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## Pack Carburizing

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### Advantages and Disadvantages

Pack carburizing is no longer a major commercial process. This has been mainly due to replacement by more controllable and less labor-intensive gas and liquid carburizing processes. However, any labor cost advantage that gas carburizing or liquid carburizing may have over pack carburizing can be negated should workpieces require additional steps such as cleaning and the cation of protective coatings in carburizing stopoff operations. Environmental concerns have also led to reduced use of pack carburizing. It still has application to some specialized uses, however.

**Advantages.** Among the principal advantages of pack carburizing are:

- It has low equipment and operating costs.
- It can make use of a wide variety of furnaces because it produces its own contained environment.
- It is ideally suited for slow cooling of work from the carburizing temperature, a procedure that may be advantageous for parts that are to be finish machined after carburizing and before hardening.
- Compared to gas carburizing, it offers a wider selection of stopoff techniques for selective carburizing.

**Disadvantages.** By its nature, pack carburizing is less clean and less convenient than other carburizing processes. Other disadvantages generally associated with pack carburizing include:

- It is not well suited to production of shallow case depths where strict case-depth tolerances are required.
- It cannot provide the degree of flexibility and accuracy of control over surface carbon content and carbon gradient that can be obtained in gas carburizing.
- Long heatup time is required to reach process temperatures. More processing time is required for pack carburizing than for gas or liquid carburizing because of the necessity of heating and cooling the extra thermal mass associated with the compound and the container.
- It is not well suited for direct quenching or quenching in dies; it is difficult (but possible) to harden directly from the carburizing box. Extra handling and processing are required to cool down and reheat to austenitizing temperatures.
- Decarburization can occur if components are allowed to air cool without protection.
- Grinding is necessary to remove surface porosity.
- It is labor intensive.