

Ready-to-Drink Tea Production

Process PDF: Extraction, Clarity & Filling

Process map & product boundaries

Ready-to-drink tea production links extraction and clarification with formulation, preservation and packaging. The best route depends on the tea material, target taste, clarity, recipe and distribution conditions. This downloadable handbook shows how to specify the process and identify the trials needed before ordering an RTD tea line.

Start by separating three cases: an acidified flavored tea, a low-acid unsweetened tea and a milk-containing tea beverage. They may look similar on a filling conveyor but need different product assessments. A tea brewed with hot water is not automatically shelf-stable after bottling. The preservation and filling system must be designed for the finished recipe and intended storage.

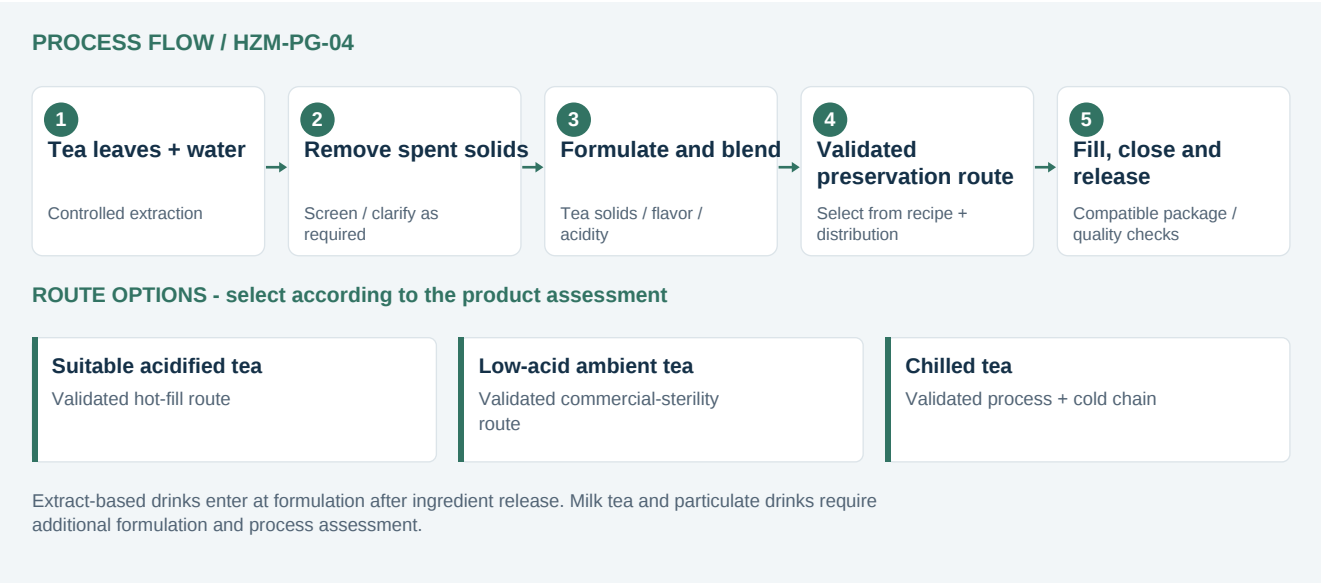


Figure 1. Original process schematic. Alternative routes require product-specific assessment.

Define the raw material route

Whole or cut tea leaves require extraction and spent-leaf handling. Purchased liquid extract, concentrate or instant tea changes the front end of the line; it does not remove the need to validate the finished beverage process.

SECTION 02 / 06

Extraction, clarification & formulation

01 / Control leaf and water specifications

Record tea type, supplier, grade, moisture and lot identity. Evaluate water as an ingredient because variation can change extraction and sensory results. Define receiving checks and storage conditions. Keep a retained reference sample of the approved tea material so that a raw-material change is not mistaken for a machine problem.

02 / Develop the extraction window

Extraction depends on time, temperature, tea-to-water ratio and mixing or circulation [2]. Establish the window through trials for the chosen tea. Record both yield and taste; maximizing extracted solids can also increase undesirable bitterness or astringency. Confirm how the equipment reproduces the selected conditions at commercial scale.

03 / Separate spent leaves and manage clarity

Screen or otherwise separate the bulk leaf material before downstream processing. Clarification may be required for a clear tea product. Oxygen exposure and the handling of aggregates influence separation performance, as described in Tetra Pak guidance [3]. Decide whether haze is a defect or part of the intended product appearance before specifying polishing equipment.

04 / Blend to the final recipe

Adjust tea strength and add approved ingredients using a controlled batch record. Evaluate sweetness, acidity, flavor, color and physical stability together. A refractometer reading in sweetened tea reflects more than tea extract solids; use an appropriate method to distinguish extraction performance from added sugar.

05 / Select preservation and packaging

GEA describes extraction, clarification, blending, thermal treatment and filling as parts of an integrated tea process [1]. The exact preservation route must follow the product assessment. Specify the package, process records, distribution conditions and shelf-life evidence together, then plan the appropriate cooling and downstream handling.

Equipment & hygienic plant design



Figure 2. General beverage mixing and storage equipment from the HZM library. This is not a photograph of a tea extractor or a complete tea production line.

Process area	Equipment to assess	Design question
Raw materials	Leaf handling, weighing, ingredient storage	How are lots separated and dust managed?
Extraction	Batch or continuous extractor, hot-water supply	How reproducible are contact time and ratio?
Separation	Screens, filters or clarification system	What clarity and solids recovery are required?
Formulation	Blending tanks and ingredient dosing	How are tea strength and recipe additions verified?
Preservation / filling	Product-specific thermal and filling system	What product and package validation is included?

Provide a separate route for spent leaves, cleaning waste and ingredient packaging so they do not cross protected product or package areas. Access for opening, inspection and cleaning is particularly important around extractors and screens. Estimate the amount and moisture of spent material from pilot trials rather than assuming it behaves like dry tea leaves.

For a factory producing several beverages, define shared and dedicated circuits. Milk ingredients introduce different soil and allergen-control requirements. Strong flavors may need changeover validation. List these cases before finalizing pumps, valves, cleaning programs and the production sequence. A generic blending-tank quotation does not resolve the whole tea process.

Quality targets & product stability

Characteristic	Suggested evaluation	Use in development
Extraction consistency	Tea-solids method, batch yield, sensory reference	Set the reproducible brewing window
Taste and color	Standardized tasting and color comparison	Detect raw-material or process shifts
Clarity / sediment	Visual and instrumental checks at relevant conditions	Assess clarification and storage stability
Formulation	Recipe additions, acidity and solids results	Confirm the finished product case
Package / process	Process records, seal integrity, microbiological program	Support release and shelf-life validation

Tea cream, haze and sediment are not interchangeable with microbial spoilage. A clear bottle at the filler can become hazy during storage, while an apparently normal bottle can still require microbiological assessment. Use a structured investigation that separates physical stability, sensory change and food-safety questions. Keep retained samples linked to both the tea lot and the production batch.

Build a storage trial matrix

Test representative batches in the intended package under the defined storage conditions. Record color, clarity, sediment, flavor and package condition at planned intervals. Include the distribution scenarios relevant to the project. Accelerated tests can inform development, but they do not automatically replace real-time evidence.

Keep preservation decisions product-specific

Do not treat a low-acid unsweetened tea as an acidified fruit drink. Evaluate a suitable commercial-sterility process for ambient low-acid products, or another validated preservation and distribution strategy. Milk tea and drinks with particles need further assessment. Avoid assigning one hot-fill temperature to the entire tea category.

SECTION 05 / 06

Extraction balance & trial checklist

Worked example - extraction planning only

Assume 5,000 L of finished tea at 2 g/L of tea-derived solids. Required tea solids are 10 kg. At an assumed 25% recovered dry-leaf solids yield, estimated dry tea demand is $10 / 0.25 = 40$ kg, before downstream losses. Actual yield must be measured in trials.

This balance distinguishes tea-derived solids from sugar and other ingredients. A refractometer result on the final sweetened drink cannot be inserted into the calculation as though it represented tea alone. Include extract retained in wet spent leaves, clarification losses, sampling and transfer residues when reconciling the real batch.

Match batch preparation to filling

At an illustrative 10,000 bottles/h and 0.5 L, running liquid demand is 5,000 L/h. A 5,000 L usable finished batch represents one hour of supply before losses. Compare this with extraction, separation, blending, testing and cleaning time. Overlapping operations or parallel equipment may be required, but intermediate holding needs its own hygiene and quality limits.

- Trial representative tea lots and record water quality.
- Compare extraction yield with sensory acceptance, not yield alone.
- Measure losses to spent leaves and clarification residues.
- Evaluate oxygen exposure and the clarity target.
- Test the chosen preservation route with the final recipe and package.
- Confirm cleaning of extractors, screens, valves and transfer lines.
- Demonstrate repeatability across batches and at the required output.

Define what the supplier must demonstrate and what remains the responsibility of the formulation laboratory or process specialist. A successful mechanical run with water does not prove tea extraction yield, flavor retention or shelf life. Include product trials in the project schedule and budget.

SECTION 06 / 06

Frequently asked questions

Can tea extract replace a leaf extractor?

It can change the front end of the process if the formulation is designed for a purchased extract. Confirm ingredient quality, flavor profile, dosing, solids measurement and storage. Finished-product preservation and packaging still need assessment.

Is milk tea covered by the same process?

No automatic equivalence should be assumed. Milk or plant proteins, fat, allergens and formulation stability affect processing and cleaning. Develop and validate a suitable route for that product family.

Why does tea become cloudy after bottling?

Possible causes include tea-component interactions, water composition, cooling history and inadequate clarification. Check these alongside microbiological results. The correct response depends on the identified cause and the intended appearance.

Can an existing juice filler be reused?

Only after reviewing the tea recipe, preservation route, hygiene level, filling conditions and packaging. Mechanical compatibility alone does not establish microbiological suitability or product stability.

What should be sent with a tea-line inquiry?

Provide tea samples or extract specifications, the finished recipe, target taste and clarity, packaging, output, shelf life, storage conditions, site utilities and cleaning requirements. State whether extraction and product trials must be included.

Technical references

General technology references accessed September 21, 2026. Diagrams and worksheets are original planning material; examples are not equipment guarantees or process settings.

1. GEA: Ready-to-drink tea processing
2. Tetra Pak: Line solution for RTD tea and coffee
3. Tetra Pak: High-quality tea through separation

Find equipment and further planning articles at www.hzmmachine.com. For a project review, provide your recipe characteristics, package specification, required output and site utilities.