

Student Feedback & Marking Report

Student: Chris Morgan (2512679)

Module: ACMA4000 – Materials and Introduction to Processing

Assessment: Manufacturing Processes and Defects (Report 40% + Video 10%)

REPORT MARKING (40%)

1. Engagement with Literature Skills

Mark Awarded: 14 / 20

The report demonstrates engagement with a reasonable range of sources, including technical platforms (AZoM, SpecialChem), industry and professional websites (BSSA, SIPA, MadeHow), and some academically oriented material. The student uses sources to support material choices and properties, for example citing AZoM (2019) for tensile strength and corrosion resistance of austenitic stainless steel, and LINSEIS (2024) to justify PET's glass transition temperature and thermal limitations. This shows appropriate alignment with the task requirements to support claims with external sources.

However, the engagement with literature remains predominantly descriptive and heavily reliant on web-based and industry sources, with very limited use of peer-reviewed journal literature or core academic texts for materials science. The environmental discussion, including claims about carbon footprint and recyclability of PET compared with glass and aluminium, relies on industry sources (e.g. SIPA, PlasticsEurope) and lacks balance from independent academic lifecycle assessment studies. There is limited synthesis across sources; references tend to be cited individually rather than compared or integrated into a coherent evidence-based argument.

To improve this criterion, the student should incorporate peer-reviewed literature on lifecycle assessment of PET, metals and ceramics, and critically contrast industry claims with independent findings. The inclusion of a short literature synthesis paragraph comparing multiple sources on environmental impact would enhance academic depth. A comparative table drawing on at least two independent sources for lifecycle CO₂ emissions per container would significantly strengthen the evidence base and raise the mark.

2. Knowledge and Understanding Skills

Mark Awarded: 17 / 25

The report shows competent foundational knowledge of materials and manufacturing processes. The student correctly identifies austenitic stainless steel (304/18-8) and links its corrosion resistance, ductility and tensile strength to suitability for cutlery. PET is described with appropriate reference to tensile strength, ductility and suitability for stretch blow moulding, and ceramics are correctly characterised as having high compressive strength, low tensile strength and brittleness. Manufacturing routes are correctly outlined using process flows, such as “Sheet Metal → Blanking → Forming → Annealing → Polishing” for forks and the injection stretch blow moulding route for PET

bottles. These process flow descriptions demonstrate basic understanding of how products are manufactured in practice.

Despite this, explanations often remain at a surface level. The report does not sufficiently explain how processing affects microstructure and, in turn, properties. For example, while cold forming is mentioned for stainless steel, the effects of cold work on strength and ductility are not discussed. The PET processing description mentions wall thickness control but does not link molecular orientation during stretch blow moulding to improved mechanical performance. In the ceramics section, while firing temperatures and thermal stability are mentioned, there is limited explanation of how porosity, grain size and glaze affect strength and thermal shock resistance.

To enhance marks in this criterion, the student should include brief explanations of structure–property–process relationships, for example how molecular orientation in PET improves bottle strength, or how grain size in porcelain influences brittleness and fracture behaviour. A simple schematic illustrating microstructural changes during forming or firing would strengthen conceptual understanding and move the work towards a higher band.

3. Cognitive and Intellectual Skills

Mark Awarded: 11 / 20

The report includes some comparative reasoning, particularly in the manufacturing comparison sections and the discussion of alternatives. For example, the student notes that PET offers “the quickest production rate and lowest cost” compared to glass and aluminium, and that stainless steel is preferred over aluminium and plastic for cutlery due to durability and production rate. There is also an attempt to justify ceramic selection over glass for mugs based on heat retention and flavour neutrality. These elements demonstrate emerging evaluative thinking.

However, the analysis remains largely descriptive, with limited critical evaluation or explicit trade-off analysis. The student states that PET has a lower carbon footprint than glass or aluminium based on industry sources but does not critically assess the assumptions behind these claims or consider lifecycle trade-offs such as single-use versus reuse. Mechanical and thermal property discussions are presented largely as lists of properties rather than being explicitly linked to design trade-offs (e.g. weight versus durability, thermal conductivity versus user safety). There is limited use of comparative metrics or structured evaluation tools.

To significantly improve this criterion, the student should adopt a structured comparison approach, such as a decision matrix comparing alternative materials for each product against criteria like cost, durability, manufacturability and environmental impact. Explicitly articulating trade-offs and design compromises would demonstrate higher-level cognitive and intellectual skills and align more closely with the marking criteria.

4. Practical Application Skills

Mark Awarded: 16 / 25

The selection of a stainless steel fork, PET bottle and ceramic mug is appropriate and allows relevant application of theory to everyday products. The report links material properties to real-world performance, such as corrosion resistance for cutlery, thermal limitations of PET for hot beverages, and heat retention of ceramics for mugs. The lifespan and cost sections show awareness of service conditions, including corrosion resistance leading to decades-long use of forks and single-use limitations of PET bottles. The end-of-life discussion correctly identifies recyclability of stainless steel and the challenges of ceramic recycling.

Nevertheless, the practical application remains somewhat general. Manufacturing constraints are described but not fully linked to real industrial decision-making, such as the impact of tooling costs on production scale or the economic thresholds for different manufacturing routes. The end-of-life discussion is limited to general statements and does not describe actual recycling processes or practical barriers, such as contamination of PET streams or energy intensity of ceramic recycling. There is also limited consideration of design-for-manufacture or design-for-recycling principles in the product examples.

To enhance this criterion, the student should include a simple lifecycle flowchart for each product, showing raw material extraction, manufacturing, use phase, and end-of-life routes. A process flow diagram for PET recycling or stainless steel recycling would demonstrate stronger application of theory to real-world systems. Including a brief discussion of design-for-recycling considerations (e.g. labelling of PET bottles, glaze composition in ceramics) would further strengthen practical application.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 6 / 10

The report is structured in a logical way, with clear aims, objectives and section headings aligned with the task structure of the brief. The use of process flow descriptions and narrative explanation indicates an attempt to communicate technical content clearly. The writing is generally understandable, and the report follows an appropriate academic format with references provided.

However, there are noticeable weaknesses in presentation and academic writing quality. Formatting is inconsistent in places, some headings and tables are implied rather than clearly formatted, and there are several typographical and grammatical errors. The integration of figures and tables is limited; while process flows and references to graphs are mentioned, they are not always clearly labelled or embedded as formal figures with captions. The absence of clearly presented comparative tables for properties, lifespan and cost reduces clarity and professional presentation.

To improve this criterion, the student should present all comparative information in clearly labelled tables and ensure consistent formatting throughout. Including properly formatted figures with captions and explicit references in the text would improve clarity and professional communication. A concise summary table comparing key properties and manufacturing routes would significantly enhance readability and professional presentation.

VIDEO PRESENTATION MARKING (10%)

Video file reviewed: Yes (meeting recording submitted)

Video Technical Content and Communication

Mark Awarded: 5 / 10

The video presentation covers the three objects and correctly identifies their materials and general manufacturing processes. The student explains key mechanical and thermal differences at a basic level and summarises durability and cost considerations. The overall structure broadly follows the required outline of introducing objects, processes and properties, and the student communicates in a clear and understandable manner.

However, the video remains largely descriptive and closely mirrors the report without emphasising engineering trade-offs or comparative reasoning. There is limited explicit comparison between materials and processes, and the justification for why designers prioritise certain properties is not fully articulated. Visual support in the video is minimal, with limited use of diagrams or schematics to reinforce understanding of manufacturing processes. The delivery, while clear, lacks a strong professional structure and could benefit from a more deliberate signposting of sections (e.g. “now I will compare manufacturing processes”).

To enhance the video mark, the student should structure the presentation more explicitly around comparisons and trade-offs, for example directly contrasting blow moulding with glass bottle forming in terms of cost and production rate. Including simple on-screen flowcharts of manufacturing processes or a comparative table of properties would significantly improve clarity and professionalism. More explicit explanation of why alternatives were rejected would also strengthen the technical content.

Overall Summary

Report marks:

Engagement with Literature: 14/20

Knowledge and Understanding: 17/25

Cognitive and Intellectual Skills: 11/20

Practical Application: 16/25

Transferable Skills: 6/10

Video mark: 5/10