FLOIM

Flexible Optical Injection Moulding of optoelectronic devices

Grant agreement nº: 820661

Call identifier: H2020-NMBP-FOF-2018

Deliverable D8.9

Communication Kit

Work Package 8

Dissemination, Exploitation and Communication

Document type	:	Report
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Date of issue	:	25th August 2022
Dissemination level	:	Confidential
Lead beneficiary	:	AIMEN

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

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	28th February 2019
V2	AIMEN	Second version of the deliverable (D8.9a + D8.9b)	24th November 2020
V3	AIMEN	Third version of the deliverable (D8.9a + D8.9b + D8.9c)	25th 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

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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.

1.3. FLOIM PROJECT FLYER

Partners

AIMEN Technology Centre

www.aimen.es

Universitat Politècnica de Catalunya (UPC)

www.upc.edu

PROMOLDING

www.promolding.nl

HYBTRONICS MICROSYSTEMS

www.hybtronics.com

MONDRAGON ASSEMBLY

www.mondragon-assembly.com

FAGOR AUTOMATION

www.fagorautomation.com

ADAMA INNOVATIONS

www.adama.tips

FLEXENABLE

www.flexenable.com

RECENDT

www.recendt.at/en

FRAUNHOFER IWU

www.iwu.fraunhofer.de

Ceit-IK4

www.ceit.es

SNELLOPTICS

www.snelloptics.com

www.floimproject.eu

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FLOIM

Flexible Optical Injection Moulding of optoelectronic devices

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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/

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.

MAIN INNOVATIONS

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

1. Product and Process design principles:
    - Optics design for highly integrated optical integration and embedding.
    - High quality optical injection moulding.
2. 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:

For additional information please contact:
Project Coordinator: AIMEN Technology Centre
Contact: Nerea Otero
E-mail: notero@aimen.es

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

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).

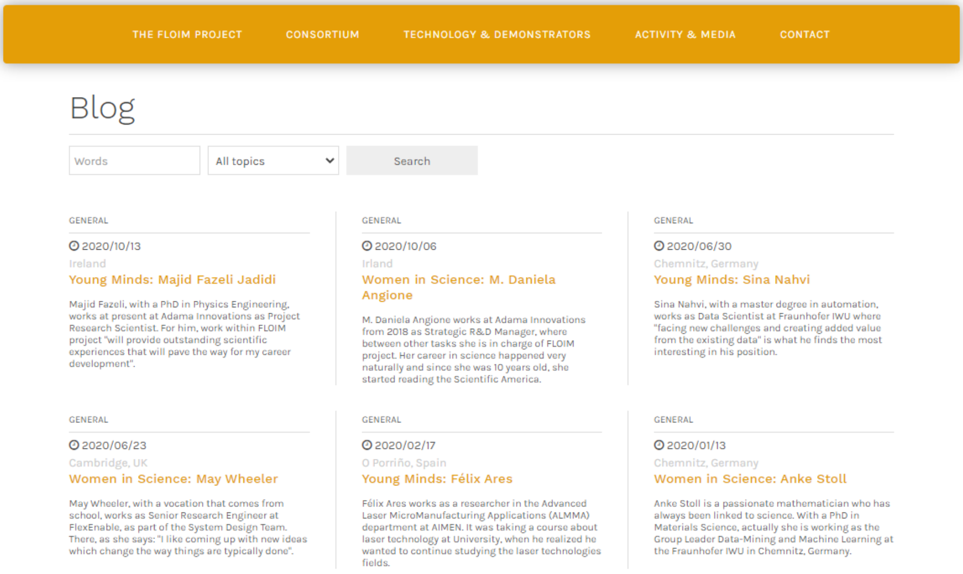

Figure 1. Blog section on FLOIM website

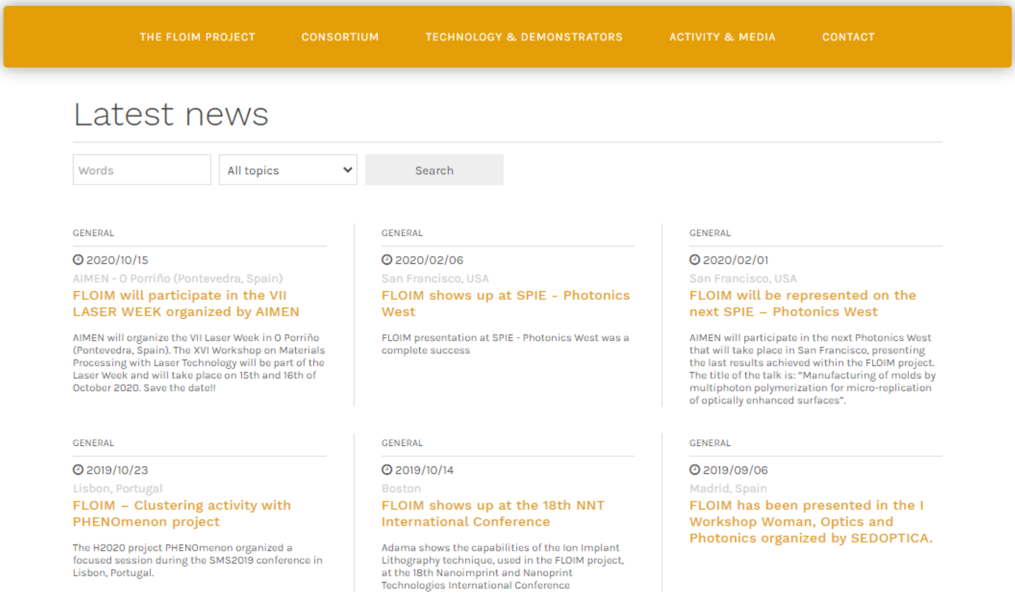

Figure 2. News section on FLOIM website

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.

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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.

1st year flyer

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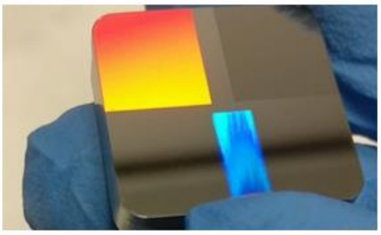
1 Year of FLOIM

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.

Key manufacturing technologies

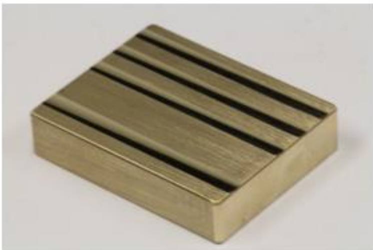
Laser technologies are used for the development of the final demonstrators of the FLOIM project. This clean and efficient technology allows for the processing of surfaces avoiding the use of other chemical or physical additives. Laser machining is being studied at CEIT, while two-photon photopolymerization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



"Laser micro/nanostructured mould insert processed at Ceit with a high repetition femtosecond laser".

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

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



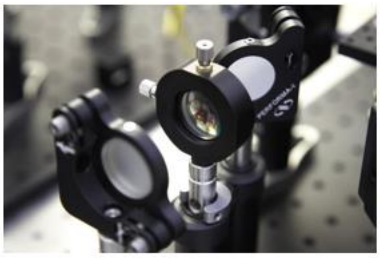
"Brass insert micromachined at Fhg-IWU with a Kugler MM3 micromachining center".

Control systems

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:

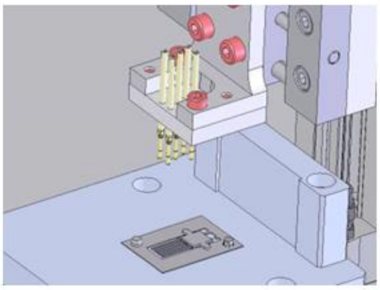
- In-mould OCT for the monitoring of the alignment of the active optical components in the mould.
- Development of an OCT setup combining galvoscanners and positioners for the quality control of manufactured parts directly after the injection moulding process.

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"

2nd Year Flyer

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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.

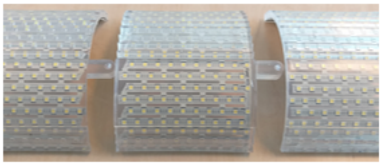
Key manufacturing technologies

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".

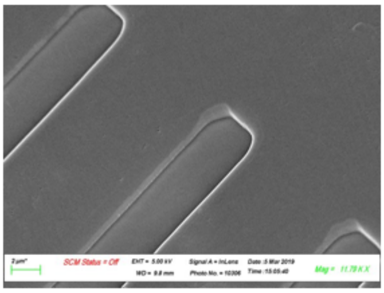
The replicated inserts proved to be resistant to the injection process, being able to withstand tens of replications without showing signs of weathering.

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.



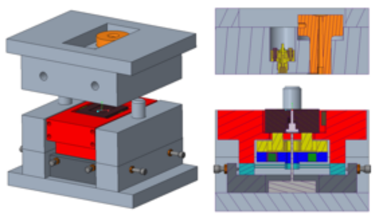
"ADAMA innovations IIL structured grating, replicated by PROMOLDING with their injection moulding machines".

Control systems

FLOIM aims to develop a very thorough and all-around 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:

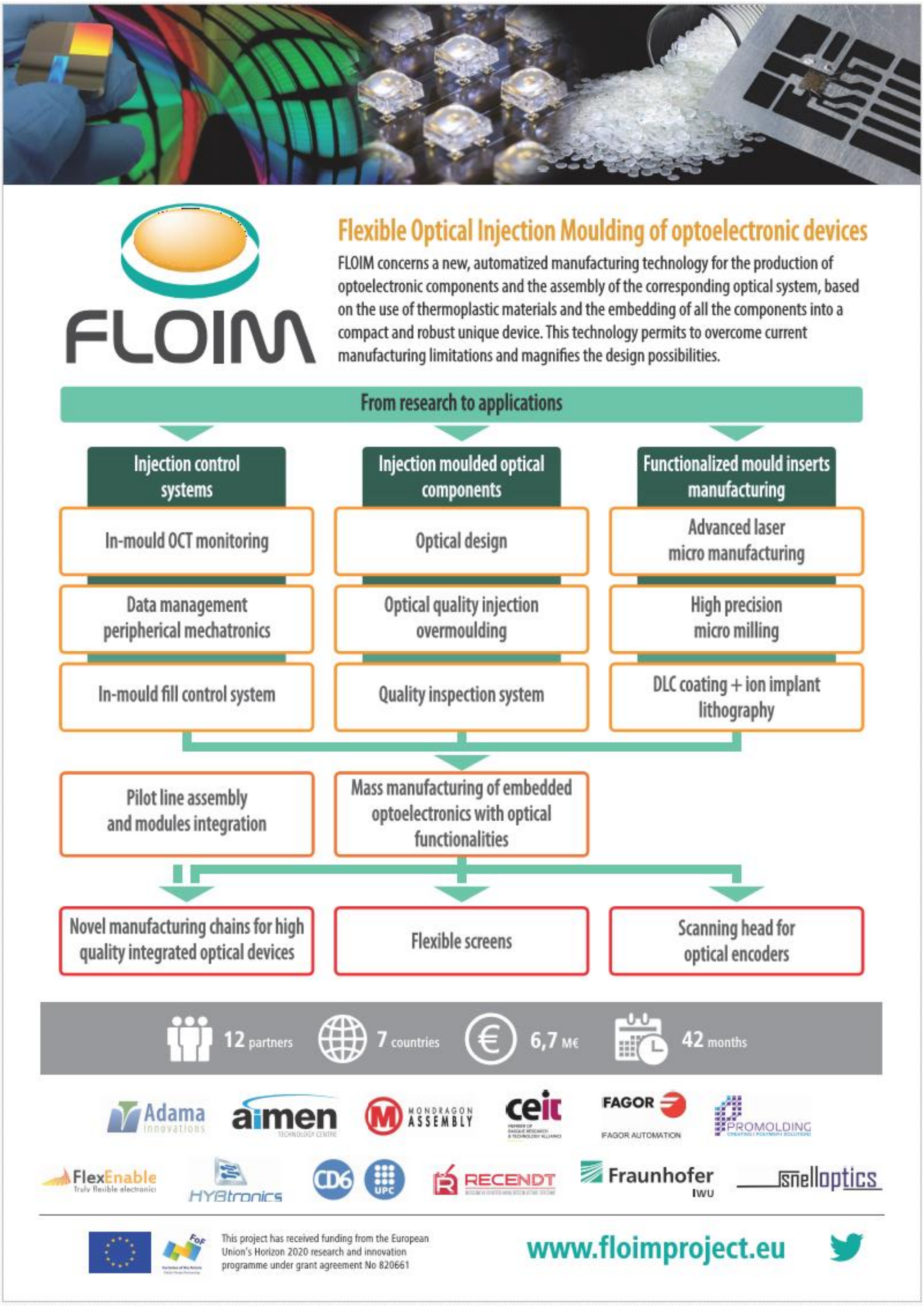
- An OCT system developed by Recendt, that will measure any insertion errors and geometric tolerances of the components to be overmoulded.
- A 3-axis mechatronic device designed and manufactured by Fraunhofer-IWU, that will compensate the measured errors with micrometric accuracy.
- A filling sensor 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 compensation of geometric tolerances".

4-point Diagram

Poster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From research to applications
Injection control systems
In-mould OCT monitoring
Data management peripherical mechatronics
In-mould fill control system
Injection moulded optical components
Optical design
Optical quality injection overmoulding
Quality inspection system
Functionalized mould inserts manufacturing
Advanced laser micro manufacturing
High precision micro milling
DLC coating + ion implant lithography
Pilot line assembly and modules integration
Mass manufacturing of embedded optoelectronics with optical functionalities
Novel manufacturing chains for high quality integrated optical devices
Flexible screens
Scanning head for optical encoders
12 partners
7 countries
6,7 M€
42 months
Adama innovations
aimen
MONDRAGON ASSEMBLY
ceit
FAGOR
FAGOR AUTOMATION
PROMOLDING
FlexEnable
HYBtronics
CD6
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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 http://www.floimproject.eu/ 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.

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For additional information please contact:
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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.

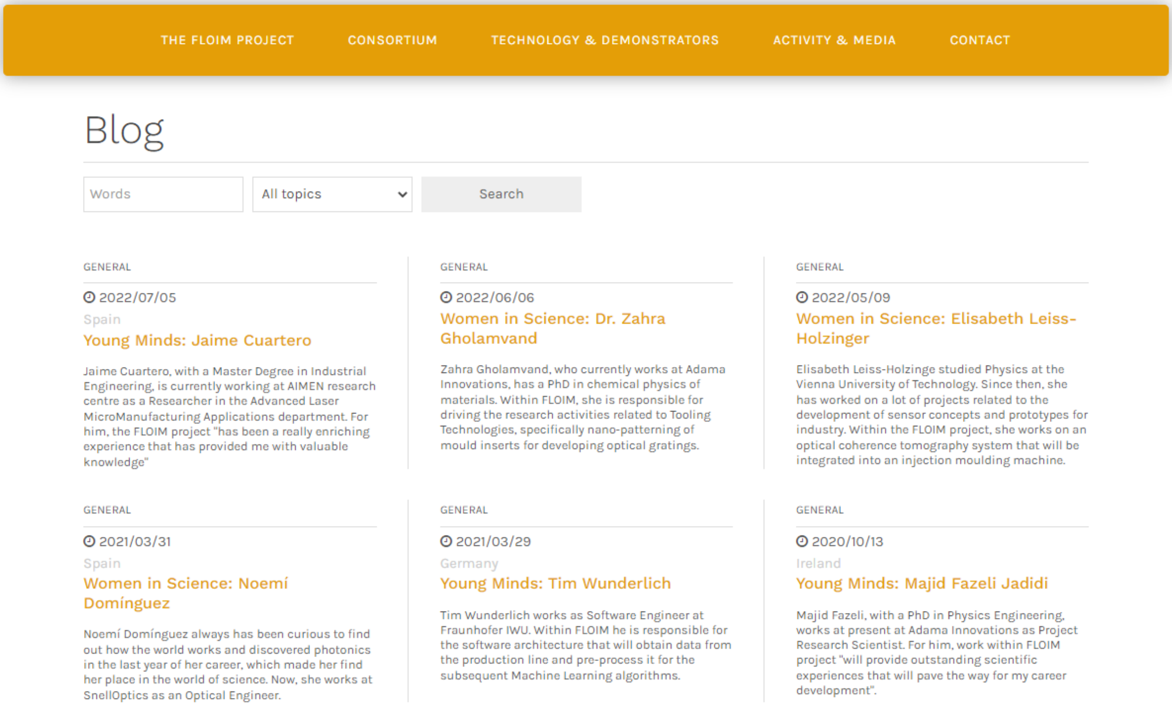

Figure 3. Blog section on FLOIM website

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.

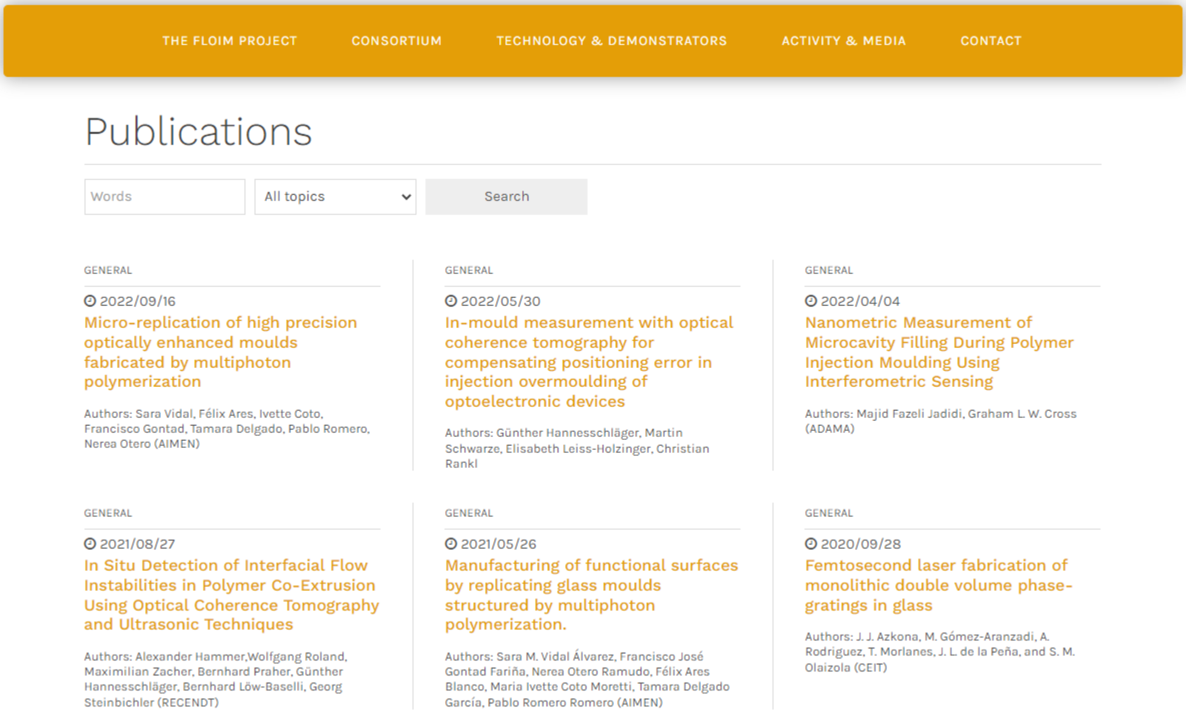

Figure 4. Publications section of the FLOIM website.

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: http://www.floimproject.eu/762/nontechnical_barriers_factsheet.

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.

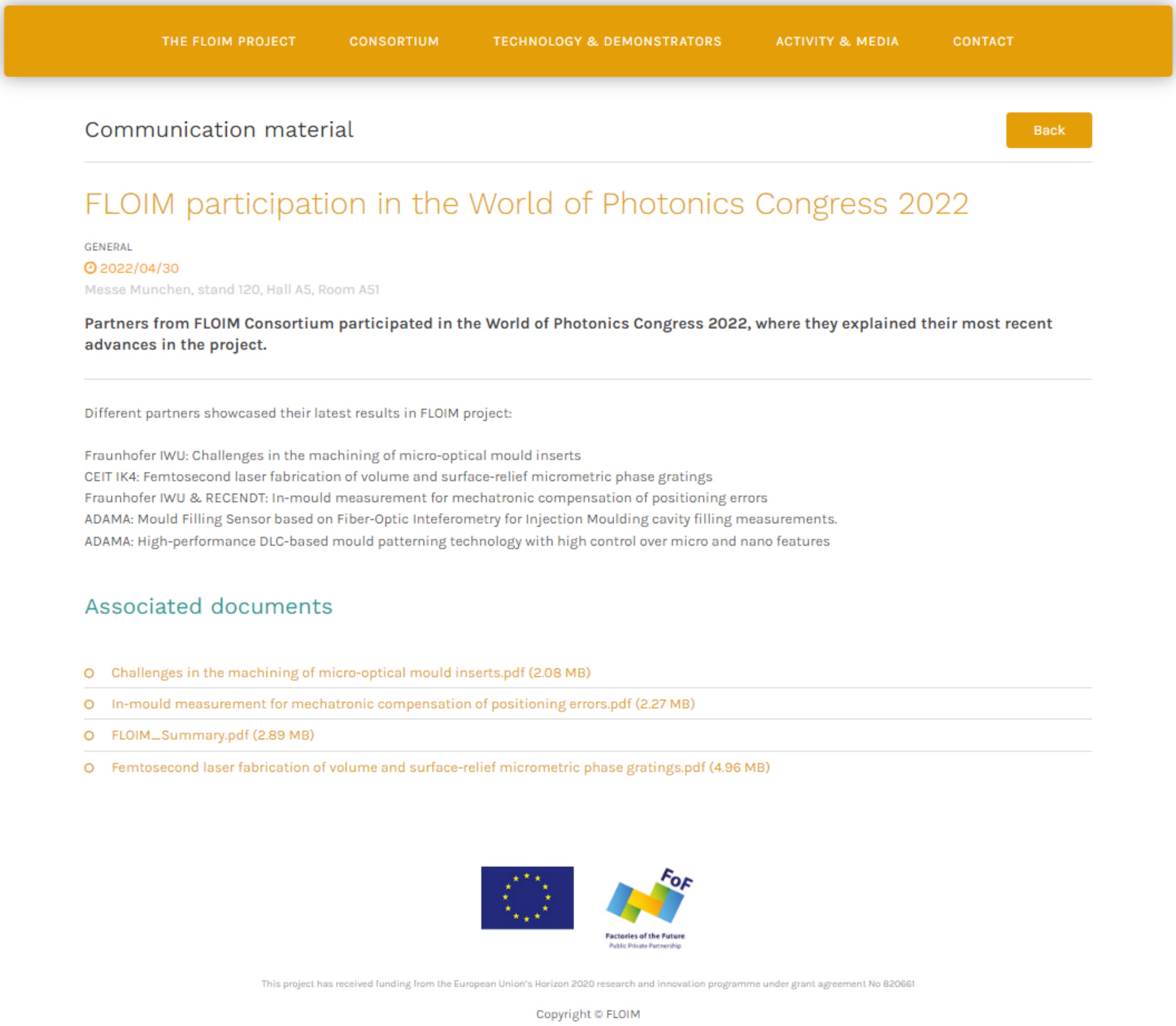

Figure 5. FLOIM Website entry with Workshop documents attached.

FLOIM Final Flyer

End of project flyer

FLOIM
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.eu

Partners

AIMEN Technology Centre
www.aimen.es
Universitat Politècnica de Catalunya
www.upc.edu
PROMOLDING
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www.snelloptics.com

FLOIM
Flexible Optical Injection Moulding of optoelectronic devices

www.floimproject.eu

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

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

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 system developed jointly by RECENDT and 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.

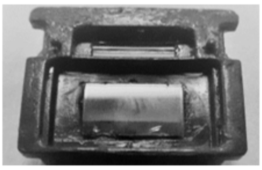
Laser Direct Writing (CEIT) and Ion Implant Lithography (ADAMA) proved to be the most suitable technologies to manufacture mould inserts with integrated optical functionalities that require sub-micron resolution.

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.

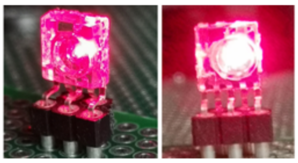
Main results of FLOIM

The demonstrator designed by FAGOR AUTOMATION consists on an Optical Encoder Head (OEH), as small as 1.5 cm^3, 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.



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

A 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.

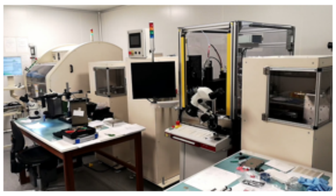


"FOT with the optical component directly overmoulded on the electronic component".

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 assembled 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.

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

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