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

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

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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.

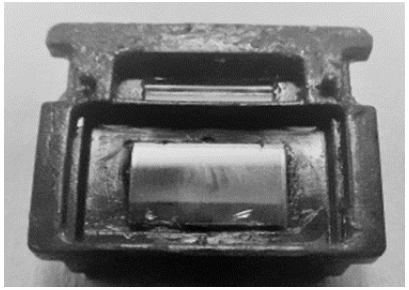
Laser Direct Writing (CEIT) and Ion Implant Lithography (ADAMA) proved to be the most suitable technologies to manufacture mould inserts with integrated optical functionalities that require sub-micron resolution.

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.

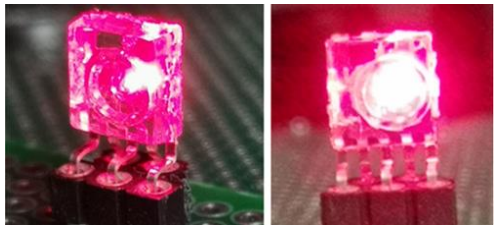
Main results of FLOIM

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".

Another demonstrator, this one designed by HYBTRONICS, is a Fibre Optic Transceiver (FOT), which 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.

"Front-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.