Complete Dairy Processing Plant Equipment Catalogue

From raw milk reception to hygienic filling, packaging, utilities and environmental services

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1. Catalogue Purpose and Design Basis

Project design data to be confirmed before equipment selection	
Parameter	**Typical catalogue range / requirement**
Raw milk intake	5,000–250,000 litres/day; road tanker, churn or both
Processing rate	1,000–50,000 litres/hour per line
Products	Pasteurised milk, cream, cultured products, ESL milk, UHT milk and product variants
Operating pattern	Single, double or continuous shift; seasonal peak capacity stated separately
Packaging	HDPE/PET bottles, cartons, pouches, cups, bag-in-box or bulk containers
Hygienic standard	Food-grade product-contact materials, drainable design and validated CIP
Product-contact material	Normally stainless steel 316L; non-contact frames normally 304
Controls	PLC/HMI, recipes, batch records, alarms, trends and

	production reporting

2. Milk Reception and Raw Milk Handling

Equipment	Function and principal features	Typical options
Tanker reception bay	Weather-protected unloading point with kerbing, drainage, hose rack, earthing and traffic protection	One or multiple bays; access platform; tanker top-sampling station
Raw milk sampling station	Representative sample collection for temperature, antibiotics, acidity, fat, protein, density and microbiology checks	Automatic sampler; barcode/LIMS link
Reception strainer/filter	Removes gross foreign matter before pumping	Duplex filter, automatic changeover, differential-pressure indication
Unloading pump set	Hygienic centrifugal or positive-displacement transfer from tanker	Variable-speed drive, dry-run protection, duty/standby arrangement
Air eliminator and flowmeter	Removes entrained air and records accepted milk quantity	Mass or electromagnetic meter; legal-for-trade package where required
Inline reception cooler	Plate heat exchanger cools incoming milk to storage temperature	Chilled-water or glycol circuit; heat recovery
Raw milk silos/tanks	Insulated storage with top-entry or side-entry agitator, level and temperature measurement	10–300 m^3; load cells; high-level protection; aseptic vent filter
Reception valve manifold	Routes milk to selected silo and separates product from CIP return	Mix-proof valves; automated line proving

3. Separation, Standardisation and Pasteurisation

Equipment	Duty	Key specification points
Balance tank	Maintains constant feed	Hygienic design, spray

	and provides low-level protection	device, level control and overflow protection
Regenerative plate heat exchanger	Preheats, pasteurises, cools and recovers energy	Multi-section frame, food-grade gaskets, differential-pressure control
Clarifier/separator	Removes sediment and separates skim milk and cream	Self-cleaning bowl, automatic solids discharge, vibration monitoring
Automatic standardisation unit	Controls milk fat and cream concentration to recipe	Flow, density and fat measurement with closed-loop control
Homogeniser	Reduces fat globule size and stabilises product	One- or two-stage; product-pressure monitoring; pulsation damping
Holding tube	Provides validated legal holding time at pasteurisation temperature	Fixed geometry; calculated minimum flow condition
Flow-diversion assembly	Diverts under-processed milk away from forward flow	Independent temperature verification, fail-safe valve position and event record
Pasteurised milk buffer tank	Decouples pasteuriser from filling line	Closed hygienic tank, filtered vent, gentle agitation and short residence time
Hot-water set	Provides stable pasteurisation heating medium	Steam-to-water exchanger, circulation pump, expansion vessel and controls

4. Product Processing Modules

Module	Included plant
Pasteurised drinking milk	Standardisation, homogenisation, HTST pasteurisation, chilled buffer storage and direct feed to filler
Cream	Cream balance tank, standardisation, pasteuriser, optional homogeniser, ageing tank and filler feed
Fermented milk/yoghurt	Mix tank, powder induction, high-heat treatment, homogeniser, fermentation tanks, cooling, fruit dosing and cup/bottle filling feed
ESL milk	Enhanced microbial reduction, high-temperature

	processing, hygienic surge tanks and ultra-clean filling interface
UHT milk	Direct or indirect UHT system, deaeration where required, aseptic homogeniser, aseptic tanks and sterile transfer
Flavoured milk	Sugar/syrup preparation, powder induction, filtration, blending, stabiliser hydration and thermal processing
Recombined milk	Water treatment, powder handling, high-shear mixing, fat melting/dosing, hydration tanks and standardisation

5. Filling, Packing and Finished-Goods Handling

Equipment	Application and options
Container infeed	Depalletiser, unscrambler, bottle blower, carton magazine or pouch-film unwind
Container treatment	Air rinse, water rinse, chemical sterilisation or UV treatment according to hygiene class
Filler-capper/ sealer	Volumetric, mass-flow, level or time-pressure filling; clean, ultra-clean or aseptic execution
Closure handling	Cap elevator/sorter, cap sterilisation, torque monitoring, foil sealing or carton closure
Product recovery interface	Hygienic filler bowl/headers, return routing, product-water interface control and drain collection
Inspection	Fill-level, cap presence, seal integrity, label, date code, barcode and foreign-body checks
Labelling and coding	Pressure-sensitive, sleeve or wraparound label; batch/date coding and vision verification
Secondary packaging	Tray packer, wraparound case packer, shrink bundler, carton former and sealer
Palletising	Robotic or conventional palletiser, pallet dispenser, layer-pad handling and stretch wrapper
Conveyors	Low-pressure accumulation, product changeover, line control and hygienic drainage
Cold store interface	Pallet transfer, racking interface, warehouse labelling and dispatch staging

6. Cleaning-in-Place and Hygiene Systems

System	Scope
Central CIP station	Water, caustic, acid and recovery tanks; dosing; heating; supply/return pumps; strainers and

	conductivity control
CIP circuits	Dedicated or shared circuits for reception, tanks, pasteuriser, product lines, fillers and ancillary skids
Single-use CIP	Compact make-up and return unit for high-risk, low-frequency or segregated duties
Valve manifolds	Mix-proof routing with leakage chambers, seat-lift cleaning and position feedback
Tank cleaning devices	Static spray balls or rotary jet heads sized for vessel geometry and soil load
Chemical storage	Bunded bulk/IBC storage, transfer pumps, locked dosing area, eyewash and ventilation provisions
Hygiene stations	Boot wash, hand wash/sanitise, controlled personnel entry and cleaning-equipment storage
CIP validation instrumentation	Time, temperature, conductivity, flow and return-turbidity recording with recipe reports

7. Utility and Service Plant

Service	Typical plant and distribution	Critical design considerations
Potable/process water	Break tank, booster pumps, filtration, softener, activated carbon, UV and optional reverse osmosis	Local water quality, hygienic storage, residual disinfectant, sampling and backflow prevention
Boiler and steam	Boiler, feed tank, water treatment, chemical dosing, blowdown vessel, condensate return and steam headers	Food-grade culinary steam where directly contacting product; pressure regulation and trap management
Hot water	Steam or heat-pump generation, insulated storage, circulation loops and temperature control	Pasteuriser, CIP and wash-down demand diversity
Chilled water/glycol	Chillers, buffer tank, pumps, plate exchanger, glycol make-up and insulated distribution	Peak cooling load, low-temperature protection, redundancy and heat recovery
Refrigeration	Ammonia, CO_2 or HFC/HFO package, compressors, condensers, evaporators and safety	Refrigerant regulation, machinery-room ventilation, relief discharge and competent maintenance

	detection	
Compressed air	Oil-free or food-grade compressor, receiver, dryer, filters and ring main	Separate instrument and process-air quality classes; dew point and condensate management
Electrical power	Transformer, main LV switchboard, motor control centres, variable-speed drives, UPS and standby generator	Load schedule, discrimination, harmonics, hygienic enclosure rating and emergency supplies
Process gases	Nitrogen/CO_2 storage or generation, pressure regulation, sterile filtration and distribution	Food-grade certification, monitoring, ventilation and asphyxiation risk controls
Ventilation/ HVAC	Air handling units, filtration, heating/cooling, extraction and pressure zoning	Positive pressure in high-care areas, condensation control and cleanable duct terminals
Vacuum	Liquid-ring or dry vacuum package with receiver and distribution	Filler, deaerator and process duty; hygienic separation from product
Fire and life safety	Detection, alarm, hydrants, sprinklers, extinguishers, emergency lighting and evacuation systems	Site risk assessment, local code and hazardous chemical/refrigerant areas
Workshop and maintenance	Maintenance shop, spares store, lifting equipment, lubrication control and calibration bench	Food-safe segregation, controlled tools and critical-spares strategy

8. Drainage, Wastewater and By-product Handling

System	Catalogue scope
Hygienic process drainage	Stainless channels, trapped gullies, screened sumps, segregated storm/process networks and cleanout access
Product-loss recovery	Interface detection, first-rinse segregation, milk recovery tank and controlled rework or disposal
Wastewater pre-	Screening, flow balancing, pH correction, dissolved-air

treatment	flotation and sludge dewatering
Biological treatment	Aerobic, anaerobic or combined treatment selected for flow, COD/BOD and discharge consent
Odour control	Covered tanks, ventilation extraction and carbon/biofilter treatment where required
Solid waste	Segregated packaging waste, rejected product containment, compactors and secure waste area
Energy recovery	Heat recovery from refrigeration, condensate and process streams; optional biogas utilisation

9. Automation, Quality Control and Traceability

Area	Minimum recommended scope
Plant automation	PLC architecture, local and central HMIs, recipe control, valve/pump interlocks, route management and alarm handling
Data and reporting	Batch genealogy, tank history, pasteurisation records, CIP reports, downtime, yields and utility consumption
Instrumentation	Calibrated flow, level, pressure, temperature, conductivity, turbidity, density and analytical measurement
Laboratory	Milk analyser, pH meter, balances, incubators, antibiotic test equipment, microbiology facilities and sample refrigeration
In-process quality	Defined sampling points, rapid tests, filler checks, environmental monitoring and release controls
Traceability	Raw-milk lot through process tanks, ingredients, packaging batches, finished product and dispatch
Cybersecurity	Role-based access, backups, network segregation, secure remote support and change control

10. Procurement, Documentation and Project Delivery

Deliverable	Required content
Process design package	Process description, mass and energy balance, equipment list, PFDs, P&IDs and utility summary
Equipment documentation	Datasheets, general arrangements, materials, certificates, weld records, manuals and spare-parts lists
Electrical and	Load list, single-line diagram, I/O list, network

controls	architecture, control narrative, software backup and licences
Installation	Battery limits, foundations, pipe supports, access platforms, insulation, cabling, drains and hygienic finishes
Testing	Factory acceptance test, installation checks, water trials, product trials, performance test and acceptance criteria
Validation	Pasteurisation/sterilisation validation, CIP coverage and recipe validation, calibration and traceability challenge
Training	Operator, maintenance, laboratory, hygiene and automation training with competency records
Handover	As-built drawings, commissioning records, certificates, recommended spares and preventive-maintenance schedule

10.1 Final Scope Checklist

- Confirm product portfolio, capacities, recipes, shelf-life targets and operating hours.
- Define raw milk quality, tanker sizes, maximum unloading time and storage days.
- Confirm local legal pasteurisation/UHT requirements and product-release criteria.
- Prepare peak electrical, steam, cooling, water, air and wastewater load profiles.
- Agree hygienic zoning, personnel/material flows and environmental conditions.
- Fix equipment battery limits, redundancy philosophy and future expansion allowance.
- Confirm package formats, nominal speeds, changeover times and line efficiencies.
- Perform food-safety, process, chemical, pressure, electrical, refrigeration and fire risk assessments.
- Agree performance guarantees for capacity, yield, energy, water, product losses and cleanability.
- Complete site survey and multidisciplinary detailed design before purchase or construction.

Engineering note: This catalogue is a complete functional scope template, not a final equipment quotation. Capacities, hygienic class, materials, statutory requirements, utilities, redundancy and acceptance criteria must be confirmed for the intended country, site and product portfolio by qualified process, mechanical, electrical, food-safety and environmental specialists.