CELLOPHANE: ITS DEVELOPMENT AND MANUFACTURE

By JACK A. GERSTER

THERE are few people today who are not familiar with the thin, transparent, flexible wrapping material which is sold on the market as "Cellophane". All popular brands of cigarettes are kept "moisture proof" under its protection; baked goods are advertised as being "fresher" when wrapped with cellophane; lampshades, playing cards, and writing paper are kept from being soiled in the retail stores by this transparent paper; and other products—vegetables, candy, soap, and many more—are given a greater sales appeal because of their cellophane dress. There can be no doubt but that this development of modern research chemistry has become a really important commodity, and its manufacture a new industry.

Cellophane is chemically similar to paper, collodion, celluloid, and rayon, for all are made from cellulose, the material which makes up more than one-third of all the vegetable matter in the world. All plants contain certain amounts of cellulose, but it is found in larger amounts in wood pulp, cotton fibers, linen fibers, jute, and hemp.

The first man to change cellulose into cellophane was J. E. Brandenberger, a French textile chemist. Early in 1908, while searching for a way to make fabrics impervious to dirt, he invented the process. It was he who proposed the term "cellophane" for this cellulose wrapping material: "cello-" coming from cellulose, and "-phane" from the Greek meaning transparent.

After its discovery, not much was done with further development of the new product; and when the duPont company asked to purchase the American rights, the French were glad to sell this product which was so difficult to manufacture and even more difficult to sell.

After further research in their own laboratories, the duPont people began manufacture in 1924. The process which they used in the early days was fundamentally the same as that used today. The cellulose first used came from wood chips, but today very often sawdust and other sawmill waste is used. Another source is cotton linters—short fibers which stick to cotton seeds after ginning.

The first step in the process is to soak material containing cellulose in an alkali-water bath. Alkali cellulose results, and this material is shredded to a fluffy mass and aged in covered containers. Carbon bisulfide is added, and the mixture tumbled together, forming cellulose sodium xanthate. This is dissolved in caustic soda to make a sticky solution called orange viscose.

After ripening, the viscose solution is forced through a thin slit into a sulfuric acid bath, where the viscose is coagulated into a thin sheet. This sheet is washed, then bleached with sodium hypochlorite. Finally it is bathed in glycerin to make it flexible, moisture-proofed with waxy lacquer, and dried over heated rolls.

The preparation of the orange viscose is exactly the same as in the manufacture of artificial silk, for when the solution is forced through tiny holes into an acid bath, a rayon thread results.

Selling this new product to the public was a bit difficult at first. However, when one large cigarette manufacturer wrapped his product in cellophane and advertised his brand as being "moisture-proof," sales rose so rapidly that all other manufacturers were forced to buy. A certain New York bread manufacturer pioneered in using cellophane to wrap a certain type of loaf that wasn't selling well. This so increased the demand that others had to follow suit.

Today cellophane ranks as the number one profit maker on the duPont list. The magazine "Fortune" estimates that the volume of business in 1933 ran 18 million dollars, and its profit 4½ million dollars.

Competition has entered the field recently when both Eastman Kodak and Celluloid Corporation began producing a transparent cellulose wrapping. Their product is a little more expensive, however, since a different process is used in its manufacture. The material containing cellulose is dissolved in a bath of acetic anhydride, forming a compound known as cellulose acetate. This is precipitated in water, dried, and dissolved in acetone. When this solution is forced through a slit into the air, the acetone evaporates, leaving the cellulose sheeting ready to be bleached, softened, and lacquered.

This product is not so desirable because of its electrostatic properties. For some reason the acetate wrapper builds up a surface charge which causes the sheets to stick together in piles and makes automatic wrapping difficult.

It is interesting to note the ever-increasing uses of this product. Cellophane cut into thin strips, knitted and woven together, forms a textile which finds use in draperies, cloth hangings, and millinery work. One company is bringing out a shiny cellophane bathing suit which also has a considerable lastex ingredient. Although form fitting, it is opaque.

The development of a cheap process for printing on cellophane has increaed its popularity greatly. Pro-

ducts which had only a cellophane window in their outer wrapping now are completely wrapped in this transparent material, since the name can be printed directly on the wrapping. With the appearance of rolls of colored cellophane and printed ribbon of cellophane, the housewife can now utilize this product in the home.

Thus we can see that the chemical engineer has found another ever-increasing use for sawdust, heretofore a waste product.