



Chemical Industry – AI ERP TicketingOS

Bulk & Specialty Chemicals · Batch Production · Blending · Filling · Logistics · EHS



Batch recipe management · Tank farm · ISO tank / drum filling · QC/QA · AI-driven safety & logistics



Key ERP Requirements (Chemical Industry – Bulk & Specialty)

- **Raw material procurement & tank farm** – Bulk storage (tanks, silos), inventory by batch/lot, expiry tracking, auto-reorder based on production schedule
- **Batch production (campaign)** – Recipe management (BOM, process parameters), reactor scheduling, in-process sampling, yield tracking
- **Blending / compounding** – Mixing of multiple chemical components (liquids, powders) with precise ratios, viscosity/density control
- **Filling & packaging** – Drums, IBC totes, ISO tanks, small containers – filling line integration, weight/volume logging, labelling with GHS
- **QC & QA** – Raw material release, in-process checks, final product COA (assay, impurities, physical properties)
- **Logistics – bulk & packed** – Tanker / ISO container dispatch, drum delivery, returnable container tracking, hazmat compliance
- **EHS (Environment, Health & Safety)** – SDS (Safety Data Sheet) generation, chemical exposure tracking, waste disposal, incident reporting



Chemical Order to Delivery – Master Execution Flow (ID + Progress)

ID	Process	Activity	Details / Systems	Progress %
8001	Customer Order	Sales order for chemical (spec, quantity, packaging, delivery date)	CRM / OMS	5
8002	MRP & Batch Planning	Check raw material stock, schedule production batch (campaign)	MRP / Production scheduler	12
8003	Raw Material Issuance	Transfer from tank farm / warehouse to reactor area (weighing)	WMS / Scale integration	20
8004	Reactor / Blending Process	Execute recipe: temperature, pressure, agitation, addition order	DCS / PLC / ERP	40
8005	In-process QC	Sample taken for pH, viscosity, assay (HPLC/GC), adjust if needed	LIMS / QC module	50
8006	Filling & Packaging	Fill into drums/IBC/totes – weight log, barcode, GHS label	Filling line + WMS	65
8007	Final QC & COA	Certificate of Analysis generated, batch release for dispatch	QA/QC	75
8008	Warehouse put-away	Move finished goods to storage (quarantine until QC release)	WMS	80
8009	Dispatch Planning	Load onto trucks / tankers, generate delivery note, hazmat docs	TMS	85
8010	Logistics – Delivery	Transport to customer, GPS tracking, temperature monitoring (if sensitive)	Fleet / telematics	90
8011	Customer Delivery & POD	Customer signs proof of delivery, returns empty containers (if applicable)	Mobile POD	95
8012	Invoicing & Settlement	Based on product volume + packaging deposit + freight	Finance / billing	100



Tank Farm & Bulk Raw Material Storage

Bulk Liquid Tanks

- Solvents, acids, bases, monomers (e.g., toluene, HCl, NaOH, styrene)
- Level, temperature, pressure monitoring (SCADA)
- Auto reorder when below safety stock

Silo / Powder Storage

- Resins, pigments, salts, catalysts
- Pneumatic conveying, moisture control
- Inventory by lot / expiry

Returnable Container Mgmt

- ISO tanks, IBC totes, drums – track by serial#, cleaning status
- Deposit / rental billing for containers

📌 Tank farm integration: real-time inventory visible in ERP, AI predicts consumption based on production schedule.



Batch Production & Blending (Reactor / Compounding)

- **Recipe management** – BOM with raw material quantities, order of addition, temperature/pH profile, mixing time.
- **Reactor scheduling** – Optimise campaign sequence to reduce cleaning time (AI suggests changeover sequence).
- **Blending / compounding** – For specialty chemicals: precise ratios (e.g., 5% additive + 95% base).
- **In-process adjustments** – If QC sample off-spec, ERP suggests correction (additive dosage).
- **Yield & efficiency tracking** – Compare actual vs theoretical yield, identify losses.

📄 Batch production record (BPR) – fully traceable, includes operator, time, parameters, QC results.



Filling & Packaging (Drums / IBC / ISO Tanks)

Packaging Type	ERP Process	Tracking
Drums (200L)	Weight-based filling → apply barcode label → palletise → WMS put-away	Batch, weight, GHS label
IBC Totes (1000L)	Volume/weight fill → serial# → cleaning status tracked	Returnable container deposit

Packaging Type	ERP Process	Tracking
ISO Tanks	Bulk liquid filling → seal number → hazmat declaration	Tracking for export / import
Small containers (bottles, pails)	High-speed filling line → date/lot coding → shrink wrap	Batch traceability

✦ Each filled unit gets a unique barcode linking to batch, QA data, and SDS.



QC / QA – Certificate of Analysis (COA)

- **Raw material QC** – Check purity, moisture, colour, identity (FTIR/HPLC) before use.
- **In-process QC** – pH, viscosity, density, assay – if off-spec, ERP triggers correction.
- **Final product QC** – Full COA with all parameters, generated automatically from LIMS.
- **Stability / shelf-life** – Expiry date assigned, system blocks dispatch if near expiry.

📄 COA includes batch number, manufacturing date, expiry, test results, and authorised signatory.



Logistics – Bulk & Packaged Chemical Movement

Movement Type	ERP Process	Compliance
Bulk tanker dispatch	Load from tank farm → weighbridge → e-way bill → GPS tracking	ADR / IMDG hazmat papers
Container (ISO / IBC) dispatch	Pick from warehouse → load → shipping docs	Container cleaning certificate
Returnable container return	Scan empty container → clean → inspect → ready for reuse	Deposit refund or credit
Waste disposal logistics	Schedule waste pickup → manifest → disposal certificate	Environmental compliance



EHS – Environment, Health & Safety (Chemical)

SDS

Management – Safety Data Sheets linked to each product, automatically included in shipment

Exposure tracking

– Operator exposure logs (chemical, time) – AI alerts if limit approached

Incident reporting

– Near-miss, spill, injury – root cause analysis, corrective actions

Waste management

– Hazardous waste tracking, disposal manifests, EPA compliance

Emergency response

– ERP contains spill kits locations, evacuation plans, contact list



AI-based safety: predicts risk based on chemical compatibility and operator history.



Billing & Payment Milestones (Chemical Industry)

Milestone	Basis	Payment % / Terms
Product (bulk / drums)	Per kg / litre / drum (fixed price or index-based)	Net 30-60 days (corporate) or advance for small orders
Returnable container deposit	Per IBC / ISO tank / drum (refundable)	Collected upfront with first order
Container rental / demurrage	Daily charge if container not returned within grace period	Auto-invoiced monthly
Custom blending / toll manufacturing	Premium for custom formulation (e.g., 20-40% extra)	50% advance, 50% on delivery

Milestone	Basis	Payment % / Terms
Freight & logistics	Distance, weight, hazmat surcharge	Pass-through or included in product price

💡 Example: 20 drums of specialty solvent – product cost + drum deposit + freight – customer pays 50% upfront.



AI-Based Automation for Chemical Industry

Demand forecasting – ML predicts orders based on customer history, seasonality, market trends

Production scheduling optimisation – AI minimises changeover time, maximises reactor utilisation

Raw material replenishment – Auto-generates PO when tank level + upcoming production demand exceeds threshold

Blending recipe optimisation – Suggests cost-effective raw material substitutions while maintaining spec

Container tracking & return – AI predicts return date, alerts if overdue, manages cleaning schedule

EHS predictive analytics – Identifies high-risk operations, suggests preventive actions

Logistics route optimisation – Multi-stop delivery with hazmat constraints, driver hours



ERP Module Mapping (Chemical)

Tank Farm & Inventory

– Bulk liquids, silos, raw material lot tracking

Production (Batch/Blending)

– Recipe management, reactor scheduling, in-process QC

Filling & Packaging

– Drum/IBC/ISO fill, labelling, weight/volume log

QC & LIMS

– COA generation, stability, expiry, quarantine release

Returnable Container Mgmt

– Deposit, rental, cleaning status, location

Logistics (TMS)

– Bulk tanker, container, drum delivery, hazmat docs

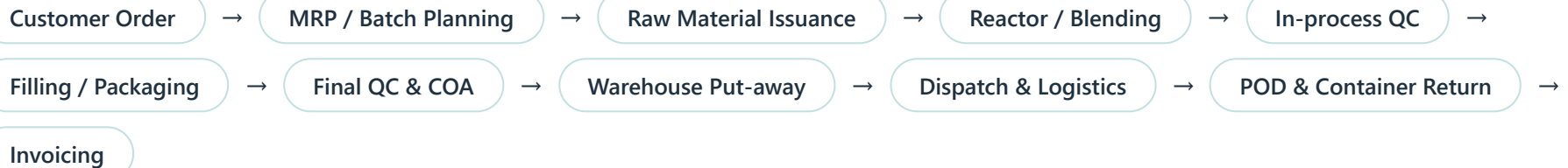
EHS & Compliance – SDS, exposure, waste, incident, regulatory reporting

Billing & Finance – Product pricing, deposit, demurrage, credit terms

AI Analytics – Forecasting, optimisation, anomaly detection, risk



Final Chemical ERP + TicketingOS Architecture



🔴 AI TicketingOS: demand forecast, production optimisation, container tracking, EHS risk, route planning, auto-replenishment

 AI ERP TicketingOS – Chemical Industry (Bulk & Specialty). Covers tank farm, batch blending, filling, QC, logistics, EHS, and AI-driven automation.
Print to PDF (Ctrl+P) → Save as PDF for plant implementation, compliance training, or investor presentation.