

NONPLASTIC MOLDED PULP PRODUCTS

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NONPLASTIC MOLDED PULP PRODUCTS¹

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The manufacture of molded pulp products³ involves the forming, drying, and finishing of articles as individual pieces, in contrast to the making up of sheets of paper or paperboard on a paper machine and then converting these sheets into shaped articles. It represents only a small part of the paper and pulp industry, particularly so far as tonnage is concerned, but its products are almost unlimited in their variety of uses. They range from molded pie plates, of which several million are used each day by bakeries throughout the country, to wood-pulp sewer pipe (asphalt-impregnated) and heavy-walled containers for grease and other fluids. Many types of containers, toys, and novelty products are molded from pulp.

Raw Materials

Waste paper is often used as a source of pulp in the pulp-molding industry. Florist vases, toys, egg cartons, and similar-class products are generally made with repulped waste paper to which has been added about 1 percent of papermaker's rosin or wax size. Groundwood or bleached sulfite pulp is employed in making pie plates and other food containers.

¹The information in this report is based on trade literature unverified by Forest Products Laboratory research. Original report issued in 1953.

²Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

³Molded pulp products that are plastic in nature (contain resin) are not included in this discussion. The preparation of papier mache products, which are a type of molded pulp product, is discussed in detail in Forest Products Laboratory Report No. 1965.

Methods of Manufacture

In general, two methods are used for molding the pulp. By one, the article is formed on a die; by the other, the article is formed inside a closed mold.

One type of machine for forming on a die consists of a drum carrying a number of wire forms or molds on the outside, placed above a vat containing a slurry of pulp. A vacuum chamber within the drum produces a strong suction through the wire molds. As the drum rotates, the molds dip into the slurry and fiber is deposited by the suction onto the mold. The suction is applied for some distance above the surface of the slurry on the emerging side so that a considerable amount of water is removed from the molded article. The article is then removed from the mold, usually by air pressure applied in a section of the rotating drum. The wet molded articles pass to a dryer, sometimes supported by forms so as to retain their shape or to prevent warpage.

Another molding machine uses two rotating drums. One drum is fitted with male molds and dips into the pulp slurry as described above. The wet formed article is transferred to a female mold on the other drum. The adjusted spacing between the two molds provides the pressure required to give the desired finish to the product. The second drum can also be used to double dip the product, thus adding a layer of another kind of fiber for decorative purposes or to provide a better surface for printing.

A variation of forming on a die is the use of a mandrel onto which a pulp sheet is laminated convolutely into a fiber tube or conduit. A relatively thick sheet of the pulp is formed and pressed on a wet machine. The wet sheet is then wound on expansible mandrels of any of several sizes. The usual sheet width is about 110 inches so as to produce a finished 8-foot product. The tube diameters vary from 2 to 6 inches with wall thicknesses from 1/4 to 3/4 inch. The pulp is dried to a low moisture content and then removed from the mandrel for impregnation with pitch or other special saturants in a treating chamber. The tubes are then allowed to drain and cool and are finished to dimensions for connectors. Curved sections can also be made by bending the tubing after slightly rewetting it, redrying it, and impregnating it as before.

In the closed-mold process, the pulp product is formed on the inside of a separable or two-part wire-cloth-lined, perforated mold by pressure applied on the inside, by a vacuum applied on the outside, or both. The dilute pulp material is introduced into the mold and agitated while pressure and vacuum are applied, thereby creating a deposit of fiber on the inside of the mold. After the deposit is formed, hot air is usually introduced into the mold to dry the article partially before the mold is opened and the article removed. The articles made by this process are rather porous and rough on the inside. They may require additional outside finishing to cover wire marks by spray coating or other work to make them suitable for their intended use.

The end use of the product usually determines the type of finish--rough or smooth--and whether a surface coating is required. For example, molded pie plates are usually smooth on both sides and may have a waterproof and greaseproof coating; flower pots and vases are often smooth on only the outside but may have a waterproof coating, such as asphalt paint, on the inside; some types of single-use containers may have a rough finish and no special coating.

Equipment

Because the commercial manufacture of molded pulp products is a highly specialized field, much of the machinery used is more or less custom-made in limited quantities. Forming machines are generally developed to meet the conditions of manufacture of some particular article or according to the ideas of the manufacturer who is going to use them. Aside from a forming machine, drying dies, and the pumps and other equipment required for delivering pulp to it, however, the only auxiliary equipment required is a wet vacuum or extraction pump, a source of compressed air, and some means of supplying heated air for drying.

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