

Student Feedback & Marking Report

Student: Hywel Cleaves (2520281)

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 a good range of sources drawn from professional bodies, industry and technical websites (British Plastics Federation; W.H. Tildesley; Ceramic Coffee Cup; MatWeb; Precision Ceramics; SKS), alongside datasheets for high-speed steel (HS 6-5-2) and market reports for production volumes and costs. These sources are applied to support material choice, manufacturing processes and property data, for example when justifying PET use in disposable bottles, slip casting for ceramic mugs, and drop forging for HSS woodturning chisels. The inclusion of production volume estimates and market value data shows engagement with industrial context.

However, the literature base is dominated by web and industry sources, with limited use of core academic textbooks or peer-reviewed journal articles. Some references are commercial or restricted-access market reports, which limits transparency and verifiability of data. The sustainability discussion is supported by NGO sources (e.g. Surfers Against Sewage) but would benefit from triangulation with peer-reviewed lifecycle assessment literature. The report uses sources largely to support isolated statements rather than synthesising evidence into comparative arguments.

To improve this criterion, the student should incorporate at least two academic or peer-reviewed sources on lifecycle assessment of plastics, metals and ceramics, and synthesise findings across multiple sources in the sustainability section. A comparative lifecycle impact table (e.g. indicative CO₂ per functional lifetime of bottle, mug and chisel) derived from independent sources would significantly strengthen critical engagement with literature.

2. Knowledge and Understanding Skills

Mark Awarded: 17 / 25

The submission demonstrates sound foundational knowledge of materials and manufacturing processes. The student correctly identifies M2 high-speed steel for woodturning chisels and describes drop forging with appropriate mention of recrystallisation temperature ranges, die forming and subsequent heat treatment and grinding. Stretch blow moulding for PET bottles is accurately described in terms of preform formation, axial stretching and inflation within a mould. Slip casting for ceramic mugs is explained clearly, including slurry preparation, moisture absorption by plaster moulds, firing and glazing. The material properties table correctly distinguishes strength, ductility, formability and heat resistance across PET, ceramics and HSS.

Nevertheless, some explanations remain descriptive and contain minor inaccuracies or oversimplifications. For example, the melting point range for PET is stated without clear distinction

between glass transition temperature and melting temperature, which can be misleading in a design context. The explanation of microstructural mechanisms underlying HSS performance (e.g. carbide strengthening, secondary hardening) is not developed, and the ceramic microstructure–property relationship (porosity, grain size and brittleness) is not explicitly explained. The structure–property–performance linkage is present in general terms but could be more technically rigorous.

To enhance this criterion, the student should refine technical accuracy (e.g. clearly distinguish T_g and T_m for polymers) and include short explanatory passages linking processing to microstructure and microstructure to properties, particularly for HSS and ceramics. A simple schematic linking processing → structure → properties for each material class would strengthen conceptual understanding.

3. Cognitive and Intellectual Skills

Mark Awarded: 12 / 20

The report demonstrates some evaluative reasoning in the material selection and alternatives section. The student compares PET bottles with stainless steel bottles, ceramic mugs with plastic mugs, and HSS chisels with carbon steel alternatives, identifying trade-offs between cost, durability, thermal performance and environmental impact. These comparisons indicate an understanding that material selection involves balancing multiple competing criteria rather than choosing solely on one property.

However, the evaluation remains largely qualitative and descriptive. Trade-offs are stated but not critically analysed or structured within a formal comparison framework. For example, the environmental implications of switching from PET to stainless steel bottles are mentioned but not quantified or assessed across the full lifecycle. The discussion of carbon steel versus HSS chisels acknowledges cost versus edge retention but does not evaluate the implications for total cost of ownership or tool lifespan. There is limited synthesis of evidence to support evaluative judgement.

To strengthen this criterion, the student should adopt a more structured comparative approach, such as a simple decision matrix ranking original and alternative materials against weighted criteria (cost, performance, durability, sustainability). Explicitly articulating why certain trade-offs are prioritised in design decisions would demonstrate stronger cognitive and intellectual skills.

4. Practical Application Skills

Mark Awarded: 16 / 25

The chosen objects are appropriate everyday products that allow application of materials and manufacturing theory to real-world contexts. The report links material properties to service requirements, such as corrosion resistance and edge retention for chisels, lightweight formability for PET bottles, and heat resistance and chemical stability for ceramic mugs. The manufacturing processes selected are realistic for industrial production, and production rate and cost considerations are discussed in a comparative table.

The practical application is supported by a reasonable number of figures and tables, including images of products, process schematics and comparative tables for manufacturing processes, properties

and lifespan. This visual evidence strengthens understanding and justifies a mid-range mark in line with the marking approach. However, the lifecycle and end-of-life discussion is largely textual and not supported by dedicated lifecycle flow diagrams. The discussion of defects and degradation mechanisms (e.g. ceramic chipping, PET degradation, tool wear) would benefit from illustrative figures or schematics showing typical failure modes.

To significantly enhance this criterion, the student should include explicit lifecycle flow diagrams for each product (raw material → manufacture → use → end-of-life) and at least one figure illustrating typical defects or degradation mechanisms for each material class. This would deepen real-world contextualisation and strengthen application of theory to practice.

5. Transferable Skills for Life and Professional Practice

Mark Awarded: 7 / 10

The report is clearly structured with an abstract, contents page, list of figures, and well-organised sections aligned with the coursework tasks. The inclusion of multiple tables (manufacturing comparison, material properties, lifespan and cost) supports professional communication of technical information. Figures are labelled and referenced, and the report demonstrates generally coherent academic writing.

Minor weaknesses include formatting inconsistencies, occasional grammatical errors, and limited interpretive commentary on some tables and figures. In some cases, figures are presented without sufficient explanation of what the reader should infer from them in relation to material selection or process suitability.

To improve this criterion, the student should ensure consistent formatting and provide brief interpretive commentary for each figure and table, explicitly linking visual evidence to the analytical argument. A concise summary table consolidating key trade-offs across all three products would further enhance professional presentation.

VIDEO PRESENTATION MARKING (10%)

Video file reviewed: Yes (MP4 submitted)

Video Technical Content and Communication

Mark Awarded: 6 / 10

The video introduces the three products and correctly identifies their primary materials and manufacturing processes. The student explains key mechanical and thermal differences and mentions alternative materials. The delivery is generally clear and the presentation broadly follows the required structure.

However, the video remains largely descriptive and does not sufficiently emphasise comparative trade-offs or engineering judgement. Visual support is limited to basic imagery of the products, with little use of on-screen process diagrams or comparative tables to reinforce understanding. The

sustainability and lifecycle considerations discussed in the report are only briefly touched upon in the video.

In line with the marking approach that rewards visual and tabular evidence, the limited use of on-screen diagrams constrains the video mark. To improve, the student should incorporate simple process flow diagrams for drop forging, stretch blow moulding and slip casting, and a concise comparative table of properties or lifecycle impacts to support verbal explanations. Clearer signposting of sections and a stronger concluding synthesis would further enhance communication quality.

Overall Summary

Report marks:

Engagement with Literature: 16/20

Knowledge and Understanding: 17/25

Cognitive and Intellectual Skills: 12/20

Practical Application: 16/25

Transferable Skills: 7/10

Video mark: 6/10