



INTISARI

Yoghurt adalah produk olahan susu fermentasi bernilai gizi tinggi yang semakin diminati di pasar domestik maupun global. Berdasarkan data BPS, tren ekspor yoghurt Indonesia, baik cair maupun bubuk, terus meningkat dan diperkirakan mencapai 5.199,74 ton untuk yoghurt cair dan 4.357,39 ton untuk yoghurt bubuk pada tahun 2029. Konsumsi yoghurt juga tumbuh pesat, dengan proyeksi peningkatan konsumsi domestik dari 2,4 juta ton pada 2018 menjadi lebih dari 3,4 juta ton pada 2029, serta konsumsi global dari 50 juta ton menjadi lebih dari 75 juta ton pada periode yang sama. Sementara itu, impor yoghurt ke Indonesia terus menurun, menandakan daya saing industri dalam negeri semakin kuat. Menanggapi tren ini, dirancang pabrik berkapasitas 45.000 ton per tahun, terdiri dari 35.000 ton yoghurt cair untuk pasar domestik dan 10.000 ton yoghurt bubuk untuk ekspor. Pabrik akan dibangun di Kecamatan Bululawang, Kabupaten Malang, Jawa Timur, karena lokasinya dekat dengan sentra susu, akses transportasi dan utilitas yang baik, serta potensi pasar dan tenaga kerja lokal yang besar, dengan luas lahan 1,08 hektar.

Prarancangan pabrik yoghurt dari susu segar ini mencakup dua produk utama, yakni yoghurt cair dan yoghurt bubuk. Proses dimulai dengan pemanasan susu segar dari 4°C ke 50°C menggunakan *Plate* dan *Double Pipe Heat Exchanger*, diikuti pemisahan lemak dengan *centrifugal separator* untuk menyesuaikan kadar SNF. Setelah penambahan bubuk karagenan sebagai *stabilizer*, dilakukan pengurangan kadar air menggunakan *falling film evaporator* dan *flash vessel*. Susu kemudian dihomogenisasi pada 200 atm, dipasteurisasi secara HTST, dan di *holding* selama 300 detik untuk denaturasi protein. Fermentasi berlangsung *batch* pada 40°C selama 6 jam dengan bakteri *Lactobacillus bulgaricus* dan *Streptococcus thermophilus*. Yoghurt cair hasil fermentasi disterilisasi ulang, didinginkan, dan dikemas. Sebagian yoghurt cair sebesar 1.262,63 kg/jam diproses menjadi yoghurt bubuk melalui pemanasan, evaporasi lanjutan, dan pengeringan menggunakan *Spray Dryer* dan *Fluidized Bed Dryer* hingga kadar padatan 98%, lalu didinginkan, digiling, diayak menjadi 80 mesh, disimpan dalam silo, dan dikemas.

Berdasarkan proses dan kapasitas prarancangan pabrik, dibutuhkan bahan baku berupa susu segar sebanyak 54.000 ton/tahun, *stabilizer* sebanyak 1422,04 ton/tahun, dan *starter culture* sebanyak 0,48 ton/tahun. Pabrik didukung oleh 196 orang karyawan yang bekerja baik secara *shift* maupun *non shift*. Kebutuhan air keseluruhan pabrik sebanyak 21.181,64 kg/jam. Untuk kebutuhan listrik pabrik total sebesar 8.222.192,81 kWh/tahun dan dilengkapi dengan *diesel emergency generator* yang dapat memenuhi 50% dari kebutuhan listrik.

Pabrik ini memiliki nilai *fixed capital* sebesar \$21.099.345,15 + Rp31.297.321.142,77, *working capital* sebesar \$9.731.078,86 + Rp158.208.366.608,98, dan *total production cost* sebesar \$106.696.562,50/tahun (Rp1.734.678.047.937,63). Sedangkan keuntungan yang diperoleh pabrik sebesar \$8.104.161,59/tahun (Rp131.757.864.307,10/tahun) sebelum pajak dan \$6.078.121,19/tahun (Rp98.818.398.230,33/tahun) setelah pajak. Berdasarkan hasil dari evaluasi ekonomi yang dilakukan untuk mengetahui kelayakan pembangunan pabrik, diperoleh nilai ROI after tax 26,40%, POT after tax 2,82 tahun, BEP 52,49%, SDP 34,94%, dan DCFRR 22,85%. Nilai-nilai ini menunjukkan bahwa pembangunan pabrik yoghurt dari susu segar ini layak untuk dikaji lebih lanjut dari segi ekonomi dan berpotensi memberikan keuntungan apabila beroperasi sesuai dengan rancangan.

Kata kunci: fermentasi, susu segar, yoghurt, yoghurt bubuk, yoghurt cair.



ABSTRACT

Yoghurt is a nutritious fermented dairy product that is increasingly popular both in domestic and global markets. According to data from the Central Bureau of Statistics (BPS), Indonesia's yoghurt export trends—both in liquid and powder forms—have shown consistent growth, with projections reaching 5,199.74 tons for liquid yoghurt and 4,357.39 tons for powdered yoghurt by 2029. Global and domestic consumption of yoghurt is also rising significantly, with domestic consumption expected to grow from approximately 2.4 million tons in 2018 to over 3.4 million tons in 2029, and global consumption increasing from 50 million to more than 75 million tons over the same period. Meanwhile, yoghurt imports to Indonesia continue to decline, indicating increased competitiveness and potential of the domestic industry. In response to these trends, a plant is designed with a total capacity of 45,000 tons per year, comprising 35,000 tons of liquid yoghurt for domestic needs and 10,000 tons of powdered yoghurt for export. The plant will be located in Bululawang District, Malang Regency, East Java, chosen for its proximity to major dairy production centers, reliable transportation and utilities, as well as access to local labor and market potential, covering a total land area of 1.08 hectares.

*The preliminary design of this yoghurt plant from fresh milk includes two main products: liquid yoghurt and powdered yoghurt. The process begins with heating fresh milk from 4°C to 50°C using a Plate Heat Exchanger and a Double Pipe Heat Exchanger, followed by fat separation using a centrifugal separator to adjust the SNF content. After adding carrageenan powder as a stabilizer, water content is reduced using a falling film evaporator and a flash vessel. The milk is then homogenized at 200 atm, pasteurized using the HTST method, and held for 300 seconds to allow protein denaturation. Fermentation is carried out in batch at 40°C for 6 hours using *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The resulting liquid yoghurt is re-sterilized, cooled, and packaged. A portion of the liquid yoghurt, amounting to 1,262.63 kg/hour, is further processed into powdered yoghurt through additional heating, evaporation, and drying using a Spray Dryer and Fluidized Bed Dryer until the solid content reaches 98%, then cooled, milled, sieved to 80 mesh, stored in a silo, and packaged.*

Based on the process and design capacity of the plant, the raw material requirements include 54,000 tons/year of fresh milk, 1,422.04 tons/year of stabilizer, and 0.48 tons/year of starter culture. The plant is supported by 196 employees working in both shift and non-shift systems. The total water requirement is 21,181.64 kg/hour. The total electricity consumption is 8,222,192.81 kWh/year, supported by a diesel emergency generator capable of supplying 50% of the electricity demand. The plant has a fixed capital investment of \$21,099,345.15 plus Rp31,297,321,142.77, working capital of \$9,731,078.86 plus Rp158,208,366,608.98, and a total production cost of \$106,696,562.50/year (Rp1,734,678,047,937.63). The annual profit is \$8,104,161.59 (Rp131,757,864,307.10) before tax and \$6,078,121.19 (Rp98,818,398,230.33) after tax. Based on the economic evaluation conducted to assess the feasibility of the plant construction, the following indicators were obtained: ROI after tax of 26.40%, POT after tax of 2.82 years, BEP of 52.49%, SDP of 34.94%, and DCFRR of 22.85%. These values indicate that the construction of the fresh milk-based yoghurt plant is economically feasible for further consideration and has the potential to be profitable if operated as designed.

Keywords: *fermentation, fresh milk, liquid yoghurt, powdered yoghurt, yoghurt.*