

Student Feedback & Marking Report

Student: Connor Ward (2412295)

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: 16 / 20

The report demonstrates strong engagement with a broad and relevant range of sources, including peer-reviewed journal literature (e.g., Duan et al., 2024 on PET supply chain emissions), authoritative textbooks and handbooks (Kutz, 2002), professional bodies (World Stainless Association, 2024), and reputable technical resources (MatWeb, Morgan Advanced Materials, The Open University). The literature is applied appropriately to support key technical and environmental claims, for example the use of Duan et al. (2024) to quantify PET disposal routes (42% landfill, 35% incineration) and World Stainless Association (2024) to contextualise CO₂ emissions associated with stainless steel production. This reflects good alignment with the requirement to evidence claims under Tasks 1–5.

However, while the range of sources is strong, some references are web-based technical summaries (e.g., EngineerCalculator, MakeltFrom) that are used for numerical properties without critical cross-checking against primary datasheets or standards. In places, literature is used to support isolated statements rather than being synthesised to build a comparative argument, for example in the environmental discussion where stainless steel, PET and ceramics are discussed in parallel rather than through a unified lifecycle comparison framework.

To improve this criterion further, the student should synthesise findings across multiple sources into comparative statements, particularly in the environmental and lifecycle sections. The inclusion of a small comparative lifecycle impact table (e.g., indicative CO₂ per functional lifetime of spoon, bottle and mug) derived from two or more independent sources would significantly enhance academic integration and critical use of literature.

2. Knowledge and Understanding Skills

Mark Awarded: 21 / 25

The submission demonstrates strong technical knowledge of materials and manufacturing processes. The student correctly identifies stainless steel grade 304 for spoons and explains its corrosion resistance and suitability for stamping (Section 3.1.1 and Section 4.1). PET processing via injection stretch blow moulding is clearly described (Section 4.2), with appropriate discussion of high production speed and capital cost, and ceramics are linked to slip casting with modern process enhancements such as pressurisation and vacuum dewatering (page xi). The mechanical and thermal properties comparison table (page xii) clearly presents quantitative data for strength, ductility, modulus and temperature limits, supporting material selection arguments. The report also

demonstrates awareness of structure–property–performance relationships, for example linking PET’s ductility to deformation without fracture and ceramics’ low ductility to brittle behaviour.

A minor limitation is that some process–microstructure links could be made more explicit. For example, while stamping is discussed in terms of cost and scalability, the effects of cold work on stainless steel microstructure and its influence on final properties are not explicitly addressed. Similarly, the ISBM process is described in terms of productivity, but the role of molecular orientation in enhancing PET bottle strength could be more clearly linked to the reported mechanical behaviour.

To reach the highest band, the student should include brief explanations of how processing modifies microstructure (e.g., strain hardening in stainless steel, biaxial orientation in PET during ISBM) and how this directly influences the measured properties presented in Table 1. A simple schematic illustrating structure–property links would further strengthen conceptual clarity.

3. Cognitive and Intellectual Skills

Mark Awarded: 16 / 20

The report demonstrates clear comparative and evaluative thinking. The student explicitly compares PET with glass for bottles, noting that glass is more sustainable but less suitable for daily use due to brittleness, while PET’s ductility and high production efficiency justify its selection (Section 7.2). The discussion of stainless steel versus polypropylene for spoons weighs thermal resistance and strength against production requirements (Section 7.1), showing appropriate trade-off analysis. The conclusion synthesises these comparisons, for example arguing that stainless steel’s superior resistance to fracture under impact makes it more suitable than ceramics for coffee mugs’ daily operating conditions.

The evaluative reasoning is generally well supported by property data and manufacturing considerations. However, some trade-offs could be quantified more explicitly. For instance, while sustainability is mentioned as a reason to consider glass over PET, the magnitude of environmental differences is not directly compared using consistent metrics. The decision-making remains primarily qualitative, with limited use of structured evaluation tools.

To enhance this criterion, the student could introduce a simple weighted decision matrix for each product, comparing original and alternative materials against criteria such as strength, manufacturability, cost and environmental impact. This would demonstrate more formal engineering judgement and strengthen the analytical depth of the comparisons.

4. Practical Application Skills

Mark Awarded: 20 / 25

The choice of everyday objects is appropriate and allows strong application of theory to real-world products. The report effectively links material properties to real service conditions, for example explaining that PET’s glass transition temperature restricts bottles to cold or ambient liquids (Section 4.2 and Section 5.1), and that stainless steel’s corrosion resistance and heat resistance enable decades-long use in cutlery (Section 6.1). The inclusion of quantitative lifespan and environmental

disposal data for PET (Section 6.2) demonstrates good contextualisation of materials within real usage and environmental systems. The manufacturing process descriptions are clearly tied to industrial realities of production volume and cost, particularly for ISBM and metal stamping.

The practical application could be strengthened further by more explicit discussion of design-for-manufacture and design-for-recycling considerations, such as how bottle geometry affects wall thickness uniformity in ISBM, or how glaze composition influences recyclability of ceramics. End-of-life pathways are discussed but not visualised, which limits clarity of lifecycle thinking.

To significantly enhance this criterion, the student should add a lifecycle flow diagram for each product (raw material → manufacturing → use → end-of-life), explicitly showing recycling and disposal routes. A simple schematic of PET bottle recycling or stainless steel recycling would improve the practical application of lifecycle concepts and demonstrate deeper engagement with real-world engineering systems.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 8 / 10

The report is professionally structured, with a clear abstract, contents page, literature review, logically ordered sections, and a comprehensive reference list. Figures and tables are appropriately included and labelled, notably the manufacturing process diagrams (pages ix–xi) and the mechanical and thermal properties table (page xii), which support clarity and readability. The writing style is coherent and technically appropriate for Level 4, with generally good academic tone and referencing practice.

Minor weaknesses include occasional formatting inconsistencies and opportunities to integrate figures more explicitly into the analytical narrative (e.g., more direct reference in the text to what each process diagram demonstrates about manufacturability or defects). Some tables could be further explained in terms of implications for design decisions.

To improve this criterion further, the student could provide short interpretive captions or brief explanatory sentences in the main text directly referencing each figure's relevance to the argument. A summary comparison table consolidating key properties, costs and environmental impacts in one place would further enhance professional communication.

VIDEO PRESENTATION MARKING (10%)

Video file reviewed: Yes (presentation MP4)

Video Technical Content and Communication

Mark Awarded: 7 / 10

The video clearly introduces the three objects and accurately identifies their materials and primary manufacturing processes. The student explains key mechanical and thermal differences in accessible terms and demonstrates understanding of why each material–process combination is used in practice. The structure broadly follows the required sequence of object identification, process

explanation, property comparison and alternatives, indicating good alignment with the brief. Communication is clear, and the delivery is generally professional and easy to follow.

However, the video would benefit from more explicit comparative framing and visual reinforcement. While differences between materials are mentioned, the engineering trade-offs (e.g., sustainability versus manufacturability, ductility versus brittleness) could be more explicitly articulated as design decisions. Visual aids are limited; incorporating simple on-screen process flow diagrams or a condensed property comparison table would strengthen clarity and technical communication.

To improve the video mark, the student should structure the narrative more clearly around trade-offs and design rationale, for example explicitly stating why PET is chosen over glass despite sustainability concerns, or why stainless steel is preferred over ceramics for impact resistance in mugs. Including one or two concise on-screen diagrams would significantly enhance the professional quality and technical clarity of the presentation.

Overall Summary

Report marks:

Engagement with Literature: 16/20

Knowledge and Understanding: 21/25

Cognitive and Intellectual Skills: 16/20

Practical Application: 20/25

Transferable Skills: 8/10

Video mark: 7/10