FIT-4-AMANDA

Future European Fuel Cell Technology: Fit for Automatic Manufacturing and Assembly

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1 Executive Summary

IRD Fuel Cells (IRD) have developed fuel cell components for long-term mobility power applications, which are suitable for integration into Proton Motors Fuel Cell Technology stacks. The components are membrane electrode assemblies (MEAs) and bipolar plates (BPPs). Existing designs were used as starting point from where new designs suitable for automated stack assembly were developed in an iterative process.

The predecessor MEA, which required many discrete operations to manufacture, was transformed into a continuous high volume manufacturable MEA with design features permitting automated stack assembly. The performance and stability have been maintained, while manufacturing at higher production rate is accomplished. A substantial further production rate increase will be realized based on MEA roll-to-roll manufacture.

The new BPP design integrates the same design features to favor automated stack assembly. Furthermore, the BPPs are designed for bonding to take place as an integrated process of the BPP manufacture. The automated bonding method has been developed and is considered for implementation in the next generation of BPPs from IRD.

BPP casting skin removal has been addressed as a supplementing task. Casting skin is an inherent challenge in the manufacture of moulded BPPs, and its presence prescribes a subsequent BPP surface activation either by IRD or by the end user, prior to the bonding step. Because the casting skin was a severe obstacle for satisfactory stack performance in the project, an effective method for the removal of casting skin from the BPPs has now been developed. Recognized as a substantial improvement adding value to IRDs entire line of BPP products, investment in the method has been made and it will be implemented in near future.

Product Quality Assurance and Quality Control in IRD has benefited from technical QA/QC developments in the project. The developments led to the implementation of new quality measures. These measures increase the quality of IRDs products and are valuable contributions towards IRDs target of ISO 45001 certification in 2021.

2 Closed sealing design for automated stack assembly

The development of the graphitic BPPs (g-BPP) design to support the automated assembly process has been one of most relevant (and challenging) tasks for the Fit-4-AMandA project. The process has been completed and most relevant information have been published in the project newsletter #5.

The Fit-4-AMandA design represents the limit of what is possible with complex BPP geometries in terms of molding.

Below a picture of the mold with a freshly cast flowplate still inside

Figure 1 – BBP mold

3 Short stack performances

The delivered stacks components have been used for the preparation of the final Fit-4-AMandA stack. The data on the final short stack performance in lab environment are reported in the confidential deliverable D2.3.

Below a 3D drawing of the short stack and a picture of the resulting one.

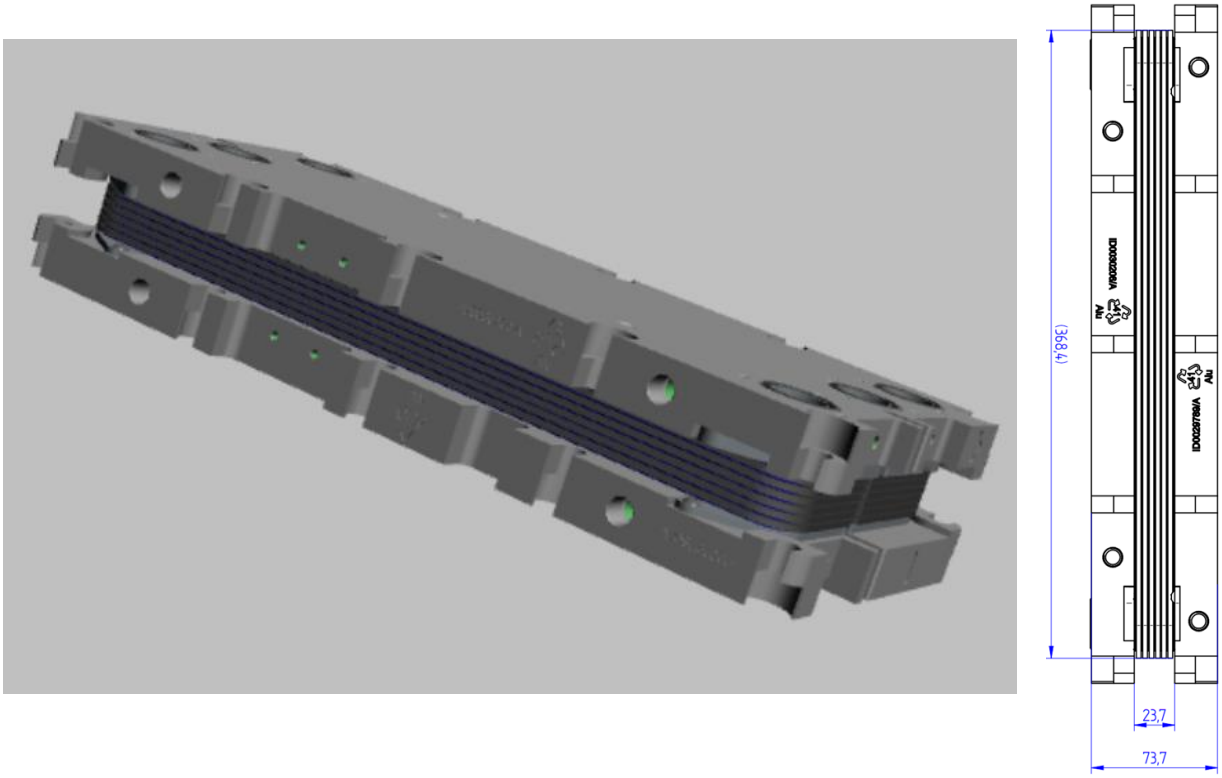

Figure 2- 3D drawing short stack and dimensions

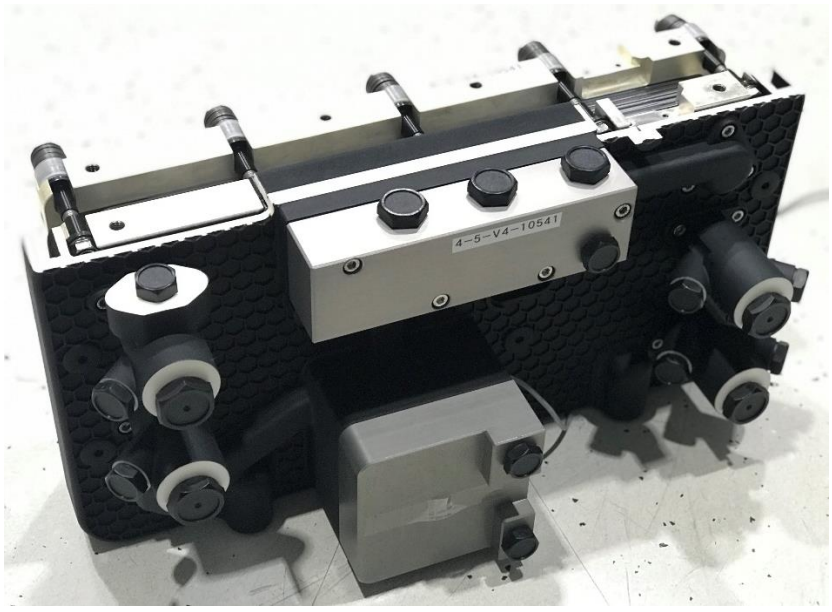

Figure 4 – Fit-4-AMandA short stack with automatically produced BBP

4 Conclusions

The Fit-4-AMandA project developed automatic solutions for assembly of fuel cell components for long-term mobility power applications (membrane electrode assemblies (MEAs) and bipolar plates (BPPs)).

The predecessor MEA, which required many discrete operations to manufacture, was transformed into a continuous high volume manufacturable MEA with design features permitting automated stack assembly. The performance and stability have been maintained, while manufacturing at higher production rate is accomplished. A substantial further production rate increase will be realized based on MEA roll-to-roll manufacture.

List of acronyms, abbreviations, and definitions

Abbreviation	Explanation
BPP	Bipolar Plate
FC	Fuel Cell
IRD	IRD Fuel Cells A/S
MEA	Membrane Electrode Assemblies
QA	Quality Assurance
QC	Quality Control

5 Acknowledgement

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Project partners:

#	Partner	Partner Full Name
1	UNR	Uniresearch BV
2	PM	Proton Motor Fuel Cell GmbH
3	IRD	IRD Fuel Cells A/S
4	AU	Aumann Limbach-Oberfrohna GmbH
5	Fhg	Fraunhofer IWU, Institute for Machine tools and Forming technology
6	TUC	Technische Universitaet Chemnitz, ALF, Department of Advanced Powertrains
7	UPS	UPS Europe SA

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