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**Material Shaping Processes**

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**Acknowledgement**

Mr John Gibson is a highly regarded educator and engineer. John taught Industrial Arts at a number of high schools before taking a position at Sydney Teachers’ College, then University of Sydney. He had an engineering education consultancy and has extensive experiencing working with NESA on Engineering Studies syllabus development and the HSC examination committee. The STEM Industry School Partnerships (SISP) Program asked John for his responses to the iTeachSTEM topic discussion questions. SISP is grateful to John for submitting these example discussion responses.

# Discuss each of these categories of shaping material:

* casting ~ the pouring of liquid into prepared moulds
* manipulative processes ~ involving plastic deformation of the material
* powder techniques ~ the shape is produced by compacting a powder
* cutting, joining and grinding operations

1. **Explain how the shaping processes are dependent on material used and shape requirements of the produce.**

The in-service properties required of an object, along with the shape requirements of the object, generally determine the most efficient and economical way of production. That is, the shape requirements of the product are a significant factor in deciding the manufacturing process. Manufacturing techniques are often linked to particular shapes as well as being linked to particular materials.

Examples ~

* thermo-softening polymers to injection moulding
* steel to cold and hot rolling
* thermosetting polymers to moulding
* aluminium to extrusion

1. **Describe the production of items considering the raw materials, preparation for forming, the forming process, and testing for quality.**

* for metals**:** discriminate between cold working processes (press work, cold forging, rolling, coining) and hot working (casting, hot forging, powder forming)
* for thermosetting polymers: hot compression moulding, transfer moulding
* for thermo-softening polymers: injection moulding, extrusion, blow moulding, calendaring, vacuum forming
* for ceramics, including glass: hand forming, flat drawn glass (industrial glass), blown glass, casting, extrusion (bricks)