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Deliverable D8.9

Communication Kit

Work Package 8

Dissemination, Exploitation and Communication

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Executive Summary

This report is an update of deliverable D8.9, version a and b. The report aims to gather all the new information generated within the last 18 months, related to the FLOIM project including narrative text, photographs, slides and any other suitable communication material. This text targets a general audience, in order to show clearly the benefits the project can bring to society. This document was updated during the project life.

The deliverable is divided into three parts. The first one includes the information of the first version of the deliverable (D8.9a), the second part includes all the material generated from February 2019 to December 2020, and the third part includes all the communication material from January 2021 until the end of the project (August 2022).

Contribution and revision history

Version	Author(s)	Changes	Date
V1	AIMEN	First version of the Deliverable D8.9a ready for submission	28 th February 2019
V2	AIMEN	Second version of the deliverable (D8.9a + D8.9b)	24 th November 2020
V3	AIMEN	Third version of the deliverable (D8.9a + D8.9b + D8.9c)	25 th August 2022

This deliverable was evaluated by the members of the Quality Control Group (QCG), following the procedure indicated in deliverable D9.1: Quality Assurance Plan.

Quality Control Group Member	Partner
Pablo Romero	AIMEN
Christian Rankl	RECENDT
Jan Edelmann	Fraunhofer
Mikel Gomez	CEIT

The final version of the document, after implementing the minor changes indicated in the individual evaluation of the QCG members, has been reviewed and approved for submission by the Project Coordinator.



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1. PART 1 – DELIVERABLE D8.9A

1.1. NARRATIVE TEXT FOR FLOIM DISSEMINATION

Miniaturized, integrated photonic devices are driving an increasing number of applications, while facing pressure to lower cost and increase flexibility.

Improving the cost efficiency, flexibility and environmental footprint of the complete integrated optoelectronics workflow, can provide European industry with a key tool for excelling in advanced applications and differentiating their products, while keeping production, innovation capacity and key Intellectual Property in Europe, which is the main goal of the FLOIM project.



The central concept on which the project rests is the overinjection of optical quality thermoplastic polymers directly on the active optoelectronic component, into a proper cavity that incorporates the geometrical micro and nanofeatures, which provide the polymer surface with the required optical functions.

This concept is grounded in the well-proven technology of Injection Moulding (IM) for high quality plastic optics (and variants like Injection Compression Moulding, ICM), extending the capabilities of the technique to enable a single step optical embedding. This single step process will substitute a number of operations usually required in production of optoelectronics, including microoptics production, handling, optomechanics attachment, positioning, alignment and encapsulation.

As an advanced development, the project will explore the generation of complex optical functions through replication of nanostructured mould surfaces, which can produce controlled diffractive effects -from lensing to wavelength splitting- extending the design space for extraordinary innovation potential and miniaturization. This will also reduce the number of assembled components, as discrete optics like diffusers or gratings could be directly moulded into the part.

The single step optical embedding will be enabled by a series of advances, result of the research activities during the project, which are supported by the solid competences of the consortium partners in their respective fields: tooling technology, injection moulding process development, optical design, sensing, inspection and advanced control.



1.2. COPYRIGHT LICENSE

Copyright clearance in the context of producing a communication kit of FLOIM project

AIMEN Technology Centre, as coordinator of the FLOIM project and on behalf of the Consortium, authorise the European Commission and Factories of the Future to use our information and images included in this deliverable D8.9 of the FLOIM project on any publication or media of the European Union.



Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

1.3. FLOIM PROJECT FLYER

Partners

www.aimen.es

Universitat Politècnica de Catalunya (UPC)

- www.upc.edu
- PROMOLDING

www.promolding.nl

AIMEN Technology Centre

HYBTRONICS MICROSYSTEMS

MONDRAGON ASSEMBLY

www.mondragon-assembly.com

FAGOR AUTOMATION

www.fagorautomation.com

www.adama.tips

FLEXENABLE

www.flexenable.com

RECENDT

RECEINDT

www.recendt.at/en

FRAUNHOFER IWU

Ceit-IK4

www.ceit.es

SNELLOPTICS

www.snelloptics.com



Flexible Optical Injection Moulding of optoelectronic devices

FLOIM concerns a new, automatized manufacturing technology for the production of optoelectronic components and the assembly of the corresponding optical system, based on the use of thermoplastic materials and the embedding of all the components into a compact and robust unique device. This technology permits to overcome current manufacturing limitations and magnifies the design possibilities.

The production chain for optoelectronic device manufacturing is inherited from microelectronics, which is not appropriate for novel, low cost, high efficiency photonic devices.



Project Duration: 42 months





Starting project date: 1st of September, 2018 http://www.floimproject.e

OBJECTIVES AND ADVANTAGES

FLOIM will pursue the following technical goals:

- Novel manufacturing chains for high quality integrated optical devices.
- Design new manufacturing equipment for functional optical embedding.
- Custom optical functions through mould insert machining and structuring.
- Sustainable production of eco-friendly optoelectronics.
- Disruptive applications

Miniaturized, integrated photonic devices are driving an increasing number of applications, while facing pressure to lower cost and increase flexibility.



Improving the cost efficiency, flexibility and environmental footprint of the complete integrated optoelectronics workflow, can provide European industry with a key tool for excelling in advanced applications and differentiating their products, while keeping production, innovation capacity and key Intellectual Property in Europe.



www.floimproject.eu



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FLOIM is an initiative of the Factories of the Future Public Private Partnership

MAIN INNOVATIONS

The innovations to be generated during the project have been identified and categorized into two categories:

- Product and Process design principles:
 Optics design for highly integrated optical
 - High quality optical injection moulding.
- Manufacturing Platform:
 - Integrated optical embedding technology, for High-precision injection moulding using modular and reconfigurable mould with quick insert exchange, and optical function reconfiguration by selective restructuring of diffractive insert nanostructures.
 - In line quality assessment, full quality evaluation and zero defect goal.
 - Compatible continuous part handling, control software system and mechatronic peripherals.







2. PART 2 – DELIVERABLE D8.9B

2.1. UPDATE OF THE NARRATIVE TEXT FOR **FLOIM** DISSEMINATION

A new narrative text has been written for all partners to do local press releases. The content this press release should include is cited as follows and has already been used by AIMEN and other partners:

FLOIM, improving mobile and another electronic device technology

New automatized manufacturing technology enabling optical assembly of optoelectronics in many solutions (light management, lighting, display, sensing, high quality holography and imaging, etc.)

Improving the cost efficiency, flexibility and environmental footprint of the complete integrated optoelectronics workflow, can provide European industry with a key tool for excelling in advanced applications and differentiating their products, while keeping production, innovation capacity and key IP in Europe.

In this context, FLOIM will develop an automated process for optical assembly of optoelectronic devices, based on optical quality injection overmoulding. Freeform and microstructured optical surfaces are generated directly on the components through thermoplastic microreplication, using microstructured inserts. The technology aims to simplify the assembly routes for heterogeneously integrated optoelectronics, with drastic cost reduction, high productivity and improved device performance.

Contribution to European photonics industry

The manufacturing solution developed in FLOIM will contribute to improve competitiveness of European photonics industry at large, generating growth and jobs, creating new market opportunities for optoelectronic device manufacturers and enabling the manufacturing of innovative products for many solutions (light management, lighting, display, sensing, high quality holography and imaging, etc.).



FLOIM has the potential for a relevant impact in photonics and optoelectronics industry and its applications at large. Estimations based on current markets status leads to a potential impact of FLOIM, when adopted by manufacturing industry, generating up to 5,200 jobs and an additional market share of €1,195M for EU companies in the sectors tackled by the project.



FLOIM in citizens daily life

FLOIM will enable highly advanced innovations for European key sectors like manufacturing, communication and information, healthcare, transport, energy... radically improving and creating new functionalities to respond to their market's needs. FLOIM will also contribute to enhance people's life quality boosting digital connectivity and enabling efficient and comfortable mobility. Indeed, within the project, the technology will demonstrate its viability to deliver the following new or improved products and services:



European consortium

FLOIM consortium is composed by 12 entities from seven EU countries. Namely, it counts with five research centres: AIMEN Technology Centre (Spain), CEIT-IK4 (Spain), FRAUNHOFER-IWU (Germany), RECENDT - Research Center for Non Destructive Testing (Austria) and UPC - Universitat Politècnica de Catalunya (Spain); as well as with four technology suppliers: ADAMA INNOVATIONS (Ireland), MASSO - MONDRAGON ASSEMBLY (France), PROMOLDING (Netherlands) and SNELLOPTICS (Spain). Finally, three end-users close the consortium: FAGOR AUTOMATION (Spain), FLEXENABLE (UK) and HYBTRONICS MICROSYSTEMS (Spain).

End-users (FAGOR, FLEXENABLE and HYBTRONICS) define the products that will demonstrate FLOIM technology, while SNELLOPTICS is in charge of the optical design of such products. AIMEN, CEIT, FRAUNHOFER-IWU and ADAMA are working with advanced manufacturing technologies, such as multiphoton polymerization, direct laser machining, high accuracy micromilling and Ion-Implant Lithography, in order to develop tooling able to provide optical functionalities by injection moulding, process handled by PROMOLDING and UPC. ADAMA, FRAUNHOFER-IWU and RECENDT are developing complete control and monitoring systems of the injection moulding process, and MASSO leads the integration of the individual developed modules into a manufacturing pilot line that will serve as a test benchmark for the FLOIM technologies.



(Here each partner should explain their main contribution to the project, or the capabilities they would like to advertise. As an example, the text used by AIMEN is reproduced as follows)

In FLOIM, the role of AIMEN is to act as project coordinator, as well as to provide intensive research support to the development of the core technology of the project, particularly the tasks related with materials and laser processing.

High power ultrafast laser systems available at the AIMEN Laser Applications Centre, together with robust optomechanical workbench and advanced nanopositioning systems, will allow testing the current upper limits of laser beam micro and nano-structuring by multi photon polymerization and direct laser micro machining.

AIMEN will test, produce, characterize and optimize a range of micro and nanostructures able to generate optical functionalities that can be replicated by injection moulding, such as light diffraction or diffusion. This will allow mass production of high quality, complex, embedded optoelectronic components at a much lower cost than current market technologies.

Details

Title: Flexible Optical Injection Moulding of optoelectronic devices Partners: 12 Countries: 6 EU Funding: 6.7M€ Start Date: 01/09/2018 Project Duration: 42 months Project Consortium:





2.2. WEBSITE ACTIVITY

FLOIM website was updated through the duration of the reporting period, where several elements were particularly active, such as the Blog and events sections, where short publications on young minds and women involved in FLOIM project were uploaded (Figure 1).

Also, the communication material generated throughout the project duration is being regularly uploaded to the website, for ease of access by any partner, and the events attended by FLOIM members related to the project are being mentioned on the news section (Figure 2).

Blog			
Words	All topics	Search	
GENERAL		GENERAL	GENERAL
Majid Fazeli, with a P works at present at A Research Scientist. F project "will provide o	tajid Fazeli Jadidi ho in Physics Engineering, dama Innovatinos as Project or him, work within FLOIM Justanding scientific pave the way for my career	© 2020/10/06 Irland Women in Science: M. Daniela Angione M. Daniela Argione works at Adams Increation from 2018 as Strategic R&D Alemage, where from 2018 as Strategic R&D Alemage, where project. Her carreer in science happened very naturally and since she was 10 years old, she started reading the Scientific America.	© 2020/06/30 Chemnitz, Germany Young Minds: Sina Nahvi Sina Nahvi, with a master degree in automation, works as Data Scientist at Froundher INU where "Facing new challenges and creating added value from the existing data" is what he finds the most interesting in his position.
GENERAL		GENERAL	GENERAL
May Wheeler, with a school, works as Sen FlexEnable, as part o There, as she says: "I	nce: May Wheeler vocation that comes from ior Research Engineer at f the System Design Team. like coming up with new ideas y things are typically done ² .	© 2020/02/17 O Portřiňo, Spain Young Mindos: Félix Ares Félix Ares vorks as a rossarcher in the Advanc Laser MicroManufacturing Applications (ALM department et AIMEN, Itwas taking a cource a laser technology at University, when he realize wanted to continue studying the laser technol	1A) always been linked to science. With a PhD in bout Materials Science, actually she is working as the d he Group Leader Data-Mining and Machine Learning at

Figure 1. Blog section on FLOIM website

1 - + +		
Latest news		
Words All topics	Search	
GENERAL	GENERAL	GENERAL
O 2020/10/15	O 2020/02/06	O 2020/02/01
AIMEN - O Porriño (Pontevedra, Spain) FLOIM will participate in the VII	San Francisco, USA FLOIM shows up at SPIE - Photonics	San Francisco, USA FLOIM will be represented on the
LASER WEEK organized by AIMEN	West	next SPIE – Photonics West
AIMEN will organize the VII Laser Week in O Porriño (Pontevedra, Spain). The XVI Workshop on Materials Processing with Laser Technology will be part of the Laser Week and will take place on 15th and 16th of October 2020. Save the date!!	FLOIM presentation at SPIE - Photonics West was a complete success	AIMEN will participate in the next Photonics West that will take place in San Francisco, presenting the last results achieved within the FLOM project. The title of the talk is: "Manufacturing of molds by multiphoton polymerization for micro-replication of optically enhanced surfaces".
GENERAL	GENERAL	GENERAL
0 2019/10/23	O 2019/10/14	O 2019/09/06
Lisbon, Portugal	Boston	Madrid, Spain
FLOIM – Clustering activity with	FLOIM shows up at the 18th NNT	FLOIM has been presented in the I
PHENOmenon project	International Conference	Workshop Woman, Optics and
The H2O20 project PHENOmenon organized a focused session during the SMS2019 conference in Lisbon, Portugal.	Adama shows the capabilities of the Ion Implant Lithography technique, used in the FLOIM project, at the 18th Nanoimprint and Nanoprint Technologies International Conference	Photonics organized by SEDOPTICA.





Overall, the FLOIM website aims to gather all the information related to the project that may be relevant to the public, while social media accounts, as FLOIM Twitter account, are focused on the task of increasing the project's visibility.

2.3. COPYRIGHT LICENSE

Copyright clearance in the context of producing a communication kit of FLOIM project

AIMEN Technology Centre, as coordinator of the FLOIM project and on behalf of the Consortium, authorise the European Commission and Factories of the Future to use our information and images included in this deliverable D8.9 of the FLOIM project on any publication or media of the European Union.

2.4. FLOIM PROJECT NEW DOCUMENTS

Two new flyers have been generated since Deliverable 8.9a submission.

A 4-point diagram was recently elaborated, with the key benefits of FLOIM project to citizens in their daily life. This one-page diagram can be included in any dissemination documents, as has been done with the press release, to reach out to citizens not familiar with the technologies or with no knowledge of the project.

A poster, summarizing the key technologies present in the FLOIM project, has been generated. This poster can be used in any in-situ scientific FLOIM publication, such as conferences.



Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

1st year flyer



FLOIM concerns a new, automatized manufacturing technology for the production of optoelectronic components and the assembly of the corresponding optical system, based on the use of thermoplastic materials and the embedding of all the components into a compact and robust unique device. This technology permits to overcome current manufacturing limitations and magnifies the design possibilities

The production chain for optoelectronic device manufacturing is inherited from microelectronics, which is not appropriate for novel, low cost, high efficiency photonic devices.

Project Duration 42 months ng project date 1st of September, 2018 http://www.floimproject.eu

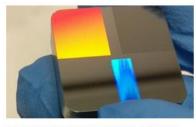
1 Year of FLOIM

FLOIM project started one year ago. During these past 12 months, efforts were focused on 2 different subjects:

- Developing the key technologies that will allow manufacturing moulds with structures in the micro and nanoscale, which will transfer optical functionalities to the injected materials.
- Developing systems to guarantee a robust quality control of the manufactured parts.

anufacturing techn

Laser technologies are used for the development of the final demonstrators of the FLOIM project. This clean and efficient technology allows for the processing of surfaces avoiding the use of other chemical or physical additives. Laser machining is being studied at CEIT, while two-photon photopolymerization is investigated at AIMEN as means to generate structures on mould inserts.



structured mould insert processed at Ceit with a etition feaster

Fhg-IWU has been investigating shape accuracy and surface quality when mechanically structuring the mould inserts with cylindrical lens geometries.



Flexible Optical Injection Moulding of optoelectronic devices

www.floimproject.eu



This project has received funding from the European Union's Horiz 2020 research and innovation programme under grant agreement No 820661.

FLOIM is an initiative of the Factories of the Future Public Private Partnership

First, potential materials for the moulding of optical components were procured, mould inserts produced, and finally machining tests were carried out.



Brass insert micromachined at Fhg-IWU with a Kugler MM3 micromachining center'

In the FLOIM project, RECENDT is responsible for the development of fast, non-destructive testing methods to control the process quality and performance. Two different measurement systems based on OCT (optical coherence tomography) will be engineered:

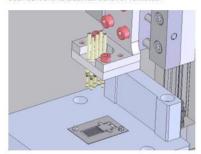
- In-mould OCT for the monitoring of the alignment of the active optical components in the mould.
- Development of an OCT setup combining galvoscanners and positioners for the quality control of manufactured parts directly after the injection moulding process.

In the first year of the project, RECENDT laid the foundations for the systems to be developed, worked on the definition of the system specification and analysed the first available test samples.



"Laboratory setup for OCT measurement at RECENDT *

For validation of the optical and electrical behavior of the final manufactured parts, Mondragon Assembly has designed a quality control station for a Fibre Optical Transmissor demonstrator. A prototype has been built and its electrical behavior validated.



Mondragon design of the quality control station for HYBTRONICS FOT demonstrator



Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

Partners

Ceit-IK4

2nd Year Flyer



Flexible Optical Injection Moulding of

FLOIM concerns a new, automatized manufacturing technology for the production of optoelectronic components and the assembly of the corresponding optical system, based on the use of thermoplastic materials and the embedding of all the components into a compact and robust unique device. This technology permits to overcome current manufacturing limitations and magnifies the design possibilities

The production chain for optoelectronic device manufacturing is inherited from microelectronics, which is not appropriate for novel, low cost, high efficiency photonic devices.

Project Duration: 42 months Starting project date 1st of September, 2018 http://www.floimproject.eu





www.floimproject.eu



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Second year of FLOIM

FLOIM project started two years ago and has come a long way since its beginning. In the last 12 months, the consortium has validated the initial proposed manufacturing technologies, and further developed the systems of in-mould and inline quality control.

Key manufacturing technologies

AIMEN focused on laser Two-Photon polymerization, to structure a hard resin on top of steel inserts, suitable to be used in injection moulding. Resolution achieved with this technique is within the hundreds of nanometers range, and it has been successfully replicated by injection moulding.



"AIMEN logo replicated by injection moulding from a photopolymerized hard resin insert".

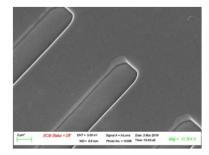
The replicated inserts proved to be resistant to the injection process, being able to withstand tens of replications without showing signs of weathering.

SnellOptics designed a light-directional lens system for overmoulding a curved BLU LED matrix from FlexEnable. This design allows a curved display to direct the light to the user, at 30°. PROMOLDING has tested different materials for its overmoulding, coming up with flexible and rigid curved alternatives.



"FlexEnable LED matrixes, overmoulded by PROMOLDING with a light-directional lens system designed by SnellOptics'

ADAMA innovations has been coating steel inserts with DLC and structuring them by Ion Implant Lithography (IIL), which provides a resolution in the range of tens of nanometers. This will allow manufacturing a very accurate diffraction grating, needed for FAGOR demonstrator, a miniaturized scanning head for optical encoders. The manufactured inserts have been successfully replicated by PROMOLDING with their injection moulding machines.



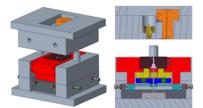
ADAMA innovations IIL structured grating, replicated by PROMOLDING with their injection moulding machines"

Control systems

FLOIM aims to develop a very thorough and allaround control system, that includes an off-line quality control and in-line, in-mould control system for the manufacturing pilot line that will be assembled to demonstrate the technologies developed during the project.

For the in-mould control, Recendt, Fraunhofer-IWU and ADAMA innovations have been closely working together, to design a system that will include:

- An OCT system developed by Recendt, that will measure any insertion errors and geometric tolerances of the components to be overmoulded.
- A 3-axis mechatronic device designed and manufactured by Fraunhofer-IWU, that will compensate the measured errors with micrometric accuracy.
- A filling sensor developed by ADAMA innovations. based on fibre-optics interferometry, which provides a resolution of tens of nanometers.



Final concept of the mechatronic device for in-mould alignment and on of geometric tolerances'



4-point Diagram







Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

Poster





3. PART 3 – DELIVERABLE D8.9c

3.1. END OF PROJECT NARRATIVE TEXT

A new narrative text has been written to share the achievements of the project. This text is uploaded in the website and will be used for a final press release, which is currently ongoing, about the end of the project.

FLOIM, a European project shaping the future of optoelectronics manufacturing

As FLOIM project reaches its end, the Consortium must look beyond the technical challenges already overcome, and focus on the societal barriers for the implementation of the developed manufacturing chain.

The production chain for optoelectronic device manufacturing is inherited from microelectronics, which is not suitable for novel, low cost, high efficiency photonic devices. Improving the cost efficiency, flexibility and environmental footprint of the complete integrated optoelectronics workflow, can provide European industry with a key tool for excelling in advanced applications and differentiating their products, while keeping production, innovation capacity and key IP in Europe.

In this context, FLOIM has developed an automated process for optical assembly of optoelectronic devices, based on optical quality injection overmoulding. Freeform and microstructured optical surfaces are generated directly on the components through thermoplastic microreplication, using microstructured inserts. The injection overmoulding technology is inherently a fast process that allows easy mass production, while at the same time permits the substitution of thermosetting plastics by thermoplastic polymers, which are fully recyclable thus, reducing the environmental impact of the optoelectronics devices.

However, injection overmoulding had to go a long way to be a viable alternative to the current manufacturing technologies. The strict requirements regarding alignment and positioning accuracy of the overmoulded part, the sub-micron resolution required for the moulding inserts to apply additional optical functionalities to the injected optics, and the sensitivity of the electronic component to the high temperature and pressure inherent to the injection overmoulding process, posed the main challenges that were overcome in this project.

Contribution to European photonics industry

The manufacturing solution developed in FLOIM demonstrated a reduction of production time of up to 80%, while guaranteeing a high repeatability rate and allowing an easy customization thanks to the possibility of quickly changing inserts within the mould cavity of the injection machine.

Such advantages will contribute to improve not only competitiveness of European photonics industry at large, generating growth and jobs, but also making new custom products available to small consumers, previously too costly to be affordable.





FLOIM demonstrated its success with a Pilot Line that proved the productivity increase and high quality yield of the developed processes. It is expected that this Pilot Line will serve as a benchmark for the future lines to be installed in optoelectronics manufacturing companies in Europe. However, even though the project is a technical success, there have been challenges that await the Consortium in the future, such as the need of well trained personnel at all levels of photonic-based production and an increase in awareness amongst the potential technology adopters.

FLOIM has participated in different events, such as the Laser World of Photonics, the World's Leading Trade Fair with Congress for photonics components, systems and applications, and clustering with other Research Projects. In addition, the Consortium prepared training material and workshops and made it available to the public at <u>http://www.floimproject.eu/</u> website, in order to ease up the adoption of the new technologies by other companies in the optoelectronics sector.



FLOIM has the potential for a relevant impact in photonics and optoelectronics industry and its applications at large. Estimations based on current markets status leads to a potential impact of FLOIM, when adopted by manufacturing industry, generating up to 5,200 jobs and an additional market share of €1,195M for EU companies in the sectors tackled by the project.

Details

Title: Flexible Optical Injection Moulding of optoelectronic devices Partners: 12 Countries: 6





Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

EU Funding: 6.7M€ Start Date: 01/09/2018 Project Duration: 42 months Project Consortium:



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Visit our website <u>http://www.floimproject.eu/</u> and follow us on Twitter @FloimProject



3.2. WEBSITE ACTIVITY

FLOIM website was updated through the duration of the reporting period, where several elements were particularly active, such as the Blog and publications sections, where 5 new short publications on young minds and women involved in FLOIM project were uploaded (Figure 3), and 5 new publications were uploaded as well.

In addition, events where FLOIM makes an appearance and the Consortium meetings are published on the different Activity & Media sections of the website.





Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

THE FLOIM PROJECT CONSOR	TIUM TECHNOLOGY & DEMONSTRATORS	ACTIVITY & MEDIA CONTACT
Blog		
Words All topics	• Search	
GENERAL	GENERAL	GENERAL
© 2022/07/05 Spain Young Minds: Jaime Cuartero	© 2022/06/06 Women in Science: Dr. Zahra Gholamvand	© 2022/05/09 Women in Science: Elisabeth Leiss- Holzinger
Jaime Cuartoro, with a Master Degree in Industrial Engineering, is currently working at AIMEN research centre as a Researcher in the Advanced Laser MicroManufacturing Applications department. For him, the FLOIM project "has been a really enriching experience that has provided me with valuable knowledge"	Zahra Gholamvand, who currently works at Adama Innovations, has a PhD in chemical physics of materials. Within FLOIM, she is responsible for driving the research activities related to Tooling Technologies, specifically nano-patterning of mould inserts for developing optical gratings.	Elisabeth Leiss-Holzinge studied Physics at the Vienna University of Technology. Since then, she has worked on a lot of projects related to the development of sensor concepts and prototypes for industry. Within the FLOIM project, she works on a optical coherence tomography system that will be integrated into an injection moulding machine.
GENERAL	GENERAL	GENERAL
O 2021/03/31	O 2021/03/29	2020/10/13
Spain	Germany	Ireland
Women in Science: Noemí Domínguez	Young Minds: Tim Wunderlich	Young Minds: Majid Fazeli Jadidi
Noemi Dominguez always has been curious to find out how the world works and discovered photonics in the last year of her career, which made her find her place in the world of science. Now, she works at Snellobtics as an Optical Engineer.	Tim Wunderlich works as Software Engineer at Fraunhofer IWU. Within FLOIM he is responsible for the software architecture that will obtain data from the production line and pre-process it for the subsequent Machine Learning algorithms.	Majid Fazeli, with a PhD in Physics Engineering, works at present at Adama Innovations as Project Research Scientist: For him, work within FLOM project "will provide outstanding scientific experiences that will pave the way for my career development".

Figure 3. Blog section on FLOIM website

Five new publications, of free access, were made during this last reporting period. The links to which were uploaded to the publications section in the FLOIM website, as seen in Figure 4.





Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

THE FLOIM PROJECT CONSOR	TIUM TECHNOLOGY & DEMONSTRATORS	ACTIVITY & MEDIA CONTACT
Publications		
Words All topics	Search	
GENERAL	GENERAL	GENERAL
O 2022/09/16	O 2022/05/30	2 2022/04/04
Micro-replication of high precision optically enhanced moulds fabricated by multiphoton polymerization Authors: Sara Vidal, Félix Ares, Ivette Coto, Francisco Gontad, Tamara Delgado, Pablo Romero, Nerea Otero (AIMEN)	In-mould measurement with optical coherence tomography for compensating positioning error in injection overmoulding of optoelectronic devices Authors: Günther Hannesschläger, Martin Schwarze, Elisabeth Leiss-Holzinger, Christian Rankl	Nanometric Measurement of Microcavity Filling During Polymer Injection Moulding Using Interferometric Sensing Authors: Majid Fazeli Jadidi, Graham L W. Cross (ADAMA)
GENERAL	GENERAL	GENERAL
O 2021/08/27	2 2021/05/26	2 2020/09/28
In Situ Detection of Interfacial Flow Instabilities in Polymer Co-Extrusion Using Optical Coherence Tomography and Ultrasonic Techniques	Manufacturing of functional surfaces by replicating glass moulds structured by multiphoton polymerization.	Femtosecond laser fabrication of monolithic double volume phase- gratings in glass Authors: J. J. Azkona, M. Gómez-Aranzadi, A.
Authors: Alexander Hammer,Wolfgang Roland, Maximilian Zacher, Bernhard Praher, Günther Hannesschläger, Bernhard Löw-Baselli, Georg Steinbichler (RECENDT)	Authors: Sara M. Vidal Álvarez, Francisco José Gontad Fariña, Nerea Otero Ramudo, Félix Ares Blanco, Maria Ivette Coto Moretti, Tamara Delgado García, Pablo Romero Romero (AIMEN)	Rodriguez, T. Morlanes, J. L. de la Peña, and S. M. Olaizola (CEIT)

Figure 4. Publications section of the FLOIM website.

Overall, the FLOIM website aims to gather all the information related to the project that may be relevant to the public, while social media accounts, as FLOIM Twitter account, are focused on the task of increasing the project's visibility.

3.3. 3RD **PERIOD NEWLY GENERATED DOCUMENTS**

A new flyer of the end of the project has been generated since Deliverable 8.9b submission. Additionally, a Fact-Sheet document explaining the barriers for implementation and the mechanism to overcome such barriers has been published and uploaded to the FLOIM website. This Fact-Sheet can be found in the following link: <u>http://www.floimproject.eu/762/nontechnical_barriers_factsheet</u>.

The workshop documents, presented in the World of Photonics congress, have been uploaded to the website, under communication material, for public access as shown in Figure 5.





Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

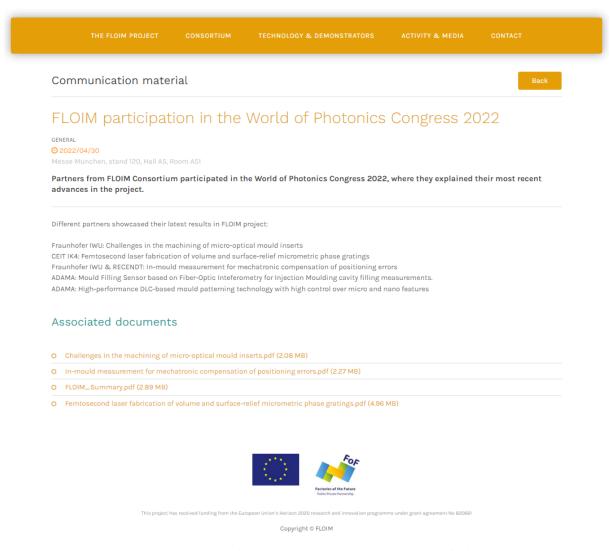


Figure 5. FLOIM Website entry with Workshop documents attached.





Flexible Optical Injection Moulding for Manufacturing of Complex Optoelectronic Devices

n:

MOLDING

snelloptics

FLOIM Final Flyer

End of project flyer



FLOIM concerns a new, automatized manufacturing technology for the production of optoelectronic components and the assembly of the corresponding optical system, based on the use of thermoplastic materials and the embedding of all the components into a compact and robust unique device. This technology permits to overcome current manufacturing limitations and magnifies the design possibilities.

The production chain for optoelectronic device manufacturing is inherited from microelectronics, which is not appropriate for novel, low cost, high efficiency photonic devices.

Project Duration: 42 months g project date: 1st of September, 2018

End of FLOIM project

FLOIM project started four years ago and has come a long way since its beginning. In the last two years, the consortium has optimized the technologies used in the project to comply with the strict requirements of the chosen optoelectronics demonstrators, as well as developing a fully functional to validate them

As such, the OCT system and In-mould positioning developed jointly by RECENDT and system FRAUNHOFER-IWU was successfully validated, being able to correct misalignments with an error of 1.5 μm, in under a second.

Additionally, the fibre-optics interferometry based sensor developed by ADAMA is able to determine the filling of a mould cavity, in real time, within nanometric accuracy

Laser Direct Writing (CEIT) and Ion Implant Lithography (ADAMA) proved to be the most suitable technologies to manufacture mould inserts with integrated optical functionalities that require submicron resolution

All these achievements led to Injection Moulding being the core technology of the new optoelectronics manufacturing chain developed within the FLOIM project, substituting complex positioning and assembly in current alternatives with a single embedding process that provides additional optical features

This not only contributed to a significant improvement regarding the quality of the product and the productivity, but also allowed to substitute the thermosetting polymers used in these components by thermoplastics, making the materials fully recyclable





www.floimproject.eu



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FLOIM is an initiative of the Factories of the Future Public Private

Pilot Manufacturing Line

The main goal of the FLOIM project was to develop new, automated manufacturing chains for the optoelectronics devices, substituting the current alternatives.

To showcase the advantages of the new manufacturing chain. HYBTRONICS and MONDRAGON ASSEMBLY have designed and assembled a fully automated Pilot line. This line includes not only the embedding operation, but all the processes required for the production of the FOTs, from cutting and bending to optical encapsulation and quality control.



Fron-End of the Pilot line developed in FLOIM project and ssembled at HYBTRONICS facilities".

FLOIM results might shape the future of optoelectronics manufacturing. The flexibility of generating different optical functionalities by simply changing an insert inside the injection moulding cavity provides an unprecedent customizability in the field of optoelectronics. In addition, the high productivity and quality standards achieved can put Europe once again ahead of the manufacturing race, making companies able to compete in a market mostly dominated by low-cost alternatives

Main results of FLOIM

SNELLOPTICS

www.snelloptics.com

consists on an Optical Encoder Head (OEH), as small as 1.5 cm³, with two transparent lenses and an opaque frame, which were both manufactured in a single process with a 2K mould developed by PROMOLDING. In addition, a moulding insert with an inscribed diffraction grating of lower resolution than a hundred nanometers was manufactured and replicated by injection moulding.

The demonstrator designed by FAGOR AUTOMATION



njected OEH with black, opaque frame and transparent optical ements. The top is a cylindrical lens".

Fibre Optic Transceiver (FOT) developed by HYBTRONICS has the optics directly overmoulded on the LED and microelectronics. Being overmoulded, an innovative injection process developed by UPC was required in order to not damage the delicate wires and electronic component



FOT with the optical component directly overmoulded on the electronic component"



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