



Tunnel Pasteurization Process



Pasteurization was developed by Louis Pasteur around 1864 and has been used in the beer industry since the nineteenth century. It refers to the reduction of microorganisms in beer or other foods by heating to a regulated temperature for a specific time in order to minimize the effect on physical stability and flavor while maximizing biological stability (1). Various organisms in beer are not pathological but affect the taste of beer (2). Draft beer is kept refrigerated and usually consumed in a short period of time, however, can and bottle beer is pasteurized for a long shelflife (1,3,4).

The shelf-life of beer has become a critical issue since it is one of the most consumed fermented beverages in the world (5). Beer's shelf-life is determined by several factors including its microbiological, foam, colloidal, color, and flavor stabilities (6). Several months are possible if common contaminants are inactivated (7,8). This requires a pasteurization process at a time temperature of around 60°C (140°F) for about 20 minutes as stated in the book "Brewing: Science and Practice" by Briggs, Boulton, Brookes, & Stevens (9). Heat treatment of beer is currently done by flash pasteurization, batch pasteurization, or by tunnel pasteurization in the form of bottles and cans already sealed (10). Tunnel pasteurizers are an important procedure in the brewery packaging line (11).

Tunnel pasteurization occurs by traveling the cans or bottles through a tunnel that consists of progressively higher temperature zones, holding zones, and progressively cooler zones (12). Tunnel pasteurizers comprise a long, enclosed

chamber, typically 15 to 30m, in which water sprayed onto the packages controls the temperature; the packages are moved through by a conveyor in the tunnel and is divided into 3 to 12 spray zones (13). The zones are divided into a heating zone where the temperature is progressively increased; pasteurization zone, where the product reaches the desired temperature; and cooling zone(s), where the packages are cooled to reach the desired beer out temperature (BOT).

The system includes a shell, tube heat exchangers, regeneration, and steam water heating. The water running off the packages falls into reservoirs and is recycled to the sprays. Tunnel pasteurizers use a single or double deck, nevertheless, the single deck conveyor has become more prevalent in the brewing industry in the United States because the lower decks in the double set are more likely to be subject to blockage (1).

Brewers should consider that aspects such as bottle size, material and shape influence the specific pasteurizing conditions, such as residence time within the tunnel, to achieve appropriate results (13). If pasteurization reaches a beer temperature too high from the desired level, flavors called “pasteurization tastes” may develop in the beer, along with alterations in the foam formation (15).

Tunnel pasteurizer manufacturers incorporated the term Pasteurization Unit (P.U.) to monitor the process, in order to measure the “lethal effect” of the heat on the microorganisms in the beer, tea, or other infused beverages (1). It is defined that 1 P.U. is added to the product when exposed to 60°C (140°F) for one minute. Lethality (P.U per minute) is a rate term exponential with temperature (16). Lethality is significant only when the temperature reaches around 57°C (135°F), even when P.U accumulation starts at 49°C (120°F). The organisms which cause the most trouble in the brewing industry are lactobacillus, pediococcus, and wild yeast, causing turbidity and poor taste in beer (13), or, additionally, in the case of yeast, continued production of carbon dioxide leading to bursting bottles or undesired can expansion.

Company Description

PRO Engineering and Manufacturing has developed a range of small, medium, and large-sized tunnel pasteurizers to fit your needs. For more than 40 years, we have been delivering solutions for beverage product shelf stability and consumption safety. As leading innovators in post-fill pasteurization, our skilled team offers the best in customized high-quality tunnel pasteurization equipment. Our focus is on solving microbiological packaging needs for a wide variety of customers. PRO actually pioneered the spray batch pasteurizer and the compact tunnel pasteurizer. We listen to our customers and you told us you need equipment that fits your footprint and your budget!

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