Compression molding

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Introduction

• Molding is the forming process.

• Compression molding process is followed by two step first one **preheating** and **pressurizing**

• Compression molding is generally used for thermosetting plastic.
History

Initially plastic molding compound known as *Florence compound*. Its inventor, Alfred Critchlow, founded the Pro Corporation, Florence MA in 1847. Pro is said to be the first plastics molding company.
Large scale compression molding press (c.1935).

Trimming flash from Ekco radio cabinets (c.1934).

Image courtesy  http://course1.winona.edu
Process Description

1. Measured Powder

2. Mold Closes Under Heat & Pressure

3. Mold Opens

4. Final Product
Stages in Compression molding cycle
Parameters

1. The quantity of charge (molding material) put into the mold

2. Pressure of the molding process
   • Range of pressure 2000-3000 psi (13.8-20.7 MPa) [4]

3. Mold temperature
   • Temperature range 300ºF to 375ºF (149ºC - 191ºC) [4].

4. Cure time variables.
   • The period required to harden thermosetting material to partial and complete polymerization is called cure time [4].
Mold

Press

Image courtesy  http://course1.winona.edu
Types of compression molding

Sheet molding compound (SMC)
• Placing a reinforcement, such as a glass mat, between sandwiching layers of a thermoplastic

Bulk molding compound (BMC)
• Billet is used with efficiently placed and distributed long reinforcement
Advantages

• Lowest cost
• More uniform density
• Uniform shrinkage due to uniform flow
• Improved impact strength due to no degradation of fibers during flow
• Dimensional accuracy
• Internal stress and warping are minimized
Disadvantages

• Curing time large
• Uneven parting lines present
• scrap cannot be reprocessed.

Applications & products

• Dinnerware
• Buttons
• Knobs
• Appliance Housings
• Radio Cases
• Automotive exterior panels especially for commercial vehicles
• ash trays & electrical parts
Materials used in this process

A) Thermosetting polymers:

B) Fiber reinforced composite

C) Thermoplastic:

- Ultra High Molecular Weight Polyethylene (UHMWPE)
- Long Fiber reinforced Thermoplastics
Material properties affected by the process

• Density
• Strength
• Anisotropic property (fiber orientation)

Fiber orientation induced by the material flow in the mold. Image courtesy [7]

• Shrinkage and wrapage
References

3. Manufacturing Process for Engineering Materials, By Serope Kalpakjian & Steven R. Schmid,
   By Edward Miller, Society of Plastics Engineers
Thank you