HBI C-Flex

D6.5 Comprehensive overview of the project

Partner:	K1-MET
Authors:	Lukas Schmidt
Version:	1.0
Date:	22.12.2023

Co-funded by the European Union

Project details

Project Title	Reoxidation behaviour and stability of direct reduced and hot briquetted iron with variable iron and carbon content to promote safe handling and transport for a future decarbonized steel production
Project Acronym	HBI C-Flex
Grant Agreement No.	101112479
Project Start Date	01.07.2023
Project End Date	31.12.2026
Duration	42 months

Document details

WP:	6
WP Leader:	K1-MET
WP Title:	Dissemination, Exploitation, Communication
Task:	6.4
Task Leader:	K1-MET
Task Title:	Dissemination and Communication activities
Deliverable No.	6.5
Deliverable Title	Comprehensive overview of the project
Dissemination level	Public
Written by	Lukas Schmidt
Contributing beneficiary(ies)	All
Approved by	K1-MET
Status	Version 1.0
Date	22.12.2023

Co-funded by the European Union

Document history

Vers.	DATE	AUTHOR / REVIEWER	NOTES
0.1	16.11.2023	Lukas Schmidt	Preparation of initial version
0.2	15.12.2023	Sergej Nesterov, Francisco Carranza, Melanie Leitner	Input specific work package leaders
0.3	19.12.2023	Melanie Leitner, Johannes Rieger	Review
1.0	22.12.2023	Lukas Schmidt	Input consortium, final review
1.1			
2.0			
2.1			

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

This project has received funding from the Research Fund for Coal and Steel under grant agreement No 101112479.

Table of Content

List of Tables

Co-funded by the European Union

Abbreviations and acronyms

AMMR	ArcelorMittal Maizières Research
BF	Blast furnace
CRM	Centre de Recherches Métallurgiques
DoA	Description of the Action
DEC	Dissemination, Exploitation and Communication
DRI	Direct Reduced Iron
EU	European Union
FAIR	Findability Accessibility Interoperability and Re-usability
FLEX	flexible
H_2	Hydrogen
HBI	Briquetted Iron
IIMA	International Iron Metallics Association
IMSBC	International Maritime Solid Bulk Cargoes
IPR	Intellectual Property Rights
PO	Policy Objective
RFCS	Research Fund for Coal and Steel
RO	Research Objective
RTO	Research and Technology Organisation
SAB	Supportive Advisory Board
T	Task
TATA	Tata Steel Nederland Technology
TQM	Total Quality Management
TU BAF	Technische Universität Bergakademie Freiberg
VASD	voestalpine Stahl Donawitz
VASL	voestalpine Stahl Linz
WP	Work package

Abstract

This report provides an overview of the status of the HBI C-Flex project in its 6th month. The project started with a kick-off meeting in Linz, which also the project officer joined virtually. The present review describes the content, goals, status and the next steps of its 6 work packages. Work package (WP) 1 comprises the overall coordination and financial administration of the project. A folder structure on a SharePoint, a project management plan, a quality control and a data management plan have already been created to ensure the efficient operation of the project. Team meetings are held every two months virtually and the next in-person meeting is already scheduled. In WP2 the equipment for HBI production and the reoxidation tests is designed including the reduction facilities at ArcelorMittal Maizières Research (AMMR) and Centre de Recherches Métallurgiques (CRM), the briquetting apparatus with heating at Technische Universität Bergakademie Freiberg (TU BAF) and the reoxidation facility at the Montanuniversität Leoben (MUL). While WP2 deals with the design of the equipment, WP3 concentrates on the trials in HBI C-Flex. A list of potential iron ore pellets was compiled, from which 3 “direct reduction”-grade and 3 “blast furnace”-grade pellets were selected. At the moment the reduction regimes and briquetting parameters are defined and the first iron ore pellets for the reduction tests will be sent soon. Iron ore pellets have already been delivered to all partners, who participate in a round robin for XRD/XRF analyses and helium pycnometry to guarantee comparable results at the different testing equipment in WP4. WP5 will summarize all findings of the HBI C-Flex project providing a guidance for safe HBI handling and transport. This work package will start in month 25. All dissemination, exploitation and communication activities are performed in WP6. A corporate identity was created by the development of a project logo (already in the proposal writing phase), a project website, a LinkedIn account, templates for the minutes of the meeting, reports and presentations, the first newsletter and a foldable flyer. Furthermore, a communication and dissemination plan was established which will be updated regularly. The next steps in WP6 are the creation of an intellectual property rights plan, a market analysis and regular updates on the website and LinkedIn account. Summarizing all activities in HBI C-Flex, all work packages are on track and the next steps are already planned.

1 Introduction

The HBI C-Flex project started in July 2023 and keeps progressing. Now, in month 6, an overview of the project and the work already done as well as the next planned steps should be given. Updates about HBI C-Flex will also be provided regularly on the project website www.hbi-c-flex.eu.

2 Project Summary

HBI C-Flex demonstrates the direct reduction of iron ore using various qualities (including lower-grade ores being typically not used for direct reduction) followed by hot briquetting. Flexible carbon contents, also including zero-carbon products, will be reached. This generates important knowledge beyond state-of-the-art, establishing the EU steel sector as an international leader for low-carbon materials. Hot briquetted iron (HBI) as well as direct reduced iron (DRI) will be subject of reoxidation trials under changing ambient conditions (dry and wet atmosphere, enhanced temperature) to quantify exothermic reactions during onsite storage, rail and maritime transportation. Mineralogical, mechanical and metallurgical analyses of the DRI/HBI before and after reoxidation will be performed. The International Maritime Solid Bulk Cargoes (IMSBC) Code, representing an important regulation for safe international maritime transport of iron products provides another basis of the HBI C-Flex project, apart from RFCS and EU policy initiatives. HBI C-Flex will extend the IMSBC Code to cover zero-carbon HBI and will define strategies for safe handling and onsite storage. HBI C-Flex will contribute to new, sustainable, and low-carbon steelmaking materials, being an important goal of the RFCS programme. The excellent consortium comprises a mix of steel producers, technology providers, RTOs and universities with outstanding know-how in ironmaking. A Supportive Advisory Board (SAB) led by the International Iron Metallics Association (IIMA) comprising several international companies. The organisations ESTEP and worldsteel are aware of the importance of this project and the necessity that the topic of handling zero-carbon HBI needs to be investigated now to facilitate the EU's push forward towards a modern, resource-efficient and competitive economy.

3 Purpose of the project

Since not all steel demand can be covered by recycling scrap, primary steel production must also decarbonise to meet the EU Green Deal objectives. This requirement induces the need to increase the production and use of direct reduced iron (DRI) and hot briquetted iron (HBI). These materials serve as enablers of the steel circular economy by diluting the metallic and other impurities present in lower-quality grades of scrap. A large amount of the iron ore available today does not meet the required grade for DRI-based Electric Arc Furnace (EAF) steelmaking. As a result, there is a need for the utilization of this higher share of lower-grade ores. The pathway to decarbonisation of the steel industry envisages DRI/HBI being produced using hydrogen (H_2) rather than natural gas with a consequent impact on product properties, notably carbon (C) content. The overall objectives of the HBI C-Flex project are:

- HBI with flexible carbon contents (down to 0%) will be produced and evaluated in terms of reactivity and stability. This knowledge is important for the EU steelmakers to see how carbon-free HBI can be transported and stored to and within their sites without safety risks.
- Direct reduction will be demonstrated using a huge spectrum of iron ores globally available also comprising low-grade ores being traditionally used in a BF; this induces a more sustainable and circular use of resources.
- The knowledge about reactivity and stability (dust formation) during HBI handling will be valuable for steelmakers in terms of logistics and up-skilling of workers' awareness of how to avoid hazardous situations during their daily work.

4 Status of the HBI C-Flex project in month 6

In this chapter, an overview of all 6 work packages is given including a description of the work package, its objectives, the status in month 6 and the next steps.

4.1 WP1 – Project management and coordination

4.1.1 Description and objectives

WP1 comprises the overall coordination, financial administration and organisation of the management structure to ensure a smooth and efficient operation of the project. It ensures that defined requirements are aligned with project objectives, user needs and expectations are considered; validation procedures are adequate and accomplished as defined; requirements are reviewed in response to risks and internal and external opportunities are identified. K1-MET monitors the progress of activities, reviews and verifies the consistency of documents, organises project meetings, elaborates and distributes meeting minutes, creates and maintains the Project Management Plan as well as plans, monitors and submits the reporting information. The specific objectives of WP1 are to:

- Deliver the project on time and budget and ensure an effective and efficient progress
- Deal with the administrative and financial management of the project
- Perform continuous evaluation and monitoring of the technical/impact content of the project
- Secure a consistent high quality of the work to be performed and of the reports produced
- Manage risks and issues effectively
- Develop and follow an efficient data management and data access policy

4.1.2 Status in month 6

The project started with a kick-off meeting on July 4th and 5th in Linz, Austria. The meeting was held in hybrid mode and the Project Officer, Mr. Miguel Medina Cobo, participated and gave recommendations and advice to realise a successful project.
The work plan of HBI C-Flex developed in the Description of the Action (DoA) was transferred to the detailed project level in the Action plan. The Action plan is a list of the current tasks indicating the responsible person, the due date and the date of completion. It specifies the

description of the single tasks in the work packages. Table 1 shows the work plan at different levels and the responsible persons.

A SharePoint folder structure was created in MS Teams that enables all partners to find and share relevant information and documents. Besides this knowledge transfer, regular project meetings are held to discuss the progress and define the next steps. After the kick-off meeting, there were virtual status meetings on September 21st and November 28th. In the minutes of the meeting, the outcomes for each work package, the next steps and the responsibilities are stated.

Table 1: Work plan at different levels and responsibilities

Level	Documents	Responsible(s)
EU/RFCS	Green Deal	European Commission/Project Officer Miguel Medina Cobo
RFCS/HBI C-Flex Project	HBI C-Flex Description of the Action (DoA), Budget tables	Project coordinator Lukas Schmidt (K1-MET)
HBI C-Flex Project	Description of work packages and tasks, Action plan	WP1: Lukas Schmidt (K1-MET) WP2: Sergej Nesterov (MUL) WP3: Francisco Carranza (AMMR) WP4: Christoph Thaler (VASL) WP5: Christian Böhm (PTAT) WP6: Melanie Leitner (K1-MET)

Two deliverables have already been submitted in WP1, which were D1.1 Project Management Plan and D1.2 Quality Control and Data Management Plan. Deliverable D1.1 summarises the structure and tools to ensure a quick working progress towards the project goals, a high level of quality and to keep the costs on track. Deliverable D1.2 describes how the 8 principles of Total Quality Management are implemented and controlled in the project and shows the Data Management Plan that comprises all relevant data, its content, type, format, source and utilisation.

4.1.3 Next steps

In the next month, templates for financial monitoring will be prepared and filled in by the partners. Furthermore, a Risk Assessment Plan will be developed, which will be evaluated regularly to identify potential internal and external risks for the project.

The next status meetings will be on February 8th (virtual) and April 17th and 18th (hybrid) in Metz (France) at the premises of AMMR.

4.2 WP2 – Design of the HBI production and reoxidation processes

4.2.1 Description and objectives

The HBI production and reoxidation comprises the following three steps: first the reduction, second the briquetting and third the reoxidation. In WP2, this three-step process is designed utilising existing equipment at AMMR and CRM for the reduction step, at TU BAF for the heating and briquetting step and the corrosion system for the reoxidation studies. The specific objectives of WP2 are:

- Design and erection of the lab-scale fixed bed reactor for direct reduction ready for first testing
- Reworking the oven for preheating the DRI in an inert atmosphere
- To develop a facility for reoxidation trials

4.2.2 Status in month 6

As mentioned above, the kick-off meeting on July 4th and 5th in Linz, Austria was the project start. In the last six months according to the work schedule of HBI C-Flex, many important aspects with the partners were discussed and an action plan was developed.

Some pretests have been performed with reactor HUGE at CRM. In the last period, it was not acceptable to heat up H_2 and CH_4 at the same time; in the beginning of 2024 trials should be possible. This reactor needed some last adaptations before starting the tests. Parameters for reduction could be according to ISO 11258; temperature should reflect current reduction practice.

Adaption of existing fixed bed reactor (BORIS) to perform DRI production according to industrial operational regimes has been carried out by AMMR engineers. Necessary preparation has been in the final stage inside AMMR: introduction of H_2O injection into the gas entering BORIS and development of a new algorithm for the BORIS furnace control for DRI production.

At the same time, 3 DR-grade pellets and 3 BF-grade pellets for DRI manufacturing in those reactors were selected.

At this point, it is important to look at the hydraulic piston press on TU BAF (discontinuously working) with pressures up to 350 MPa and, additionally, a furnace for preheating the DRI

pellets to relevant temperatures which are now available. In the piston press of TU BAF, the standard briquetting time is 3 s with a compaction speed of 10 m/s.

The modification of the used ingots (maximal 1400 °C) of the furnace for inertisation and preventing reoxidisation of DRI pellets as well as the assessment of a heat-up pattern have started.

The furnace for preheating the DRI pellets has been adapted and a suitable heat-up pattern was found; the pellets can be preheated in an inert atmosphere without any structural change (e.g., reoxidation).

Fulfilling a certain temperature pattern during the heat-up phase to avoid any structural changes of the inserted DRI pellets, the required temperature of the pattern should be discussed. Therefore, the communication between TU BAF and MUL about necessary technical aspects and supports in this area will continue.

A presentation about the mathematical correlation between briquetting parameters/material properties and HBI quality was given by specialists of TU BAF.

At the same time, the design of climate boxes with different climatic conditions to investigate the impact of climatic conditions on reoxidation of HBI was discussed and defined.

Next, the climatic conditions for five boxes were chosen. They include ambient air, air saturated with water (with and without contact with the water), air saturated with saltwater and contact with it as well as elevated temperature. As a result of preparatory work, the lab-scale corrosion system for reoxidation studies is designed at MUL and will be ready in a short time.

4.2.3 Next steps

In the following month, all tasks for the HBI C-Flex production and reoxidation will be continued, prepared, discussed and filled in by the partners.

- Design and erection of the lab-scale fixed bed reactor (AMMR and CRM) for direct reduction will be ready for first testing by M7 and in the beginning of 2024 first trials could be possible.
- Design and erection of the lab-scale briquetting system should be ready for first testing by M10.
- Design and erection of the lab-scale corrosion system for reoxidation studies will be ready for first testing by M13.

4.3 WP3 – Experimental ore reduction, hot briquetting and HBI reoxidation studies

4.3.1 Description and objectives

WP3 comprises the selection and supply of representative pellets for the reduction tests. Besides direct reduction ore grades, blast furnace grade pellets, which have a lower quality than direct reduction ore grades will be investigated in this project. The selected pellets (BF and DR grade) will be characterised according to the standard test for direct reduction process (shaft) inputs: size distribution, mechanical strength, reducibility and clustering.
The production of DRI in the laboratory will necessitate a study of DRI carburisation as well as metallisation. The laboratory tools such as thermos-gravimetry and a reduction facility will be employed in the study. The produced DRI will be in-depth analysed with appropriate techniques.
Direct reduced iron will be produced in the laboratory using the adapted equipment. The non-isotherm reduction regime will be applied to the iron ore pellets. The resulting DRI will be of equivalent quality and properties as industrially produced DRI. The quantity of the produced DRI will be sufficient to produce hot briquetted iron.
Two different HBI qualities will be produced regarding metallisation degree. One out of low reduced iron (LRI) with a metallisation degree of about 75% and one out of DRI with a metallisation degree of about 92%. The specific objectives of WP3 are:

- Reduction of DRI pellets with a variation of the quality of the pellets (blast furnace grades and direct reduction grades)
- Reduction of DRI pellets with variation of the carbon content and metallisation degree
- Compaction of the produced DRI pellets to HBI by hot briquetting and determination of material parameters (density, apparent density, porosity, specific surface)
- Evaluation of the compaction behaviour (compaction ratio, compaction work)
- Comprehensively testing the HBI in terms of physico-mechanical and chemical parameters (e.g. SEM/EDX, XRD/XRF, ignition temperature, abrasion resistance, compressive strength)
- Determination of the influence of the briquetting parameters on the apparent density of the HBI as a function of the material parameters

- Determination of the influence of the briquetting parameters on the mechanical strength of the HBI as a function of the material parameters
- Analysis of the influence of parameters, such as quality of pellets, carbon content, metallisation degree, HBI density and ambient conditions, on the reoxidation behaviour of HBI
- Comparison of the reoxidation behaviour of HBI with the reoxidation behaviour of reduced DRI
- The results of the first reoxidation tests should be implemented in further reduction, briquetting and reoxidation tests.

4.3.2 Status in month 6

For the activities related to this work package, the status is:

- Iron ore selection: 6 iron ores (3 DR degree and 3 BF degree) have been chosen to carry out the tests.
- Reduction campaigns: A preselection of conditions has been discussed, considering three different process conditions (Midrex, HYL and H_2 reduction), three levels of carbon, two levels of metallization and six types of iron ore.
- Briquetting campaigns: Research stage to know the effect of the parameters' variation
- Reoxidation test: The design of experimental boxes is ongoing.

4.3.3 Next steps

For the tasks required in this work package, the next steps foreseen are:

- Iron ore selection: Deliver the iron ore to the partners involved in reduction and quality tests.
- Reduction campaigns: Define the reduction conditions and start with the H_2 reduction of iron ore.
- Briquetting campaigns: Finish the research report and define the parameters to evaluate in the briquetting stage.
- Reoxidation tests: Finish the elaboration of experimental tools and define the requirements.

4.4 WP4 – Process analysis and product quality evaluation

4.4.1 Description and objectives

This work package comprises the development of a model for predicting the carbon content in the reduced DRI. The modelling environment that will be used in this activity is a flow-sheeting software developed (and maintained) in-house at Tata Steel Nederland Technology (TATA). Calculations are based on a mix of thermodynamic equilibrium relations and empirical relations. Thermodynamic calculations are carried out by the ChemApp library, based on the thermodynamic phase equilibrium calculation module of FactSage. It permits the calculation of complex, multicomponent, multiphase chemical equilibria. The software also has the option to make user-defined models. Furthermore, this work package concerns chemical analyses of the reduced DRI which includes Fe_{tot}, Fe_{met}, Fe_{2+}, Fe_{3+}, C, S and other elements. Chemical analyses of the HBI before and after the reoxidation trials will support the examination and validation of the metallisation loss in various oxidising atmospheres. It will also be analysed whether carbon is present in elemental form or as cementite. To identify the correlation of the physical properties of the HBI to its reoxidation behaviour, porosity and density measurements as well as mechanical strength tests will be performed. The physical properties also have an impact on the dust formation, which will be evaluated in this project. The specific objectives of WP4 are to:

- Predict and evaluate the degree of carbonisation and its morphological form
- Evaluate the quality of the reduced pellets
- Determine the impact of physical parameters and properties on the reoxidation of HBI
- Determine the impact of morphological properties on the reoxidation of HBI

4.4.2 Status in month 6

The HBI production process consists of a direct reduction, a briquetting and a reoxidation step. Different partners are going to perform one of these production steps and the product quality evaluation will also take place at different places. To ensure that these measurements are comparable a round robin test with iron oxide pellets is performed. The round robin comprises two standard tests:

- X-ray diffraction (XRD) / X-ray fluorescence (XRF) for chemical analyses
- Helium pycnometry for the determination of the density

Iron ore pellets were already sent to all relevant partners to perform the round robin tests.

In the HBI C-Flex project various other tests will be performed, but gaining comparable results during the production chain about the chemical composition and the density of the material is crucial. A list of further available testing equipment was compiled:

- Scanning electron microscope (SEM) / Energy-dispersive X-ray (EDX) analyses
- Carbon, hydrogen, nitrogen, sulphur & oxygen elemental composition by catalytic combustion-pyrolysis
- Mineral composition by light microscopy
- Raman microscopy/spectroscopy – phase identification
- Determination of the metallic iron content
- Apparent density (Displacement of a liquid), for pellets and briquettes
- Nitrogen adsorption (BET; specific surface)
- Compressive strength tests
- Abrasion resistance (cylindric drum)
- Moisture content
- Water absorption capacity BS ISO 15968:2016

4.4.3 Next steps

The first results of the round robin test are already available. When all partners have finished their tests, the results as well as the preparation and testing method will be compared.

4.5 WP5 – Guidance for safe HBI handling and transport

4.5.1 Description and objectives

Recommendations for the HBI production will be given with findings of the project regarding the selection of pellets, the reduction process and the briquetting process and based on these findings elaborate recommendations to produce HBI. A ranking of the impact of the analysed parameters (pellet quality, carbon content, metallisation degree, HBI density) on reoxidation of HBI will be given. WP5 also comprises considerations about a possible scale-up of the briquetting tests. Furthermore, the impact of HBI production on dust formation will be evaluated by analysing the effects of HBI properties such as metallisation degree, chemical, morphological and physical characteristics on the dust formation during the briquetting process and the utilisation in a steel plant. Moreover, HBI C-Flex will prepare guidelines for HBI

handling and transport and discuss the meaning of the results and the consequences for the safe handling and transport of HBI. The influences of the parameters to thresholds of standard regulations such as the IMSBC (International Maritime Solid Bulk Cargoes) Code which requires HBI density >5,000 kg/m^3 for shipping internationally by sea will be compared. With hydrogen-based HBI, which could achieve a density of >5,000 kg/m^3 with lower moulding forces. Anyway, reactivity could be such that a threshold density of 5,000 kg/m^3 is not commensurate with adequate mitigation of the self-heating hazard. The specific objectives of WP5 are to:

- Deliver the findings of the trials and give recommendations for HBI production
- Evaluate the impact of HBI properties on dust formation
- Compare the results with standard regulations for the safe handling and transport of HBI

4.5.2 Status in month 6

This work package will start in month 25, nevertheless, all partners are involved in other work packages.

4.5.3 Next steps

No actions are planned in the following months.

4.6 WP6 – Dissemination, Exploitation and Communication

4.6.1 Description and objectives

In WP6 the Dissemination, Exploitation and Communication (DEC) plan is defined to be approved by the Consortium. The DEC plan is updated periodically and is used to monitor and control DEC activities. Quantifiable target values are used to focus on the identification of target groups, schedule dissemination and exploitation activities, communication channels and define the Key Performance Indicators (KPIs). The DEC plan also considers opportunities and goals for post-project dissemination of results. WP6 uses project results with the interest of partners and stakeholders. Individual business cases of the demonstrated HBI C-Flex results are developed in detail, considering market needs of products, techno-economics aspects. All partners play a key role in the DEC strategy. The support of IIMA and ESTEP is of utmost importance and their networks assure that all relevant target groups are addressed. The DEC plan will be made public via the HBI C-Flex website.

Exploitation activities for the HBI C-Flex results aim at an increased impact of the results in a wide industrial community and will ensure that a consensus is kept among partners to exploit the results. At least 2 exploitation workshops will be organised by K1-MET in coincidence with project meetings. Issues will be covered, such as identifying and analysing the exploitation potentials of results, identifying main risks for exploitation, discussing and validating the exploitation strategy, monitoring exploitation activities, and discussing IPR strategy & protection. The DEC plan will contain an exploitation strategy report on agreements among partners regarding each exploitable result.

The project is represented by a dedicated website being updated quarterly and provides broad information on the project outline and activity. The website contains links to consortium partners and proceedings of workshops, conferences and scientific publications ("open access"). Attention will be realised via press releases, brochures, newsletters, social media and videos. Guided tours to lab facilities will be offered to e.g., schools, universities, or representatives from politics. K1-MET will prepare and publish news at least once per quarter via the project web page. The aim is to provide information to relevant parties being necessary to highlight HBI reoxidation behaviour during its handling. Target values of communication activities (newsletters, social media activities etc.) will be reported and published periodically. The specific objectives of WP6 are to:

- Develop a dissemination, exploitation and communication (DEC) strategy and plan for different target groups and continuously execute DEC measures
- Analyse market perspectives, risks and opportunities for the uptake of solutions to guarantee the replicability of project results in the EU steel sector
- Define a suitable strategy for result exploitation focusing on IPR management among the partners
- Define potential risks for a successful result exploitation
- Carry out engagement and interaction activities with other relevant projects (RFCS, Horizon Europe/Clean Steel Partnership) and external key stakeholders

4.6.2 Status in month 6

In order to differentiate HBI C-Flex from other projects, a visual identity was developed comprising a logo, a colour scheme as well as templates for presentations, deliverables and meeting minutes. To ensure a consistent project appearance in all communication and dissemination channels, the logo and colour scheme will be incorporated into all promotional materials.

The DEC strategy carefully considers the specific interests of each target group. This ensures comprehensive and productive public relations throughout the project. The results will be disseminated online via newsletters, flyers, posts on LinkedIn, articles in newspapers and scientific journals as well as on the HBI C-Flex website and company websites. Events, workshops, trade fairs, guided tours and presentations will serve as physical communication venues. The DEC plan was prepared, and the consortium partners agreed upon it. A newsletter will be published twice a year summarising current activities. A double-sided foldable brochure provides an overview of the project, its motivation, objectives and consortium partners and will be handed out at physical events. In November, the LinkedIn account and the website were launched to communicate regular updates on the project's activities. The Deliverable 6.4 Communication and Dissemination Plan provides further information on the above-described activities. The deliverable will be submitted in December.

4.6.3 Next steps

The following actions are anticipated for the tasks included in this work package:

- IPR management plan:
  - Partners are asked to fill in their background knowledge as well as their potential contribution to the foreground project IP.
- The market analysis and exploitation activities:
  - Analysis of the existing HBI market as well as future trends, including deep-dive interviews with relevant stakeholders
  - Set up an exploitation-working group consisting of one person per partner
- Dissemination and Communication activities:
  - Regular publishing of information and the current project status on the homepage and on LinkedIn to increase the visibility of the project

5 Conclusion

In the 6th month of HBI C-Flex, the project has been progressing without any delays or deviations from the plan. The first deliverables were submitted on time and the first milestone has been achieved yet. As shown above, all work packages are well on track and the next steps are already planned.