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Complete Beverage Production Line Process PDF: Flow Chart & Equipment Guide

Process map & project scope

A complete beverage production line starts with a finished-product specification and ends with released, traceable packs. The filler is only one part of that system. Raw-water quality, ingredient preparation, preservation, package design and secondary packaging must all support the same recipe and output target. This downloadable guide provides a planning flow chart, an equipment schedule and a practical worksheet for discussing a new line with suppliers.

Use this guide for early project definition rather than as a production recipe. A sugar-free carbonated drink, a pulpy juice and an unsweetened tea can share some utilities, but they do not automatically share the same preservation process or filling machine. Confirm the product family first; then develop a line configuration around the package and distribution conditions.

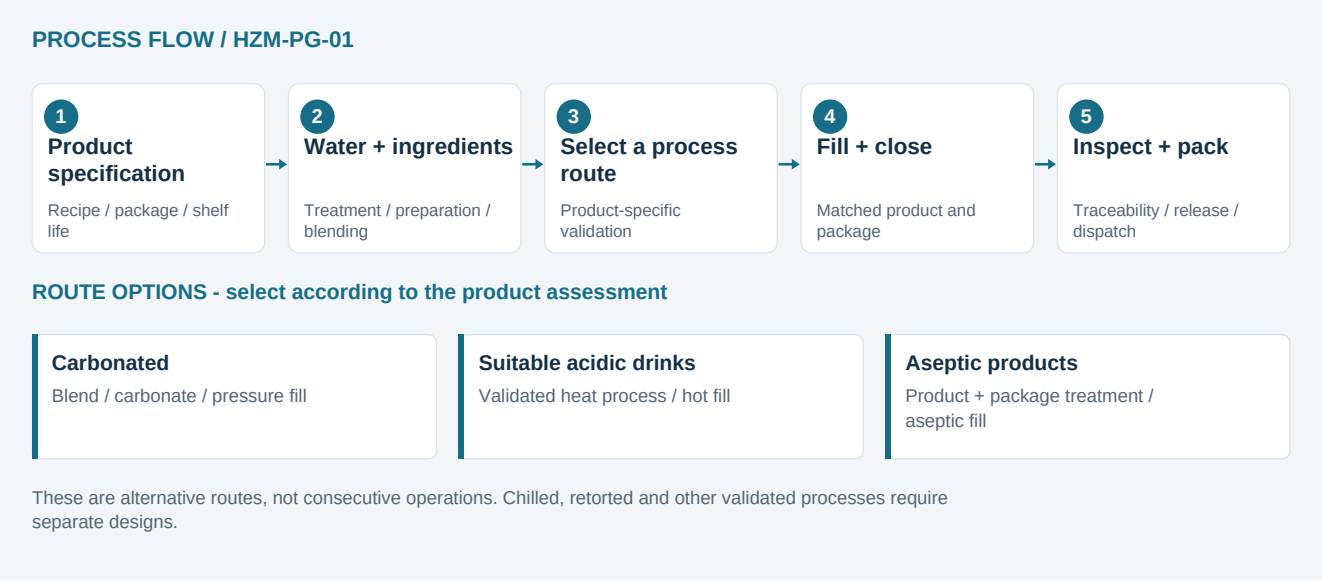

Figure 1. Original process schematic. Alternative routes require product-specific assessment.

Define the product before requesting a quotation

Record the recipe, acidity, carbonation, viscosity, particles, allergens, bottle or can specification, target shelf life and intended storage conditions. These inputs determine the process route.

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From raw materials to finished packs

01 / Treat the water for its intended use

Obtain an actual source-water analysis, including seasonal variation where relevant. Specify product water separately from boiler feed, cooling water and cleaning water. Treatment may include filtration, hardness control, membrane treatment or other appropriate stages; buying reverse osmosis equipment without defining the required water quality can create unnecessary cost and waste.

02 / Prepare and verify the ingredients

Provide an approved receiving area, lot identification, weighing and controlled storage. Prepare sugar syrup, dissolve powders or meter liquid concentrates according to the recipe. Decide which ingredients need separate dissolving or pre-mixing equipment. Confirm the method for correcting a batch before it is released to the next stage.

03 / Blend and apply the selected process

Batch tanks suit many multi-recipe plants, while continuous dosing may suit long, stable production runs. Carbonated beverages need a defined gas-dissolution and pressure-filling route; suitable hot-filled products need a validated thermal and package-contact process. Aseptic production additionally requires a protected filling system and treated packaging. These differences affect equipment and operating procedures [1-3].

04 / Prepare containers, fill and seal

Purchased bottles, on-site PET blowing and can depalletizing need different infeed systems. Specify bottle necks, caps, seams, filling tolerances and change parts. Establish how containers and closures are prepared for the selected hygiene level. Ordinary rinsing should not be described as sterilization.

05 / Inspect, label, pack and release

Check closure integrity, fill level or mass, code legibility and label position. Group containers into the required pack, then palletize if the project calls for it. Separate rejected and unreleased stock from saleable goods. Link the packaging code to the ingredient lots, processing records and final quality decision.

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Equipment schedule & line interfaces

Figure 2. Beverage processing tanks and sanitary pipework from the HZM equipment library. This photograph illustrates the processing area, not a complete line layout.

Area	Equipment to assess	Interface to confirm
Water and ingredients	Treatment, storage, dissolving, weighing	Water specification; batch and lot identity
Product processing	Mixing; route-specific thermal or carbonation equipment	Flow, pressure, temperature and hygienic boundary
Primary packaging	Container preparation, filler, capper or seamer	Package drawing; closure; change parts
End of line	Inspection, coding, labeling, packing, conveying	Pack format; reject handling; accumulation
Plant services	CIP, heating, cooling, compressed air, drainage	Peak demand and simultaneous users

A useful equipment schedule includes the supplier, nominal duty, guaranteed duty for the actual product, utility demand, footprint and connection points for each machine. It should also say which company owns each interface. A conveyor gap, mismatched control signal or missing drain can delay a project even when every individual machine passes its factory test.

Request a capacity matrix for all planned bottle sizes and recipes. A speed quoted for water in a small bottle is not evidence of the same performance with a foaming beverage or a larger package. List format parts, cleaning constraints and minimum economical batch sizes alongside the headline speed.

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Quality controls, hygiene & traceability

Control area	What to record	Decision supported
Incoming materials	Supplier approval, lot, condition, test results	Accept, hold or reject
Blending	Recipe version, actual additions, Brix or other solids measure	Batch conformity
Preservation	Validated process settings and actual records	Product disposition after a deviation
Packaging	Closure tests, fill checks, inspection rejects	Package integrity and net contents
Cleaning	Circuit, time, temperature, chemistry and flow	Readiness for the next product
Finished stock	Lot code, retained samples, release results	Traceability and dispatch

The table is a planning checklist, not a generic HACCP plan. A site-specific hazard analysis determines which steps are critical control points and which belong in prerequisite or quality programs. Assign a responsible person, an approved limit, a sampling method and an action for every monitored item. A number on a dashboard is useful only when operators know what to do if it moves outside its allowed range.

Design cleaning into the line

Map product-contact circuits, cleaning supply and return paths, valves, tanks and dead-end risks before installation. Cleaning effectiveness depends on the soil and circuit as well as the selected time, temperature, chemical conditions and mechanical action [4]. Confirm compatibility with seals, instruments and packaging equipment.

Plan for interruptions

Define restart checks after loss of utilities, filler stoppage, incomplete cleaning or an abnormal product hold. Keep uncertain product identifiable while its disposition is assessed. The acceptance test should demonstrate alarm handling and segregation, not only steady-state speed.

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Capacity worksheet & utility planning

Worked example - planning assumptions, not a machine guarantee

Target: 10,000 good 500 mL bottles per hour. If effective output is 80% of nominal speed over the chosen operating period, required nominal speed is 10,000 / 0.80 = 12,500 bottles/h. Liquid demand while running at that nominal rate is 12,500 x 0.5 = 6,250 L/h, before losses.

Keep instantaneous running flow separate from average shift output. The upstream process must supply the running filler, while daily production also depends on cleaning, changeovers and planned downtime. If the 80% factor already includes quality losses, do not subtract those losses a second time. Write down the availability, speed and quality assumptions used in the calculation.

Batch and buffer sizing

At 6,250 L/h, a 3,000 L usable batch provides 28.8 minutes of product at nominal speed, ignoring losses. Compare that time with the next batch preparation, testing and transfer cycle. If preparation takes longer, assess parallel tanks or a different working volume. A buffer must also respect the product hold-time limit and the hygiene requirements of its position in the line.

Service	Information to request
Heating	Peak load during start-up, production and cleaning; supply and return conditions
Cooling	Product heat load, ambient conditions, cooling duty and redundancy requirements
Compressed air / gases	Flow, pressure, quality at use points; simultaneous peak consumption
Water / drainage	Product, rinse and CIP demand; discharge temperature, chemistry and volume
Power / space	Connected and running loads; access, lifting routes and future expansion

Ask vendors to state utility use per operating hour and per thousand saleable containers, together with the test conditions. Compare quotations on the same package, recipe and operating basis. A lower machine price can be offset by extra utilities, slower changeovers or equipment omitted from the supply boundary.

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Commissioning checklist & common questions

- Approve product and package samples, the process description and the line capacity matrix.
- Agree factory and site acceptance tests using representative recipes and containers.
- Confirm process records, recipe access control, alarms and reject tracking.
- Train operators on cleaning, format changes and restart decisions.
- Verify finished-product specifications and shelf life before routine commercial release.

Can one line make water, juice and carbonated drinks?

Some equipment can be shared, but compatibility must be checked across product-contact design, filling method, package strength, hygiene and changeover. A flexible filler alone does not make the entire process suitable for all beverages.

Is PET blowing always part of a complete line?

No. A plant may buy empty bottles or blow them on site. Define this explicitly because a blower adds molds, preform handling, high-pressure air, cooling and operator requirements.

Does a faster filler increase daily output?

Only if upstream processing, packaging and operational availability support it. Compare good packs per shift and changeover performance, not just containers per hour during a short run.

What should accompany an RFQ?

Send the product list, recipe characteristics, bottle and closure drawings, output by format, annual demand, storage conditions, plant plan and utility information. Ask for an itemized scope with exclusions and measurable acceptance criteria.

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. Krones: Process technology for soft drinks and juices
2. Krones: Contiflow mixing and carbonation
3. Sidel: Hot-fill lines and heat-resistant PET
4. Tetra Pak: Cleaning of processing equipment

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.