

# Process Lines

## for recombined products

- Proven high-shear efficiency
- Scalable automation on your terms
- Hygienic by design, globally compliant
- Faster ROI through lower OPEX
- Serviceability without barriers

**Purpose-Built**

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The power of simplicity

# Process Lines

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## Recombined Products

### TPS MixSing High-Shear Mixers

- **High-shear efficiency:** Intense shear forces for fine emulsification and dispersion, yielding small particle sizes and stable emulsions.
- **Hygienic, robust design:** Sanitary stainless-steel construction suitable for sanitary environments, with CIP integration.
- **Low noise and energy usage:** Optimised design lowers noise, reduces power consumption, and lowers operating costs.
- **Easy maintenance:** Accessible components and standardised parts for minimal downtime. Service MixSing high-shear unit in less than one hour.
- **Flexible integration:** Adaptable to batch or continuous process lines and configurable to specific plant needs, ensuring a fit for various production scales.
- **Upgradable:** Tank mixers are designed and fabricated with the option to be upgraded from manual to automatic systems in the future.

### Process Lines

#### Experienced Engineering and Design Team

TPS' process success begins with its people. Every member of our engineering and design staff brings more than five years of hands-on experience and has previously worked for internationally recognised engineering firms. Their combined mechanical, electrical, and process-design expertise ensures that each project phase - concept, detail design, procurement, installation, and commissioning - is executed with meticulous attention to detail. This depth of knowledge allows TPS to anticipate challenges, optimise layouts, and deliver solutions that work first time.

#### Purpose-Built Excellence

TPS designs recombined process lines that pair consistent product quality with low operating risk. Whether you run a boutique factory or a multi-line industrial plant, each project is centred on our proprietary MixSing high-shear mixer and delivered with exactly the level of automation you specify. Premium OEM parts, hygienic stainless-steel fabrication and decades of experience give you a future-proof platform that meets international standards and safeguards operating costs.

#### From Manual to Full Automation

Start simple and scale when you are ready. A hand-valve batch skid can later grow into a PLC-SCADA system without replacing core hardware. Options include:

- Siemens / Rockwell PLCs with redundant I/O for high uptime.
- Touch-based HMIs featuring recipe management and step-by-step CIP prompts.

This modular route lets you invest at your own pace - no throw-away components, no costly rebuilds.

#### Built on Proven Brands

To maximise uptime, TPS specifies only globally supported parts:

Function	Preferred OEMs
Product and CIP pumps	Alfa Laval
Heat exchangers	Alfa Laval
Valves and agitators	Alfa Laval
Vacuum systems	Busch
Instrumentation	IFM, WIKA
Controls	Siemens PLC/HMI
Hygienic hardware	NGI levelling feet

Every item is compliant with international standards where required, simplifying export approvals and audits.

#### Hygienic Stainless-Steel Fabrication

In addition to TPS, our fabrication partners regularly supply internationally recognised engineering firms. The scope of supply is defined by clear rules that guarantee repeatable quality and fast installation.

- **Materials and surface Finish:** AISI 304 is used as the default grade, with AISI 316L specified for critical wetted zones and always for MixSing high-shear mixer tanks; non-product surfaces remain 304.
- **Weld ground:** Every internal and external weld is ground and polished to  $\leq 0.8 \mu\text{m Ra}$  before full pickle and passivation.
- **Welding and NDT:** Orbital/semi-automatic welding throughout; 10 % X-ray of main-body tank welds and 100 % dye-penetrant testing of all nozzle welds.

- **Hygienic integration:** TPS supplies manholes, air vents, CIP spray balls, adjustable feet, and complete instrumentation sets; the workshop installs these components along with TPS-provided agitators on workshop-fabricated flanges.
- **Geometry and cleanability:** Self-draining slopes, minimal dead-legs.
- **Documentation:** Detailed as-built dossier including material certificates and NDT reports provided as standard.
- **TPS on-site FAT:** A full Factory Acceptance Test is carried out at the workshop for every tank and skid fabrication, verifying functionality and quality before shipment.
- **Pre-dispatch quality:** The team performs a detergent wash-down, inspects visually, then preserves each unit before packing; this ensures the plant arrives clean and ready for installation.

### Shipment and Logistics

TPS recognises that impeccable logistics are key to a trouble-free start-up. From protective packing to specialist forwarding, every step is planned to keep your equipment safe, paperwork compliant, and delivery schedules on track.

- **OEM packaging:** All components sourced from global suppliers are shipped in the original manufacturer's packaging to protect fit and finish.
- **Workshop packaging:** Stainless-steel vessels, pipework, and skids are packed to workshop sea-freight standards. Each unit is shrink-wrapped and secured in steel frames for safe transit.
- **Specialist forwarding:** Transport and customs clearance are managed by industry-specialist logistics partners who routinely handle food-process equipment, ensuring on-time delivery and compliant documentation.

### Installation

TPS partners with experienced installation specialists who have successfully erected and installed multiple plants in your country and region.

- **On-site expertise:** Teams with years of installation know-how manage rigging, piping, and utility hook-ups.
- **Clash-free layout:** Digital models ensure that every skid, tank, and pipe spool fit first time.
- **Time-saving skids:** Pre-fabricated modules minimise on-site welding, cutting installation schedules by up to 40 %.
- **Sanitary welding techniques:** On-site tie-ins use GTAW (TIG) with continuous argon purge.

### Mechanical Commissioning

Once the equipment is in place, TPS and our installation partners supervise a structured mechanical commissioning programme:

- **Utility hook-ups:** Verification of steam, water, air, and electrical connections to ensure correct flow, pressure, and load.
- **Integrity checks:** Hydrostatic testing of tanks, leak testing of pipework, and torque checks on all critical fasteners.
- **Rotation and alignment:** No-load rotation tests for pumps, agitators, and MixSing high-shear mixers followed by vibration analysis to confirm proper alignment.
- **Safety verification:** Inspection of guards, pressure relief devices, and earthing to comply with local safety regulations.

### Control and Automation Start-Up

With mechanical systems proven, focus shifts to controls:

- **I/O point-to-point:** Every sensor, valve, and motor are verified back to the PLC with correct scaling and signal polarity.
- **Interlock and alarm testing:** Simulation of fault scenarios to validate safety interlocks, emergency stops, and alarm escalation.
- **Recipe and HMI configuration:** Upload of customer recipes, set-points, and user levels; verification of multi-language HMIs where required.
- **Factory Acceptance Test to Site Acceptance Test:** All test sheets captured during FAT are re-run on site to document a smooth hand-over.

### Product Commissioning

The final step is bringing product through the line under real-process conditions:

- **Water trials:** Initial runs with water to tune flow rates, level controls, and heat-exchange parameters.
- **Powder introduction:** Gradual dosing of powder to confirm dissolution time, viscosity build, and shear performance.
- **Quality benchmarks:** Sampling for fat globule size, total solids, and microbiological counts to demonstrate compliance with specifications.
- **Ramp-up and handover:** Controlled scale-up to full throughput, with operator training, and spare-parts handover.

## Manual Process Lines

For plants that prefer hands-on control, TPS offers the MixSing LC high-shear mixer as the heart of a straightforward recombination line. The system gives production managers a reliable, low-cost route to smooth blends without the complexity of full automation.

### How It Works

1. **Powder charging:** Operators open the top manway and tip milk powder, sugar or stabilisers straight into the vessel. The MixSing LC impeller-stator head instantly pulls powders into a vigorous vortex, breaking agglomerates and dispersing solids in seconds.
2. **Flow diversion:** Hygienic flow plates replace automated valve blocks. By swinging a plate, personnel can send product to circulation or further processing. The design is easy to clean and keeps maintenance simple.
3. **Heating:** Before mixing starts, the system is filled with hot water. This allows the jackets of the circulation tanks to maintain the correct mixing temperature during ingredients addition, shortening mix time and improving powder hydration.
4. **CIP cycle:** After production, operators switch the flow plates to cleaning mode. The tank is flushed with rinse water, followed by alkaline and acid detergents.

### Why Choose MixSing LC?

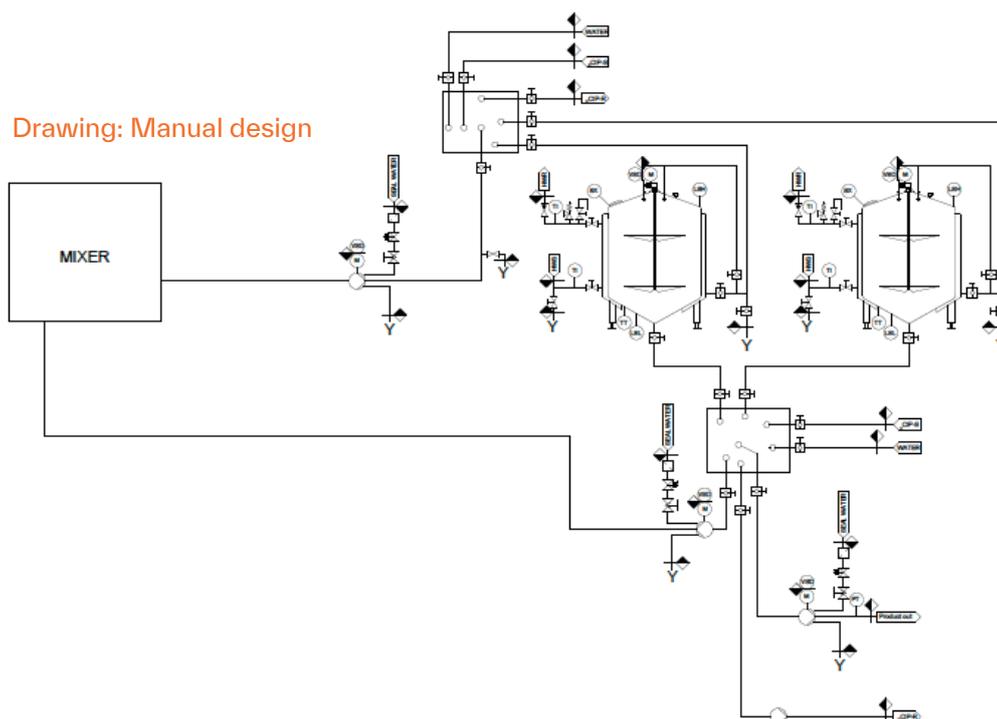
- **Capital-friendly:** Minimal automation means fewer valves, cables, and control panels, ideal for facilities watching their budget.

- **Operator-friendly:** Clear sight of the product and manual flow plates give staff direct feedback and immediate control.
- **Flexible:** One vessel can handle different batch sizes and recipes; changing over is as quick as rinsing and resetting the flow plates.
- **High performance:** Despite its simplicity, MixSing LC delivers the same intense shear and sanitary-build quality found in every TPS mixer.

With MixSing LC, you combine the craft of manual operation with cutting-edge high-shear technology, achieving consistent, recombined products while keeping both capital and running costs firmly under control.



Picture: Impeller and stator



## Automated Process Lines

For plants that demand maximum throughput and repeatability, TPS supplies a MixSing Vacuum high-shear system at the core of a fully automated recombination line. Controlled by a Siemens PLC and recipe-driven HMI, the line delivers smooth, air-free products with minimal operator input.

### How It Works

- 1. Powder charging:** Powder, sugar, and stabilisers are conveyed from silos to a vacuum hopper. The PLC meters each ingredient by load-cell weight and inducts it below the liquid surface, eliminating dust and clumping.
- 2. Flow diversion:** A sanitary mix-proof valve block routes product through heating and circulation tanks, or to CIP, with every move logged for traceability. No manual plate swings or hose changes are required.
- 3. Heating:** Product passes through a dedicated inline heat exchanger regulated by PID loops. The hot-water skid provides stable temperature with minimal product damage, and the circulation tanks are jacket-free, relying on insulation only.
- 4. CIP cycle:** At batch end, the PLC executes a validated CIP cycle: Pre-rinse, alkaline wash, intermediate rinse, acid wash, and final rinse, all temperature and conductivity-verified. The system is ready for the next recipe without manual cleaning.

### Why Choose MixSing Vacuum?

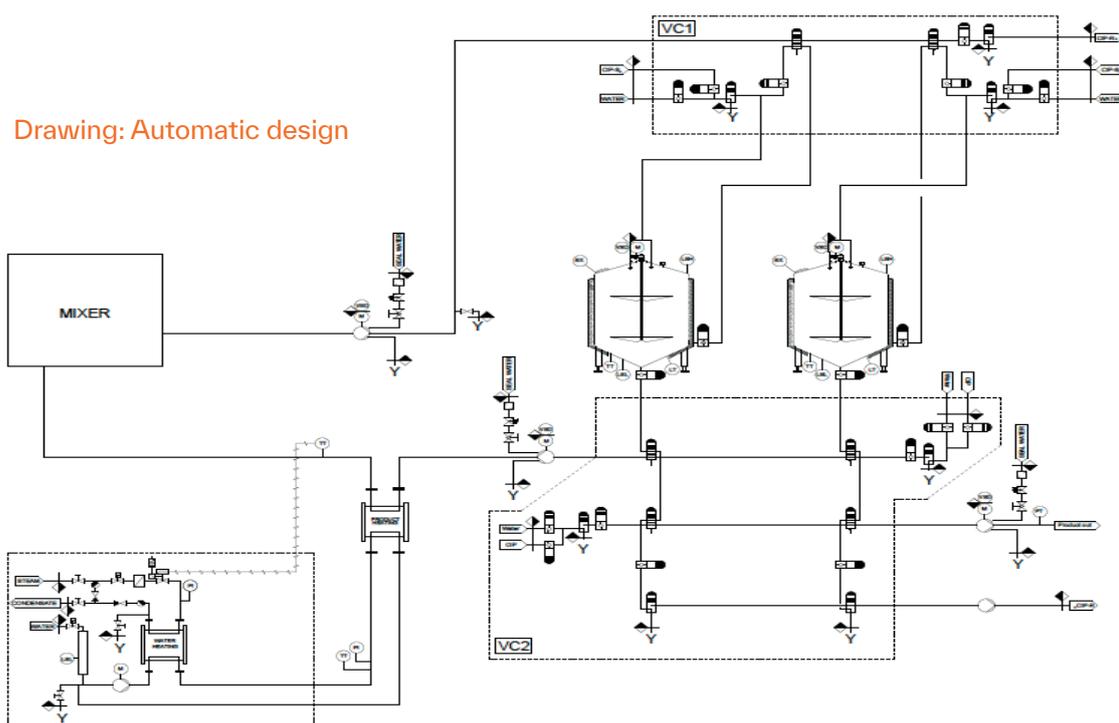
- **Labour-lean operation:** Operators can supervise multiple lines: Dosing, mixing, transfer, and cleaning on recipe schedules.

- **Unmatched consistency:** Automated ingredients-ratio control and high-shear dispersion give identical solids, viscosity, and fat-globule size in every batch.
- **Full traceability:** Time-stamped batch reports capture every valve position, temperature, and flow - ideal for audits and export compliance.
- **Higher OEE:** Rapid CIP and recipe change-over achieve high uptime, boosting daily output without extra tanks.
- **Future-proof:** Open-code software and remote connectivity enable fast support and seamless MES integration.

With MixSing Vacuum, TPS brings fully automated capability to recombined processing - delivering repeatable quality, lower labour costs, and real-time production insight.



Picture: Recombination in MixSing Vacuum



# Dos and Don'ts

Best practices for powder mixing with the MixSing Vacuum high-shear mixer.

PROCESS OPTIMISATION	DOS	DON'TS
Powder incorporation	<ul style="list-style-type: none"> <li>• Keep vacuum at -60 to -70 kPa before opening the powder valve.</li> <li>• Use the sub-surface induction under vacuum for quick and uniform wetting.</li> <li>• Sieve hygroscopic powders and break up lumps before feeding.</li> </ul>	<ul style="list-style-type: none"> <li>• Drop large bags directly into the hopper - air pockets cause bridging.</li> <li>• Allow powder to enter above the liquid surface (dust, poor wet-out).</li> <li>• Skip pre-blending of minor ingredients - risk of dosage errors.</li> </ul>
Mixing speed & sequence	<ul style="list-style-type: none"> <li>• Run the MixSing Vacuum at its recommended tip-speed while dosing powders.</li> <li>• Add sugars first, then proteins, then stabilisers/thickeners last.</li> <li>• Follow recommended dwell times.</li> </ul>	<ul style="list-style-type: none"> <li>• Add fat-based powders (e.g. cocoa) before sugars - they may coat and agglomerate.</li> <li>• Don't stop mixing immediately after powder addition - proteins need time to hydrate.</li> </ul>
Vacuum settings and deaeration	<ul style="list-style-type: none"> <li>• Reach full vacuum before powder feed; release slowly at batch end.</li> <li>• Hold a 3-min deaeration step after mixing to vent micro-bubbles.</li> </ul>	<ul style="list-style-type: none"> <li>• Chase vacuum leaks with higher pump speed - fix seals instead.</li> <li>• Vent the tank abruptly - can foam product.</li> </ul>
Temperature control	<ul style="list-style-type: none"> <li>• Pre-heat liquid via the inline plate heat exchanger to 45-55 °C before powder dosing.</li> <li>• Ramp up gently if needed to reduce viscosity.</li> </ul>	<ul style="list-style-type: none"> <li>• Rely on tank jackets for heating - slower and uneven.</li> <li>• Allow product to stagnate in exchangers during pauses - risk of fouling.</li> </ul>
PRODUCT QUALITY	DOS	DON'TS
Foam and air inclusion	<ul style="list-style-type: none"> <li>• Start powder dosing only after full vacuum is reached.</li> <li>• Vent the tank slowly after mixing to let micro-bubbles escape.</li> <li>• Keep return lines submerged to avoid drawing air.</li> </ul>	<ul style="list-style-type: none"> <li>• Break vacuum abruptly - causes sudden foaming.</li> <li>• Skip the 3-min post-mix deaeration hold.</li> </ul>
Viscosity control	<ul style="list-style-type: none"> <li>• Maintain product temperature within <math>\pm 0.5</math> °C of the set-point during dosing.</li> <li>• Add thickeners/stabilisers last and allow a 5-min hydration step at low speed.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce thickeners before sugars - risk of lumping and uneven viscosity.</li> </ul>
Emulsion stability	<ul style="list-style-type: none"> <li>• Ensure fat is pre-heated to 45-55 °C for optimum dispersion.</li> <li>• Sample fat-globule size daily (target <math>&lt; 2 \mu\text{m}</math>).</li> </ul>	<ul style="list-style-type: none"> <li>• Add cold fat directly - poor wetting leads to free-fat rings.</li> <li>• Over-recirculate after dispersion - can shear proteins and destabilise emulsion.</li> </ul>

# Internal View of the MixSing Vacuum High-Shear Mixer

- **MixSing Wall Valve:** A specialised valve designed by TPS. It is built on the Alfa Laval sizing/parts structure, with moving parts integrated from an Alfa Laval valve. The design minimises dead legs in the valve integration and ensures proper drainage into the tank.
- **Minor ingredients:** A side-mounted MixSing Wall Valve allows for the addition of speciality ingredients, if required. If not needed, it can be removed from the design prior to manufacturing.
- **Product outlet:** A bottom-mounted MixSing Wall Valve enables complete emptying of the tank.
- **Vortex breaker:** Two stainless steel structures designed to break the vortex created by the bottom shear.
- **Bottom shear:** The impeller-stator high-shear unit, designed by TPS. The parts are cast and then CNC-machined to achieve a very narrow clearance between impeller and stator, significantly increasing shear rates.
- **Tangential inlet:** Allows for product recirculation over an external hydration tank.
- **IFM instruments:** Installed with sanitary welding parts.



# The MixSing Vacuum High-Shear Mixer

is built using subcomponents from globally recognised OEM suppliers.

- Alfa Laval: SSV, butterfly valves, ThinkTop, SaniMidget, tank vents, and manways.
- Busch: Vacuum pump.
- Hoyer: High-efficiency motor with low vibration allowing for optimised clearance between impeller and stator.
- IFM: Instruments and sanitary weld-in parts.
- NGI: Hygienic tank feet and load cells.

All components are selected for their quality, durability, and global availability through supplier contact points.

The collage features several images of mixer components:

- High-Efficiency Motor:** A large black industrial motor.
- Impeller system:** Three views of the stainless steel impeller and stator assembly.
- Internal:** A view into the stainless steel mixing tank showing the impeller.
- Level Switch:** A cylindrical sensor component.
- Vacuum:** A cylindrical vacuum pump component.
- Hygienic Feet:** Two stainless steel feet for the tank.
- MixSing Wall Valve No Dead Legs:** A valve assembly for sanitary applications.
- Components:** A collection of various small stainless steel parts.
- Vacuum Pump:** A smaller industrial vacuum pump.

The TPS logo is visible in the top right corner of the collage.

