

Student Feedback & Marking Report

Student: Charlie Gallagher (2416608)

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 a good breadth of sources, including core academic texts such as Ashby et al. (2018) and Callister & Rethwisch (2017), alongside relevant industry and professional sources including thyssenkrupp (2017), the British Plastics Federation (2025), and the American Ceramic Society (2025). The literature is clearly applied to support key claims, for example when the student explains the corrosion resistance of stainless steel by linking chromium content to oxide layer formation, and when PET tensile strength values are taken from a datasheet to justify suitability for beverage bottles. These examples show appropriate engagement with literature to support material choice and properties, in line with the assessment brief.

However, the engagement remains largely descriptive and source-by-source, with limited synthesis across multiple sources. The environmental impact discussion, including statements such as plastic bottles releasing microplastics into ecosystems, is supported by general sources but lacks recent peer-reviewed lifecycle or environmental impact studies. The reliance on industry websites for production rates and costs, while acceptable at Level 4, limits the academic depth of the work. There is also limited critical comparison between sources, for example contrasting different datasets for material properties or environmental performance.

To improve this criterion, the student should integrate recent peer-reviewed journal articles on lifecycle assessment and sustainability of metals, polymers and ceramics. A short synthesis paragraph comparing multiple sources on environmental impact would strengthen the academic rigour. A comparative lifecycle impact table (e.g. CO₂ per functional lifetime of each product) would significantly enhance the mark.

2. Knowledge and Understanding Skills

Mark Awarded: 19 / 25

The submission demonstrates sound knowledge of materials and processes appropriate to Level 4. The student correctly identifies austenitic stainless steel (18/8) and explains its face-centred cubic crystal structure, linking this to toughness and plastic deformation behaviour. PET is accurately described in terms of polymer chain structure and melt processability, and ceramics are discussed with reference to ionic and covalent bonding, brittleness, and high heat resistance. Manufacturing processes are correctly matched to products, with stamping for spoons, blow moulding for bottles, and slip casting for mugs, and the report explains key process characteristics such as production rate and tooling cost.

Nevertheless, some explanations lack depth in linking processing to microstructure and performance. For example, while stamping is described as repeatable and efficient, there is no discussion of how plastic deformation during stamping may induce work hardening and affect the final mechanical behaviour of the spoon. Similarly, the low melting point of PET is noted, but the implications for deformation under hot liquids or temperature limits in service are not fully explored. In the ceramics section, the relationship between grain size and fracture behaviour is mentioned but not explained mechanistically.

The mark could be improved by including a short explanatory diagram linking forming processes to microstructural changes (e.g. grain elongation during stamping) and a concise structure–property–performance mapping table for each material. These additions would demonstrate deeper conceptual understanding and strengthen alignment with the knowledge and understanding criterion.

3. Cognitive and Intellectual Skills

Mark Awarded: 13 / 20

The report includes comparative elements, particularly in the manufacturing methods and properties sections. The student compares production rates and costs between stamping, blow moulding and slip casting, and explains why blow moulding is particularly cost-effective for high-volume PET bottle production. The mechanical and thermal properties table enables relative comparison between materials, and the narrative justifies why stainless steel combines strength and corrosion resistance, PET provides lightweight toughness, and ceramics offer superior heat resistance at the expense of brittleness. The alternatives section also demonstrates emerging evaluative thinking, for example in the comparison between aluminium and stainless steel for cutlery.

However, much of the analysis remains descriptive rather than evaluative. Trade-offs are stated but not quantified or critically explored. For instance, while aluminium is identified as lighter, the report does not estimate the magnitude of mass reduction or discuss how this might affect user perception or durability. Environmental impacts are discussed qualitatively without comparative metrics. There is limited use of structured decision-making tools to justify material and process selection.

To enhance marks in this criterion, the student should include a simple multi-criteria decision matrix comparing candidate materials for each product against weighted criteria such as cost, durability, manufacturability and environmental impact. Incorporating even basic quantitative comparisons (e.g. density differences translated into percentage weight change) would strengthen the evaluative depth and demonstrate more advanced cognitive skills.

4. Practical Application Skills

Mark Awarded: 18 / 25

The chosen objects are appropriate everyday products that allow clear application of materials and manufacturing theory. The report effectively links properties to real-world use, such as corrosion resistance for cutlery in contact with liquids, gas barrier properties for PET bottles, and thermal insulation for ceramic mugs. The discussion of degradation mechanisms, including corrosion for stainless steel, UV and heat degradation for PET, and chipping for ceramics, shows good awareness of

service conditions. Environmental considerations are also applied to real contexts, particularly in the discussion of single-use PET bottles versus longer-life metal and ceramic products.

The practical application could be strengthened by deeper engagement with manufacturing constraints and end-of-life realities. The discussion of tooling cost in stamping, for example, is not linked to production volume thresholds or economic decision-making. Recycling and disposal pathways are described generally but without process-level detail. There is limited discussion of how design choices (e.g. wall thickness in bottles, glazing in ceramics) influence durability and recyclability in practice.

The mark could be enhanced by adding a process flow diagram for end-of-life pathways of each product (reuse, recycling, landfill) and a brief discussion of real recycling challenges. A simplified lifecycle flowchart for PET bottle recycling or stainless steel recycling would significantly strengthen the practical application dimension of the work.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 7 / 10

The report is professionally structured, with an abstract, table of contents, lists of figures and tables, and clearly labelled sections aligned with the coursework tasks. The writing is generally coherent and technically appropriate, and the use of tables and figures supports clarity. The inclusion of comparative tables for manufacturing methods, properties and lifespan demonstrates good communication of technical information. Referencing is consistent with Harvard style and figures are captioned.

Minor weaknesses are evident in formatting consistency and integration of visuals into the narrative. Some figures are presented without sufficient explanation of their relevance to the argument, and there are minor typographical and stylistic inconsistencies. Greater explicit reference to what each figure demonstrates in relation to material selection or process suitability would improve clarity and professional communication.

To enhance this criterion, the student should ensure all figures and tables are explicitly discussed in the text and linked to the analytical points being made. A single summary flowchart showing the full manufacturing route for each object would further improve the clarity and professional presentation of the report.

VIDEO PRESENTATION MARKING (10%)

Video file reviewed: Yes (MP4 submitted)

Video Technical Content and Communication

Mark Awarded: 6 / 10

The video provides a clear overview of the three selected objects and correctly identifies their primary materials. The student explains, in general terms, the manufacturing processes used and highlights key differences in mechanical and thermal properties. There is an attempt to summarise durability

and cost considerations, and the presentation broadly follows the required structure of introducing objects, processes, properties and alternatives. The delivery is clear and understandable, demonstrating basic professional communication skills.

However, the video remains largely descriptive and closely mirrors the report content without sufficiently emphasising comparative trade-offs or engineering judgement. For example, while differences between materials are mentioned, the rationale for why designers prioritise certain properties over others is not explored in depth. The discussion of alternatives is brief and does not fully articulate the engineering reasoning behind accepting or rejecting alternatives. Visual support in the video is limited; while objects are shown, there is little use of diagrams or simple process schematics to reinforce understanding of manufacturing routes.

To improve the video mark, the student should structure the presentation more explicitly around engineering trade-offs, for example explaining why blow moulding is preferred over injection moulding for hollow bottles in terms of cost and production rate, or why ceramics are chosen over glass for mugs in terms of thermal shock resistance. Including one simple on-screen flowchart of each manufacturing process or a comparative table of properties would significantly enhance technical clarity and communication quality.

Overall Summary

Report total (out of 100 within Generic Criteria framework):

Engagement with Literature 15/20

Knowledge and Understanding 19/25

Cognitive and Intellectual Skills 13/20

Practical Application 18/25

Transferable Skills 7/10

Video total: 6/10