

CEPA TECHNICAL INTELLIGENCE BRIEF

Food, Beverage, Brewing,
Distilling & Dairy Edition



Prepared by
EterSolis
Waste & Carbon
Management
etersolis.com



CEPA TECHNICAL INTELLIGENCE BRIEF

FOOD, BEVERAGE, BREWING, DISTILLING & DAIRY EDITION

Where Product Loss, Water and Carbon Converge

A decision-grade operating framework for yield, clean-in-place systems, wastewater loading, by-products and verified value recovery.



Published by CEPA



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Issue 001
2 August 2026
CEPA-TIB-FOODBEV-001-20260802



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Where Product Loss, Water and Carbon Converge



CEPA-TIB-FOODBEV-001-20260802

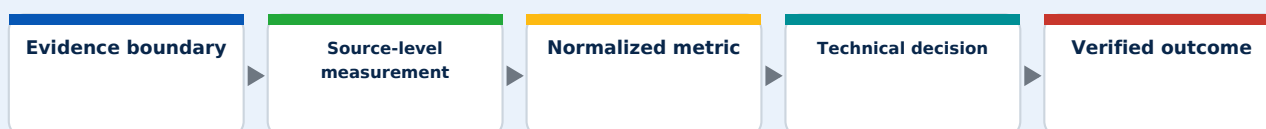
A decision-grade operating framework for yield, clean-in-place systems, wastewater loading, by-products and verified value recovery.

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CONTROLLING EXECUTIVE FINDINGS

- 1 Product loss, wastewater organic load and carbon performance are different expressions of the same material-efficiency problem.
- 2 Product-to-drain must be measured before dilution; final wastewater concentration alone cannot recover yield information.
- 3 Clean-in-place optimization is valid only when hygiene, allergen and microbiological performance remain verified.
- 4 Food loss before retail and food waste at retail/consumer stages are distinct SDG measurement boundaries.
- 5 By-product value depends on quality preservation, traceability, safety and receiving specification.
- 6 Anaerobic treatment is not automatically suitable for every high-COD stream; inhibition, solids and biogas use govern performance.
- 7 Benchmarks are valid only when process, product, denominator, period and boundary are aligned.

DECISION-GRADE PUBLICATION SYSTEM



FOOD-001 | Sources: F01, F03, F04, F06, F07

The manuscript is a technical intelligence product, not a facility permit, certification or substitute for jurisdiction-specific legal advice.

Scope, sector boundary and evidence

FOOD-002

KEY

The edition integrates food, beverage, brewing, distilling and dairy through a common material-flow framework while preserving subsector-specific process and safety boundaries.

Documented + analytical

DOCUMENTED

Law, permit, standard, official method or audited record.

MEASURED

Calibrated meter, scale, laboratory result or production record.

CALCULATED

Transparent calculation from measured or documented inputs.

REPORTED

Company, association, stewardship or public disclosure.

ESTIMATED

Engineering estimate, market estimate or extrapolation.

UNCERTAIN

Incomplete, non-comparable or boundary-limited information.

SCOPE AND BOUNDARY

The EU BAT conclusions cover specified industrial-scale food, drink and milk activities and associated wastewater treatment, while IFC guidance provides good international industry-practice context. The issue also uses EPA sector rules, FAO/UNEP measurement frameworks, Codex hygiene principles and GHG Protocol lifecycle accounting.

DECISION RULE

No single range is a universal benchmark. Applicability depends on product mix, capacity, climate, hygiene requirements, technology, utilization and discharge boundary.

CONTROL ACTION

Declare included process and excluded utilities.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-002 | Sources: F01, F02, F03, F06, F08
 Legal scope and thresholds require jurisdiction-specific review.

CEPA TECHNICAL INTELLIGENCE BRIEF | EXECUTIVE FINDINGS

Executive operating system

FOOD-003

KEY

Yield, cleaning, wastewater and energy must be reviewed as one operating system because a lost kilogram often carries embedded ingredients, heat, cooling, labour and treatment demand.

Documented + analytical

01

Measure value before dilution - Track concentrated product, heel, first rinse and by-product before mixing.

02

Separate prevention from recovery - A lower disposal rate is not proof of prevention or verified recovery.

03

Normalize every metric - Declare numerator, denominator, period, product family, owner and confidence.

04

Protect safety and quality - Efficiency cannot override chemical safety, food safety or product conformance.

05

Require route evidence - Collection, storage or transfer is not a completed recovery outcome.

EXECUTIVE QUESTION	EVIDENCE	DECISION
Where is value lost?	Batch and stream balance	Prioritize source control
What creates load?	Flow x concentration	Prevent or segregate
Is recovery credible?	Receiving specification and accepted mass	Approve or reject claim
Can data be compared?	Aligned boundary and denominator	Benchmark or caveat

FOOD-003 | Sources: F01, F03, F04
 Site measurement is required to establish causation.

Sector operating map

FOOD-004

KEY

The common industrial chain is receipt, storage, preparation, conversion, separation, stabilization, filling, packaging and cleaning; each subsector adds distinct material transformations.

Documented + analytical

TECHNICAL BASIS

Food plants may trim, cook or freeze; beverage plants blend and fill; breweries mash, ferment and filter; distilleries ferment and distil; dairies separate, pasteurize, culture, concentrate or dry. The shared control point is the interface where saleable or usable material becomes diluted, contaminated or untraceable.

DECISION INTERPRETATION

The issue therefore uses a common data architecture but separate process profiles and denominators.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: The common industrial chain is receipt,.

RECORD: Source record linked to the process event

DECISION: The issue therefore uses a common data.

CONTROL ACTION

Map every product and utility interface.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-004 | Sources: F01, F02, F03
The process map must be adapted to each facility.

Cross-sector mass balance

FOOD-005

KEY

A facility mass balance must account for added water, removed moisture, fermentation gas, evaporation, by-products, rework and inventory change before treating the residual as loss.

Documented + analytical

TECHNICAL BASIS

Food processes transform both composition and moisture. A simple input-minus-product calculation can overstate loss when water is evaporated or understate loss when water is added. Fermentation releases carbon dioxide; drying and concentration remove water; brines and syrups alter mass.

DECISION INTERPRETATION

Use component balances for solids, water, extract, protein, fat or sugar where total mass alone is ambiguous.

Inputs = product + co-products + reuse + waste + emissions + inventory change + unaccounted Use a consistent mass basis and period.

 Raw material +
ingredients

 Process + water +
energy

 Product + by-
product

 Wastewater +
residuals

 Inventory +
unaccounted

SOURCE: A facility mass balance must account for.

RECORD: Source record linked to the process event

DECISION: Use component balances for solids,.

CONTROL ACTION

Choose total-mass and component balances.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-005 | Sources: F01, F04, F05
Composition and moisture data determine balance quality.

CEPA TECHNICAL INTELLIGENCE BRIEF | MATERIAL CONTROL

Raw-material receiving and storage

FOOD-006

KEY

Acceptance yield and storage loss should be measured before processing efficiency is assessed.

Documented + analytical

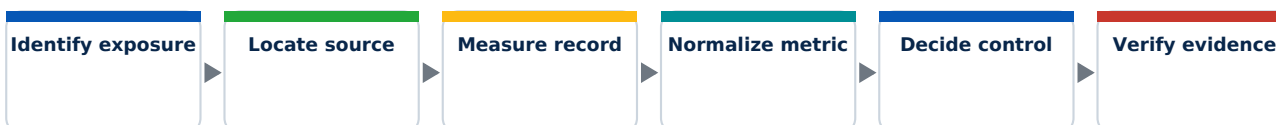
TECHNICAL BASIS

Losses include rejected lots, damaged packaging, temperature abuse, spills, residues in tankers or silos, shrinkage and expiry. Receiving records often capture purchased quantity but not accepted usable mass.

DECISION INTERPRETATION

A receiving balance should combine supplier documents, weighbridge or meter data, quality disposition and packaging/tanker residue.

Material	Critical record	Loss risk
Liquid bulk	Meter/weight and heel	Tanker residue
Dry ingredients	Bag count/net mass	Spill/dust
Perishables	Temperature/age/grade	Quality deterioration



CONTROL ACTION

Measure delivered versus accepted usable mass.

REQUIRED RECORDS

Meter/weight and heel; Bag count/net mass

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-006 | Sources: F03, F04, F12
 Food-safety disposition overrides value recovery.

CEPA TECHNICAL INTELLIGENCE BRIEF | SUBSECTOR ANALYSIS

General food processing profile

FOOD-007

KEY

Yield must distinguish unavoidable inedible fraction, avoidable edible loss, moisture change, quality downgrade and saleable co-product.

Documented + analytical

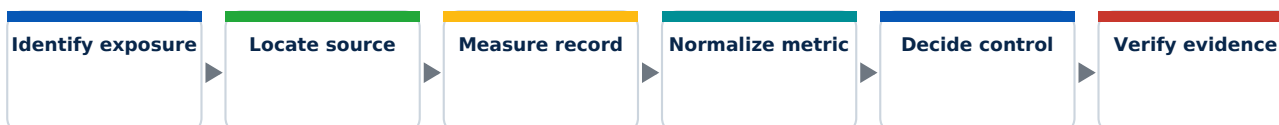
TECHNICAL BASIS

Preparation may involve washing, grading, peeling, trimming, cutting, cooking, cooling and filling. The correct denominator depends on whether performance is evaluated against incoming gross raw material, edible input or standardized solids.

DECISION INTERPRETATION

Edible and inedible fractions should be recorded separately, along with destination and quality.

Stage	Primary metric	Boundary
Preparation	edible yield	Gross vs usable input
Thermal	cooking yield	Moisture loss
Filling	giveaway/rejects	Nominal pack mass



CONTROL ACTION

Measure stage yield, not only final yield.

REQUIRED RECORDS

Nominal pack mass

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-007 | Sources: F05, F06, F13
 Unavoidable fraction is product- and specification-dependent.

CEPA TECHNICAL INTELLIGENCE BRIEF | SUBSECTOR ANALYSIS

Beverage processing profile

FOOD-008

KEY

Beverage loss control depends on measuring syrup, concentrate, blend, product-water interfaces, filler loss and returned product separately.

Documented + analytical

TECHNICAL BASIS

Key events include ingredient dosing, blending, pasteurization, filtration, tank transfer, line changeover, filler start-up and container breakage. Brix, density, conductivity and flow can support interface detection and reconciliation.

DECISION INTERPRETATION

Water volume alone cannot quantify product loss; product concentration or component data are required.

Product-equivalent loss = stream volume × product concentration fraction
 Concentration may be based on Brix, density or validated composition.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Beverage loss control depends on.

RECORD: Source record linked to the process event

DECISION: Water volume alone cannot quantify.

CONTROL ACTION

Balance syrup room and finished beverage separately.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-008 | Sources: F01, F03, F22
 Sensor relationships must be product-specific.

CEPA TECHNICAL INTELLIGENCE BRIEF | SUBSECTOR ANALYSIS

Brewing process and benchmark context

FOOD-009

KEY

Brewing performance must integrate extract yield, beer loss, water, energy, by-products and packaging—not only packaged volume.

Documented + analytical

TECHNICAL BASIS

The EU BAT conclusions report indicative yearly-average ranges of 0.02-0.05 MWh/hl product for specific energy and 0.15-0.50 m3 wastewater/hl product. These ranges apply within the BAT boundary and are not automatic targets for every brewery.

DECISION INTERPRETATION

Loss points include spent grain, weak wort, trub, yeast, filtration, tank bottoms, filler start-up and packaging rejects.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Brewing performance must integrate.

RECORD: Source record linked to the process event

DECISION: Loss points include spent grain, weak.

CONTROL ACTION

Use extract as well as volume balances.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when denominator, boundary, product family, period or confidence differs between compared datasets.

FOOD-009 | Sources: F01, F03, F20
 BAT ranges require aligned scope, product and annual average.

CEPA TECHNICAL INTELLIGENCE BRIEF | SUBSECTOR ANALYSIS

Distilling process and organic-load nexus

FOOD-010

KEY

Distilleries couple fermentation, heat-intensive separation and high-strength residual streams; decisions must integrate water, energy, solids and biodegradability.

Documented + analytical

TECHNICAL BASIS

Principal streams include spent grain or mash, stillage, spent wash, yeast, condensate, weak alcohol streams and cleaning residues. High COD can support biological conversion, but solids, sulphur, temperature, pH, inhibitory chemicals and load variability control feasibility.

DECISION INTERPRETATION

Heat recovery and material-route decisions should be assessed together because hot concentrated streams carry both energy and organic value.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Distilleries couple fermentation,.

RECORD: Source record linked to the process event

DECISION: Heat recovery and material-route.

CONTROL ACTION

Characterize residual alcohol, COD, solids and biodegradability.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-010 | Sources: F01, F03, F23
 No universal digestion yield is assumed.

Dairy process and benchmark context

FOOD-011
KEY

Dairy product entering drains is both a yield loss and a high biodegradable load containing fat, protein and lactose.

Documented + analytical

TECHNICAL BASIS

EPA identifies residues in tankers, lines and equipment; spills; clarifier sludge; pasteurizer start-up/shutdown and changeover; spoiled or returned product; by-products and cleaning compounds as principal wastestreams. EU BAT gives indicative product-specific energy and wastewater ranges.

DECISION INTERPRETATION

Milk, whey, permeate, cream, buttermilk and cleaning interfaces require separate accounting.

Identify exposure
Locate source
Measure record
Normalize metric
Decide control
Verify evidence

SOURCE: Dairy product entering drains is both a.

RECORD: Source record linked to the process event

DECISION: Milk, whey, permeate, cream,.

CONTROL ACTION

Measure milk-equivalent loss at source.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when denominator, boundary, product family, period or confidence differs between compared datasets.

FOOD-011 | Sources: F01, F04, F21
 BAT figures use specific main-product and raw-material bases.

CEPA TECHNICAL INTELLIGENCE BRIEF | PACKAGING

Packaging and filling losses

FOOD-012

KEY

Packaging defects can convert conforming food into waste and can also create giveaway, food-safety and traceability risks.

Documented + analytical

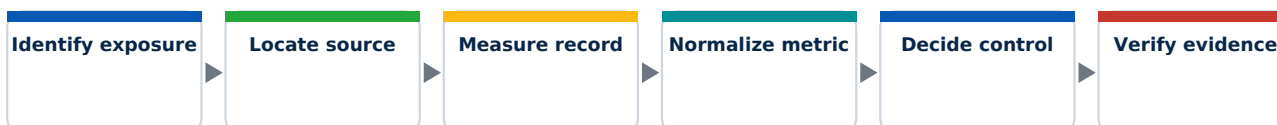
TECHNICAL BASIS

Relevant losses include overfill, underfill, seal failure, label error, container breakage, coding error, damaged secondary packaging and product remaining in fillers or transfer lines.

DECISION INTERPRETATION

The filling balance should reconcile bulk feed, saleable packed product, giveaway, rejects, rework and product-to-drain.

Metric	Unit	Decision
Giveaway	kg above nominal/t	Filler control
Reject rate	units/10,000	Defect reduction
Line heel	kg/changeover	Recovery/design



CONTROL ACTION

Use checkweigher/filler data for giveaway.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-012 | Sources: F03, F10, F12
 Legal quantity and food-safety requirements remain controlling.

Product-to-drain: hidden yield loss

FOOD-013

KEY

Wastewater organic load should be treated as a potential product-loss signal before it is treated only as an effluent parameter.

Documented + analytical

TECHNICAL BASIS

Product enters drains through spills, interfaces, start-up, shutdown, changeovers, rinsing, equipment malfunction and rejected product. Final COD indicates combined organic load but does not identify which product or event caused it.

DECISION INTERPRETATION

Source flow and concentration data can estimate product-equivalent loss and direct prevention.

Product-to-drain intensity = product-equivalent mass / conforming output Do not infer exact product mass from COD without a validated relationship.

Saleable product

Interface loss

First rinse

Wastewater load

Treatment energy

SOURCE: Wastewater organic load should be.

RECORD: Source record linked to the process event

DECISION: Source flow and concentration data can.

CONTROL ACTION

Sample first rinse and interface streams.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when load peaks are unexplained, source streams are mixed, or final discharge data cannot be traced to a.

FOOD-013 | Sources: F04, F05, F23
 COD includes non-product organics and cleaning chemicals.

CIP architecture

FOOD-014

KEY

CIP optimization is a constrained engineering problem: water, chemical, heat and time may be reduced only while validated hygienic performance is retained.

Documented + analytical

TECHNICAL BASIS

A typical sequence includes product recovery, pre-rinse, caustic wash, intermediate rinse, acid wash where needed, final rinse and sanitization. Actual cycles depend on soil, equipment, microbiological risk, allergens and product.

DECISION INTERPRETATION

The control system should record cycle identity, circuit, time, temperature, concentration, flow and endpoint.

Recover product

Pre-rinse

Validated wash

Intermediate rinse

Sanitize / release

SOURCE: CIP optimization is a constrained.

RECORD: Source record linked to the process event

DECISION: The control system should record cycle.

CONTROL ACTION

Define validated recipes by circuit and product family.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when water or chemical reductions are proposed without validated hygiene, product-release or.

FOOD-014 | Sources: F10, F11, F12
CIP cycles must follow applicable food-safety validation.

CEPA TECHNICAL INTELLIGENCE BRIEF | CLEANING AND YIELD

CIP product recovery and interfaces

FOOD-015

KEY

The highest-value CIP improvement is often recovering product before the pre-rinse rather than shortening the wash after product has entered the drain.

Documented + analytical

TECHNICAL BASIS

Drain-down, air or water push, pigging where appropriate, interface detection and dedicated recovery tanks can preserve product or co-product quality. The route must account for dilution, allergen status, traceability and microbiological stability.

DECISION INTERPRETATION

First-rinse recovery requires defined cut points and disposition rules.

Recovery yield = specification-accepted recovered mass / recoverable interface mass
 Define recoverable interface through trials.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: The highest-value CIP improvement is.

RECORD: Source record linked to the process event

DECISION: First-rinse recovery requires defined.

CONTROL ACTION

Measure product recovered before water.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when water or chemical reductions are proposed without validated hygiene, product-release or.

FOOD-015 | Sources: F04, F10, F12
 Recovered material must remain safe and fit for intended use.

CIP performance metrics

FOOD-016
KEY

Water per cycle is incomplete without cleaned surface, circuit volume, soil load and validated outcome.

Documented + analytical

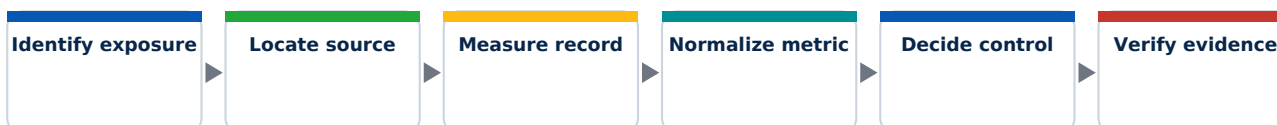
TECHNICAL BASIS

A robust CIP dashboard includes water, active chemical, thermal and electrical energy, cycle time, product displacement, return conditions, microbiological verification and re-clean frequency. A reduction that increases re-cleaning is a false saving.

DECISION INTERPRETATION

Normalize by circuit or cleaned surface before comparing unlike systems.

Metric	Preferred basis	Caution
Water	m3/circuit or m2	Cycle size differs
Chemical	kg active/cycle	Concentration matters
Energy	kWh/cycle	Heat recovery boundary
Product loss	kg/cycle	Interface dilution



CONTROL ACTION

Track active chemical, not solution volume only.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when water or chemical reductions are proposed without validated hygiene, product-release or.

FOOD-016 | Sources: F10, F11, F12
 No hygiene compromise is acceptable for resource reduction.

CEPA TECHNICAL INTELLIGENCE BRIEF | WATER

Water balance and intensity

FOOD-017

KEY

Water withdrawal, consumption and wastewater discharge are different quantities and must not be used interchangeably.

Documented + analytical

TECHNICAL BASIS

The balance should distinguish incoming water, product water, evaporated water, separately discharged cooling water, condensate reuse, cleaning water and wastewater. EU BAT wastewater indicators explicitly exclude separately discharged cooling water and runoff in the stated calculation.

DECISION INTERPRETATION

Report absolute volume and normalized intensity with a declared boundary.

Water balance error = |withdrawal - product - evaporation - discharge - inventory change| / withdrawal Include separately managed streams.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Water withdrawal, consumption and.

RECORD: Source record linked to the process event

DECISION: Report absolute volume and normalized.

CONTROL ACTION

Meter major users and recirculation loops.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-017 | Sources: F01, F02
 Water scarcity impact requires local context beyond volume.

CEPA TECHNICAL INTELLIGENCE BRIEF | WASTEWATER

Wastewater source segregation

FOOD-018

KEY

Mixing clean or reusable water with high-strength product streams increases treatment volume and destroys recovery options.

Documented + analytical

TECHNICAL BASIS

Separate relatively clean cooling water, condensate, first rinse, later rinse, fats, brine, sanitary sewage, stormwater and concentrated by-products where technically and legally appropriate. Segregation enables source control and tailored treatment.

DECISION INTERPRETATION

Stream maps should preserve source identity to the equalization point.

Source stream

Identity preserved

 Measure flow +
load

Select route

Verify outcome

SOURCE: Mixing clean or reusable water with.

RECORD: Source record linked to the process event

DECISION: Stream maps should preserve source.

CONTROL ACTION

Prevent high-strength by-product from entering general drains.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when load peaks are unexplained, source streams are mixed, or final discharge data cannot be traced to a.

FOOD-018 | Sources: F01, F03, F23
Reuse quality and cross-connection risks require validation.

Wastewater load, peaks and normalization

FOOD-019
KEY

Flow-weighted load is the correct basis for treatment and source-control analysis; concentration alone can reward dilution.

Documented + analytical

TECHNICAL BASIS

Core parameters commonly include flow, pH, temperature, COD, BOD, TSS, total nitrogen, total phosphorus, fats/oils/grease and conductivity. Sampling must capture batch and cleaning variability.

DECISION INTERPRETATION

Daily average, maximum event and normalized load answer different questions and should all be retained.

Load (kg) = flow (m3) × concentration (mg/L) / 1000 Use consistent units; composite design affects representativeness.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Flow-weighted load is the correct basis.

RECORD: Source record linked to the process event

DECISION: Daily average, maximum event and.

CONTROL ACTION

Calculate kg pollutant per production unit.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when load peaks are unexplained, source streams are mixed, or final discharge data cannot be traced to a.

FOOD-019 | Sources: F01, F04, F05
Permits may specify different sampling and averaging.

Solids, screenings and sludge

FOOD-020
KEY

Wet residual mass is not comparable across sites or periods unless moisture, dry solids and conditioning chemicals are reported.

Documented + analytical

TECHNICAL BASIS

Screenings, DAF float, biological sludge and digestate have different composition and route potential. Dewatering changes water mass; polymer addition can change dry solids and route quality.

DECISION INTERPRETATION

Report wet mass, total solids, volatile solids where relevant, nutrient or contaminant data and destination.

Dry residual mass = wet mass × total-solids fraction Sampling must represent the dispatched material.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Wet residual mass is not comparable.

RECORD: Source record linked to the process event

DECISION: Report wet mass, total solids, ..

CONTROL ACTION

Normalize dry solids to production and pollutant removed.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when wet mass changes without dry-solids evidence, chemistry changes, or a receiving route rejects the.

FOOD-020 | Sources: F01, F23
Destination suitability requires pathogen, contaminant and legal assessment.

CEPA TECHNICAL INTELLIGENCE BRIEF | TREATMENT TRAIN

Primary and physicochemical treatment

FOOD-021

KEY

Screening, equalization, pH control and flotation protect downstream treatment but transfer captured material into residual streams that require accounting.

Documented + analytical

TECHNICAL BASIS

EU BAT describes equalization, coagulation/flocculation, filtration, flotation and sedimentation among wastewater techniques. DAF is often useful for fat and suspended-solids removal; chemical dosing changes sludge quantity and composition.

DECISION INTERPRETATION

Treatment selection should follow source characterization and whole-system residual analysis.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Screening, equalization, pH control and.

RECORD: Source record linked to the process event

DECISION: Treatment selection should follow.

CONTROL ACTION

Size equalization for flow and load variability.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-021 | Sources: F01, F23
Technique applicability depends on wastewater characteristics.

Anaerobic treatment and biogas

FOOD-022

KEY

High COD alone does not establish anaerobic suitability; biodegradability, solids, inhibition, temperature, alkalinity and load stability are decisive.

Documented + analytical

TECHNICAL BASIS

Anaerobic systems can convert biodegradable organics to biogas and reduce aeration demand. UASB and related systems require controlled hydraulic and organic loading, biomass retention and gas management. Cleaning chemicals, sulphur, fats and sudden pH changes can inhibit performance.

DECISION INTERPRETATION

A feasibility study should include biochemical methane potential, inhibition tests, mass balance and a credible biogas-use plan.

Specific methane yield = methane produced / COD destroyed Measured yield must use standardized gas conditions and complete COD balance.

Characterize feed

Screen inhibition

Set loading

Capture biogas

Use energy

Manage digestate

SOURCE: High COD alone does not establish.

RECORD: Source record linked to the process event

DECISION: A feasibility study should include.

CONTROL ACTION

Segregate toxic or shock loads.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-022 | Sources: F01, F03, F23
No default methane yield is claimed.

CEPA TECHNICAL INTELLIGENCE BRIEF | TREATMENT

Aerobic treatment and nutrient removal

FOOD-023

KEY

Aerobic treatment is a polishing and residual-load control system; excessive upstream product loss increases oxygen demand, energy and sludge.

Documented + analytical

TECHNICAL BASIS

Activated sludge and related systems require oxygen transfer, nutrient balance, solids separation and control of filamentous or settling problems. Nitrification and denitrification add oxygen, carbon and alkalinity considerations.

DECISION INTERPRETATION

Energy should be normalized to pollutant removed as well as wastewater volume.

Aeration intensity = electrical energy / kg COD or BOD removed Boundary must include or exclude pumping consistently.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Aerobic treatment is a polishing and.

RECORD: Source record linked to the process event

DECISION: Energy should be normalized to.

CONTROL ACTION

Track oxygen demand and aeration energy.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-023 | Sources: F01, F23
Performance depends on temperature, biomass and influent variability.

CEPA TECHNICAL INTELLIGENCE BRIEF | MEASUREMENT BOUNDARY

Food loss versus food waste

FOOD-024

KEY

Manufacturing loss should not be presented as equivalent to retail or household food waste because SDG indicators divide the value chain.

Documented + analytical

TECHNICAL BASIS

FAO's Food Loss Index covers post-harvest through pre-retail stages. UNEP's Food Waste Index covers retail, food service and households, while acknowledging possible overlap at the manufacturing-retail interface for complex foods.

DECISION INTERPRETATION

The publication should state which indicator boundary a claim occupies and avoid using the 1.05-billion-tonne consumer-stage estimate as a manufacturing loss rate.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Manufacturing loss should not be.

RECORD: Source record linked to the process event

DECISION: The publication should state which.

CONTROL ACTION

Label supply-chain stage with every external statistic.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-024 | Sources: F06, F07, F08, F15, F18
Global estimates are context, not facility benchmarks.

By-product hierarchy

FOOD-025

KEY

A by-product retains value only when quality, safety, traceability and receiving specification are preserved; delayed or mixed material can become waste.

Documented + analytical

TECHNICAL BASIS

Potential routes include human food, ingredient extraction, animal feed, fermentation, biomaterials, anaerobic digestion, composting, land application, energy and disposal. The hierarchy is constrained by law, contamination, perishability and market demand.

DECISION INTERPRETATION

Route selection should begin before generation so storage and segregation protect the intended use.

Prevention

Direct reuse / food

Material or ingredient recovery

Biological conversion

Treatment

Disposal

SOURCE: A by-product retains value only when.

RECORD: Source record linked to the process event

DECISION: Route selection should begin before.

CONTROL ACTION

Define product/by-product specification and expiry.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when a route lacks receiving specification, mass acceptance, legal authorization or proof of actual.

FOOD-025 | Sources: F06, F10, F12, F18
Food and feed law governs admissible routes.

Animal-feed routes

FOOD-026

KEY

A feed destination is not automatically beneficial if composition, contaminants, stability, traceability or nutritional consistency are uncontrolled.

Documented + analytical

TECHNICAL BASIS

Spent grain, dairy by-products, bakery residues and other streams may be suitable for feed under applicable law. Water content, spoilage, foreign material, cleaning chemicals and transport distance affect viability.

DECISION INTERPRETATION

The route dossier should include analytical specification, lot traceability, storage time, receiver approval and rejection handling.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: A feed destination is not automatically.

RECORD: Source record linked to the process event

DECISION: The route dossier should include.

CONTROL ACTION

Preserve source identity and prevent cleaning-chemical contact.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when a route lacks receiving specification, mass acceptance, legal authorization or proof of actual.

FOOD-026 | Sources: F10, F12, F24
This manuscript does not determine feed eligibility.

CEPA TECHNICAL INTELLIGENCE BRIEF | HIGHEST-VALUE ROUTES

Human-food and ingredient recovery

FOOD-027

KEY

Human-food or ingredient use can preserve the greatest value but requires the strongest safety, allergen, quality and traceability controls.

Documented + analytical

TECHNICAL BASIS

Examples include whey fractionation, fat or protein recovery, surplus product redistribution and extraction of fibre, colour or flavour. A technically recoverable material may still be unsuitable because of time-temperature exposure or cross-contact.

DECISION INTERPRETATION

Route qualification must integrate HACCP or preventive-control analysis with material yield and market specification.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Human-food or ingredient use can.

RECORD: Source record linked to the process event

DECISION: Route qualification must integrate.

CONTROL ACTION

Validate hazards and intended consumer/use.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when a route lacks receiving specification, mass acceptance, legal authorization or proof of actual.

FOOD-027 | Sources: F10, F11, F12, F24
 Human consumption requires full compliance with applicable food law.

CEPA TECHNICAL INTELLIGENCE BRIEF | BY-PRODUCT ROUTES

Biological routes: digestion, compost and land

FOOD-028

KEY

Biological treatment is a controlled conversion route, not proof that upstream food loss was unavoidable.

Documented + analytical

TECHNICAL BASIS

Anaerobic digestion can recover biogas; composting can produce soil amendment; land application can recycle nutrients. Each route has feedstock, contamination, pathogen, odour, nutrient and regulatory constraints.

DECISION INTERPRETATION

Report input mass and solids, conversion yield, residual material, final use and emissions boundary.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Biological treatment is a controlled.

RECORD: Source record linked to the process event

DECISION: Report input mass and solids,.

CONTROL ACTION

Prioritize prevention and food/feed routes where safe.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when a route lacks receiving specification, mass acceptance, legal authorization or proof of actual.

FOOD-028 | Sources: F18, F23
Route hierarchy depends on local law and lifecycle evidence.

CEPA TECHNICAL INTELLIGENCE BRIEF | ENERGY

Energy and heat integration

FOOD-029

KEY

Thermal integration should recover useful heat before fuel switching is used to claim efficiency.

Documented + analytical

TECHNICAL BASIS

Food and drink facilities use heat for cooking, pasteurization, evaporation, drying and distillation, and cooling for product stability and refrigeration. Opportunities include condensate return, heat exchangers, vapour recompression, hot-water cascade and process scheduling.

DECISION INTERPRETATION

Energy mapping should distinguish thermal and electrical use and avoid double counting recovered heat.

Specific energy = thermal and electrical energy / declared production basis Report energy carriers separately before conversion.

Reduce demand

Recover heat

Return condensate

 Integrate
utilities

Decarbonize supply

SOURCE: Thermal integration should recover.

RECORD: Source record linked to the process event

DECISION: Energy mapping should distinguish.

CONTROL ACTION

Create temperature-level heat maps.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-029 | Sources: F01, F02, F03
BAT ranges depend on included utilities and products.

Lifecycle carbon and avoided-emission claims

FOOD-030

KEY

A credible product-carbon analysis requires a declared functional unit, lifecycle boundary, allocation method and data-quality assessment.

Documented + analytical

TECHNICAL BASIS

The GHG Protocol Product Standard supports lifecycle hotspot analysis. Waste treatment, purchased goods, energy and logistics can be material, but comparative avoided-emission claims require a transparent reference scenario and should remain separate from inventory totals unless the selected standard permits treatment.

DECISION INTERPRETATION

Preventing product loss generally avoids embedded upstream and processing impacts; the exact benefit is product-specific.

Carbon intensity = lifecycle GHG emissions / functional unit Do not compare products with different functions on mass alone.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: A credible product-carbon analysis.

RECORD: Source record linked to the process event

DECISION: Preventing product loss generally.

CONTROL ACTION

Define functional unit based on product function.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-030 | Sources: F09, F14
 GHG standards and factors evolve; retain version control.

CEPA TECHNICAL INTELLIGENCE BRIEF | SAFETY BOUNDARY

Food safety, allergens and traceability

FOOD-031
KEY

Resource efficiency cannot override preventive controls, sanitation validation, allergen management or traceability.

Documented + analytical

TECHNICAL BASIS

FDA preventive-control rules require hazard analysis and risk-based controls for covered facilities. Codex provides internationally recognized GHP and HACCP principles, while national law remains controlling. Rework and recovered interfaces can create biological, chemical, physical and allergen hazards.

DECISION INTERPRETATION

Every reuse or recovery route intended for food or feed must be included in the food-safety plan.

Identify exposure
Locate source
Measure record
Normalize metric
Decide control
Verify evidence
SOURCE: Resource efficiency cannot override.

RECORD: Source record linked to the process event

DECISION: Every reuse or recovery route intended.

CONTROL ACTION

Map hazards introduced by recovery.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-031 | Sources: F10, F11, F12, F19, F24
 Applicability depends on jurisdiction and facility status.

KPI architecture

FOOD-032
KEY

The executive dashboard must connect yield, product-to-drain, water, pollutant load, CIP, by-products, energy and verified destination.

Documented + analytical

TECHNICAL BASIS

Recommended metrics include stage yield, first-pass yield, product-loss intensity, water and wastewater intensity, COD load, CIP resources, by-product capture, dry residuals, energy and carbon intensity.

DECISION INTERPRETATION

Each metric needs numerator, denominator, exclusions, owner, period and confidence.

Metric	Preferred unit	Decision
Product loss	kg/t or L/hl	Yield prevention
COD load	kg/t or kg/hl	Source/treatment
CIP water	m3/circuit	Cleaning control
By-product capture	% generated	Quality preservation

Identify exposure
Locate source
Measure record
Normalize metric
Decide control
Verify evidence

CONTROL ACTION

Show absolute and normalized values.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-032 | Sources: F01, F04, F06
Targets require a stable baseline.

CEPA TECHNICAL INTELLIGENCE BRIEF | DATA ANALYSIS

Statistical control and benchmark eligibility

FOOD-033

KEY

A benchmark is eligible only when product, process, denominator, boundary, period, scale and data quality align.

Documented + analytical

TECHNICAL BASIS

EU BAT ranges are indicative yearly averages within stated sector boundaries. They can support screening but not direct ranking of a small seasonal facility, a multi-product site or a plant with different utility boundaries. Batch distributions should be analyzed for central tendency, variability and high-load events.

DECISION INTERPRETATION

Use control charts for stable repeated processes and percentile/event analysis for episodic discharges.

Coefficient of variation = standard deviation / mean × 100 Do not use when the mean is near zero or the process is non-stationary.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: A benchmark is eligible only when.

RECORD: Source record linked to the process event

DECISION: Use control charts for stable repeated.

CONTROL ACTION

Retain mean, median, range and coefficient of variation.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when denominator, boundary, product family, period or confidence differs between compared datasets.

FOOD-033 | Sources: F01, F20, F21, F22
 BAT performance levels are not universal permit limits.

Cross-sector BAT reference ranges

FOOD-034

KEY

Published BAT ranges are boundary-specific reference signals; their primary value is to trigger investigation of large deviations, not to declare compliance or leadership.

Documented + analytical

TECHNICAL BASIS

Selected EU indicative yearly-average ranges include brewing energy 0.02-0.05 MWh/hl and wastewater 0.15-0.50 m³/hl; soft drinks/processed juice energy 0.01-0.035 MWh/hl and wastewater 0.08-0.20 m³/hl. Dairy ranges vary by main product: market milk energy 0.1-0.6 MWh/t raw material and wastewater 0.3-3.0 m³/t raw material; cheese energy 0.10-0.22 and wastewater 0.75-2.5.

DECISION INTERPRETATION

The denominator, main-product share and included utilities must be matched before comparison.

Identify exposure

Locate source

Measure record

Normalize metric

Decide control

Verify evidence

SOURCE: Published BAT ranges are.

RECORD: Source record linked to the process event

DECISION: The denominator, main-product share.

CONTROL ACTION

Use ranges as screening references.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-034 | Sources: F01, F20, F21, F22
 Values are indicative BAT performance levels, not universal targets.

Maturity model

FOOD-035

KEY

Operational maturity advances from disposal accounting to reconciled yield, source-level control and verified high-value destination.

Documented + analytical

TECHNICAL BASIS

Level 1 records waste invoices. Level 2 measures major streams. Level 3 reconciles product and pollutant loads. Level 4 controls prevention, CIP and by-product quality. Level 5 integrates lifecycle data and verifies downstream outcomes.

DECISION INTERPRETATION

Maturity must be demonstrated through records and stable performance, not policy statements.

Level	Capability	Proof
1 Reactive	Waste invoices	Cost records
2 Measured	Stream quantities	Meters/scales
3 Reconciled	Yield/load balance	Batch linkage
4 Controlled	Prevention/CIP/by-products	Validated SOPs
5 Verified	Lifecycle and destinations	Downstream evidence

Verified value / lifecycle
 Controlled prevention / reuse
 Reconciled source-level flows
 Measured streams
 Disposal accounting

CONTROL ACTION

Assess each line and subsector separately.

REQUIRED RECORDS

Cost records; Meters/scales

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-035 | Sources: F01, F06, F09
This is a management model, not certification.

CEPA TECHNICAL INTELLIGENCE BRIEF | IMPLEMENTATION

90-day implementation protocol

FOOD-036

KEY

The first 90 days should establish a defensible baseline, isolate high-value losses and validate controls before major capital commitment.

Documented + analytical

TECHNICAL BASIS

Days 1-30 define boundaries, map streams and verify meters. Days 31-60 sample product-to-drain, rank true cost, characterize by-products and review CIP. Days 61-90 implement interface recovery, segregation, control limits and destination verification.

DECISION INTERPRETATION

Food-safety review runs through every phase.

DAYS 1-30

Baseline

Boundaries, flow map, meters, source codes

DAYS 31-60

Isolate

High-value losses, first-rinse, route evidence

DAYS 61-90

Control

Sequencing, trials, dashboard, owner review

SOURCE: The first 90 days should establish a.

RECORD: Source record linked to the process event

DECISION: Food-safety review runs through every.

CONTROL ACTION

Assign operations, quality, environmental and finance owners.

REQUIRED RECORDS

Source record linked to the process event; Declared denominator and reporting period

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-036 | Sources: F01, F03, F10, F12
Ninety days establishes control but may not complete engineering projects.

Executive action agenda

FOOD-037
KEY

The immediate management priority is to measure product before dilution, preserve by-product quality and integrate hygiene, water, energy and carbon decisions.

Documented + analytical

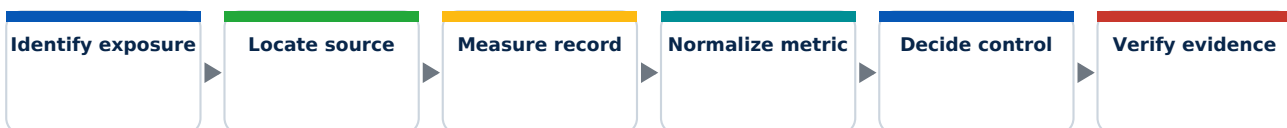
TECHNICAL BASIS

A cross-functional program should approve process boundaries, top loss events, CIP data requirements, wastewater source sampling, by-product specifications and route evidence. The same governance should prevent recovery projects from bypassing food-safety or traceability controls.

DECISION INTERPRETATION

Executive review should focus on true cost, risk and verified outcome.

Priority	First deliverable	Executive test
Yield	Stage balance	Where is product lost?
CIP	Circuit dashboard	Is cleaning validated and efficient?
Wastewater	Source load map	Can peaks be traced?
By-products	Specification/outlet dossier	Is value preserved safely?



CONTROL ACTION

Approve a site material-efficiency charter.

REQUIRED RECORDS

Specification/outlet dossier

AUDIT TRIGGER

Escalate when the process record, denominator, boundary, owner or evidence class is missing or inconsistent.

FOOD-037 | Sources: F01, F04, F09, F10
 Priorities must follow facility hazard and value.

Source register A

FOOD-038
KEY

Source quality is controlled by authority, methodological transparency, boundary relevance and direct support for the claim—not by citation volume.

Documented

F01 BAT Conclusions for Food, Drink and Milk Industries - Decision 2019/2031. European Commission. Use: Sector scope, BAT techniques, indicative energy and wastewater performance ranges, and monitor.

F07 Food Waste Index Report 2024. United Nations Environment Programme. Use: Retail, food-service and household food-waste measurement framework and global context.

F02 Food, Drink and Milk Industries BREF. European Commission Joint Research Centre. Use: Integrated prevention, resource efficiency, water, energy, wastewater and waste context.

F08 Indicator 12.3.1(b). United Nations Environment Programme. Use: Food Waste Index boundary and relationship to the FAO Food Loss Index.

F03 EHS Guidelines - Agribusiness and Food Production. International Finance Corporation. Use: Good international industry practice for breweries, dairy and food/beverage processing.

F09 Product Life Cycle Accounting and Reporting Standard. GHG Protocol. Use: Lifecycle inventory boundary and product-level reduction opportunity analysis.

F04 Dairy Products Processing Effluent Guidelines. U.S. Environmental Protection Agency. Use: Dairy process boundary, product-loss wastestreams, pollutants and subcategories.

F10 FSMA Final Rule for Preventive Controls for Human Food. U.S. Food and Drug Administration. Use: Hazard analysis, food-safety plan and risk-based preventive-control requirements.

F05 Canned and Preserved Fruits and Vegetables Effluent Guidelines. U.S. Environmental Protection Agency. Use: Fruit and vegetable process scope, regulated pollutants and technology-based wastewater framework.

F11 Food Safety Plan Builder. U.S. Food and Drug Administration. Use: Food safety plan components including allergen, sanitation, supply-chain and recall controls.

F06 Food Loss Measurement and SDG 12.3.1a. Food and Agriculture Organization of the United Nations. Use: Food Loss Index boundary from post-harvest through pre-retail and measurement methodology.

F12 General Principles of Food Hygiene CXC 1-1969. Codex Alimentarius Commission. Use: International GHP and HACCP framework; voluntary unless incorporated into law.

Complete URLs and access dates are retained in the exported source register.

Source register B

FOOD-039
KEY

Source quality is controlled by authority, methodological transparency, boundary relevance and direct support for the claim—not by citation volume.

Documented

F13 Codex Codes of Practice. Codex Alimentarius Commission. Use: Commodity and process hygiene codes, including canned and dehydrated products.

F19 Food Safety Modernization Act - Hazard Analysis. U.S. Food and Drug Administration. Use: Statutory hazard-analysis, preventive-control, monitoring and records principles.

F14 Scope 3 Standard. GHG Protocol. Use: Purchased goods, waste treatment and value-chain emissions-accounting categories.

F20 EU BAT - Brewing Energy and Wastewater Tables. European Commission. Use: Indicative brewing energy range 0.02-0.05 MWh/hl and wastewater discharge 0.15-0.50 m3/hl.

F15 UNEP Food Waste Press Release 2024. United Nations Environment Programme. Use: Reported 2022 global retail/consumer food-waste estimate; context only, not manufacturing benc.

F21 EU BAT - Dairy Energy and Wastewater Tables. European Commission. Use: Indicative dairy energy and wastewater ranges by main product; boundary-specific reference.

F16 Delivering on SDG 12.3. United Nations Environment Programme. Use: Distinction between post-harvest loss and consumer/retail waste, plus climate context.

F22 EU BAT - Soft Drink Energy and Wastewater Tables. European Commission. Use: Indicative soft drink/juice energy 0.01-0.035 MWh/hl and wastewater 0.08-0.20 m3/hl.

F17 Food Loss Index Overview. United Nations Environment Programme SDG Platform. Use: Indicator boundary and interaction between loss and waste at manufacturing-retail interfaces.

F23 EU BAT Wastewater Treatment Technique Descriptions. European Commission. Use: Equalisation, flotation, filtration, nutrient removal, struvite recovery and UASB descriptions.

F18 Food Waste Index Methodology Overview. United Nations Environment Programme SDG Platform. Use: Destination categories, edible/inedible disaggregation and methodological comparability caveat.

F24 Codex General and Commodity Standards. Codex Alimentarius Commission. Use: Food hygiene, contaminants, allergens, labelling and international trade standards context.

Complete URLs and access dates are retained in the exported source register.

Page-specific claim index

FOOD-040
KEY

The claim index provides a rapid audit trail from page purpose to evidence classification and source set.

Controlled

- | | |
|---|--|
| <p>01 FOOD-001 This executive review manuscript contains forty controlled logical... [F01,F03,F04,F06,F07]</p> <p>02 FOOD-002 The edition integrates food, beverage, brewing, distilling and dairy... [F01,F02,F03,F06,F08]</p> <p>03 FOOD-003 Yield, cleaning, wastewater and energy must be reviewed as one... [F01,F03,F04]</p> <p>04 FOOD-004 The common industrial chain is receipt, storage, preparation,... [F01,F02,F03]</p> <p>05 FOOD-005 A facility mass balance must account for added water, removed... [F01,F04,F05]</p> <p>06 FOOD-006 Acceptance yield and storage loss should be measured before... [F03,F04,F12]</p> <p>07 FOOD-007 Yield must distinguish unavoidable inedible fraction, avoidable... [F05,F06,F13]</p> <p>08 FOOD-008 Beverage loss control depends on measuring syrup, concentrate,... [F01,F03,F23]</p> <p>09 FOOD-009 Brewing performance must integrate extract yield, beer loss, water,... [F01,F03,F20]</p> <p>10 FOOD-010 Distilleries couple fermentation, heat-intensive separation and... [F01,F03,F13]</p> <p>11 FOOD-011 Dairy product entering drains is both a yield loss and a high... [F01,F04,F21]</p> <p>12 FOOD-012 Packaging defects can convert conforming food into waste and can... [F03,F10,F12]</p> <p>13 FOOD-013 Wastewater organic load should be treated as a potential... [F04,F05,F23]</p> <p>14 FOOD-014 CIP optimization is a constrained engineering problem: water,... [F10,F11,F12]</p> <p>15 FOOD-015 The highest-value CIP improvement is often recovering product before... [F04,F10,F12]</p> <p>16 FOOD-016 Water per cycle is incomplete without cleaned surface, circuit... [F10,F11,F12]</p> <p>17 FOOD-017 Water withdrawal, consumption and wastewater discharge are different... [F01,F02]</p> <p>18 FOOD-018 Mixing clean or reusable water with high-strength product streams... [F01,F03,F23]</p> <p>19 FOOD-019 Flow-weighted load is the correct basis for treatment and... [F01,F04,F05]</p> <p>20 FOOD-020 Wet residual mass is not comparable across sites or periods unless... [F01,F23]</p> | <p>21 FOOD-021 Screening, equalization, pH control and flotation protect downstream... [F01,F23]</p> <p>22 FOOD-022 High COD alone does not establish anaerobic suitability;... [F01,F03,F23]</p> <p>23 FOOD-023 Aerobic treatment is a polishing and residual-load control system;... [F01,F23]</p> <p>24 FOOD-024 Manufacturing loss should not be presented as equivalent to retail... [F06,F07,F08,F15,F18]</p> <p>25 FOOD-025 A by-product retains value only when quality, safety, traceability... [F06,F10,F12,F18]</p> <p>26 FOOD-026 A feed destination is not automatically beneficial if composition,... [F10,F12,F24]</p> <p>27 FOOD-027 Human-food or ingredient use can preserve the greatest value but... [F10,F11,F12,F24]</p> <p>28 FOOD-028 Biological treatment is a controlled conversion route, not proof... [F18,F23]</p> <p>29 FOOD-029 Thermal integration should recover useful heat before fuel switching... [F01,F02,F03]</p> <p>30 FOOD-030 A credible product-carbon analysis requires a declared functional... [F09,F14]</p> <p>31 FOOD-031 Resource efficiency cannot override preventive controls, sanitation... [F10,F11,F12,F19,F24]</p> <p>32 FOOD-032 The executive dashboard must connect yield, product-to-drain, water,... [F01,F04,F06]</p> <p>33 FOOD-033 A benchmark is eligible only when product, process, denominator,... [F01,F20,F21,F22]</p> <p>34 FOOD-034 Published BAT ranges are boundary-specific reference signals; their... [F01,F20,F21,F22]</p> <p>35 FOOD-035 Operational maturity advances from disposal accounting to reconciled... [F01,F06,F09]</p> <p>36 FOOD-036 The first 90 days should establish a defensible baseline, isolate... [F01,F03,F10,F12]</p> <p>37 FOOD-037 The immediate management priority is to measure product before... [F01,F04,F09,F10]</p> <p>38 FOOD-038 Source quality is controlled by authority, methodological... [F01,F02,F03]</p> <p>39 FOOD-039 Source quality is controlled by authority, methodological... [F13,F14,F15]</p> <p>40 FOOD-040 The claim index provides a rapid audit trail from page purpose to... [F01]</p> |
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