

Student Feedback & Marking Report

Student: Joseph Davies (2502677)

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: 15 / 20

The report demonstrates engagement with a reasonable range of technical and industry sources, including Callister & Rethwisch (2020) for foundational materials science, MatWeb for aluminium alloy A356 property data, Fractory and MFG Shop for casting process comparisons, the British Plastics Federation for PET context, and several industry and educational web sources for manufacturing routes and lifespan information. These sources are applied to support claims about aluminium engine blocks, PET water bottles and porcelain plates, and show that the student has consulted appropriate reference material to underpin the main descriptive content of the report.

However, the literature base is dominated by web and industry sources, with no peer-reviewed journal articles or independent lifecycle assessment (LCA) studies used to support environmental and sustainability claims. Several sources are blog-style or commercial websites, which limits academic depth. The literature is used largely to support isolated statements rather than being synthesised into coherent comparative arguments, particularly in the sustainability and lifecycle sections. There is also limited critical evaluation of the reliability of sources used for environmental claims such as PET decomposition times.

To improve this criterion, the student should integrate at least two peer-reviewed or authoritative academic sources on lifecycle impacts of aluminium, PET and ceramics, and synthesise findings into a comparative lifecycle paragraph or table. This would strengthen critical engagement with literature and raise the mark.

2. Knowledge and Understanding Skills

Mark Awarded: 19 / 25

The submission demonstrates basic to sound understanding of materials classes, manufacturing processes and properties. The identification of aluminium alloy A356 for engine blocks is appropriate, and the description of sand casting is generally correct, including recognition of low tooling cost and limitations in cooling rate control. The PET water bottle section correctly identifies blow moulding as a suitable high-volume process, and the porcelain plate section outlines press moulding and kiln firing. The report includes mechanical and thermal property tables for aluminium, PET and porcelain, showing awareness of comparative property ranges across metals, polymers and ceramics.

Nevertheless, there are several technical weaknesses and inaccuracies that limit the mark in this criterion. The mechanical property ranges reported for PET (e.g. tensile strength and ductility ranges spanning several orders of magnitude) are unrealistic and suggest uncritical extraction of database

ranges without contextual interpretation. The statement that porcelain has “0” tensile and yield strength is incorrect; ceramics have low tensile strength relative to metals but not zero. The comparison section contains conceptual errors, such as stating that PET has higher tensile strength than aluminium, which is not supported by the data presented. The structure–property–process relationships are described superficially, with limited explanation of why aluminium dissipates heat well at the microstructural level, or how polymer chain mobility influences PET behaviour.

To improve this criterion, the student should ensure technical accuracy of property data, critically interpret ranges from databases, and clearly link processing to microstructure and microstructure to properties. Correcting misconceptions in the comparison section and adding short explanatory passages on structure–property relationships would significantly strengthen the level of understanding demonstrated.

3. Cognitive and Intellectual Skills

Mark Awarded: 15 / 20

The report includes some comparative reasoning, particularly in the alternative materials section, where aluminium engine blocks are compared with cast iron, PET bottles with metal bottles, and ceramic plates with plastic plates. The discussion identifies trade-offs between weight, strength, cost and environmental considerations, and the student articulates personal judgement in selecting aluminium over cast iron and ceramics over plastics for plates. This indicates emerging evaluative thinking.

However, the evaluation is largely qualitative and sometimes inconsistent with the property data presented. Trade-offs are stated but not critically examined or supported by structured analysis. Environmental considerations are mentioned but not assessed systematically across the full lifecycle, and economic trade-offs are discussed without clear comparison of total cost of ownership. The reasoning is often assertive rather than analytical, with limited justification using quantitative metrics.

To enhance this criterion, the student should adopt a more structured evaluative framework, such as a simple decision matrix ranking original and alternative materials against weighted criteria (performance, cost, manufacturability, sustainability). Explicitly justifying the prioritisation of criteria for each application would demonstrate stronger cognitive and intellectual skills.

4. Practical Application Skills

Mark Awarded: 17 / 25

The selection of everyday objects is appropriate and allows application of materials and manufacturing theory to real-world contexts. The report links material properties to service requirements, such as thermal conductivity for engine cooling, low cost and high production rate for PET bottles, and chemical resistance for porcelain plates. Manufacturing processes are described in practical terms, and cost and lifespan considerations are included, which demonstrates awareness of real-world engineering constraints.

The practical application is supported by several product images and process figures (e.g. sand casting, blow moulding, press moulding), which helps contextualise manufacturing routes. In line with the marking approach, the presence of multiple figures and tables supports a moderate mark in this criterion. However, the figures are largely illustrative and not integrated analytically into the discussion. There are no lifecycle flow diagrams, and degradation or defect mechanisms are not visualised. The end-of-life discussion is descriptive and not supported by process-level visuals.

To significantly enhance this criterion, the student should include explicit lifecycle flow diagrams for each product (raw material → manufacturing → use → end-of-life) and at least one figure illustrating typical defects or degradation mechanisms (e.g. casting porosity in aluminium, polymer degradation in PET, thermal shock cracking in porcelain). Clear process flowcharts with brief analytical commentary would also strengthen practical application.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 7 / 10

The report is clearly structured with an abstract, aims and objectives, contents page, and logically organised sections aligned with the coursework tasks. The inclusion of multiple tables and figures supports communication of technical information, and referencing is generally consistent. The writing is coherent and understandable, with appropriate academic tone for Level 4.

However, presentation quality is uneven. There are duplicated figure captions, formatting inconsistencies, and some typographical and grammatical errors. Several figures are included without sufficient interpretation in the main text, and some tables contain unrealistic or uncontextualised data. The overall professional presentation would benefit from tighter editing and clearer integration of visuals into the analytical narrative.

To improve this criterion, the student should ensure consistent formatting and figure labelling, remove duplicated captions, and provide brief interpretive commentary for each table and figure to guide the reader. A concise summary table consolidating key trade-offs across all three products would enhance professional communication.

VIDEO PRESENTATION MARKING (10%)

Video file reviewed: Yes (meeting recording submitted)

Video Technical Content and Communication

Mark Awarded: 7 / 10

The video introduces the three products and identifies their materials and manufacturing processes. The student explains, in general terms, why aluminium is used for engine blocks, PET for bottles and porcelain for plates, and mentions alternatives. The delivery is understandable and broadly structured.

However, the video remains largely descriptive and mirrors the report without strong comparative analysis or explicit engineering trade-off discussion. Visual support is limited, with little use of on-

screen process diagrams, comparative tables or lifecycle visuals to reinforce understanding. Sustainability and lifecycle considerations are only briefly addressed.

Consistent with the marking approach that rewards strong visual evidence, the limited use of on-screen diagrams constrains the video mark. To improve, the student should include simple on-screen process flow diagrams for sand casting, blow moulding and press moulding, and a concise comparison table of properties or lifecycle impacts to support verbal explanations. Clearer signposting of sections and a stronger concluding synthesis of trade-offs would also enhance technical communication.

Overall Summary

Report marks:

Engagement with Literature: 14/20

Knowledge and Understanding: 19/25

Cognitive and Intellectual Skills: 15/20

Practical Application: 17/25

Transferable Skills: 7/10

Video mark: 7/10