



2020

# VALIDATION GUIDELINES

OF 16 PAINT FORMULATIONS DEVELOPMENT OF PROJECT  
“ALINA LIFE FORMULATIONS IN OPEN-SOURCE PLATFORM”

LIFE17 ENV/LV/000318



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## The scope of the validation guidelines

The Validation Guidelines is a document that describes how and when the validation activities are proceed when developing LIFE ALFIO open-source formulations. End-to-end validation is essential in determining product quality because quality cannot always be determined by finished-product inspection. The quality of formulations is determined by their design, development, in-process controls, controls of good manufacturing practices, process validation, and by specifications applied to them throughout development and deployment in open-source platform.

Goal of validation guidelines are 16 formulations what are developed to be EU Ecolabel ([www.ecolabel.com](http://www.ecolabel.com)) compliant paint and coating formulations with reduced or no biocides (biocide free) and low VOCs (< 10g/L).

The document outlines the principles of validation and checklist what are divided in five major phases and four control gate mechanisms. Each phase is described with relevant readiness level and control gate checklist assures reaching milestones of feasibility, desirability and viability of relevant readiness levels.

Phase/Gate	Description	Relevant readiness level
Phase 1	User requirement specification and Risk assessment	1-3
Control gate	Formulation Definition Acceptance	
Phase 2	Concept and Feasibility of low fidelity formulations	4-5
Control gate	Initial Formulation Design Acceptance	
Phase 3	Design and development of Formulations	6-7
Control gate	Final Design Acceptance	
Phase 4	Pilot - Formulation and manufacturing process validation - product launch preparation	8
Control gate	Formulation Launch Acceptance	
Phase 5	Formulation Launch - Feedback assessment and corrective action	9

## Co-creation principles of LIFE ALFIO project stakeholders

LIFE ALFIO project targets paint industry at the EU level. As a large-scale project it requires supervision by the industry authorities across the EU. An expert Team of 5 well-respected experts in paint industry from the leading companies of the industry in the EU will be established ensuring implementation of validations guidelines and expertise of:

- Formulation development for industrial scale and EU market
- Chemical engineering expertise of paints and coatings
- Manufacturing experience
- Knowledge about paint market and its tendencies in the EU
- Related EU legislation and certification knowledge / experience.

Within participation in the LIFE project, stakeholders encouraging the industry for healthier paint and coating formulations, accelerating human health and environment friendly product entrance into green building and sustainable product market. Awareness about healthier paint and coating products, is achieved via transparency - opening formulations, for traceable supply chain and raw material suppliers. Sustainable future is in a traceable and reliable product, securing end-user confidence to facilitate conscious consumption.

Paint formulation work is organized within a group of ALINA, paint and binder manufacturer. Work-flow organization is done throe regular meetings, for project activity planning and progress reporting. ALINA project management team is responsible for process management, keeping timeline and agreed deadlines.

LIFE ALFIO takes the responsibility, limiting number of paint manufacturer partnerships within LIFE ALFIO project as one per country. In cases where more than one paint manufacturer is interested into the project participation, written approval has to be received from assigned partner from specific market.

Defined paint formulations with all supporting documentation is the outcome of the project. Paint formulations are published on the web, for public screening and use. Published information include, paint formulation, paint product test results (documented), used raw materials and suppliers, including supporting documentation, required for Eco-label certification needs.

Responsibilities of the paint manufacturer involved into the formulation process:

- Support with frame formulation.
- Define raw material suppliers and requirements.
- Identify paint system requirements and potential applications.
- Evaluate and follow paint formulation R&D progress.
- Assess paint testing methodologies and standards.
- Evaluate Paint testing results.
- Manufacture test batch.

Responsibilities of the Binder manufacturer:

- Provide binder samples.
- Provide frame formulation.
- Assist and consult towards ALINA and binder compatibility issues.
- Evaluate and follow paint formulation R&D progress.
- Evaluate Paint testing results.

## Co-creation activities of the stakeholders

Phase/Gate	Activities planned	Relevant readiness level
Phase 1	<ul style="list-style-type: none"> <li>NDA agreement signature</li> <li>Agreement about project participation</li> <li>Defining application and requirements</li> </ul>	1-3
Phase 2	<ul style="list-style-type: none"> <li>Identifying raw materials and suppliers</li> <li>Defining frame formulations</li> </ul>	4-5
Phase 3	1. Formulation of paints <ul style="list-style-type: none"> <li>Physical &amp; chemical tests</li> <li>Microbiological tests</li> </ul> 2. Selecting formulations <ul style="list-style-type: none"> <li>100L sample manufacturing</li> <li>3rd parity ISO tests</li> </ul>	6-7
Phase 4	<ul style="list-style-type: none"> <li>Documentation</li> <li>900L batch manufacturing</li> <li>Pilot construction projects painted</li> <li>Outdoor exposure tests</li> </ul>	8
Phase 5	Tested formulations published in the web	9

## Phase 1 - User requirement specification and risk assessment

Check list of Control Gate of Phase 1 - Formulation Definition Acceptance

Readiness level	Feasibility milestones	Desirability milestones	Viability milestones
1	<b>Formulation basic principles observed</b> <ul style="list-style-type: none"> <li>R&amp;D hypothesis of formulations formulated</li> </ul>	Not relevant	Not relevant
2	<b>Formulation concept formulated</b> <ul style="list-style-type: none"> <li>Basic elements of formulations have been identified</li> <li>Experiments performed with synthetic data</li> <li>Co-creation principles are developed</li> </ul>	<ul style="list-style-type: none"> <li>Initial discussions with industry stakeholders started</li> </ul>	Not relevant
3	<b>Experimental proof of concept</b> <ul style="list-style-type: none"> <li>Analytical studies completed to predict the performance of separate elements of the formulations in appropriate context.</li> <li>Laboratory-based studies completed to physically validate that the analytical predictions are correct.</li> <li>Proof of concept of formulations showcased.</li> <li>Requirements of certification compliance defined</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder analyses accomplished.</li> <li>Target market identified and described.</li> <li>Interviews with potential customers started.</li> </ul>	<ul style="list-style-type: none"> <li>Business environment trend analyses.</li> <li>Risk areas identified in general terms.</li> <li>Risk mitigation strategies identified.</li> </ul>

## Phase 2 - Concept and Feasibility of low fidelity formulations

Check list of Control Gate of Phase 2 - Initial Design Acceptance

Readiness level	Feasibility milestones	Desirability milestones	Viability milestones
4	<p><b>Technology validated in lab</b></p> <ul style="list-style-type: none"> <li>• Comprehensible technical concept defined of the formulations.</li> <li>• Experiments started to collect full scale data sets.</li> <li>• Basic technological components are integrated to establish that they will work together.</li> <li>• <b>“Low fidelity”</b>* system demonstrated.</li> <li>• Based on experimental results, concept defined, and assessment completed.</li> <li>• Application and requirements defined of the formulations</li> </ul> <p>* A representative of the component or system that has limited ability to provide anything but initial information about the end product.</p>	<ul style="list-style-type: none"> <li>• Customer segment defined and characterized.</li> <li>• Existing alternatives identified and described.</li> <li>• <b>Solution / problem fit identified and validated</b></li> </ul>	<ul style="list-style-type: none"> <li>• Assessment for the key activities and recourses, needed for product development.</li> <li>• Net cost assessment done.</li> <li>• Environmental impact assessment is done.</li> </ul>
5	<p><b>Technology validated in relevant environment</b></p> <ul style="list-style-type: none"> <li>• Requirements are known for specific applications.</li> <li>• Basic technological components are integrated with reasonably realistic supporting elements, <b>“High fidelity”</b>* lab integration of system completed, so they can be tested in a controlled relevant environment.</li> <li>• Experiments started to collect full scale data sets.</li> </ul> <p>* Addresses form, fit, and function. A high-fidelity laboratory environment would involve testing with equipment that can simulate and validate all system specifications within a laboratory setting.</p>	<ul style="list-style-type: none"> <li>• Product concept completed.</li> <li>• Product concept validation with customers started.</li> <li>• Compliance with regulations assessed, validated.</li> <li>• Pricing strategies identified and validation with customers started.</li> </ul>	<ul style="list-style-type: none"> <li>• Value analysis includes life-cycle cost analysis.</li> <li>• IP assessment is started</li> </ul>

## Phase 3 - Design and development

Critical Parameters - Compliance to EU Ecolabel certification standard;

- White pigment and wet scrub resistance compliance;
- Titanium dioxide compliance;
- Efficiency in use compliance;
- Volatile and Semi-volatile Organic Compounds (VOCs, SVOCs) compliance;
- Compliance documentation towards use of hazardous substances and mixtures;
- Documented guidelines towards consumer information and information appearing on the EU Ecolabel;

Check list of Control Gate of of Phase 3 - Final Design Acceptance

Readiness level	Feasibility milestones	Desirability milestones	Viability milestones
6	<b>Technology demonstrated in relevant environment</b> <ul style="list-style-type: none"> <li>Formulation prototype system specification complete.</li> <li>Representative model or formulation <b>prototype system</b> is tested in a relevant environment.</li> <li>Formulation prototype system documentation available.</li> </ul>	<ul style="list-style-type: none"> <li>Product concept, pricing and revenue strategy, sales channels and form of relationships validated with project stakeholders.</li> <li><b>Product / market fit identified and validated.</b></li> <li>Potential customer leads identified, market opportunity assessed.</li> </ul>	<ul style="list-style-type: none"> <li>IP strategy completed</li> <li>Value analysis includes business case.</li> <li>On-line platform business model is finalised</li> </ul>
7	<b>System prototype demonstration in operational environment</b> <ul style="list-style-type: none"> <li>Prototype system integrated within supporting systems.</li> <li>Prototype near or at planned operational system. Formulations pototype system successfully tested in a field environment.</li> <li>Prototype system demonstration successfully completed.</li> </ul>	<ul style="list-style-type: none"> <li>Partnership role identified and needed partnerships has been established.</li> <li>Potential customer opportunities identified.</li> </ul>	<ul style="list-style-type: none"> <li>Future road map development of On-line platform is done.</li> <li>Investment needs determined for the further On-line platform business development.</li> </ul>

## Phase 4 - Pilot - Product and process validation - product launch preparation

### Check list of Control Gate of Phase 1 - Product Launch Acceptance

Readiness level	Feasibility milestones	Desirability milestones	Viability milestones
8	<b>System complete and qualified</b> <ul style="list-style-type: none"> <li><b>16 formulations</b> completed and qualified through test and demonstration in operational environment, test results completed and documented.</li> <li>Finished testing of formulations in accredited laboratories (according to the ISO 17025, standard EN 45011 or equivalent)</li> <li>Documented guidelines towards consumer information is prepared</li> <li>TDS and MSDS documentation, including list of raw materials and dosages;</li> <li>White pigment and wet scrub resistance compliance/ test documentation;</li> <li>Titanium dioxide compliance/ test documentation;</li> <li>Efficiency in use compliance/ test documentation;</li> <li>Volatile and Semi-volatile Organic Compounds (VOCs, SVOCs) compliance/ test documentation;</li> <li>Compliance documentation towards use of hazardous substances and mixtures;</li> <li>Documented guidelines towards consumer information and information appearing on the EU Ecolabel;</li> </ul>	<ul style="list-style-type: none"> <li>Marketing activities of the On-line platform started.</li> <li>Final branding</li> <li>Final design/ documentation</li> <li>Manufacturing scale-up</li> </ul>	<ul style="list-style-type: none"> <li>On-line platform business model is validated with stake holders</li> </ul>

	<ul style="list-style-type: none"> <li>• Full life cycle assessment of each paint formulation executed in accordance to LCA standard ISO 14040.</li> </ul>		
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## Phase 5 - On-line platform Launch

Phase 5 check list of Control Gate - Feedback assessment and corrective action

Readiness level	Feasibility milestones	Desirability milestones	Viability milestones
9	<p><b>Actual system proven in operational environment</b></p> <ul style="list-style-type: none"> <li>• Formulations fully demonstrated with demo batches and On-line platform paid customer, system in its final form and in full commercial deployment.</li> <li>• Feedback assessment and corrective actions.</li> <li>• EU Ecolabel certification completed and submitted.</li> <li>• Sustaining engineering, quality audits</li> <li>• Project performance monitoring</li> <li>• Technical dissemination activities for paint and coating industry professionals</li> </ul>	<ul style="list-style-type: none"> <li>• Sales and marketing activities.</li> <li>• Continuous sales effort</li> <li>• Market surveillance</li> </ul>	



## Phase-gate readiness level timeline and involvement of project associates

### LIFE Project timeline

Version: nr.2

Latst edited: 17.04.2020

Read. level	1st quarter 2020			2nd quarter 2020			3rd quarter 2020			4th quarter 2020			1st quarter 2021			2nd quarter 2021			3rd quarter 2021			4th quarter 2021			1st quarter 2022			
	janv.20	febr.20	marts.20	apr.20	maijs.20	jün.20	jül.20	aug.20	sept.20	okt.20	nov.20	dec.20	janv.21	febr.21	marts.21	apr.21	maijs.21	jün.21	jül.21	aug.21	sept.21	okt.21	nov.21	dec.21	janv.21	febr.21	marts.21	
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<b>Involvement of project associates:</b>																												
ALINA			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Paint Company			YES	YES	YES	YES								YES							YES	YES	YES	YES	YES	YES	YES	
Binder Manufacturer					YES	YES																						
Riga Technical University						YES	YES	YES	YES	YES																		
University of Latvia						YES	YES	YES	YES	YES																		

## Timetable of parallel development of Actions B.1 and B.3

