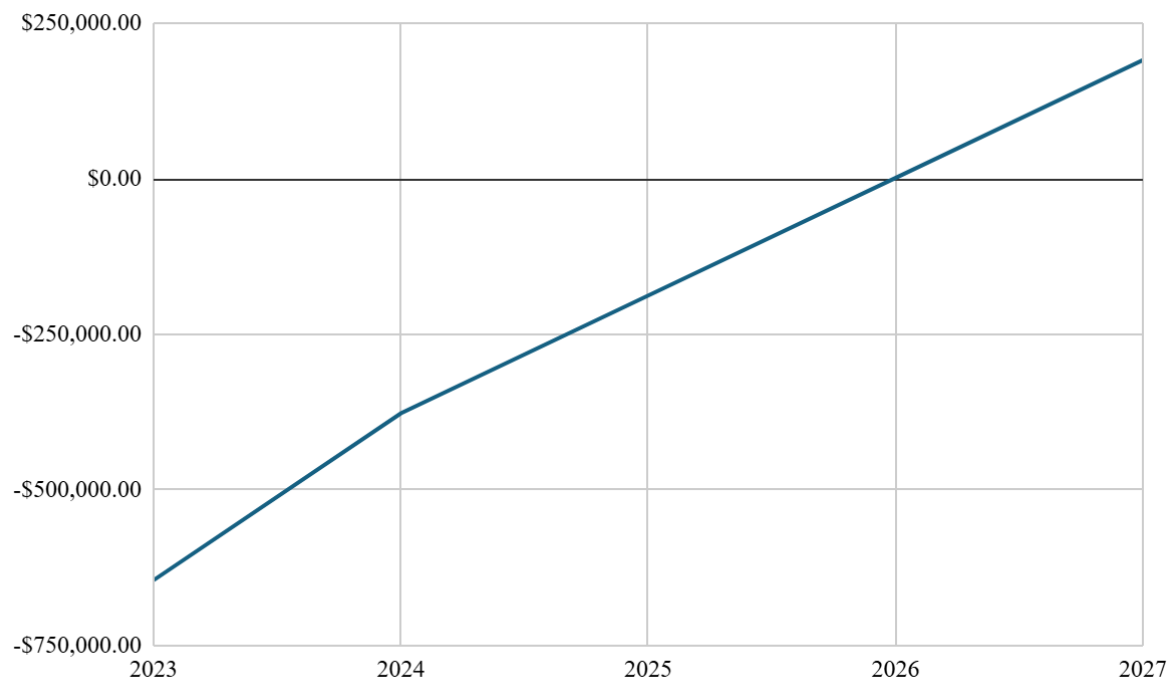
The project budget of \$409,480.50 is taken from the Project Charter.

The asset depreciation is calculated using an expected lifetime of 15 years.

The liability interest is calculated using an interest of 10%.

### 3.4. Financial Analysis Report

The financial analysis report considers the initial capital investment and the net profit from 2023 to 2027. Fig. 8 shows the overall net profit of the business.



*Figure 8 – Projected Net Profit FY2023-FY2027*

The net profit becomes positive just after the second year. When also considering the initial capital investment, the pay-back period is just under 3 years, achieving a net profit of \$1,518.63 in 2026.

### 3.5. Scenario Report

#### Worst-case:

For the worst-case scenario, it was assumed that the sales would be lowered from a lack of interest from businesses within the country and issues with quality control. To predict this, the unit sales were reduced by half. Additionally, the tooling and material cost were increased by 10% to mimic freight increases and shortages involving materials from external supply pressures such as fuel cost increase. Machine maintenance was increased on the assumption that there would be more apparent machinery issues from ongoing production demand. Finally, human resources were reduced overall to mimic the lack of development in production, with layoffs to reduce costs.

|  | Units per year                 | 1513.5        | 3207          | 4810.5         | 6414           | 8017.5         |
|--|--------------------------------|---------------|---------------|----------------|----------------|----------------|
| <b>Income Statement</b>                |                                |               |               |                |                |                |
|  |                                | <b>2023</b>   | <b>2024</b>   | <b>2025</b>    | <b>2026</b>    | <b>2027</b>    |
| <b>Net Revenue</b>                     |                                | \$454,050     | \$962,100     | \$1,443,150    | \$1,924,200    | \$2,405,250    |
| <b>Direct Costs (COGS)</b>             | Materials                      | \$166,485.00  | \$352,770.00  | \$529,155.00   | \$705,540.00   | \$881,925.00   |
|  | Tooling                        | \$14,529.60   | \$30,787.20   | \$46,180.80    | \$61,574.40    | \$76,968.00    |
|  | In-Freight                     | \$6,054.00    | \$12,828.00   | \$19,242.00    | \$25,656.00    | \$32,070.00    |
|  | Out-Freight                    | \$15,135.00   | \$32,070.00   | \$48,105.00    | \$64,140.00    | \$80,175.00    |
|  | Inventory Storage              | \$20,000.00   | \$30,000.00   | \$40,000.00    | \$50,000.00    | \$60,000.00    |
|  | Machinery Maintenance          | \$300,000.00  | \$300,000.00  | \$300,000.00   | \$300,000.00   | \$300,000.00   |
|  | Human Resources                | \$200,000.00  | \$200,000.00  | \$300,000.00   | \$400,000.00   | \$500,000.00   |
|  | Total (Direct)                 | \$722,203.60  | \$958,455.20  | \$1,282,682.80 | \$1,606,910.40 | \$1,931,138.00 |
| <b>Gross Profit</b>                    |                                | -\$268,153.60 | \$3,644.80    | \$160,467.20   | \$317,289.60   | \$474,112.00   |
| <b>Gross Profit Margin</b>             |                                | -59.06%       | 0.38%         | 11.12%         | 16.49%         | 19.71%         |
| <b>Indirect Costs</b>                  | (Admin, legal, insurance, etc) |               |               |                |                |                |
|  | Total (Indirect)               | \$144,440.72  | \$191,691.04  | \$256,536.56   | \$321,382.08   | \$386,227.60   |
| <b>EBITDA</b>                          |                                | -\$412,594.32 | -\$188,046.24 | -\$96,069.36   | -\$4,092.48    | \$87,884.40    |
| <b>Depreciation &amp; Amortisation</b> |                                | \$27,298.70   | \$27,298.70   | \$27,298.70    | \$27,298.70    | \$27,298.70    |
| <b>EBIT</b>                            |                                | -\$439,893.02 | -\$215,344.94 | -\$123,368.06  | -\$31,391.18   | \$60,585.70    |
|  | Interest                       | \$40,948.05   | \$40,948.05   | \$40,948.05    | \$40,948.05    | \$40,948.05    |
|  | Investments                    | \$50,000.00   | \$50,000.00   | \$50,000.00    | \$50,000.00    | \$50,000.00    |
|  | Tax                            | \$109,973.26  | \$53,836.24   | \$30,842.02    | \$7,847.79     | \$15,146.43    |
| <b>Net Profit</b>                      |                                | -\$640,814.33 | -\$360,129.23 | -\$245,158.13  | -\$130,187.03  | -\$45,508.78   |
| <b>Net Profit Margin</b>               |                                | -141.13%      | -37.43%       | -16.99%        | -6.77%         | -1.89%         |

Figure 9 – Worst-case Income Statement FY2023-FY2027

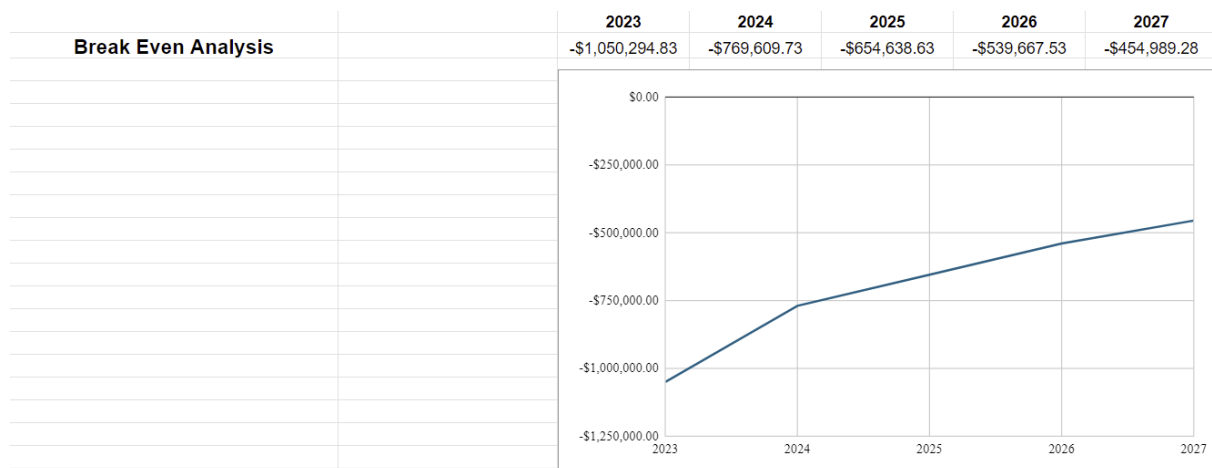


Figure 10 – Break Even Analysis of Worst-case

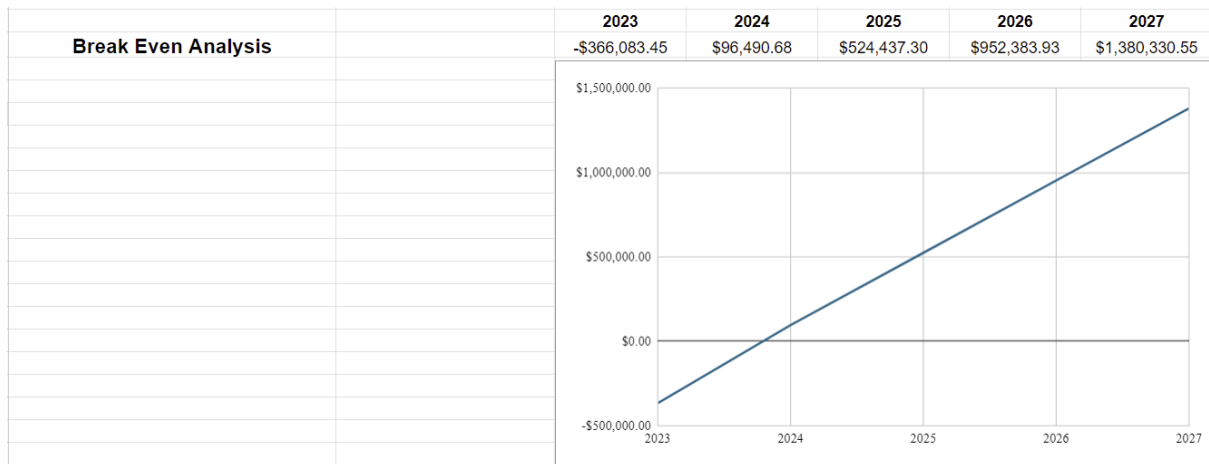
From Figures 9 and 10, the reduction of sales was the main contributor affecting the Break-Even Analysis. Profitability was graphed to not be achieved within the first five years, with a prediction of break-even in the seventh year.

### Best-case:

For the best-case scenario, the sales were increased by 50% per year on the assumption of exceeding the most-likely scenario. The product had garnered more interest than expected. Shipping per unit for in and out freight were reduced to \$2.5 and \$7 per unit respectively (see figure xxx). The decision was to lower the freight cost under the prediction of alleviating transport pressures stemming from lowered fuel costs. These assumptions were all made with respect that it can be achieved with the initial production ability.

|  | Units per year                 | 4540.5       | 9621           | 14431.5        | 19242          | 24052.5        |                          |
|--|--------------------------------|--------------|----------------|----------------|----------------|----------------|--------------------------|
| <b>Income Statement</b>                |                                |              |                |                |                |                |                          |
|  |                                | <b>2023</b>  | <b>2024</b>    | <b>2025</b>    | <b>2026</b>    | <b>2027</b>    | <b>Comments</b>          |
| <b>Net Revenue</b>                     |                                | \$1,362,150  | \$2,886,300    | \$4,329,450    | \$5,772,600    | \$7,215,750    |                          |
| <b>Direct Costs (COGS)</b>             |                                |              |                |                |                |                |                          |
|  | Materials                      | \$408,645.00 | \$865,890.00   | \$1,298,835.00 | \$1,731,780.00 | \$2,164,725.00 | \$100 materials per unit |
|  | Tooling                        | \$36,324.00  | \$76,968.00    | \$115,452.00   | \$153,936.00   | \$192,420.00   | \$8 per unit             |
|  | In-Freight                     | \$11,351.25  | \$24,052.50    | \$36,078.75    | \$48,105.00    | \$60,131.25    | \$2.5 shipping per unit  |
|  | Out-Freight                    | \$31,783.50  | \$67,347.00    | \$101,020.50   | \$134,694.00   | \$168,367.50   | \$7 shipping per unit    |
|  | Inventory Storage              | \$25,000.00  | \$35,000.00    | \$45,000.00    | \$55,000.00    | \$65,000.00    |                          |
|  | Machinery Maintenance          | \$250,000.00 | \$250,000.00   | \$250,000.00   | \$250,000.00   | \$250,000.00   |                          |
|  | Human Resources                | \$200,000.00 | \$400,000.00   | \$600,000.00   | \$800,000.00   | \$1,000,000.00 | Staff @ \$100k pa        |
|  | Total (Direct)                 | \$963,103.75 | \$1,719,257.50 | \$2,446,386.25 | \$3,173,515.00 | \$3,900,643.75 |                          |
| <b>Gross Profit</b>                    |                                | \$399,046.25 | \$1,167,042.50 | \$1,883,063.75 | \$2,599,085.00 | \$3,315,106.25 | Rev - COGS               |
| <b>Gross Profit Margin</b>             |                                | 29.30%       | 40.43%         | 43.49%         | 45.02%         | 45.94%         |                          |
| <b>Indirect Costs</b>                  | (Admin, legal, insurance, etc) |              |                |                |                |                |                          |
|  | Total (Indirect)               | \$192,620.75 | \$343,851.50   | \$489,277.25   | \$634,703.00   | \$780,128.75   | 20%                      |
| <b>EBITDA</b>                          |                                | \$206,425.50 | \$823,191.00   | \$1,393,786.50 | \$1,964,382.00 | \$2,534,977.50 |                          |
| <b>Depreciation &amp; Amortisation</b> |                                | \$27,298.70  | \$27,298.70    | \$27,298.70    | \$27,298.70    | \$27,298.70    |                          |
| <b>EBIT</b>                            |                                | \$179,126.80 | \$795,892.30   | \$1,366,487.80 | \$1,937,083.30 | \$2,507,678.80 | Operating Profit         |
|  | Interest                       | \$40,948.05  | \$40,948.05    | \$40,948.05    | \$40,948.05    | \$40,948.05    |                          |
|  | Investments                    | \$50,000.00  | \$50,000.00    | \$50,000.00    | \$50,000.00    | \$50,000.00    |                          |
|  | Tax                            | \$44,781.70  | \$198,973.08   | \$341,621.95   | \$484,270.83   | \$626,919.70   |                          |
| <b>Net Profit</b>                      |                                | \$43,397.05  | \$505,971.18   | \$933,917.80   | \$1,361,864.43 | \$1,789,811.05 |                          |
| <b>Net Profit Margin</b>               |                                | 3.19%        | 17.53%         | 21.57%         | 23.59%         | 24.80%         |                          |

Figure 11 – Best-case Income Statement FY2023-FY2027



*Figure 12 – Break Even Analysis of Best-case*

In Figure 12, the Break Even Analysis showed profitable margins within the first year, and modelled exceptional growth in the five year period. Creating opportunities for further investments into the product with additional cash flow.

## Section 4 – Consult (20%)

This Sustainable Development Goals report reviews the product proposed by Group 3 taking into account environmental, social, and governance (ESG) standards. The objective of this report is to evaluate the organisation and product against key sustainability indicators as described with the United Nations Sustainable Development Goals to ensure that the proposed product aligns with these values. The key SDG's assessed include:

1. SDG 3: Good Health and Well-Being
2. SDG 9: Industry, Innovation, and Infrastructure
3. SDG 12: Responsible Consumption and Production
4. SDG 13: Climate Action
5. SDG 14: Life Below Water & SDG 6: Clean water and sanitation

This report and analysis is based on Group 3's responses to questions proposed by Excellence Sustainable Engineering. This report covers the usage of materials, waste management, emissions, and market capture. Recommendations for adjusting their approach and direction are supplied to assist in providing a product that better aligns with the UNSDGs.

### 4.1. SDG 6 & 14:

Sustainable Development Goal 6 focuses on ensuring availability and sustainable management of water and sanitation for all [11]. Sustainable Development Goal 14 aims to conserve and sustainably use the oceans, seas, and marine resources for sustainable development [12]. The Ocean Pen aligns with these two goals as it is built primarily using recycled plastic waste recovered from the ocean. By reducing plastic waste in the ocean, cleaner water can be made available for all, especially in lower-income places with limited fresh water supplies. The reduction in plastic ocean waste will assist in battling ocean acidification, coastal eutrophication, and help conserve sea and marine resources.

**Challenges:**

To make a notable difference in water quality and management and help preserve marine ecosystems, significant amounts of waste must be removed. At present, Group 3 have indicated that they intend to remove 2-4 tonnes of waste plastic from the ocean per year for the Ocean Pen. This is quite a small amount relative to the 17 million metric tons of waste pollution every year as of 2021. Additionally, waste plastic is likely to include several different types of plastic - some suitable for a product such as the Ocean Pen and some not so suitable. The Ocean Pen is currently only intended to be constructed using polystyrene plastic, which greatly limits the impact and effectiveness of waste removal in the ocean. The method of collecting the required waste plastic can also greatly affect the net benefit of the business. As an example, utilising human labour to manually pick and sort the required plastic from shorelines is effective but resource and time intensive.

**Recommendation:**

It is highly advised that Group 3 begin to think about the scalability of this product, and potentially other products that they could include in their catalogue to increase the volume of plastic waste removed from the ocean. Additionally, we recommend the possibility of producing Ocean Pens using varying types of plastic to try and reduce the limitations introduced by single plastic type pens. More thought and consideration into the method of collecting the required waste plastics is needed as this will greatly influence the cost and effectiveness of the business.

## 4.2. SDG 12: Responsible Consumption and Production

### *4.2.1 Production Materials & Processes*

By collecting and recycling ocean plastic, the Ocean Pen project promotes sustainable consumption through the production of pens. Ocean-sourced material called polystyrene is used in the pen's manufacturing process. It should be highlighted that the team has not yet used any significant measures for reducing energy consumption during the production process.

**Recommendation:**

Investigate low-energy injection moulding and other energy-efficient manufacturing techniques to reduce the production's carbon footprint. A further way to better connect

with SDG 12 aims could be to incorporate renewable energy sources into manufacturing.

#### *4.2.2 Lifecycle of Products and Waste Management*

Comparable to conventional disposable pens, the Ocean Pen has an equal lifespan. Since every part of the pen is constructed of the same kind of plastic, recycling will be easier when its time comes to an end. Packaging waste reduction is not addressed, and there are currently no programs to encourage customers to return old pens for recycling.

#### **Recommendation:**

To help reduce waste even more, implement a program for the return of used pens and investigate sustainable packaging solutions. Using recyclable or biodegradable packaging could greatly reduce the pen's environmental impact.

### **4.3. SDG 13: Climate Change:**

This section examines how Group 3's Ocean Pen project relates to SDG 13: Climate Action. Reducing manufacturing and transportation emissions, investigating renewable energy sources, and participating in carbon offset programs are the main areas of concentration. The project already uses certain eco-friendly measures, according to the interview, but there are still ways to reduce its impact on the environment.

#### *4.3.1 Use Virgin materials:*

The Ocean Pen project collects single-use plastics, such thermometer probe covers and syringe caps, which are both made of PP (polypropylene) or PE (polyethylene) to reduce the usage of virgin materials. The initiative makes sure that most of the materials are recycled by reusing these things, which significantly decreases the demand for virgin plastics.

#### **Positive Contributions:**

- By procuring recycled materials instead of depending on virgin polymers, the project shows a commitment to reducing plastic waste and advancing the circular economy.
-

### Opportunities for Improvement:

- While the project minimizes dependency on virgin materials, a more thorough materials management plan should be created to evaluate the environmental impact of each raw material utilized, including those that might not be recycled entirely.

### Suggestions:

- **Track Material Impact:** To more effectively track and report on the use of recycled materials as well as any locations where virgin materials might still be used, develop a material monitoring system.
- **Increase Product Sourcing:** Keep looking into other sources of recycled materials, particularly those that can be reliably included into the production process to ensure a low dependency on virgin resources throughout the duration of the product lifecycle.

#### *4.3.2. Emission reduction during production*

By switching to cardboard packaging, which is more environmentally friendly than conventional plastic packaging, the Ocean Pen project has already acted to lower emissions during production. However, the results of the interviews show that no additional methods are presently being used to lower emissions while the production process is underway.

### Positive Contributions:

- By using minimal non-recyclable packaging material, switching to cardboard packaging substantially decreases the project's overall environmental impact.

### Opportunities for Improvement:

- No specific measures have been implemented to minimise carbon emissions in the manufacturing process, which represents an opportunity for advance development.

### Suggestions:

- **Energy Efficiency:** To cut down on the energy used in the Ocean Pen's production, invest in energy-efficient equipment and procedures. This can

include the use of recycled energy systems or low-energy production techniques.

#### *4.3.3. Emissions reduction in Transportation:*

There are currently no actions being taken to specifically lower emissions when the Ocean Pen products are being transported. The total carbon footprint of a product can be considerably increased by transportation-related emissions, particularly when goods are transported across faraway or when raw materials are obtained from remote areas.

#### **Positive Contributions:**

using local plastic recycling product helps minimising transportation emissions by reducing the distance materials need to travel during the process.

#### **Opportunities for Improvement:**

No specific plans to cut transportation emissions, including utilizing low-emission cars or optimizing logistics, are in place.

#### **Suggestions:**

- **Improve Transport Logistics:** Examine the supply chain to find ways to shorten transit distances, or employ more energy-efficient modes of transportation, including hybrid or electric cars.
- **Carbon-Efficient Shipping:** Consider into account carbon-efficient shipping methods when distributing products and monitor transportation emissions to find areas where additional efficiencies can be achieved.

#### *4.3.4. Carbon Offset strategies:*

According to the interview, no carbon offset plans have been considered into account for the product's lifecycle. To balance the overall environmental impact, carbon offsetting is a useful technique to offset emissions that cannot be entirely reduced during production and transportation.

#### **Opportunities for Improvement:**

- Group 3 has not yet investigated any carbon offset initiatives, which offers a chance to better align with the objectives of climate action. Offsetting may be

especially helpful in decreasing the environmental effect of emissions that are hard to get rid of by altering transportation or production methods.

**Suggestions:**

- Investigate Carbon Offset Initiatives: Start looking for carbon offset schemes that match the objectives of the Ocean Pen, like funding initiatives that support renewable energy, reforestation.
- Lifecycle Assessment: perform a lifecycle evaluation to determine how much of the Ocean Pen project's total carbon emissions could be mitigated by these activities.

#### *4.3.5. Renewable Energy in manufacturing*

Neither the usage of renewable energy sources in the creation of the Ocean Pen nor any particular plans to incorporate sustainable energy options into the production process were addressed in the interview. Group 3 has yet another opportunity to reduce its carbon footprint and support climate action in this area.

**Opportunities for Improvement:**

- The lack of renewable energy in the production process offers a chance to investigate more environmentally friendly energy sources, such as hydropower, wind, or solar power.

**Suggestions:**

- Integrate Renewable Energy: Examine if employing renewable energy sources during the production process is possible. This can involve installing solar panels on manufacturing buildings or moving to green energy providers.

## 4.4. SDD9: Industry, Innovation, and Infrastructure

This report's section on Group 3's Ocean Pen project's alignment with SDG 9 focuses on the project's potential for sustainable industry, innovation, and infrastructural development. Group 3's interview questions and answers are analysed to figure out how things are doing now and where they might make improvements.

#### *4.4.1 Technology & Innovation*

Compared to other pens that are either partially recycled or constructed of numerous materials, the Ocean Pen project is unique in that it uses only 100% recycled ocean plastic. Because the pen is constructed of a single type of material, this strategy improves the recycling process and has benefits for waste management.

But no manufacturing efficiency or technological development has been applied yet. This suggests that although the product uses resources in an innovative way, the production process is still mainly conventional and might not be optimized for sustainability.

#### **Positive Contribution:**

- The Ocean Pen is a material innovation that uses ocean plastics to minimize marine pollution and streamline recycling procedures after usage.
- The research shows how waste from developing nations can be recycled, supporting efforts to promote sustainability on a worldwide scale.

#### **Recommendations:**

- Scalability: It does not seem that there are plans implemented for scalability in the current manufacturing process. Making sure that production can increase without affecting environmental sustainability will be essential as market demand rises.
- Technological Advancements: Group 3 has not yet implemented any modern manufacturing methods that could improve the production process's sustainability or efficiency.

#### *4.4.2. Infrastructure & Cooperation*

Group 3's collaboration with local plastic recycling businesses is a step in the right direction toward creating a sustainable supply chain. Through this partnership, purchasing of ocean plastic is made easier, and materials are recycled safely and locally. Beyond local partnerships, there are no well-defined plans for working with international projects or other stakeholders to advance sustainable practices or further enhance infrastructure.

#### **Positive Contributions:**

By partnering with local recycling facilities, the project's infrastructure is strengthened, promoting a circular economy, and minimizing the logistical strain associated with procuring materials.

#### **Opportunities for Development:**

- **International Partnerships:** The lack of international collaborations restricts the project's potential to support wider sustainability initiatives. Working with international organizations may provide access to sustainability certifications and more options for the removal of plastic from the ocean on a larger scale.
- **Automation:** To increase productivity, the team has thought about automating several steps of the production process, however this has not been fully implemented yet. Automation could improve production scalability and lower resource use.

#### **Suggestions:**

- **International Initiatives:** Consider working with international groups that support environmentally friendly production methods. This could bring the Ocean Pen initiative into alignment with international standards and enhance the sourcing and recycling of ocean plastics.
- **Automation:** Quickly implement automation technologies to improve manufacturing process efficiency overall, minimize resource consumption, and streamline production.

#### **4.4.3. Certifications for Sustainability**

Group 3 does not currently have any plans to apply for any sustainability certifications, like the Australian Carbon Credit Unit. Obtaining certificates could validate the project's environmental impact and greatly improve its reputation in the market, especially with environmentally concerned consumers.

#### **Positive Contributions:**

- Using recycled ocean plastics gives the project an additional focus on sustainability, which is a solid basis for satisfying certification standards.

#### **Opportunities for Development:**

- In addition to verifying the project's contribution to environmental goals, applying for sustainability certifications would act as a marketing tool to draw in eco-aware customers.

#### **Recommendations:**

- Apply for Sustainability Certifications: Consider obtaining certifications related to internationally recognized environmental standards, such as the Australian Carbon Credit Unit. As a result, the project will have greater marketability and credibility as a sustainable product.

### **4.5. SDG3: Good Health and Well-Being:**

SDG 3: Good Health and Well-Being is discussed in this section in relation to Group 3's Ocean Pen project. The product's benefits to user health, safety, and well-being as well as the project's efforts to guarantee commitment to key safety laws are the main points.

#### *4.5.1 Improving User Health and well-being:*

The Ocean Pen project does not currently address the health and well-being of users. Pens are commonly used, and a comfortable shape could greatly improve the product's accessibility and promote general well-being, particularly for people who might find it difficult to handle standard-sized pens.

#### **Opportunities for Improvement:**

- There are no special design features or modifications for users with difficulties with mobility in the product.
- Using materials or designs that could reduce stress for individuals with arthritic or limited hand strength is not emphasized.

#### **Suggestions:**

- Functional Design: To make the pen easier to hold for persons who have arthritis problem, redesign it with proper characteristics like a larger grip or a more flexible body.

- **Accessibility Testing:** Make sure the product can accommodate a variety of users' needs, including those who have physical disabilities, by conducting accessibility testing.

#### *4.5.2 Safety features:*

There are currently no user-protecting safety features included in the Ocean Pen project. Since the pen is a relatively low-risk product, there are currently no known safety issues. To minimize any possible hazards from material composition (such as allergic responses or sharp parts), it is crucial to ensure compliance with key safety regulations in high-impact markets like workplaces, hospitals, and schools.

#### **Opportunities for Improvement:**

- The product lacks safety features like non-toxic materials or softer edges for kids or individuals with health issues.

#### **Suggestions**

- **Material Safety:** Make sure that every material used complies with all legal health and safety requirements and is non-toxic, especially when it comes to the use of children and other vulnerable groups.
- **Design Safety:** To reduce any risks related to handling the pen, think about integrating rounded or softer edges.

#### *4.5.3. Incorporating digital technologies:*

The Ocean Pen project did not consider about any digital technologies for integration, which restricts the potential for innovation in areas like emergency warnings or tracking features that could help users in particular industries (e.g., healthcare).

#### **Opportunities for Improvement:**

There's opportunity to investigate digital features like data-tracking pens, smart device integration, and features that can help users with needs like emergency warnings for individuals with disabilities.

#### **Suggestions:**

- **Investigate Digital Technologies:** Investigate the possibility of integrating smart technologies that could increase the product's marketability, especially for users in specific sectors like education or healthcare.
- **Innovation Partnerships:** Work with tech firms or developers of assistive technology to investigate the economics of incorporating digital features,
- **Innovation Partnerships:** Work with tech firms or developers of assistance devices to investigate the possibility of incorporating digital features, boosting accessibility, and ensuring user safety.

#### *4.5.4. Possible risks to users:*

Because of the design of the Ocean Pen, there aren't many risks for users. However, there are a few possible risks: sharp parts, material safety issues (if users have allergies to specific types of plastic), or handling difficulty for those with disabilities.

#### **Opportunities for Improvement:**

To minimize any health hazards, make sure all components are non-toxic and allergen-free. Additionally, the pen's design could be changed to prevent accidental harm (such as from sharp tips) for younger users or those with disabilities.

#### **Suggestions:**

- **Material Risk Assessment:** To determine whether the product has any possible health dangers, conduct a material risk analysis.
- **User Safety:** To further reduce dangers, incorporate extra safety measures like softened edges or a softer grip for younger or disabled users.

## Section 5 – Close-out (20%)

### 5.1. Deliverables

| Item | Assignment Deliverables        | Days Planned | Days Taken | Status Complete | On Schedule | Completed to Specification |
|------|--------------------------------|--------------|------------|-----------------|-------------|----------------------------|
| 1    | Project Team Report            | 2            | 2          | 100%            | On          | Yes                        |
| 2    | Project Selection Report       | 2            | 2          | 100%            | On          | Under                      |
| 3    | Communications Management Plan | 1            | 1          | 100%            | On          | Yes                        |
| 4    | Document Management Plan       | 1            | 1          | 100%            | On          | Yes                        |
| 5    | Schedule Management Plan       | 2            | 1          | 100%            | Under       | Yes                        |
| 6    | Progress Report #1             | 1            | 1          | 100%            | On          | Yes                        |
| 7    | Product Report                 | 4            | 4          | 100%            | On          | Yes                        |
| 8    | Organisation Report            | 4            | 4          | 100%            | On          | Yes                        |
| 9    | Progress Report #2             | 1            | 1          | 100%            | On          | Yes                        |
| 10   | Sales and Revenue Report       | 3            | 2          | 100%            | Under       | Yes                        |
| 11   | Income Statement               | 3            | 1          | 100%            | Under       | Yes                        |
| 12   | Assets & Liabilities Statement | 3            | 1          | 100%            | Under       | Yes                        |
| 13   | Financial Analysis Report      | 3            | 1          | 100%            | Under       | Yes                        |
| 14   | Scenario Report                | 3            | 4          | 100%            | Over        | Yes                        |
| 15   | Progress Report #3             | 1            | 1          | 100%            | Yes         | Yes                        |
| 16   | Close Out Report               | 2            | 1          | 100%            | Under       | Yes                        |
| 17   | Group 3 Report                 | 10           | 12         | 100%            | Over        | Yes                        |

Table 8 – Project deliverables completion status

## 5.2. Register of Key Lessons Learnt

| Item | Title                  | Description  | Recommendations   |
|------|------------------------|--|---|
| 1    | First Meeting Schedule | The first meeting was organised quite late and put us behind from the start                                    | Be more proactive about the first meeting and organise sooner   |
| 2    | Unscheduled meetings   | There were little to no meeting outside the scheduled weekly meeting   | More meetings organised between team members to collaborate on the assignment together                  |
| 3    | Group communication    | The communication between members in the group was below the expected level at times throughout the assignment | Encourage members to communicate their progress and questions more openly and frequently                |
| 4    | Deadlines              | The deadlines were not always enforced or met on schedule  | More frequent reminders and encouragement to meet deadlines   |
| 5    | Folder structure       | Some documents were misplaced or information written in the wrong place  | Clearly define a structure at the beginning of the project so that everyone is aware of what goes where |

Table 9 – Key lessons learnt

### 5.3. Key Operations Recommendations

| Item | Title                               | Description  |
|------|-------------------------------------|--|
| 1    | Equipment selection and procurement | Ensure that further research is done into the specific equipment required to ensure the project does not run over budget or delay the timeline/schedule  |
| 2    | Document management                 | Maintain a register of all documentation and their latest released versions to differentiate those that in progress or released                          |
| 3    | Stakeholder relations               | Continue networking within the industry and gain connections to expand the market for the business   |
| 4    | Partnering businesses               | Begin reaching out to other businesses who can provides services such as transportation and business at reduced costs through partnership and agreements |

Table 10 – Operations recommendations

## 5.4. Key Team Recommendations

| Item | Title   | Description   |
|------|---|---|
| 1    | Team meeting involvement                                  | Some members did not contribute anything towards or during the team meeting and were bystanders. More encouragement and participation is required |
| 2    | Clearer defined team members strengths and weaknesses     | Clearer defined strengths and weaknesses would help improve team performance and meet deadlines   |
| 3    | Clearer post-meeting tasks                                | During the weekly meeting, create a task list that clearly defines what is expected to be done prior to the next meeting                          |
| 4    | Better defined team member contributions and expectations | Better defined responsibilities and commitments from each team member, including the consequences for not meeting the agreed upon expectations    |
| 5    | Better team member accountability                         | If a deliverable cannot be completed on schedule, team members should be communicating this to the group and organise for another member to help  |

Table 11 – Team recommendations

## 5.5. Project Selection Review


The team has remained satisfied with the selection of the project. The group believes that the selected project provides the highest possibility of going to market and being successful without too much of an initial capital investment and therefore lower risk. The project was reviewed to have the greatest potential to be applied in different markets and use applications.

## 5.6. Project Sign-Off

|                              |  |                        |                                |
|------------------------------|--|------------------------|--------------------------------|
| <b>Project Name</b>          | Injection Moulded Industrial Gears Using Recycled Zip Tie and Carbon Fibre Offcuts |                        |                                |
| <b>Project #</b>             | IGPC001  |                        |                                |
| <b>Creation Date</b>         | 28/07/2024   |                        |                                |
| <b>Project Manager (DTR)</b> | Nicolas Vidal  | <b>Contact Details</b> | 20154288@student.curtin.edu.au |
| <b>Sponsor/Client</b>        | Dr. Zahra Jabiri   | <b>Contact Details</b> | zahra.jabri@curtin.edu.au      |

### Project Description

This project highlights the reuse and recycling of zip tie and carbon fibre offcuts common in the manufacturing industry to create composite materials for producing industrial gears by injection moulding.

| Project Manager (DTR) |   |
|-----------------------|---|
| <b>Decision</b>       | <input checked="" type="radio"/> Approved<br><input type="radio"/> Postponed<br><input type="radio"/> Cancelled<br><input type="radio"/> Reveiw |
| <b>Name</b>           | Nicolas Vidal   |
| <b>Signature</b>      |    |
| <b>Date</b>           | 18/10/2024  |

| Sponsor/Client   |   |
|------------------|---|
| <b>Decision</b>  | <input checked="" type="radio"/> Approved<br><input type="radio"/> Postponed<br><input type="radio"/> Cancelled<br><input type="radio"/> Reveiw |
| <b>Name</b>      |   |
| <b>Signature</b> |   |
| <b>Date</b>      |   |

# Appendix A – Weekly Progress Report 1

## Weekly Progress Report

This compulsory progress report is to be completed by your DTR or a proxy. Late forms will not be accepted.

In completing this report, please attempt to be honest and transparent. The goal here is to communicate with your project sponsor on the status of your project, provide accountability to team members, identify any emerging issues, and to later provide you with historical insight into the assignment's success or failure.

| Item | Description  | Answer  |
|------|--|---|
| 1.   | Weekly Progress Report:<br>e.g: #1 or #2   | 1   |
| 2.   | Submission Date:   | 28/09/2024  |
| 3.   | Your group name:   | G7  |
| 4.   | Completed by (full-name):  | Nicolas Vidal   |
| 5.   | Email Address  | 20154288@student.curtin.edu.au  |
| 6.   | The name of your organisation/company as decided by the team (if there is no name yet enter N/A)   | N/A   |
| 7.   | Indicate % completion of each section of the assignment:<br>e.g. 20% , not started, completed  | Section 1: 10%  |
|      |  | Section 2: Not started  |
|      |  | Section 3: Not started  |
|      |  | Section 4: Not started  |
|      |  | Section 5: Not started  |
| 8.   | Indicate the health of the assignment project (1 to 5, where 1 is terrible, 5 is excellent):   | <div>€ 1</div> <div>€ 2</div> <div>€ 3</div> <div>€ 4</div> <div>€ 5</div>  |
| 9.   | How well is the assignment project progressing?  | Productive first meeting, still need to allocate responsibilities for the assignment project.                         |
| 10.  | Please report on the team status and any issues, such as team members not being present at meetings (with or without apologies). Team members being uncontactable or unresponsive. | All team members attended the meeting. We all came to an agreement on which project to continue with and how we would |

|     |   |  |
|-----|---|--|
|     | Team members suffering from illness or other issues requiring time away, slowing progress. Consider lack of commitment to team goals, social loafing, and any issues with team cohesion or team morale. | work together. Communication between members was okay. |
| 11. | Briefly list any assignment accomplishments or milestone completions.   | Assignment has not been started yet.                   |
| 12. | Any assignment issues or risks to report to the Project Sponsor?  | N/A  |
| 13. | Any other comments about your assignment project, positive or negative?   | N/A  |

## Meeting Minutes – MGMT3000 project

### Name of Organization:

**Location:** Online

**Date:** 27/09/2024

**Time:** 13:00 PM

### Attendance

Harry Nguyen, Nicolas Vidal, Corran O'Brien, Thomas Inwood, Tashi Lhadon, Dhrubo Troyee, Mayur Purmessur, Nooha Budullah

### Apologies

[none]

### Absent

[none]

### Call to order

27/09/2024 at 1:00 PM Chairperson called meeting to order.

### Approval of minutes from (NA)

Motion: NA

Motion by: NA

Seconded by: NA

Resolution: NA

### Additions to the agenda

[none]

### Approval of the agenda

Motion: to approve the agenda as circulated

Motion by: Harry Nguyen

Seconded by: Thomas Inwood

Carried or defeated: carried

Resolution: agenda approved

## **Business arising out of the previous meeting**

[none]

### **Item #1 to be discussed**

- a) Election of DTR, proxy, and secretary
- b) Nicolas is elected as the DTR. Thomas is elected as proxy. Harry is elected as secretary

### **Item #2 to be discussed**

- a) Decide if DTR, proxy and secretary are fixed roles or changed weekly
- b) The roles discussed are to be fixed to elected individuals.

### **Item #3 to be discussed**

- a) Decide on other team members responsibilities.
- b) Corran decided to be document editor.

### **Item #4 to be discussed**

- a) Decide on DTR authority.
- b) Decisions will be made via a majority-rules system of those in attendance. As we have an even number of group members, if there is a tie in votes, the option that the DTR voted for is favoured.

### **Item #5 to be discussed**

- a) Project selection
- b) Everyone has read each other's project proposal. Each person had 2 votes they could use to vote on projects. By majority vote, the project Nicolas proposed was selected.

### **Item #6 to be discussed**

- a) Communication management
- b) Whatsapp and discord will be the communication methods.
- c) There will be weekly meeting that everyone attends, with opportunity for other meetings with only required members.

### **Item #7 to be discussed**

- a) Document management
- b) Google drive has been the decided share storage service.

**Item #8 to be discussed**

- a) Scheduling
- b) Most people work jobs, meeting will be scheduled at a time that everyone can attend.

**Adjournment**

1:40 PM

**Next meeting**

To be decided.

## Appendix B – Weekly Progress Report 2

### Weekly Progress Report

This compulsory progress report is to be completed by your DTR or a proxy. Late forms will not be accepted.

In completing this report, please attempt to be honest and transparent. The goal here is to give communicate with your project sponsor on the status of your project, provide accountability to team members, identify any emerging issues, and to later provide you with historical insight into the assignment success or failure.

| Item | Description  | Answer   |
|------|--|--|
| 1.   | Weekly Progress Report:<br>e.g: #1 or #2   | 2  |
| 2.   | Submission Date:   | 05/10/2024   |
| 3.   | Your group name:   | G7   |
| 4.   | Completed by (full-name):  | Nicolas Vidal  |
| 5.   | Email Address  | 20154288@student.curtin.edu.au   |
| 6.   | The name of your organisation/company as decided by the team (if there is no name yet enter N/A) | Excellence Sustainable Engineering   |
| 7.   | Indicate % completion of each section of the assignment:<br>e.g. 20% , not started, completed    | Section 1: 50%   |
|      |  | Section 2: 50%   |
|      |  | Section 3: 50%   |
|      |  | Section 4: Not started   |
|      |  | Section 5: Not started   |
| 8.   | Indicate the health of the assignment project (1 to 5, where 1 is terrible, 5 is excellent):     | € 1<br>€ 2<br>€ 3<br>€ 4<br>€ 5  |
| 9.   | How well is the assignment project progressing?  | Section 1, 2, and 3 has been started with a draft version internally due on 05/10/2024. The remaining two sections to be delegated in the next meeting. All 3 sections have been equally distributed between team members. |

|     |  |  |
|-----|--|--|
| 10. | Please report on the team status and any issues, such as team members not being present at meetings (with or without apologies). Team members being uncontactable or unresponsive. Team members suffering from illness or other issues requiring time away, slowing progress. Consider lack of commitment to team goals, social loafing, and any issues with team cohesion or team morale. | All team members except one attended the last meeting, however apologies were provided in advance. Most team members are responsive to communications and during meetings. No illness or other issues requiring time away. |
| 11. | Briefly list any assignment accomplishments or milestone completions.  | Draft for Section 1, 2, and 3 completed.   |
| 12. | Any assignment issues or risks to report to the Project Sponsor?   | N/A  |
| 13. | Any other comments about your assignment project, positive or negative?  | N/A  |

Meeting Minutes – MGMT3000 project

**Name of Organization:** Excellence Sustainable Engineering (ESE)

**Location:** Online

**Date:** 01/10/2024

**Time:** 11:00 AM

---

### Attendance

Harry Nguyen, Nicolas Vidal, Thomas Inwood, Tashi Lhadon, Dhrubo Troyee, Mayur Purmessur, Nooha Budullah

### Apologies

Corran O'Brien

### Absent

[none]

### Call to order

01/10/2024 at 11:00 AM Chairperson called meeting to order.

### Approval of minutes from 27/09/2024

Motion: to approve the previous meeting minutes as circulated

Motion by: Harry Nguyen

Seconded by: Nicolas Vidal

Resolution: minutes approved

### Additions to the agenda

- Deciding on a company name

### **Approval of the agenda**

Motion: to approve the agenda as circulated

Motion by: Harry Nguyen

Seconded by: Thomas Inwood

Carried or defeated: carried

Resolution: agenda approved

### **Business arising out of the previous meeting**

[none]

### **Item #1 to be discussed**

- a) Considering company roles for section 2.
- b) Nicolas has been assigned CEO. Harry has been assigned COO. Tom has been assigned CFO. Noohas has been assigned marketing manager. Troyee has been assigned general manager. Tashi has been assigned manufacturing manager. Mayur has been assigned project director. Corran has been assigned engineering manager.

### **Item #2 to be discussed**

- a) Distributing work for members to work on in sections 1-3.
- b) Nic and Tom have been assigned section 3. Nooha, Tashi, Troyee and Mayur have been assigned section 2. Corran and Harry have been assigned section 1.
- c) Have a draft or talking point due by 5/10/2024.

### **Item #3 to be discussed**

- a) Decide on a company name.
- b) Nic has suggested Excellence Engineering or Excellence Sustainable Engineering. Everyone has voted for ESE.

### **Adjournments**

11:30 AM

### **Next meeting**

8/10/2024 11:00 AM

## Appendix C - Weekly Progress Report 3

### Weekly Progress Report

This compulsory progress report is to be completed by your DTR or a proxy. Late forms will not be accepted.

In completing this report, please attempt to be honest and transparent. The goal here is to give communicate with your project sponsor on the status of your project, provide accountability to team members, identify any emerging issues, and to later provide you with historical insight into the assignment success or failure.

| Item | Description  | Answer  |
|------|--|---|
| 1.   | Weekly Progress Report:<br>e.g: #1 or #2   | 3   |
| 2.   | Submission Date:   | 12/10/2024  |
| 3.   | Your group name:   | G7  |
| 4.   | Completed by (full-name):  | Nicolas Vidal   |
| 5.   | Email Address  | 20154288@student.curtin.edu.au  |
| 6.   | The name of your organisation/company as decided by the team (if there is no name yet enter N/A) | Excellence Sustainable Engineering  |
| 7.   | Indicate % completion of each section of the assignment:<br>e.g. 20% , not started, completed    | Section 1: 100%   |
|      |  | Section 2: 100%   |
|      |  | Section 3: 100%   |
|      |  | Section 4: 10%  |
|      |  | Section 5: 0%   |
| 8.   | Indicate the health of the assignment project (1 to 5, where 1 is terrible, 5 is excellent):     | <ul style="list-style-type: none"> <li>• 1</li> <li>• 2</li> <li>• 3</li> <li>• 4</li> <li>• 5</li> </ul> |

|     |  |   |
|-----|--|---|
| 9.  | How well is the assignment project progressing?  | Section 1, 2, 3 are complete. The members assigned to Section 4 are behind - they are still putting questions together to send to G3. Our group has met with G17 to answer their questions and G17 are happy with the responses.          |
| 10. | Please report on the team status and any issues, such as team members not being present at meetings (with or without apologies). Team members being uncontactable or unresponsive. Team members suffering from illness or other issues requiring time away, slowing progress. Consider lack of commitment to team goals, social loafing, and any issues with team cohesion or team morale. | In the 3rd weekly meeting, there was 1 absentee, 1 with apologies, and 1 who was late (joined half way through). There has been minimal communication from some team members despite frequent check-ins by myself and other team members. |
| 11. | Briefly list any assignment accomplishments or milestone completions.  | Section 1, 2, and 3 are complete.   |
| 12. | Any assignment issues or risks to report to the Project Sponsor?   | N/A   |
| 13. | Any other comments about your assignment project, positive or negative?  | N/A   |

Meeting Minutes – MGMT3000 project

**Name of Organization:** Excellence Sustainable Engineering (ESE)

**Location:** Online

**Date:** 8/10/2024

**Time:** 11:00 AM

**Attendance**

Harry Nguyen, Nicolas Vidal, Corran O'Brien, Thomas Inwood, Nooha Budullah, Mayur Purmessur (late)

**Apologies**

Tashi Lhadon

**Absent**

Dhrubo Troyee

**Call to order**

8/10/2024 at 11:00 AM Chairperson called meeting to order.

**Approval of minutes from 1/10/2024**

Motion: to approve the previous meeting minutes as circulated

Motion by: Harry Nguyen

Seconded by: Nicolas Vidal

Resolution: minutes approved

**Additions to the agenda**

[none]

**Approval of the agenda**

Motion: to approve the agenda as circulated

Motion by: Harry Nguyen

Seconded by: Thomas Inwood

Carried or defeated: carried

Resolution: agenda approved

**Business arising out of the previous meeting**

[none]

**Item #1 to be discussed**

- a. Section 1 progress
- b. Draft complete. Final revision is 75% complete. Corran getting confirmation of date of completions.
- c. Section 1 to be completed by 7/10/2024 by Harry and Corran.

**Item #2 to be discussed**

- a. Section 2 progress
- b. Draft complete. Needs reviewing. Decided on logo. Waiting for everyone to contribute to specific sections before making decisions for fairness.
- c. Section 2 to be completed by 6/10/2024.

**Item #3 to be discussed**

- a. Section 3 progress
- b. Draft complete. Current work all in excel. Information extracted from Assignment 1 Part 2. Need Nicolas to send some information to other members.
- c. Aiming for 70% - 80% completion by 6/10/2024.

**Item #4 to be discussed**

- a. Friday meeting with G17.
- b. Harry and Nic confirmed they were attending.

**Item #5 to be discussed**

- a. Referencing
- b. Reference based on order of appearance with initials of person who used the reference e.g. [1, H]. Formatting will be performed after all text has been finalized.

**Item #6 to be discussed**

- a. Meeting with G3 to be organized
- b. Members available will contribute to questions and attend online meeting.

**Adjournment**

11:40 AM

**Next meeting**

15/10/2024

## Appendix D – SDG Consulting Report from G17

The SDG Consulting report from G17 was not provided on time before submission of this report.

## REFERENCES

- [1] hGears, “EPMA Sustainability Award - hGears,” *hGears*, Accessed: Oct. 08, 2024. [Online] Available: <https://hgears.com/epma-sustainability-award/>
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- [11] United Nations Department of Economic and Social Affairs, “Goal 6: Ensure availability and sustainable management of water and sanitation for all” *sdgs.un*, Accessed: Oct. 11, 2024. [Online] Available: <https://sdgs.un.org/goals/goal6>

[12] United Nations Department of Economic and Social Affairs, “Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development” *sdgs.un*, Accessed: Oct. 11, 2024. [Online] Available: <https://sdgs.un.org/goals/goal14>