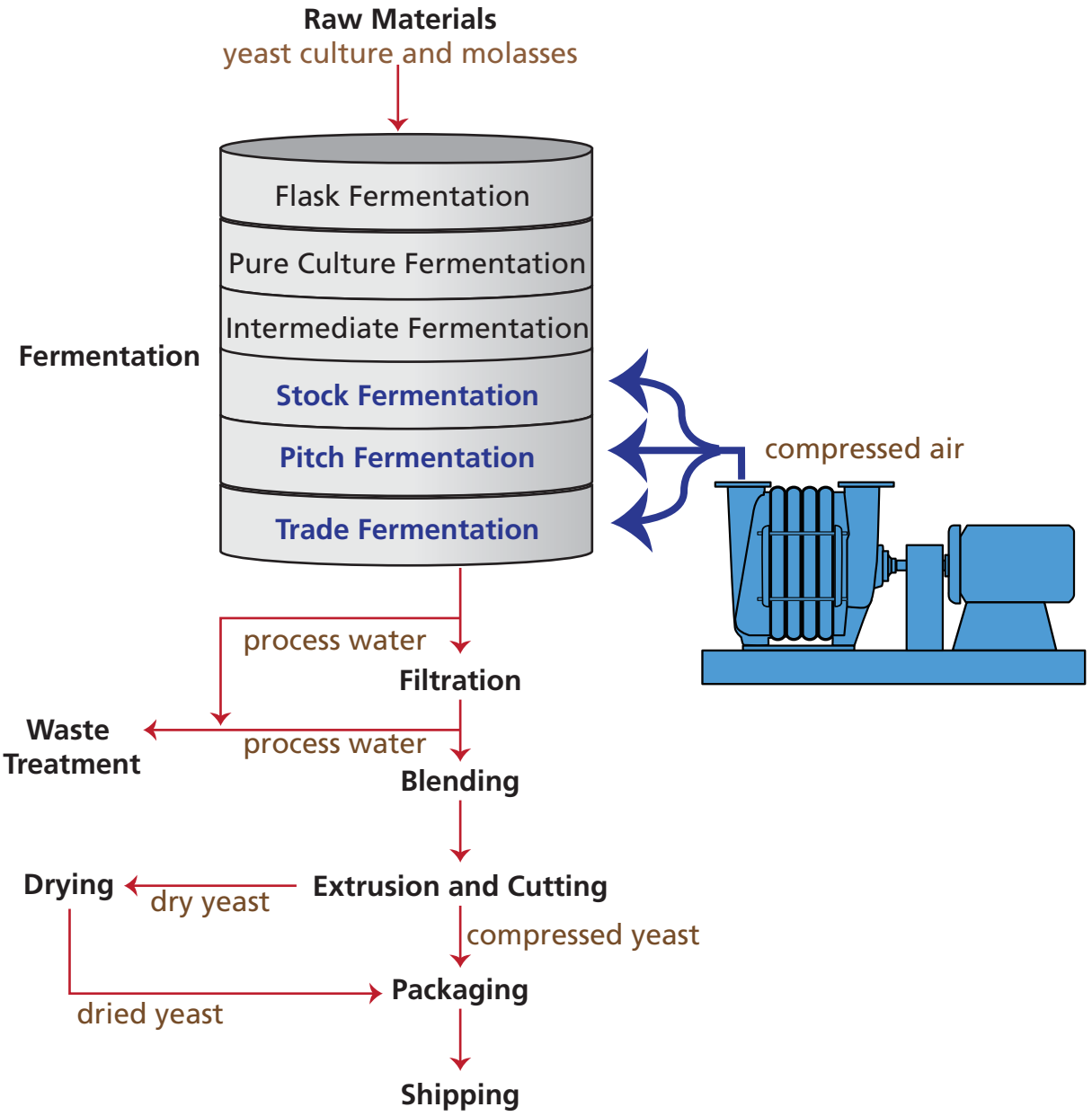
Yeast Production
Aeration

HOFFMAN LAMSON

Raw Materials

The principal raw materials used in producing baker's yeast are pure yeast culture and molasses. Other raw materials required include nitrogen, potassium, phosphate, magnesium, and calcium. Several vitamins are required for yeast growth (biotin, inositol, pantothenic acid, and thiamine). Once the feed materials are blended, the pH of the molasses mixture is adjusted to create an alkaline solution that is conducive to bacteria growth. Bacteria growth occurs under the same conditions as yeast growth, making pH monitoring very important. Following pH adjustment, the molasses mixture is clarified to remove any sludge. The clarified molasses mixture is subsequently sterilized with high-pressure steam, diluted with water, and put in holding tanks until it is needed for the fermentation process.



Fermentation

The yeast is grown in a series of fermentation vessels. In general, the process consists of placing a laboratory-grown pure yeast culture, along with the other feed materials, into the first fermentor and allowing the yeast to grow. In the first stages of yeast propagation, the medium is richer in nutrients and there is less aeration than in subsequent fermentation stages.

The majority of the yeast yield is grown in the final fermentation stages. The fermentors used in the final stages are usually constructed of stainless steel and vary considerably in size, ranging from 37,900 L (10,000 gal) to over 283,900 L (75,000 gal). These vessels have diameters in excess of 7.0 meters (24.5 feet) and heights up to 14 m (45 ft). The larger vessels are associated with the final fermentation stages. The fermentation vessels are typically operated at 30°C (86°F).

Fermentors used in the final stages must be equipped with heat exchangers to remove the heat produced from the production process and to cool the fermentor. The type of heat exchanger system depends on the size of the fermentation vessel. Because large volumes of air are supplied to the fermentation vessels during this stage of production, the fermentor size and the type of aeration system selected are interdependent. The different types of aeration systems include horizontal, perforated pipes; compressed air and mechanical agitation; and a self-priming aerator.

In the horizontal, perforated pipe system, air is blown through a large number of horizontal pipes that are placed near the bottom of the fermentor. With this aeration system, the only agitation of the fermentor liquid is carried out by the action of the air bubbles as they rise to the surface. Typically, this type of aeration system requires from 25 to 30 cubic meters (880 to 1,060 cubic feet) of air to produce 0.45 kilograms (1 pound) of yeast.

The efficiency of aeration with a given volume of air is greatly increased by mechanical agitation. In a compressed air/mechanical agitation aeration system, air under pressure is supplied to a circular diffuser pipe. Directly above the air outlets, a horizontal turbine disk provides mechanical agitation, which distributes the air bubbles uniformly. Agitation systems have baffles to keep the fermentor liquid from rotating in the direction of the motion of the disk. This uniform distribution of air bubbles reduces the volume of air needed to grow the yeast. In an agitated system, only 10 to 15 m3 (350 to 530 ft3) of air are required to produce 0.45 kg (1 lb) of yeast.

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Hoffman & Lamson blowers are most often used in the last three fermentation stages. Two blowers are used to feed two fermentors which are doing the same process. A plant in Australia has recently put the Revolution to work in this application.

Info courtesy of the EPA: AP-42, section 9.13.4

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