

CHAPTER 18

Hot-Working Processes

Review Questions

1. Metal forming probably began with "tools" as simple as rocks being used to shape bits of naturally-occurring metal. Hand tools and muscle power then gave way to machine processes during the industrial revolution. The machinery further evolved, becoming bigger, faster, and more powerful, and the sources of power also changed. Most recently, computer control and automation have been incorporated.

2. Various means have been used to classify metal forming process. These include: (1) primary processes that produce intermediate shapes, and secondary processes that produce finished or semifinished products; (2) bulk deformation processes and sheet-forming operations; and hot-working processes and cold-forming processes .

3 . The division of metal forming processes into hot working and cold working is quite artificial. With increased emphasis on energy conservation, the growth of warm working, and new advances in technology, a temperature classification is often arbitrary. Processes normally considered as hot forming processes are often performed cold and cold-forming processes can often be aided by some degree of heating.

4. At elevated temperatures, metals weaken and become more ductile. With continual recrystallization, massive deformation can take place without exhausting material plasticity. In steels, hot forming involves the deformation of the weaker austenite

structure as opposed to the much stronger, room temperature ferrite .

5. Ingots are usually the primary product supplied to rolling mills. Rolling is used to convert the primary product to wrought products that are called by different terms depending on cross section size and shape.

Simple cross section shape products of rolling such as rectangular, square or circular sections are separated by size with

- blooms having thickness greater than 15 cm,
- billets smaller than blooms with rectangular or circular cross section shape,
- slabs have rectangular section shape with width greater than twice the thickness,
- plates, sheets and strips have rectangular cross sections with differing width to thickness ratios.

Blooms and billets can be further rolled to slightly more complex cross section shapes to produce semifinished shapes such as bars and rods that are usually processed further.

Still more complex shapes can be produced by further rolling of billets, bars and rods to produce structural shapes finished products such as channel sections, I-beams and railroad rails.