PARTICLEBOARD

By definition, wood particleboard are usually of medium density, are made in panel form from dry wood particles that have been coated with a binder, and are formed and bonded to shape by pressure and heat. They are known by several names, including chipboard, chipcore, core board, synthetic lumber, and composition board. The boards can be made from almost any type of wood, whole or residue, and of any species, but generally the lower density woods are preferred. Other forms of lignocellulosic raw materials also are used to a lesser extent. For specific properties, careful selection of residues and species are important.

The particleboard industry started in Europe during and shortly after World War II. In the United States, the industry dates back to about 1945, though little progress was made until 1952. Since then, the particleboard industry has grown rapidly, and at present about 70 plants are in production. The present total productive capacity, based on the 3/4-inch thickness, is over 4.0 billion square feet a year. Actual production is about 3.6 billion square feet or about 5 million tons.

Particleboard is used for furniture, tabletops, doors, underpayment, wall paneling, and many other purposes. Core stock for furniture represents the largest single use. At present, particleboard goes mainly into interior applications. As the structural and engineering properties are developed and improved, a large outlet for particleboard may develop in the construction field.

There are two major processes of making particleboard: (1) Pressing the boards flatwise in single or multiple-opening hot presses, and (2) continuously extruding the boards through a hot extrusion die.
Boards made by the pressing method are commonly called flat-pressed boards, and those made by the extrusion method are called extruded boards. At present, flat-pressed boards made in a range of thickness between 1/10 and 1-1/2 inches account for about 95 percent of the production, with extruded boards 1/2 to 2 inches thick supplying the remainder.

The following sequence of operations applies to the production of boards by either process:

1. Hogging, grinding, hammermilling, or machining the wood raw material to the desired particle size and shape.

2. Drying the particles to a uniform, predetermined moisture content, and in some cases, screening out the fines.

3. Adding controlled amounts of binder and other additives by spraying or other means, mixing the ingredients thoroughly. At the present time, urea resins are the most common binder, although the use of phenol resins is growing.

4. Flat pressing (preceded by mat formation) or extruding the boards under controlled heat and pressure to a density about 20 to 30 percent greater than that of the species in the particles.

5. Cooling, trimming, and equalizing the moisture content in the formed boards.

6. Sanding, or sometimes planing, the equalized boards to the proper exact thickness.

7. Cut to size, overlaying, routing, sizing, and other remanufacture to customer’s need.

In such important properties as strength, stiffness, and dimensional stability, most flat-pressed boards are better and more uniform across their width and length than are extruded boards. Flat-pressed boards made from well-cut flakes have initial dry properties that approach those of plywood, although usually at some slight increase in weight. Extruded boards have properties in the widthwise direction (across the extruder) somewhat similar to those of flat-pressed boards; however, the properties in the extrusion direction are relatively low. For this reason, extruded boards are almost universally crossbanded with straight-grain veneer sheets and used primarily for core stock. Flat-pressed boards are generally less stable in thickness than extruded boards.

The plant layout and equipment required for producing flat-pressed particleboard are more complicated and costly than those required for production of extruded particleboard; in either case, however, costs depend primarily on the output desired. For profitable operation in producing particleboard for sale, it is said that either process requires a continuous supply of raw material at the rate of at least 200 tons per day. However, “captive plants” producing boards for internal consumption, and some smaller plants, are operated successfully on much smaller quantities.