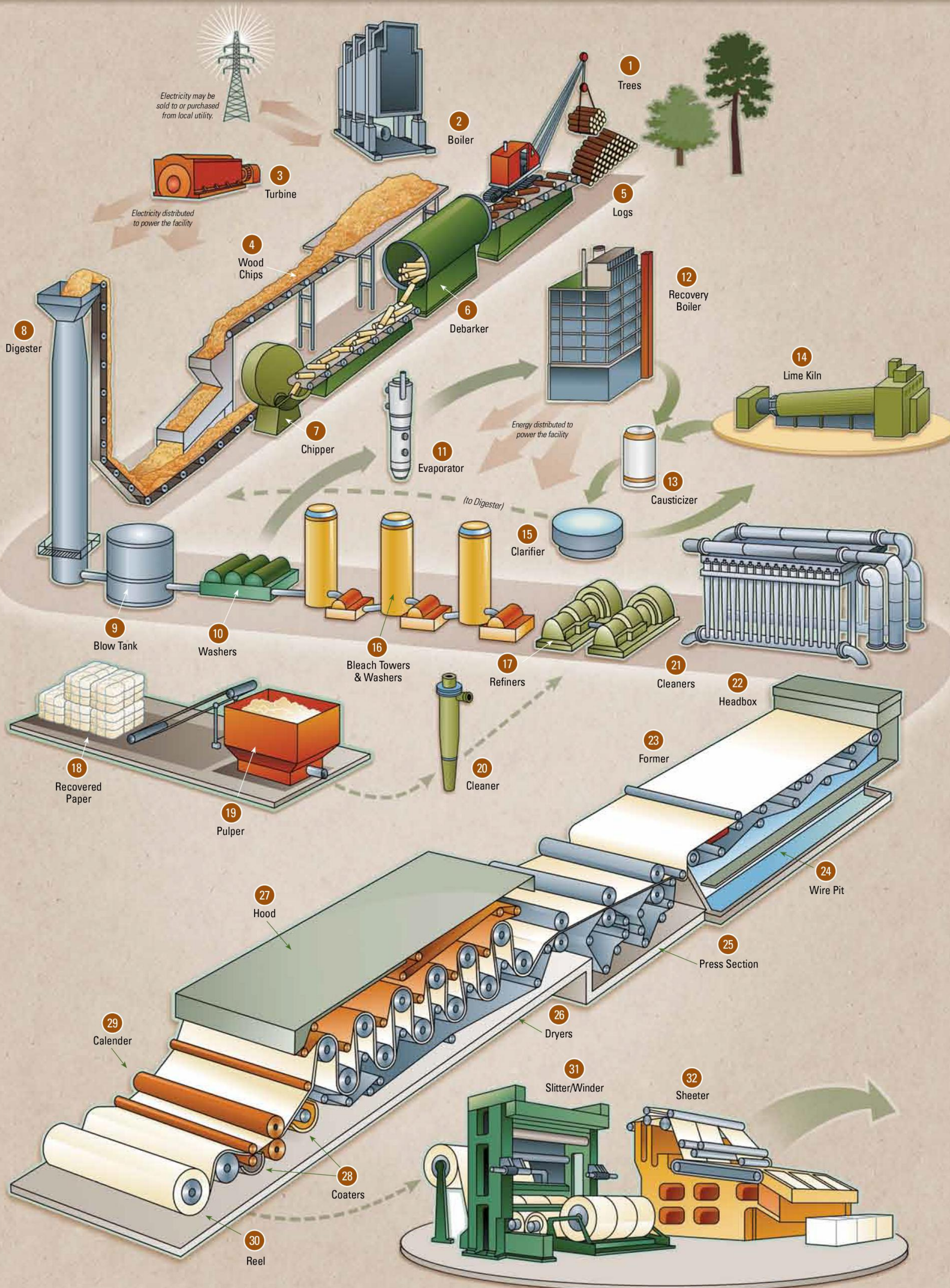


From Forest to Finished Products: The Papermaking Process



The process of papermaking uses raw materials including water, energy, chemicals and wood chips (1), that contain cellulose. Cellulose is the fiber component of wood, and exists naturally in most plant life.

The paper mill boilers (2) produce steam for turbines (3) that make electricity for motors and pumps. Steam is also used to dry the paper, and to cook the wood chips in the digester during pulping. The boilers use mostly bark and wood by-product as fuel. Less than 30 percent of the boiler fuel comes from oil, coal, and natural gas.

Wood fiber often comes from lumber mills to paper mills as chips, (4) or as logs, (5) which are debarked (6) and then sent into a chipper. (7) Chips and chemicals go into a digester, (8) which is a big pressure cooker. After cooking with chemicals and steam, the wood chips are separated into wood fiber and lignin, the chemical binding the cellulose together. Then, the mixture is blown out of the pressurized digester into a non-pressurized blow tank (9). Washers (10) clean the mixture by removing the cooking chemicals and lignin, turning it into pulp. The cooking chemicals and lignin, called black liquor, is pumped to evaporators (11), which remove water. The concentrated black liquor is pumped into a recovery boiler where (12) its bio-based content is burned to generate the majority of steam and electricity needed to power the facility. The organic material in the liquor burns and provides energy, while any inorganic material becomes a molten stream that is drained from the boiler, dissolved in water and prepared for reuse in the digester to cook more wood chips. Lime is added in the causticizer (13) from a lime kiln (14) and the chemicals are pumped to a clarifier (15) to allow the solids to settle. Clean cooking chemicals are sent to the digester for re-use, and residuals are washed and sent to the lime kiln to be turned into lime.

The naturally brown pulp is made white through a bleaching process (16). Bleached paper is used for books and magazines, food packaging, tissues, and hundreds of other uses. Some unbleached pulp is used to make grocery bags, and corrugated shipping containers (cardboard boxes). The pulp fibers are then prepared for the paper machine in refiners (17). Recovered paper (18) is often used for additional fiber, or instead of wood fiber from trees. This fiber is pulped (19) and cleaned, (20) just like the fiber from the digester and the pulper, (21) to ensure a uniform sheet of paper.

To make paper, a pulp mixture of 1 percent fiber and 99 percent water flows from the headbox (22) onto a moving former (23), a wire screen that drains some of the water into a wire pit (24). The sheet that is formed is carried into a press section (25) where more water is removed. The paper passes over dryers (26) enclosed in a hood (27). Some specialty papers get coated with liquid clay or chemicals in a coating machine (28), to improve the surface and printability of the paper.

The calender (29) smooths the paper, which is then wound on a reel (30). The reel is either cut into smaller rolls on a slitter (31) or made into sheets of paper on a sheeter (32). The finished product is then shipped to our customers around the world.