

# Product Lifecycle Management

- Architecture Landscape
- Capabilities
  - Advanced Formulation Management - [ Maturity: MEDIUM ]
  - Integrated Regulatory Compliance - [ Maturity: MEDIUM ]
  - Sustainability and "Green Chemistry" Integration - [ Maturity: MEDIUM ]
  - Process Scale-Up and Transfer - [ Maturity: MEDIUM ]
  - Unified Data Management (Single Source of Truth) - [ Maturity: MEDIUM ]
- Enablers
- Solutions

## Architecture Landscape

WiP

## Capabilities

- 1. Advanced Formulation Management - [ Maturity: MEDIUM ]**
  - a. Dynamic Formula Building: Directly manage formulations with linked ingredient properties and version histories, replacing static spreadsheets with "living" records.
  - b. Ingredient Traceability: Track raw material sourcing, supplier information, and chemical compositions.
  - c. Automated Calculations: Use built-in formulas to automate data entry for concentration, weight, and volume across different batch sizes.
- 2. Integrated Regulatory Compliance - [ Maturity: MEDIUM ]**
  - a. Global Database Cross-Referencing: Systems can automatically check ingredients against global inventories such as REACH, GHS, or TSCA.
  - b. Safety Data Sheet (SDS) Generation: Automate the creation of SDS and labels based on the specific chemical properties of a formulation.
  - c. Early Compliance Risk Assessment: Identify potential regulatory hurdles early in the design phase to avoid costly late-stage reformulations.
- 3. Sustainability and "Green Chemistry" Integration - [ Maturity: MEDIUM ]**
  - a. CO Footprint Analysis: Estimate emissions for raw materials and finished products during the R&D phase.
  - b. Eco-Friendly Alternatives: AI-driven tools can suggest more sustainable chemical substitutes during formulation.
  - c. Lifecycle Impact Evaluation (LCA): Assess environmental impacts from inception through disposal.
- 4. Process Scale-Up and Transfer - [ Maturity: MEDIUM ]**
  - a. Lab-to-Plant Consistency: Manage critical process parameters (CPPs) and equipment settings as a formula moves from lab scale to pilot and full production.
  - b. Yield & Waste Optimization: Predict and minimize waste through optimized resource management and raw material usage.
- 5. Unified Data Management (Single Source of Truth) - [ Maturity: MEDIUM ]**
  - a. Integration with Lab Systems: Connects R&D data directly with Laboratory Information Management Systems (LIMS) or Electronic Lab Notebooks (ELN).
  - b. ERP Synchronization: Ensures formulation updates and material substitutions are immediately reflected in Enterprise Resource Planning (ERP) systems for procurement and manufacturing.
  - c. Scientific Data Capture: Stores molecular structures, molecular models, and test results alongside standard business documentation.

## Enablers

## Solutions