DIGITAL MATERIALS CHARACTERIZATION PROOF-OF-PROCESS AUTO ASSEMBLY

Grant agreement no.: 736290
***Start date**: 01.01.2017 – **Duration**: 42 months*
***Project Coordinator**: CEA Tech - LITEN*

DELIVERABLE REPORT

D7.4 – SURVEY OF DISSEMINATION ACTIVITIES AND FINAL PLAN FOR DISSEMINATION AND EXPLOITATION OF PROJECT RESULTS	
Due Date	30 June 2020
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Work Package	WP7
Work Package Leader	PXO
Lead Beneficiary	PXO
Date released by WP Leader	10 June 2020
Date released by Coordinator	07 July 2020

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)*	
CO	*Confidential, only for members of the consortium (including the Commission Services)*	

NATURE OF THE DELIVERABLE		
R	*Report*	
P	*Prototype*	
D	*Demonstrator*	
O	*Other*	***X***

SUMMARY	
Keywords	Dissemination and Communication
Abstract	*During the whole duration of the DIGIMAN project, the consortium has undertaken various dissemination and communication measures. Target groups included industry, academia, government bodies and the public.* *At the end of the project, the consortium will be engaged in conducting further activities for promoting and disseminating the project results.* *Those activities will first receive the agreement of the partners to protect the intellectual property rights, confidentiality and the legitimate interests according to the Grant Agreement article II.30. and the internal dissemination protocol (D7.2)*
Public abstract for the public website (only for confidential deliverables)	*NA*

REVISIONS			
Version	**Date**	**Changed by**	**Comments**
0.1	10 June 2020	N. Cros - PXO	Draft version
0.2	11 June 2020	T. Wilson - IE	Exploitation input
0.3	15 June 2020	C. Rakousky - FPM	Exploitation input
0.4	25 June 2020	T. Ridler - WMG	Dissemination input
0.5	07 July 2020	J. Pauchet – CEA	Dissemination and exploitation inputs

D7.4: Survey of Dissemination Activities and Final Plan for Dissemination and Exploitation of Project Results

Contents

1. INTRODUCTION

During the whole duration of the DIGIMAN project, the consortium has undertaken various dissemination and communication measures. Target groups included industry, academia, government bodies and the public.

At the end of the project, the consortium will be engaged in conducting further activities for promoting and disseminating the project results.

Those activities will first receive the agreement of the partners to protect the intellectual property rights, confidentiality and the legitimate interests according to the Grant Agreement article II.30. and the internal dissemination protocol (D7.2).

2. DISSEMINATION & COMMUNICATION ACTIVITIES

1.1. WEBSITE

The project website (http://www.digiman.eu/), fully operational since 31st March 2017, reflects the status and the progress of the project. Public deliverable reports, publishable summaries of confidential deliverable reports, updates on dissemination activities and other project news were communicated towards the public and the scientific community.

This website will first of all be kept as an information source of the activities performed in the project. The website will also continue to receive and provide information on published papers from the project. The website will be updated to reflect the current status of the project as finished. Reports and final results will be clearly communicated through relevant news items and reports.

1.2. NEWS UPDATES ON INDUSTRIAL PARTNER WEBSITES

As planned, two news updates were issued on industrial partner websites:

- Warwick Manucturing Group (WMG) at University of Warwick - Press release - 11 May 2017: WMG announce partnership with clean energy solution company Intelligent Energy: Direct Link
- Intelligent Energy - Press release - 8 May 2017: Intelligent Energy takes technical lead in programme to further develop fuel cell stack for future mass manufacture: PDF
- Freudenberg – Press release – December 2018: A press release on DIGIMAN was published in the Freudenberg Magazine, a quarterly newspaper available to the 50.000 Freudenberg employees and guests.

1.3. BROCHURE AND NEWSLETTER

To assist communication from DIGIMAN, two different types of communication supports were designed and edited in agreement with all the consortium. Both communication supports are available from the public website. Furthermore, to increase their availability and efficiency, they were also printed and distributed to the partners for their use during attendance at conferences and technical fair events.

- Project brochure: PDF
- Two Project newsletters were issued at M18 and at M34: PDF issue#1 & PDF issue#2

The DIGIMAN consortium will continue to disseminate its results; in particular, a third newsletter is planned for October 2020, which will focus on the main outcomes of the project.

This final newsletter will be made available from the public website and relayed on LinkedIn through the partners' accounts.

1.4. PUBLICATIONS

- **Automatic PLC Code Generation Based on Virtual Engineering Model,** Mohammad Jbair ; Bilal Ahmad ; Mus'ab H. Ahmad ; Daniel Vera ; Robert Harrison Tony Ridler*, 2019 IEEE International Conference on Industrial Cyber Physical Systems (ICPS) proceedings, August 2019*.
  DOI: 10.1109/ICPHYS.2019.8780213
- **Uncertainty in Measurement, Carlo Ferri**, Carlo Ferri, *IntechOpen, November 27th, 2019*
  DOI : 10.5772/intechopen.89568

Other publications are planned or already submitted, amongst them:

- **Development of a Proof-of-Process manufacturing line for an automotive fuel cell application,** Hazem, Nureldin; David Urquhart; Robert Harrison; Tony Ridler*, Draft in writing, Target Journals being assessed.*
- **Impact of GDL modifications on the transport properties and PEMFC performances**, F. Fouda-Onana, J. Thery, J. Pauchet. Draft in writing, target journals are Journal of Power Sources, Electrochimica Acta

1.5. PRESENTATIONS AT INTERNATIONAL CONFERENCES

DIGIMAN partners have disseminated project results at conferences through oral or poster presentations including:

- EFC2019, 9-11 December 2019, Naples, Italy - **CEA oral presentation**: Impact of GDL modifications on the transport properties and PEMFC performances, F. Fouda-Onana, J. Thery, J. Pauchet.
- 2019 IEEE International Conference on Industrial Cyber-Physical Systems, 6-9 May 2019, Taipei, Taiwan - **WMG oral presentation**: Virtual engineering methods and tools for smart fuel-cell assembly equipment using a Proof of Process demonstrator case study, M. Jbair, B. Ahmad, M. Ahmad, R. Harrison, T. Ridler
- Industry 4.0 Summit and Expo, 10 April 2019, Manchester, UK - **Video presentation** on WMG stand of DigiMan for WMG Virtual Engineering Activities
- FHC JU PEMFC development workshop, 5-6 March 2019, Marseille, France - **DIGIMAN poster presented by IE and FRE**
- CCSF2018, the 14th International Hydrogen & Fuel Cell Conference held in Birmingham, UK, on 13th March 2018 - **IE oral presentation**: Fuel Cells Commercialising and Production, C. Dudfield
- Hydrogen and Fuel Cells Energy Summit, Brussels, Belgium, 25 January - **IE Oral presentation**: The future landscape for hydrogen and Fuel Cell Energy, D. Hayter
- CENEX-LCV event, Bedford, UK, 6-7 September 2017 - **IE oral presentation**: Creating the blueprint for advanced fuel cell manufacturing, C. Dudfield
- European Fuel Cell Forum 2017 conference held in Lucerne, Switzerland, 4-7 July 2017 - **DIGIMAN poster presented by TME**

In addition, the project coordinator delivered a poster presentation at the 2018 and 2019 Programme Review Days.

1.6. NETWORKING

The DIGIMAN team attended the FCH JU PEMFC development workshop organised by the Project INSPIRE in **Marseille on 5th and 6th March 2019**, combining several FCH JU H2020 projects focused on PEM fuel cell components together for poster sessions, forums and project presentations. The workshop was free of charge for the participants.
The website for this workshop may be found at http://www.inspire-fuelcell.eu/
The workshop presented recent advances relating to catalysts and catalyst supports, membrane, MEA, bipolar plates, stack assembly and fuel cell characterisation testing, and was an opportunity for FCH JU projects to network and exchange both information and technical developments.

The following projects were represented:

- CRESCENDO: www.crescendo-fuelcell.eu
- DIGIMAN: www.digiman.eu
- Fit-4-AMANDA: www.fit-4-amanda.eu
- GAIA: www.gaia-fuelcell.eu
- GRASSHOPPER: www.grasshopperproject.eu
- HYDRAITE: www.hydraite.eu
- ID-FAST: www.id-fast.eu/
- INSPIRE : www.inspire-fuelcell.eu
- MAMA-MEA: www.mama-mea.eu
- VOLUMETRIQ: www.volumetriq.eu

1.7. VIDEOS

- How virtual engineering tools have been utilised within the DIGIMAN project: Direct Link
- 3D reconstruction of a commercial GDL based on X-Ray tomography: Direct Link

3. EXPLOITATION OF THE RESULTS

Freubenberg

DIGIMAN project results are highly relevant to:

- Support the industrialization of fuel cell component production (GDL) to meet growing quality demands of FC market.
- Optimize and further develop GDL product quality to enable elevated fuel cell performances levels.
- increase the information depth and speed of optical and physical QC for GDL.

FPM has started and will continue to exploit DIGIMAN project results, predominantly QC methods developed in the project, for a large amount of GDL types used in fuel cells designed for:

- The transportation sector (automotive, heavy duty, material handling)
- Heat and power generation (stationary applications)

Highlighted project outcomes are:

- Optimized 100% visual GDL inspection, marking and their alignment to the subsequent customer-based stack assembly step, including a digital database.
- Improved knowledge about cause and effect relations between structural GDL features and fuel cell performance levels
- further improved digital QC methods

Intelligent Energy

Key DIGIMAN outcomes have:

- Established the costs, lead-times, operational considerations for investment in a fully proven and build-to-print (MRL6) ready, blueprint design for production lines capable of assembling 50k AC64-72 stacks pa.
- Informed the design-for-manufacture considerations for future stack development with the knowledge that stack performance and durability will not be degraded.
- Established a digital supply chain for critical to stack performance components with known-good quality assured, ready-to-assemble status from GDL roll-stock, which, being of non-woven construction cannot otherwise be guaranteed.

These outcomes will be exploitable in scaling up production of stacks for not only, primary/range extender electric propulsion for two & four wheeled FCEVs, but also, FC enabled drones for deliveries of online purchases. For global roll out see recently announced significant international distribution and service networks:

- *https://www.intelligent-energy.com/news-and-events/company-news/2020/06/02/intelligent-energy-continues-to-expand-international-distributor-network-and-signs-agreement-with-korean-based-hogreen-air/*
- *https://www.intelligent-energy.com/news-and-events/company-news/2020/05/05/intelligent-energy-to-enhance-offering-to-uav-customers-mou-signed-with-robotic-skies-to-meet-increased-demand-for-fuel-cell-products/*
- *https://www.intelligent-energy.com/news-and-events/company-news/2020/04/16/intelligent-energy-agrees-distributer-agreement-with-japanese-customer-and-drone-specialist-robodex/*

WMG, University of Warwick

Publications, past and planned are listed in section 1.4.

CEA

- The thermal techniques that allowed identifying on-line GDL defects could have an interest for quality insurance for other components for fuel cells, batteries…
- The influence of GDL defects on performance is a much larger topic than planned and depends on the defect type, size, location, flow-field design… This shall be taken into account for future work on quality insurance to find the trade-off between request of high quality (to reach high performance) and acceptance of low quality (to reduce the cost).

4. CONCLUSIONS AND FUTURE WORK

With regards to the project objectives, the DIGIMAN consortium has finalised all planned communication and dissemination actions and exceeded the targets for WP7.
The DIGIMAN partners will continue collectively to implement dissemination and communication measures depending on the latest results obtained. This will be achieved through:

- A third edition of the newsletter
- An update of the public website: it will continue to receive and provide information on published papers related to the project. Reports and final results will be clearly communicated through relevant news items and reports.
- Publications

Finally, partners, will undertake all the necessary measures to exploit the project results.

- Increased competitiveness and knowledge (IE, FRE)
- Use the DIGIMAN approach for other applications
- Keep on progressing on the route towards cause and effects between GDL structure and performance