INTISARI

Susu bubuk formula merupakan hasil proses dari susu sapi segar. Berdasarkan data dari BPS, diproyeksikan bahwa konsumsi susu mencapai 1,2 juta pada tahun 2026. Mempertimbangkan peningkatan kebutuhan susu tersebut, pendirian pabrik pada prarancangan ini berkapasitas 22.000 ton/tahun. Pabrik susu bubuk dirancang untuk dibangun di kawasan *Java Integrated Industrial and Port Estate Gresik* (JIIPE Gresik), Kecamatan Manyar, Kabupaten Gresik, Provinsi Jawa Timur dengan luas total lahan 0.8 hektar.

Proses pembuatan susu formula bubuk terbagi menjadi 2 tahapan yaitu proses basah (*wet process*) dan proses kering (*dry process*). Proses basah diawali dengan pasteurisasi pada suhu 121^{o}C dalam *plate heat exchanger*, kemudian dilanjutkan dengan pencampuran susu pasteurisasi dengan bahan pembantu. Susu yang telah tercampur di-sterilisasi menggunakan sistem High Temperature Short Time (HTST) pada suhu 82^{o}C. Susu kemudian diuapkan kadar airnya hingga kadar TS 61,04% dengan single effect evaporator tipe *falling film* (EV-301). Sebelum proses *spray drying*, susu dilewatkan dalam High Pressure Pump sebagai homogenizer dan dilanjutkan pengaliran ke dalam ruang pengering utama (chamber) pada alat Spray Dryer (D-301) melalui vaned wheel nozzle. Padatan susu yang memiliki berat jenis yang memenuhi standar akan jatuh karena gaya gravitasi dan masuk ke dalam shaking bed dryer (FB-301) hingga mencapai TS 3,5%. Proses dilanjutkan dengan pendinginan hingga mencapai suhu normal 30^{o}C dalam shaking bed cooler (FB-302). Produk keluaran akhir memiliki kadar TS 97%. Proses akhir berupa pengadukan kering menggunakan dry mixer berjenis ribbon blendor (M-301).

Berdasarkan proses dan kapasitas rancangan pabrik, dibutuhkan bahan baku berupa susu sapi segar sebanyak 14954,4506 ton/tahun, *Skimmed Milk Powder* sebanyak 6346,9382 ton/tahun, *Whey Protein Concentrate* sebanyak 4524,8733 ton/tahun, Gula (*lactose)* sebanyak 5305,0909 ton/tahun, *vegetable oil* sebanyak 3700,2715 ton/tahun, dan vitamin & mineral sebanyak 212,5511 ton/tahun. Pabrik didukung oleh 245 orang karyawan yang baik secara *shift* maupun *non shift.* Kebutuhan air keseluruhan pabrik sebanyak 10.319,39 kg/jam. Untuk kebutuhan listrik pabrik total sebesar 6.640.791.06 kWh/tahun dan dilengkapi dengan *diesel emergency generator* yang dapat memenuhi 50% dari kebutuhan listrik.

Pabrik ini memiliki nilai *fixed capital* sebesar $ 25.072.790,69 & Rp 45.376.337.063,13, *working capital* sebesar $ 88.653.084 & Rp20.285.760.000, dan *total production cost* sebesar $ 107.029.152,23/tahun. Sedangkan keuntungan yang diperoleh pabrik sebesar $ 11.062.387,40 sebelum pajak dan $ 8.296.790,55 setelah pajak. Berdasarkan hasil dari evaluasi ekonomi yang dilakukan untuk mengetahui kelayakan pembangunan pabrik, diperoleh nilai ROI after tax 26,57%, POT after tax 2,73 tahun, BEP 49,92%, SDP 22,54%, dan DCFRR 22,54%. Berdasarkan parameter tersebut, parbik susu bubuk formula tergolong pada parbik *low risk* yang sudah memenuhi kelayakan pembangunan pabrik dan memperoleh keuntungan jika pabrik sudah beroperasi.

ABSTRACT

Formula milk powder is a derived dairy product from fresh cow milk. Based on BPS data, the projected milk consumption in 2026 will reach 1,2 million litre in a year. Therefore, considering future milk demand, this pre-eliminary milk factory design study will have 22.000 ton/year production capacity. The plant is projected to be built in Java Integrated Industrial and Port Estate Gresik (JIIPE Gresik), East Java by considering raw material and finished good easy-distribution channel, utility, and human resource availability with the total land size around 0.8 acre.

There are two main steps of formula milk powder production process, wet process, and dry process. During wet process, the arrived fresh milk will go through pasteurization process on 121^{o}C in plate heat exchanger followed by wet mixing of milk and supporting materials. A well-mixed milk then will be sterilized using Hight Temperature Short Time (HTST) system on 82^{o}C. Then, milk will be evaporated to remove water up to 61.04% of milk total solid using single effect falling film evaporator (EV-301). Before getting fed to the spray dryer, concentrated milk will go through High Pressure Pump to be homogenized. Milk will be fed into the chamber by using vaned wheel spray nozzle. Milk powder then fall down to the shaking bed dryer by a gravity force. In shaking bed dryer, milk powder undergo another drying process up to 96.5% of milk total solid and cooling process until the ambient temperature (30^{o}C). The final milk powder has 97% of total solid composition. Last process of formula milk production is dry mixing using blender ribbon (M-301)

Based on production process and plant design capacity, it requires 14954,4506 ton/year of fresh milk, 6346,9382 ton/year of Skimmed Milk Powder, 4524,8733 ton/year of Whey Protein Concentrate, 5305,0909 ton/year of sugar (lactose), 3700,2715 ton/year of vegetable oil, and 212,5511 ton/year of vegetable oil. The company will absorb 245 employees consists of shift and non-shift employees. The amount of water as the utility is 10319.39 kg/hour and electricity needs are 6,640,791.06 kWh/year complemented with diesel emergency generator with 50% capacity of the overall plant electricity needs.

The plant fixed capital is $ 25.072.790,69 & Rp 45.376.337.063,13, working capital is $ 88.653.084 & Rp20.285.760.000, and the total production cost is $ 107.029.152,23/year. Meanwhile, the total profit before tax $ 11.062.387,40 and reduced to $ 8.296.790,55 after the income tax deduction. There are several economic evaluations shown by several parameters to determine the overall plant feasibility. As a result, the ROI after tax is 26,57%, POT after tax is 2,73 year, BEP 49,92%, SDP 22,54%, and DCFRR value is 22,54%.

Hence, using those parameters, this formula milk powder plant, considered as a low-risk factory has already met the minimum requirement of technical and economic feasibility.