Brewery & Bottling Execution Structure (ERP + AI TicketingOS)

Carbonated Soft Drinks – Syrup · Water Treatment · Carbonation · Filling (PET/Can) · Packaging · Distribution

Batch traceability · CO_2, Brix, pH, microbial control · High-speed bottling · Cold chain (optional)

1. Master Beverage Manufacturing Execution Flow (Batch-Driven)

ID	Department	Process	Activity	Action	Progress %
6001	Sales	ORDER	Customer PO	Order received (retail chain / distributor / export)	5
6002	Procurement	RAW MATERIAL	Ingredient purchase	Sugar, concentrate/colour, CO_2, flavours, preservatives	10
6003	QA/QC	INWARD	Raw material inspection	Concentrate brix, sugar purity, CO_2 purity, microbial limits	12
6004	Production	SYRUP PREPARATION	Simple syrup + blending	Sugar dissolved, concentrate added, mixed in syrup tank	20
6005	Production	WATER TREATMENT	Reverse Osmosis + deaeration	TDS removal, chlorine removal, UV sterilization	25
6006	Production	PROPORTIONING	Syrup + water + CO_2	In-line mixing via proportioner (5:1 or other ratio)	35

ID	Department	Process	Activity	Action	Progress %
6007	Production	CARBONATION	CO_2 injection	Carbonator – target CO_2 volume (3.5-4.0 v/v)	45
6008	QA/QC	IN-LINE TEST	Brix, CO_2, pH, TA	Automatic online check – adjust if out of spec	50
6009	Production	FILLING	Bottling / Canning	Isotonic filling (PET, glass, or aluminium can)	60
6010	Production	CAPPING & SEAMING	Seal application	Plastic screw cap, crown cork, or can seaming	65
6011	Production	LABELLING & CODING	Batch code & expiry	Inkjet print: batch no., manufacturing date, MRP	70
6012	QA/QC	FINAL INSPECTION	Fill level, cap torque, seam inspection	Automatic vision check & weight check	75
6013	Production	PACKAGING	Shrink wrap / tray packing	Multi-pack (6/12/24) + palletizing	80
6014	Warehouse	STORAGE	Finished goods warehouse	Ambient storage (avoid direct sun)	85
6015	Dispatch	LOGISTICS	Truck loading	Route planning, E-way bill, GST invoice	90
6016	Distribution	DELIVERY	To retailer / distributor	Proof of delivery (POD)	95
6017	Finance	SETTLEMENT	Final payment	Credit term (30-60 days) or cash before delivery	100

2. Carbonated Soft Drink Production Lifecycle

Water treatment (RO/DI) → Syrup batching → Proportioning → Carbonation → Filling → Capping/Seaming → Labelling & coding → Packing → Palletizing → Storage → Dispatch

📊 Critical Quality Parameters

- **Brix (°Bx) –** Sugar content (target ±0.2°Bx) for taste consistency
- **CO_2 volume –** Typically 3.2–4.0 v/v, measured by CarboQC or pressure/temperature method
- **pH –** Around 2.5–3.0 (phosphoric/citric acid)
- **Dissolved oxygen (DO) –** < 1 ppm to prevent flavour degradation
- **Air content in headspace –** Minimise to prevent oxidation
- **Microbial limits –** Yeast, mould, bacteria absent

3. Milestone-Based Payment Release (Bottling Plant)

Stage	Release Condition	Payment %	Typical Buyer
Order confirmation + advance	PO received, credit check done	15% advance	Export / large chain
Raw material procurement (concentrate, CO_2, sugar)	Inward inspection passes	20%	Franchise bottlers (e.g., PepsiCo contracts)
Syrup batching completed	Syrup Brix & pH verified	10%	Own brand / copacker
Filling & capping completed (batch ready)	First-off inspection (fill level, CO_2) passed	15%	All

Stage	Release Condition	Payment %	Typical Buyer
Packing & palletizing done	Final QA signed off	10%	Domestic
Dispatch – truck loaded	E-way bill & invoice generated	15%	Distributor
Delivery confirmed (POD)	Customer acceptance + quality sign-off	10%	All
Final settlement (after credit period)	No returns or claims	5% (retention)	Large retail chains

📦 Bottler's typical terms: 30% with PO, 40% against dispatch, 30% against delivery (or 100% before dispatch for contract manufacturing).

4. ERP Module Mapping (Brewery & Bottling)

🥤 **Formula & BOM –** Syrup recipe, concentrate usage, water ratio, CO_2 factor, packaging materials (PET

🏭 **Production (SCADA Integration) –** Real-time data from proportioner, carbonator, filler – OEE tracking

💉 **QA/QC (LIMS) –** Brix, CO_2, DO, microbial tests, batch release automation

📦 **Inventory (FEFO) –** Concentrate (temperature-sensitive), packaging materials, finished pallets

🚚 **Logistics TMS –** Route optimisation, truck temperature (if needed), POD mobile app

preform, labels, shrink film)

🏷️ **Label & Compliance –** FSSAI/ FDA, nutritional info, batch printing, traceability QR

💰 **Finance –** GST (12% or 18% depending on packaging), export documentation, excise (if applicable)

📊 **AI & Analytics –** Yield prediction, CO_2 consumption efficiency, line downtime root cause

5. AI-Based Brewery & Bottling Automation (TicketingOS)

Function	AI Automation
Predictive syrup batching	AI calculates exact sugar & concentrate based on previous batch Brix variation
CO_2 injection optimisation	Machine learning adjusts carbonation pressure for temperature and desired v/v
Vision fill level inspection	Camera detects underfill / overfill at 60,000 bottles/hour → auto reject
Cap torque anomaly detection	Sound / vibration AI detects loose or cross-threaded caps
Predictive maintenance	Filler valve wear, capper head, conveyor motor → auto ticket to maintenance team
Supply chain demand forecast	Historical sales + weather data + promotion calendar → predicts weekly SKU mix

Function	AI Automation
Returnable glass bottle inspection	AI vision for cracks, chips, contamination before refilling
Energy & water efficiency	Real-time anomaly in CIP (clean-in-place) → reduce water waste
Batch traceability via QR	Consumer scan reveals production date, lab test results, expiry
Distributor inventory auto-replenishment	Based on secondary sales data → auto generate dispatches

6. Final Brewery & Bottling ERP + TicketingOS Architecture

🥤 **Customer / Order Side** : Distributor PO → Production planning (batch) → Filling line → Packing → Dispatch → Delivery → Settlement

⚙️ **Internal ERP Side** : Sales → Formula mgmt → Water treatment → Syrup → Carbonation → Filling → QC → Packaging → Logistics → Finance

🤖 **AI TicketingOS Side** : AI Batching → AI CO_2 Control → AI Vision Inspection → AI Cap Torque → AI Predictive Maintenance → AI Demand → AI Traceability

🔲 Batch Traceability & Barcode (FSSAI / FDA compliant)

🍺 **Concentrate lot –** Supplier batch, receipt

💧 **Water treatment log –** TDS, flow rate, UV

🧾 **Production batch –** Unique batch number

📦 **Pallet SSCC –** Scan to see which bottles from

🔄 **Recall engine –** Any batch of concentrate or

date, storage temperature log	hours linked to final batch	printed on each bottle/can (inkjet)	which batch, expiry date	CO_2 can be traced across all shipped SKUs instantly

📊 Beverage Manufacturing Dashboards

- Line efficiency % (OEE) – filler utilisation, changeover time
- Brix & CO_2 consistency – standard deviation across bottles in a batch
- Bottle rejection rate (fill, cap, label defects)
- Water usage ratio (litres water per litre of finished beverage)
- Concentrate yield (actual vs standard usage)
- CO_2 consumption efficiency (kg per 1000 litres)
- On-time delivery to distributors
- Customer complaint rate (flat taste, low carbonation)
