



H2020-NMBP-HUBS-2019

FlexFunction2Sustain

Open Innovation Ecosystem for Sustainable Nano-functionalized Flexible Plastic and Paper Surfaces and Membranes

Starting date of the project: 01/04/2020
Duration: 48 months

= Deliverable D8.3 =
2nd update of Report from interconnection
with regional, national and EU level intermediaries and
standardisation bodies

Dissemination level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
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Executive Summary

The objective of the deliverable 8.3 is twofold:

- to consolidate interconnections with regional, national and EU intermediaries. These intermediaries include thematic scientific and industry associations on regional, national and EU level and economic development agencies.
- to ensure the alignment of FlexFunction2Sustain (FF2S) with existing European and international standards (CEN, ISO, IEC).

Exploiting their pre-existing relationships, the partners have identified **39 relevant public bodies, organisations and association (OE-A, EMMC, EPPN, Nanosafety Cluster, ...)** to ensure efficient communication and outreach towards the scientific, economic and **standardisation community (AFNOR, UNE and different technical groups)**. A mapping of targeted stakeholders was realized to plan future networking activities based on the project future needs. Priorisation was made over the identified organisations that have been contacted to start discussing subject such as certification, clustering, dissemination or extension of service portfolio.

For the M24-M36 project period, the deliverable details the special relationship designed with the French plastic cluster, Polymeris, to engage in the dissemination of the open calls and ultimately the recruitment of possible candidates. At the end, **22 entities were contacted** to directly promote the open calls and the project in general.

The identification of internal capacity to contribute to the standardisation activity was realized to implicate the consortium members capable of implementing pragmatic actions. The partners identified **23 standard projects** (with three new ones in D8.3) that are followed and where the consortium planned to possibly contribute. Partners such as IPC, OE-T, AUTH and Fraunhofer are involved in the concrete and direct contribution to standards. The table below described the standard projects that were monitored and where contributions were realized or foreseen.

For the M24-M36 period, the deliverable details the **contributions made on five standards and the identification of three new ones**. This led to **eight contributions** to standards since the starting of the project.

Topic	Standard ID		Title
Bio-based plastics	ISO/CD	22526-4	Plastics — Carbon and environmental footprint of bio-based plastics — Part 4: Environmental (total) footprint (Life Cycle Assessment)
Marine Biodegradability	ISO/CD	23832	Plastics — Test method for determination of degradation rate and disintegration degree of plastic materials exposed to marine environmental matrices under laboratory conditions
Marine Biodegradability	ISO/NP	5430	Plastics - Marine eco-toxicity testing scheme for biodegradable plastic materials - Test methods and requirements
Water Vapor Permeability Testing	ISO	15106/4-7	Plastics – Measurement of water vapour permeation rate below 10-3 g/(m ² d)
Water Side-leakage testing printed electronic device layouts	IEC	TC119	Printed and Organic Electronics – measuring water side ingress through adhesives in typical device layouts
Organic Electronics	ISO/PWI	119-17 ED1	Future IEC 62899-2XX-X: Space charge mobility measurement in organic diodes
Plastics recycling	ISO/PWI	ISO/PWI	Plastics — Guidelines for the recovery and recycling of plastic waste — Part 1: General principles
Plastics recycling	ISO/PWI	15270-2	Plastics — Guidelines for the recovery and recycling of plastic waste — Part 2: Mechanical recycling
Plastics recycling	ISO/PWI	15270-5	Plastics — Guidelines for the recovery and recycling of plastic waste — Part 5: Organic recycling
Biodegradability	ISO/CD	20200	Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test

Biodegradability	ISO/DIS	5412	Biodegradable plastic shopping bags for industrial composting
Biodegradability	ISO/FDIS	5148	Plastics — Determination of specific aerobic biodegradation rate of solid plastic materials and disappearance time (DT50) under mesophilic laboratory test conditions
Mechanical Testing	ISO/PWI	8809	Plastics-Erosion test for plastics and composites
Mechanical Testing	ISO/PWI	9990	Measurement of surface roughness of plastics using laser scanning confocal microscopy
Mechanical Testing	ISO/PWI	18485	, Peel test for the determination of interlaminar fracture toughness of flexible packaging laminates
Mechanical Testing	ISO/CD	19252	Plastiques — Détermination du comportement à la rayure
Physicochemical properties	ISO/DIS	11357-1	Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles
Recycling	EN/PWI	nc	Quality requirements for application of plastic recyclates in products — Part 1: General
			Quality requirements for application of plastic recyclates in products – Part 3 : Polypropylene (PP)
			Quality requirements for application of plastic recyclates in products – Part 3 : Polypropylene (PP)
Recycling	Revision EN	15345: 2007	Plastics. Recycled plastics. Characterization of polypropylene (PP) recyclates
Characterisation	ISO/FDIS	7765-2	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test
Novel standard contributions during the M24-M36 period			
Biodegradability	ISO/CD	16623	Plastics — Optimized intertidal seawater and sediment preparation for marine biodegradation testing of plastics
Biodegradability	ISO/NP	18957	Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater using accelerated conditions in laboratory
Biodegradability	ISO/FDIS	5430	Plastics — Marine ecotoxicity testing scheme for soluble decomposition intermediates from biodegradable plastic materials in products intentionally used in the marine environment – Test methods and requirements.
Biodegradability	ISO/FDIS	5412	Plastics — Industrial compostable plastic shopping bags
Biodegradability	ISO/CD	20200:2022	Plastics - Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test
Biodegradability	ISO/CD	16636	Disintegration field test of plastics under water environmental conditions

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1. Introduction

D8.3 is the second update of the report dealing with the interconnection of regional, national and EU level intermediaries and pre-normative contribution to standardisation bodies (D8.1, 1st update in D8.2). D8.3 is produced within tasks 8.1 that complements tasks 8.2 that focuses on the clustering activities among OITBs.

The deliverable is built around two objectives that are:

- Make use of the consolidated contact list. Contact targeted stakeholders and propose actions to develop the networking activities of the project. During this period, **actions were focused on the dissemination of the 2nd and 3rd open call** which cut-off date ended in July, 29th, 2022 (extended to August, 12th) and January, 31th, 2023 (extended to February, 03rd) respectively.
- To drive the standardisation activities by **contributing to several standard projects**.

2. Results and discussion

2.1. Interconnection of regional, national and EU level intermediaries

2.1.1. Definition of the prioritization

The objective of this subtask is to consolidate interconnections with regional, national and EU intermediaries. These intermediaries include thematic scientific and industry associations (e.g. OE-A, VDMA, etc.) on regional, national and EU level and economic development agencies.

At first, a list of targets have been produced (see [Table 1](#)). This list represents potential targets that were contacted for different proposes (open calls, wide dissemination, clustering activities, ...). A level of prioritization has been set to organise the work. The list was continuously updated and complemented with new relevant associations and intermediaries.

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Entity Name	Company type	Purpose of the contact / Role of the stakeholder	Contacted
Acreo/Rise	SME	RTO in Sweden will be contacted as our link to Sweden	no
OE-A	Association/Cluster	Network related to flexible electronics , FlexFunction2Sustain Coordinator is Spokesperson of the OE-A working group "Encapsulation".	Yes
NIA - Nanotechnology Industries Association	Association/Cluster	Link with industry on nanotechnologies. EAB Member.	yes
EMMC -European Materials Modelling Council	Association	EMCC Representing Characterisation activities/initiatives Facilitate cooperation across Europe with other projects Pilot Lines	yes
European Chemical Council (cefic.org)	Association	Association of Chemical Industry in Europe	no
Réseau Europe en Région Auvergne	Public body / Authority	Regional Government Authorities to promote regional <=> transnational interactions	yes
Auvergne Rhone Alpes Region	Public body / Authority	Regional Government Authorities to promote regional <=> transnational interactions	yes
Normandie Regions	Public body / Authority	Regional Government Authorities to promote regional <=> transnational interactions	yes
Loire Region	Public body / Authority	Regional Government Authorities to promote regional <=> transnational interactions	yes
PlasticRecyclersEurope	Association	Association of Plastic Recyclers: Provide official protocols for testing the recyclability of products. Wide dissemination.	yes
European Plastics Converter EUPC	Association	Association of Plastic Converters. EAB Member	yes
Food Drink Europe	Association	Association of Food and Drink companies. Pool of potential customers of the OITB	no
EUROPEN	Association	The European Organization for Packaging and the Environment. Pool of potential customers of the OITB	yes
CEFLEX	Cluster	Cluster of companies representing the entire value chain of flexible packaging	yes
Nanosafety Cluster	Cluster	Cluster on the safety of nanotechnology Facilitate cooperation across Europe with other projects Pilot Lines; to enhance user involvement; and to ensure the accessibility and reusability of data.	yes
AFELIM	Cluster	AFELIM brings together the various contributors of the printed electronics sector in France. National network related to flexible electronics	yes
POLYMERIS	Cluster	French competitive cluster for plastics and composites	Yes (Priority)
JIIP - JOINT INSTITUTE FOR INNOVATION POLICIES	Association	JIIP provides intelligence to support policy-making, with a focus on research and innovation policy.	no
European Factories of the Future Research Association - EFFRA	Association	Made in Europe roadmap, Industry 4,0 factory of the future. The European Factories of the Future Research Association (EFFRA) is a non-for-profit, industry-driven association promoting the development of new and innovative production technologies	no
SUSCHEM	Association	SusChem is the European Technology Platform for Sustainable Chemistry. It is a forum that brings together industry, academia, policy makers and the wider society.	no
European composites, plastics and polymer processing platform - ECP4	Association	Industry-driven collaboration that unites members from 13 countries amongst the top-level European research institutions, regional plastic clusters, and EU-level industrial organisations of plastics and composites converters.	no

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Circular Plastic Alliance	Initiative	CPA gathers 245 public and private actors covering the whole plastics value chains	yes
CEFIC (European Chemical industry Council)	Association	Dissemination	no
EPPN (European Network for Pilot Production Facilities and Innovation Hubs)	Association	Dissemination , links with other pilot production facilities and OITBs	yes
EUROPEAN POWDER METALLURGY ASSOCIATION (EPMA)	Association	To promote and develop Powder Metallurgy (PM) technology in Europe	no
TECHTERA	Cluster	French competitive cluster for textile	no
Alliance Électronique - ACSIEL	Trade union	Trade union bringing together all players in the electronics value chain	no
4M association	Association	Network of Excellence to develop Micro- and Nano- Technology (MNT) for the batch-manufacture of micro-components and devices in a variety of materials for future microsystems products.	no
European Composites Industry Association - EUCIA	Cluster	European Composites Industry Association (EuCIA) represents European national composite associations as well as industry-specific sector groups at EU level.	no
Austrian Standards	Association	Standards Development	no
UNE (Spanish standardisation authority)	Association	Standards Development. Engage on an early-stage discussion on OITB standardisation activities harmonisation (INNPRESSME + OASIS)	yes
Cecimo (European Machine Tool Industries and related Manufacturing Technologies)	Association	Secretary General/Director General	no
AIMCAL (https://www.aimcal.org/)	Association	Publisher of AIMCAL Magazine, Association for Metallizers and Coaters on Plastic web (worldwide, but with growing European Community)	no
LINPRA	Business organisation	Lithuanian, Estonian and Latvian Engineering Association. EAB Member	yes
Environmental Investment Partners	Venture Capitalists	Investor for environmentally friendly projects and companies. EAB Member	yes
M27 GmbH	commercial company	Investor to SME relations broker and Platform	no
TÜV Austria	Certification Agency	Issues certificates for accredited test labs for biodegradability testing as well as acts as certification agency subcontracting accredited test labs for test measurements. They have been contact for for facility certification	yes
Additional Entity Name	Company type	Purpose of the contact / Role of the stakeholder	Contacted
Plast Center Danmark	Cluster	Business foundation with the aim of building a knowledge and competence environment within the plastics and polymer area. PCD will help communicate on the project results in Danmark	yes
The Ministry of Development and Investment of Greece	Public body / Authority	Government Authorities to promote national interactions. Disseminate the content of the open call to Greek SMEs	yes

Table 1: Updated list of targeted stakeholders for networking

2.1.2. Promotion of the open call

A list of targets was selected to promote the dissemination material related to the first open call. Communication materials and links to the dedicated webinars and their replay were provided to increase the open call visibility.

Company Name	Company type	Role of the stakeholder	Impact
Réseau Europe en Région Auvergne	Public body / Authority	Regional Government Authorities to promote regional transnational interactions	Disseminate the content of the open call to French SMEs
Auvergne Rhone Alpes Region			
Normandie Regions			
Loire Region			
Plast Center Danmark	Cluster	National organisation to promote transnational interactions	Disseminate the content of the open call to Danish SMEs
LINPRA	Business organisation		Disseminate the content of the open call to Lithuanian SMEs
The Ministry of Development and Investment of Greece	Public body / Authority	Government Authorities to promote national interactions	Disseminate the content of the open call to Greek SMEs
EPPN	Association	Wide dissemination	Disseminate the content of the open call to European SMEs
Nanosafety cluster	Cluster		

Table 2: List of targeted stakeholders to promote the project open calls

IPC, HOPE-A and AUTH initiated regional dissemination activities for the open calls in French (IPC) and Greek (HOPE-A, AUTH) language. HOPE-A presented FF2S and FF2S's Open Call to the 11th International Conference & Exhibition on Green Flexible & Printed Electronics Industry. The conference was attended by the Greek Minister of Development and Investments Mr Adonis Georgiadis and the Greek Deputy Minister of Development and Investments in Research, Technology & Innovation Mr. Michael Dritsas.

All RTO partners (JOA, Fraunhofer, IPC, AUTH, INL) began to create an awareness about the open calls to their partner and customer network by pushing the event on their respective social networks and disseminating it during various types of events (trade fairs, workshops, conferences, etc.).

A workshop was also organized by Fraunhofer and AMIRES to start the promotion of the open call on the European scale.

Workshop name	Date	Lead organizer	Targets	Number of attendees
Pilot Case projects on novel nano-functionalised plastic, paper and membrane surfaces	16/12/22	HOPE-A	Greek SME	N/C
Feasibility meets economical interest	30/11/22	Fraunhofer – AMIRES – SHP - GEMIFO	EU SMEs	16
Appel à projet FF2S	21/10/21	IPC	French SMEs	15
Open Call for Pilot Case projects	05/10/21	Fraunhofer - AMIRES	EU SMEs	20
SME Session at LTN conference	11/10/21	HOPE-A	Greek SME	15
PLASTEKO Stakeholder Meeting	28/07/21	PLASTEKO	Latvian Packaging Industry	33

Table 3: List of workshops organised to promote the open calls

Novel actions related to outreach realized during the M24-M36 period

A special promotion of the open call was realized in partnership **with the French plastic cluster. Polymeris** is the competitiveness cluster for rubber, plastics, and composites. It draws on 15 years of expertise and experience in supporting businesses, with in-depth knowledge of the techniques and markets of tomorrow.

The open call was presented to business developers in charge of the development of the industrial networking. The objective was to deliver a clear pitch to the cluster members through them and identify technical needs .

Three serious candidates were identified that **lead to the signature of the open call project** carried out by the SME CASCADE (see WP7 deliverables).

2.2. Pre-normative contribution to standardization bodies

In the frame of task 8.1, FF2S partners contribute to standardisation developments in specific topics related to the project research. The purpose is to increase the project results exploitation and impact by promoting their inclusion in new or future standards or in already existing standards that can be easily used by the European or international industry.

The specific strategy followed by the partnership is fourfold:

1. Identify the partners having the capability to directly contribute to standard activities.
2. Identify the standard projects about to be published and contribute to it.
3. Identify the standard projects that are considered as problematic and are potentially targeted for revision.
4. Homogenisation of standard activities with the others OITB.

2.2.1. Identification of normative capacity within the consortium

Definition: a partner having the capacity to contribute to standardisation activity is a partner that is either the national standardisation authority, is a sectorial standardisation authority (by delegation) or is an active member of a standardisation technical committee.

Partners having the capability to contribute directly to the standardisation activities through standardisation bodies are:

Standards topic covered	Partners	Means of contribution / link to Authorities	Link
Plastics and composite	IPC	Directly to the French national standardisation body (AFNOR). IPC is the French sectorial bureau of standardisation on plastics and composite	https://ct-ipc.com/page/bnpp
Organic Electronics/Organic Photovoltaics	OE-T	OET is interested in the connection with national standardization authorities such as the Hellenic Organization for Standardization and the Hellenic Accreditation System	http://www.elot.gr/
Printed flexible electronics	AUTH	Through a membership at the IEC (technical comity - TC 119)	https://www.iec.ch/dyn/www/f?p=103:7:::::FSP_ORG_ID:8679
Encapsulation technology and water vapour permeability testing	Fraunhofer	Through Fraunhofer ENAS and FEP to the standards in the IEC-TC119 and TC124 for flexible and wearable electronics, further access to the ISO TC61 working group 7	https://www.enas.fraunhofer.de/en/about_us/cooperation_s_1/fraunhofer-project-center.html

2.2.2. Identification to standard projects and contributions

Description of the methodology through the example of IPC:

IPC as the French sectorial standardisation bureau on plastics and composite, represents the French standardisation authority in this specific field. Hence, IPC belongs to several French expert commission dealing with plastics. The expert Scientific Committee (SC) explore standards issues belonging to the thematic below:

- bio-based plastics
- recycling of plastics
- micro-plastic and Nano plastics
- composting
- composting in marine environment
- LCA in the bio-based plastics value chain

A normative watch is permanently realized by IPC within those SC to list the principal and latest standards edited every year. Those SC corresponds to the **Working Group (WG) ISO-TC-61-SC14**. TC 61 standing for the Technical Committee dealing with plastics standards, and SC14, the sub-committee dealing with environmental aspect of plastics. In addition, this WG explore the topics described below:

- 1- Terminology, classifications and general guidance
- 2- Biodegradability
- 3- Biobased plastics
- 4- Characterization of plastics leaked into the environment (including microplastics) and quality control criteria of respective methods
- 5- Mechanical and chemical recycling

In a nutshell, through the implication in specific national technical committee, **IPC have access to all normative projects dealing with plastics and composites that are presented to the ISO, the CEN or the NF (French standards)**. In addition, other partners that are members of technical committee, will have the same capability to detect and contribute to any standards project conceived within their committee.

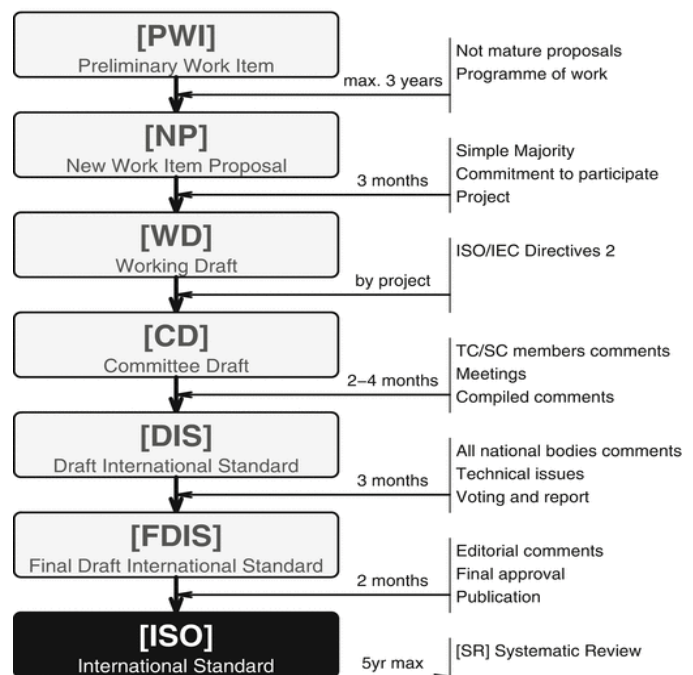
A second normative watch is permanently realized through the Fraunhofer activities within the OE-A Working Group Encapsulation. This includes both water vapour permeability measurements on plastic webs and packaging products and testing of encapsulation performance in flexible organic electronics devices.

2.2.3. Contribution strategy

A list of targeted standard projects is described in Table 4. The strategy proposed by the FF2S consortium is to set a close watch of the standardisation activities and contribute to the projects if possible and also if the stage of the standard projects development allows it.

Hence, **direct contributions will be made to standard projects that are in a development stages from PWI to CD** (for abbreviations see fig. 1). Stages between DIS and FDIS were favourable for minor comment and/or editorial comments. Those stages will be monitored for possible contributions but also to have a complete standard watch.

Figure 1: Description of the ISO standards publication path



Topic	Standard ID		Title	Subject	Lead Partner
Bio-based plastics	ISO/CD	22526-4	Plastics — Carbon and environmental footprint of bio-based plastics — Part 4: Environmental (total) footprint (Life Cycle Assessment)	This document provides guidance and requirements to assess impact over the life cycle of bio-based plastics products. The applications of LCA as such are outside the scope of this document.	IPC
Marine Biodegradability	ISO/FDIS	23832	Plastics — Test method for determination of degradation rate and disintegration degree of plastic materials exposed to marine environmental matrices under laboratory conditions	<p>This document specifies test methods for the measurement of the physical degradation of samples made with plastics materials when exposed to marine environmental matrices under aerobic conditions at laboratory scale. Plastics samples can be exposed to three different test conditions and different marine matrices: buried into a wet sandy marine sediment; at the interface between a marine sandy sediment and the water column; to seawater.</p> <p>The conditions applied in these test methods are designed to determine the degradation rates of plastics materials and give an indication of their propensity to physical degradation and disintegration in natural environments.</p> <p>Degradation rates considered in this document are mass loss rate, erosion rate, and mechanical properties loss. Disintegration, i.e. physical breakdown of a sample into very small fragments (<2mm) can also be assessed.</p> <p>The test design (i.e. the total number of tested samples, the number of replicates and of repeated measurements) of the test methods is flexible. The complexity of test design and the cost of testing can be modulated according to the requests and purposes of the client. For example, tests planned for results delivered under statistically optimal conditions can be arranged for certification purposes, while simpler tests can be arranged for screening purposes.</p> <p>This document is not suitable for the assessment of degradation caused by heat (thermo-degradation) or light exposure (photo-degradation).</p>	IPC
Marine Biodegradability	ISO/CD	5430	Plastics - Marine eco-toxicity testing scheme for biodegradable plastic materials - Test methods and requirements	<p>This document specifies test methods and evaluation criteria by addressing potential eco-toxicological adverse effects on marine organisms. Adverse effects on marine species may be caused by plastic materials and degradation products resulting from the decomposition of biodegradable plastic materials that are intentionally or unintentionally disposed to marine environment. The eco-toxicity testing scheme covers marine organisms from three trophic levels:</p> <ul style="list-style-type: none"> - toxicity to marine microorganisms - toxicity to marine algae - toxicity to marine invertebrate. Toxicity to marine fish is not considered due to animal welfare considerations. <p>This document is not suitable for the assessment of adverse effects caused by solid, non-biodegradable plastic materials such as microplastics.</p>	IPC
Water Vapor Permeability Testing	ISO	15106/4-7	Plastics - Measurement of water vapour permeation rate below 10^{-3} g/(m ² d)	<p>These standards address the measurement of water vapour permeability in a range below 10^{-3} g/(m²d) using direct pressure measurement, calcium mirror test and mass spectrometry. In that regime called "ultra-high permeation barriers", time-dependent effects significantly influence the measurement results leading to non-comparable results. However, these time-dependent effects are not sufficiently respected in the corresponding ISO documents. The OE-A working group Encapsulation aims at proposing a revision to these standards that better reflect the time-dependent behaviour of the materials. The activities are brought to the standardisation bodies through the UK National Physical Laboratory (NPL).</p>	Fraunhofer, AUTH

Water Side-leakage testing printed electronic device layouts	IEC	TC119	Printed and Organic Electronics – measuring water side ingress through adhesives in typical device layouts	The OE-A Working Group encapsulation currently undergoes experimental investigations on best suited device setups to measure the side ingress of corrosive gases to typical printed electronics device layouts. Currently no standard exist, which allow the comparison of different adhesives and adhesive/substrate combinations with respect to the amount of water penetrating through the side to an organic electronic device. Through the fact that this “side-ingress” is determined both by the bulk permeation through the adhesive material itself and the diffusion along the substrate/adhesive interface – creation of a reference test layout is challenging. The standardisation project is currently still in a pre-normative experimental evaluation phase. The interaction to the standardisation body TC119 is secured through FHG.	Fraunhofer, AUTH
Organic Electronics	PWI	119-17 ED1	Future IEC 62899-2XX-X: Space charge mobility measurement in organic diodes	https://www.iec.ch/dyn/www/?p=103:38:24553919859845:::FSP_ORG_ID,FSP_APEX_PAGE,FSP_PROJECT_ID:8679,23,103722	OET/AUTH
Plastics recycling	ISO/PWI	15270-1	Plastics — Guidelines for the recovery and recycling of plastic waste — Part 1: General principles	ISO 15270 provides guidance for the development of standards and specifications covering plastics waste recovery, including recycling. The standard establishes the different options for the recovery of plastics waste arising from pre-consumer and post-consumer sources. It also establishes the quality requirements that should be considered in all steps of the recovery process, and provides general recommendations for inclusion in material standards, test standards and product specifications. Consequently, the process stages, requirements, recommendations and terminology presented in the standard are intended to be of general applicability.	IPC
Plastics recycling	ISO/PWI	15270-2	Plastics — Guidelines for the recovery and recycling of plastic waste — Part 2: Mechanical recycling		
Plastics recycling	ISO/PWI	15270-5	Plastics — Guidelines for the recovery and recycling of plastic waste — Part 5: Organic recycling		
Biodegradability	ISO/CD	20200	Plastics — Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test	ISO 20200 specifies a method of determining the degree of disintegration of plastic materials when exposed to a laboratory-scale composting environment. The method is not applicable to the determination of the biodegradability of plastic materials under composting conditions. Further testing is necessary to be able to claim compostability.	IPC
Biodegradability	ISO/DIS	5412	Biodegradable plastic shopping bags for industrial composting	This document specifies the terms and definitions, requirements, test methods, test regulations and packaging, transportation and storage of biodegradable plastic shopping bags for industrial composting. This document is applicable to plastic shopping bags made from biodegradable plastic resin as the main raw material, processed by heat sealing or bonding, etc. It is also suitable for shopping bags made of composite of biodegradable plastic and other materials.	IPC
Biodegradability	ISO/FDIS	5148	Plastics — Determination of specific aerobic biodegradation rate of solid plastic materials and disappearance time (DT50) under mesophilic laboratory test conditions	This proposed deliverable specifies a method to determine the specific biodegradation rate of solid, non-water soluble plastic materials. The method described in this document can be considered as an additional extension (“add-on”) of the existing ISO standard test methods for measuring biodegradation of plastic materials to make it possible the determination of the specific biodegradation rate and the 50% Disappearance Time (DT50).	IPC
Mechanical Testing	ISO/PWI	8809	Plastics-Erosion test for plastics and composites	Not communicated yet	IPC
Mechanical Testing	ISO/PWI	9990	Measurement of surface roughness of plastics using laser scanning confocal microscopy	Not communicated yet	IPC
Mechanical Testing	ISO/PWI	18485	Peel test for the determination of interlaminar fracture toughness of flexible packaging laminates	Not communicated yet	IPC

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Mechanical Testing	ISO/CD	19252	Plastics — Determination of scratch properties	ISO 19252:2008 specifies a method for determining the scratch properties of plastics under defined conditions. The method involves making a scratch by moving a hard instrument (scratch tip) of specified geometry under specified conditions of load and speed across the surface of a test specimen and then assessing the result.	IPC
Physicochemical properties	ISO/DIS	11357-1	Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles	ISO 11357 specifies several differential scanning calorimetry (DSC) methods for the thermal analysis of polymers and polymer blends, such as <ul style="list-style-type: none"> thermoplastics (polymers, moulding compounds and other moulding materials, with or without fillers, fibres or reinforcements); thermosets (uncured or cured materials, with or without fillers, fibres or reinforcements); elastomers (with or without fillers, fibres or reinforcements). 	IPC
Recycling	EN/PWI	Not communicated	Quality requirements for application of plastic recyclates in products — Part 1: General	Not communicated yet	IPC
			Quality requirements for application of plastic recyclates in products - Part 3 : Polypropylene (PP)	Not communicated yet	IPC
			Quality requirements for application of plastic recyclates in products - Part 3 : Polypropylene (PP)	Not communicated yet	IPC
Recycling	Revision EN	15345:2007	Plastics. Recycled plastics. Characterization of polypropylene (PP) recyclates	This European Standard defines a method of specifying delivery conditions for Polypropylene (PP) recyclates. It gives the most important characteristics and associated test methods for assessing a single batch of PP recyclates intended for use in the production of semi-finished/finished products.	IPC
Characterisation	ISO/FDIS	7765-2	Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test	This document specifies a test method for the determination of puncture impact properties of a plastic film using instruments for measuring force and deflection. It is applicable if a force-deflection or forcetime diagram, recorded at nominally constant striker velocity, is required for detailed characterization of the impact behaviour.	IPC
Novel standard contributions during the M24-M36 period					
Topics	Standard ID	Title	Subject	Lead Partner	
Biodegradability	ISO/CD 16623	Plastics — Optimized intertidal seawater and sediment preparation for marine biodegradation testing of plastics	The ISO/CD 16623 standard specifies the procedure for preparing natural seawater and seafloor sediments used in laboratory-scale test methods to evaluate the degree and rate of aerobic biodegradation of plastic materials in marine environments under aerobic conditions.	IPC	
Biodegradability	ISO/NP 18957	Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater using accelerated conditions in laboratory	The standard specifies a test method for determination of the aerobic biodegradation of plastic materials exposed in seawater using accelerated conditions in laboratory	IPC	

Biodegradability	ISO/FDIS 5430 ¹	Plastics — Marine ecotoxicity testing scheme for soluble decomposition intermediates from biodegradable plastic materials in products intentionally used in the marine environment – Test methods and requirements.	See description above	IPC
Biodegradability	ISO/FDIS 5412 ²	Plastics — Industrial compostable plastic shopping bags	See description above	IPC
Biodegradability	ISO/CD 20200:2022 ³	Plastics - Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test	See description above	IPC
Biodegradability	ISO/CD 16636	Disintegration field test of plastics under water environmental conditions	This document specifies test methods for the determination of the degree of disintegration of plastic materials immersed to marine habitats under real field conditions.	IPC

Table 4: List of targeted standard projects open for partners contributions

¹ novel version of the standard from CD to FDIS status

² novel version of the standard from DIS to FDIS status

³ review of an already published standard

2.2.4. Direct contributions to standards project

Disclaimer: drafted standards are, like published standards, subject to copyright. Hence, the text of these documents cannot be made public, even partially. The direct contributions made by the partners are summarized below but not strictly reproduced.

ISO-23832 (published): Plastics — Test method for determination of degradation rate and disintegration degree of plastic materials exposed to marine environmental matrices under laboratory conditions

Regarding this standard, IPC proposes a series of comments that were integrated through the IPC/BNPP in the standards FDIS stage. A summary of the items commented that are linked to the FF2S project is described below.

Decay measurement is not essential in a marine environment compared to a compost study. It will even be redundant with the biodegradation standard and will not really add significant additional material. From previous experience with the PHB, after 90 days in an artificial marine environment, the decay signals were weak (measured mass loss, but no deformation or decay) compared to the biodegradation signals.

In addition, this standard mixes the notion of disintegration and biodegradation, because it speaks of a microbial activity to be maintained throughout the incubation period. In general, this standard allows too wide a choice of the starting inoculum and the incubation conditions which can influence the final result.

Several technical remarks:

- *The composition of artificial seawater for the biodegradability test*
- *Storage condition of the test material*
- *Agitation protocol for the sample*
- *Product sample description*
- *Duration of the test*

ISO/CD-5430: Marine eco-toxicity testing scheme for soluble breakdown intermediates from biodegradable plastic materials used in and intentionally added to the marine environment – Test methods and requirements. IPC participated in the review of the ISO/CD 5430 standard. A summary of the items commented that are linked to the FF2S project is described below:

The ISO/CD 5430 standard uses the NF-EN ISO 18 830 standard (Determination of the aerobic biodegradation of submerged plastics at the seawater / sandy sediment interface – Method) by measuring the oxygen demand, in a closed respirometer test environment and uses NF-EN ISO 11348-2: 2007 as well.

Several technical remarks:

- *Temperature span of the testing*
- *Storage condition of water and sediment*
- *Addition of artificial seawater*
- *The preparation of the inoculum*

ISO/DIS 22526-4: Plastics — Carbon and environmental footprint of biobased plastics — Part 4: Environmental (total) footprint (Life Cycle Assessment)

Regarding this standard, IPC proposes simple editorial comments that were integrated through the IPC/BNPP in the standards CD stage.

2.2.5. Other items of the standardization watch that were addressed

ISO/DIS 5412, Biodegradable plastic shopping bags for industrial composting

After reviewing the standard and previous associated comments, IPC did not add further comments. Indeed, many points raised have been corrected and the standards project was satisfactory.

ISO 15106-1 Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 1: Humidity detection sensor method

The Standards ISO 15106 are currently being under investigation and suggestions for revising standards are in preparation

Transfer to European standards of international standards: ISO 22526-1:2020, ISO 22526-2:2020, ISO 22526-3:2020

Public surveys have been sent for the transfer of international standards in European standards following:

- ISO 22526-1:2020, Plastics — Carbon and environmental footprint of plastics bio-based — Part 1: General principles
- ISO 22526-2:2020, Plastics — Carbon and environmental footprint of plastics materials — Part 2: Carbon footprint of materials, amount (mass) of CO₂ captured in the air and incorporated into polymer molecules
- ISO 22526-3:2020, Plastics — Carbon and environmental footprint of plastics bio-based — Part 3: Carbon footprint of processes, requirements and lines guidelines for quantification

Transfer in European standards of the international standards: ISO 22403:2020, ISO 22404:2019, ISO 22766:2020, ISO 23977-1:2020 and ISO 23977-2:2020

Public inquiries have been launched for the transfer of international standards in European standards of the following items:

- ISO 22403:2020, Plastics — Assessment of the intrinsic biodegradability of materials exposed to marine inocula under mesophilic aerobic laboratory conditions — Test methods and requirements
- ISO 22404:2020, Plastics — Determination of the aerobic biodegradation of non-floating materials exposed to marine sediment — Method by analysis of evolved carbon dioxide
- ISO 22766:2020 Plastics — Determination of the degree of disintegration of plastic materials in marine habitats under real field conditions
- ISO 23977-1:2020, Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater — Part 1: Method by analysis of evolved carbon dioxide
- ISO 23977-2:2020, Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater — Part 2: Method by measuring the oxygen demand in closed respirometer

Novel actions related to standard contribution realized during the M24-M36 period

ISO/CD 16623 Plastics — Optimized intertidal seawater and sediment preparation for marine biodegradation testing of plastics

IPC participated in the review of the ISO/CD 16623 standard. **IPC approved the standard.** A summary of the items commented that are linked to the FF2S project is described below:

The ISO/CD 16623 standard specifies the procedure for preparing natural seawater and seafloor sediments used in laboratory-scale test methods to evaluate the degree and rate of aerobic biodegradation of plastic materials in marine environments under aerobic conditions.

Several technical remarks:

- *vocabulary*
- *identification of geographical working zone*

ISO/NP 18957 Plastics — Determination of the aerobic biodegradation of plastic materials exposed to seawater using accelerated conditions in laboratory

IPC participated in the review of the ISO/NP 18957 standard. A summary of the items commented that are linked to the FF2S project is described below:

The standard specifies a test method for determination of the aerobic biodegradation of plastic materials exposed in seawater using accelerated conditions in laboratory

Several technical remarks:

- *definition of the pelagic zone*
- *temperature range*
- *stirring recommendation*
- *control the concentration of microorganisms*

ISO/FDIS 5430 Plastics — Marine ecotoxicity testing scheme for soluble decomposition intermediates from biodegradable plastic materials in products intentionally used in the marine environment – Test methods and requirements

IPC participated again in the review of the ISO/DIS 5430 standard. A summary of the items commented that are linked to the FF2S project is described below:

The ISO/FDIS 5430 standard uses the NF-EN ISO 18 830 standard (Determination of the aerobic biodegradation of submerged plastics at the seawater / sandy sediment interface – Method) by measuring the oxygen demand, in a closed respirometer test environment and uses NF-EN ISO 11348-2: 2007 as well.

Several technical remarks:

- *Biodegradation definition*
- *pre-exposed inoculum problematics*
- *true toxicity representativeness*

ISO/FDIS 5412 Plastics — Industrial compostable plastic shopping bags

IPC participated in the review of the ISO FDIS 5412 standard. The standards was approved without comments

ISO/CD 20200:2022. Plastics - Determination of the degree of disintegration of plastic materials under simulated composting conditions in a laboratory-scale test

IPC participated in the review of the ISO/CD 20200 standard. A summary of the items commented that are linked to the FF2S project is described below:

This standard specifies a method for determining the degree of disintegration of plastic materials exposed to a composting environment in the laboratory.

Several technical remarks:

- *add a qualitative test*
- *addition of water in the reactor*

ISO/CD 16636: Plastics — Disintegration field test of plastics under water environmental conditions

IPC participated in the review of the ISO/CD 16636 standard. **IPC disapproved the standard.** A summary of the items commented that are linked to the FF2S project is described below:

This document specifies test methods for the determination of the degree of disintegration of plastic materials immersed to marine habitats under real field conditions.

Several technical remarks:

- *Micro-plastic production potential*
- *Creation of new vocabulary not suitable*

2.2.6. Homogenization of standards activities with the others OITB

In relation to task 8.2 on inter-clustering activities, the FF2S project plan to team up with other project to start discussing homogenization of standardization activities among OITBs.

The INPRESSME OITB project lead by VTT and dealing with a similar technical subject propose a standardization task. This task has a similar purpose as our task 8.1 and ultimately will propose a guide to harmonized good practice in OITB standardization activities.

A first contact with UNE, the Spanish national standardization authority, was established. A workshop was organized the 1st of October 2021 on this subject. Discussions about **the standardisation harmonization guide started at the end of the year 2022 to align on a common goal**. During the workshop IPC described the methodology used within FF2S to manage the standardisation activities as well as a broader description of actions undertaken in T8.1.

October 1st 2021. From 10:00 to 12:00 CET (Workshop online using Teams)

Program of the workshop:

- 10:00 Welcome and introduction to standardisation and the European Standardisation system
 - Raquel Martínez (UNE), INNOMEM Project
- 10:15 CEN and CENELEC resources to take advantage of standardisation on R&D projects. Standards+Innovation
 - Livia Mian (CEN-CENELEC Management Centre, Innovation)
- 10:35 UNE approach to standardisation in R&D
 - Fernando Machicado (UNE), OASIS Project
- 10:55 Use case: CEN Workshop Agreements (CWAs) on the outcomes of FormPlanet
 - Begoña Casas (Eurecat) & Javier López-Quiles (UNE), FormPlanet Project
- 11:15 Experiences and initiatives in different OITBs
 - Selected partners in charge of the standardisation activities of several OITBs were invited to present their approach to the subject: **Mathieu Lions & Yan Archambeau (IPC), FlexFunction2Sustain**
- 11:45 Conclusions and remarks
 - Fernando Utrilla (UNE), Head of the Research and Innovation Unit
- 12:00 End of the Workshop

3. Conclusions and next steps

On the interconnection aspects

Conclusion: Within the three first years of the project, preparatory work was realized to list targeted audiences/stakeholders. From this list, mainly stakeholders relevant to the open call were contacted. The idea was to promote the open call and attract through this network as many SMEs as possible. At the end, **22 entities were contacted** to directly promote the open calls and the project in general.

On the standardisation aspect

Conclusion: Organisation of work was realized by identifying project internal capability. Detection of standard projects were realized that lead to the identification of **23 standard** projects of interest. **Contributions were made on eight** of them while the standards watch remain active.

Contact outside the consortium were realized with other national standardisation authorities (UNE) to discuss harmonisation procedure among OITB. A clustering workshop were organised by UNE where the FF2S partner IPC was able to describe our standardisation activities.

4. Degree of progress

Deliverable 8.3 is fulfilled by 100%.

5. Dissemination level

The deliverable is completely public. It does not contain confidential material.

The content of the standardisation activities is confidential. Only the title of the standard projects are described. The content of the standards is available on internet.