



CIRCULAR MANUFACTURING SYSTEMS PROGRAM

Twente
Board

LEADING THE CHARGE IN SUSTAINABLE BATTERY MANUFACTURING

The Fraunhofer Innovation Platform at the University of Twente (FIP-AM@UT) has been awarded the management of the Circular Manufacturing Systems Program (CMSP), an initiative aiming to significantly improve battery manufacturing by enhancing sustainability, automation, and efficiency.

Advancing Sustainability in Battery Manufacturing

The CMSP is designed to address the urgent need for sustainable practices in the battery manufacturing industry. With a comprehensive approach that covers the entire lifecycle of battery modules and packs, the program aims to enhance circularity in this sector.

Activities of this initiative are supported by the Advanced Manufacturing Centre (AMC) at the University of Twente, providing state-of-the-art industrial equipment.

Leveraging Strategic Partnerships

Through initiatives supported by the province of Overijssel, Twente Board and projects like Manufacturing NextMaterials (MNM) in the framework of Interreg, the CMSP ensures a cohesive and effective approach to sustainability. Facilitated by a consortium of regional industrial partners, with potential international collaborations, the program focuses on various use cases within the energy storage sector.

Addressing Key Challenges

The CMSP tackles several persistent challenges in battery manufacturing. One significant challenge is designing battery packs that can be easily assembled and disassembled, even when damaged. Additionally, adapting to the evolving conditions and specifications of battery packs poses a significant challenge. The program also aims to maximise the reuse of battery modules in secondary applications, develop reliable health assessment methods for extended battery use, and integrate eco-design principles to mitigate environmental impact.



The main objectives of the CMSP are multifaceted. They include facilitating:



efficient disassembly and material recovery from spent battery packs,



innovating methods to adapt manufacturing processes to changing battery specifications,



and assessing and repurposing battery modules to maximize sustainability and extend their lifecycle.

Furthermore, the program aims to incorporate **eco-design principles** to minimize emissions and promote material circularity in battery production.

Use Case Spotlight: Advancing Energy Sustainability through Battery Repurposing

One example of a use case within the program involves **Riwald Recycling**, a division of ArcelorMittal, focusing on battery repurposing to advance energy sustainability.

Riwald Recycling encounters challenges in efficiently managing used lead-acid batteries from energy plants. Their goal is to repurpose these batteries for internal or external uses, such as solar parks. However, current challenges include sorting usable cells, designing a battery pack, and potential grid integration, highlighting the limited knowledge that exists on large-scale lead-acid battery repurposing.

To address these challenges, the program will concentrate on enhancing techniques to transform used batteries into functional battery packs suitable for various applications. This effort aims to promote circularity, alleviate grid congestion issues, and explore diverse industrial and modular uses for the battery packs.

Repurposing waste batteries into functional battery packs will not only contribute to circularity but also help alleviate grid congestion issues. This innovation opens avenues to serve new customer segments such as grid operators and industries requiring sustainable energy solutions. Furthermore, insights gained can foster new business models or even spawn startups, driving regional economic growth and sustainability.

Delivering Impact

The CMSP aims to produce tangible outcomes, including the implementation of a test production environment that showcases advanced battery module production and disposal techniques.

The program also seeks to demonstrate a significant reduction in waste and emissions throughout the battery lifecycle. Organising workshops and training sessions to disseminate best practices is a key component, along with engaging in international events to foster collaboration and share insights. Developing and implementing eco-friendly design and assembly solutions is another crucial objective, as is involving local companies to enhance cooperation and innovation. Creating design guidelines for sustainable battery pack assembly and disassembly is also a major goal.

Knowledge dissemination is a cornerstone of the CMSP. FIP-AM@UT will lead efforts to spread awareness and educate industry stakeholders. This includes maintaining a comprehensive CMSP program page on the FIP-AM@UT website, organising a series of seminars, workshops, and conferences, and utilising social media, press releases, and publications to reach a broader audience.

Looking Ahead

The Circular Manufacturing Systems Program (CMSP) represents a significant step forward in sustainable manufacturing, particularly in the battery sector. By focusing on circularity, automation, and eco-design, the CMSP aims to reduce environmental impact and promote resource conservation. With strategic partnerships and a comprehensive knowledge transfer strategy, the CMSP is set to make a lasting impact on the battery manufacturing industry and broader sustainability efforts. ■



If you would like to know more or are interested in getting involved through a use case or participating in existing ones, please contact FIP-AM@UT.