

# PYROCO<sub>2</sub>



Demonstrating sustainable value creation from industrial CO<sub>2</sub> by its thermophilic microbial conversion into acetone

## Results of the third year of project implementation

The PYROCO<sub>2</sub> Project is about to enter its fourth year of activities, and many results have been achieved by the consortium so far!

From September 25-27, the consortium gathered in Stavanger, Norway, for the M36 project meeting, where the partners reviewed and discussed the progress made toward the project's goals. The meeting explored the results obtained in each work package, highlighting the next steps for the coming months.



During the event, the consortium had the opportunity to visit the demo plant and host several breakout workshops. These included sessions led by NORCE, AGAIN, RANIDO, KIT and CiaoTech. During each workshop, specific objectives and actions were identified and discussed.

Do you want to know more about the status of the activities?

Check out the 6<sup>th</sup> issue of the PYROCO<sub>2</sub> newsletter to uncover the progress made by the partners.

Remember to follow PYROCO<sub>2</sub> on [LinkedIn](#) and [Twitter](#) to be up to date with the project progress at all times!

## FEEDSTOCK PREPARATION AND PROVISION

The team has identified several relevant suppliers of the major feedstocks and are collaborating closely in planning the Demonstrator establishment at Herøya Industripark (Porsgrunn, NO). As expected, the Demonstrator establishment steadily incorporates relevant findings from the other technical activities, and the project is beginning to converge as the tenders for feedstock and equipment are published.

## **FROM FEEDSTOCK TO ACETONE: BIOPROCESS DEVELOPMENT & OPTIMIZATION (DEMONSTRATOR)**

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Within WP2 the key focus of the third year has been the commissioning and operation of the pilot plant. With this key milestone in scale up, we focus on further process integration to continually improve process metrics and outlooks as we scale further to the demonstrator. In parallel, the microbial cell factories are continuously improved, allowing us to tailor the key microbial catalysts to the final process requirements at scale.

## **FROM ACETONE TO MARKETABLE PRODUCTS: CHEM-CAT DEVELOPMENT & OPTIMIZATION**

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Processing acetone to hydrocarbons for use in liquid fuel applications is one of the goals of the PYROCO<sub>2</sub> project. Aldol condensation followed by hydrogenation/hydrodeoxygenation is an effective method for converting acetone into valuable compounds. This process involves key steps of ketone condensation, dehydration, hydrogenation, and hydrodeoxygenation, with catalysts and conditions tailored to achieve optimal results. In recent tests, batch experiments showed high acetone conversion and selectivity for target compounds, while continuous reactor tests indicated that switching from nitrogen to hydrogen significantly changed the product profile. Ongoing work aims to fine-tune conditions to further enhance selectivity, aligning with Task 3.5 objectives.

## **OVERALL PROCESS DESIGN, INDUSTRIAL SCALE-UP AND DEMONSTRATION (DEMONSTRATOR)**

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The full demonstrator design is completed accounting the design of feed tanks, bioreactors and product separation units. The plant layout (2D) has been produced and later re-design to achieve a lesser footprint. A preliminary 3D has also been produced. The tender process for the equipment has also been started and is ongoing. The project team have taken important steps towards the implementation the process design into Herøya Industrial Park, including electrical load, specifying the utilities needed and orientating plant-demonstrator the on the ground. The first aspects of the engineering of the civil infrastructure have also been completed.

## PROCESS INTEGRATION AND SUSTAINABILITY ASSESSMENT

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WP5 is working on process integration and sustainability assessment. As the conceptual process design is key for process assessments, we were able to include first larger-scale experimental results from WP2 in the conceptual process design models. Thus, both, a first, preliminary environmental LCA assessment and a first social LCA questionnaire round provided insight into the effects of the demonstrator process design and guided finalization of the demonstrator process model. With all the information of WP5 on the demonstrator process concept, we were able to hand over to WP4 towards tendering. With this fixed set of input parameters, different process concepts for different PYROCO<sub>2</sub> process locations were developed. As the WP5 tasks of LCC, eLCA, sLCA and TEA are on a common base of assessment, we concluded on scenarios and process concepts to apply. Finally, we exchanged on the M36 project meeting methodology as used in preliminary assessments to better align and being ready for the final assessments of both the PYROCO<sub>2</sub> demonstrator and further CCU Hubs, as information provided by WP6.

## EXPLOITATION, REPLICATION, COMMUNICATION AND DISSEMINATION

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In recent months, CiaoTech has been advancing the preparation of PYROCO<sub>2</sub>'s Preliminary Business Plan, to assess its commercial viability, position it within the market, and define the path to commercialisation. During the M30 consortium meeting, CiaoTech organized and chaired a Business Plan Workshop with project partners, a collaborative brainstorming session to help characterise key aspects of the project business plan, its value proposition, costs & revenues structure, etc. Strategic business tools have been applied to refine the plan. AXELERA, key organisation for fostering the replication of the PYROCO<sub>2</sub> technology, has completed and submitted the "Roadmap and Investment Plan for Replication of a CCU Hub in Europe", leveraging insights from the AURA region (Auvergne-Rhône-Alpes), France's leading chemical production area and the 7<sup>th</sup> in Europe. AXELERA also coordinated a meeting with major CO<sub>2</sub>-emitting companies and is working with clusters like AVENIA and ENVIPARK to support replication, providing vital information to derisk CCU hub investments. CiaoTech has further boosted the project's visibility through updates to the website and social media, now reaching over 700 followers. Collaboration with EU projects has strengthened, with a [joint article published with ECOFUEL](#) in June 2024. PYROCO<sub>2</sub> will also be showcased at key events like IFIB 2024, CO<sub>2</sub> Value Days, and Ecomondo 2024.

# PYROCO<sub>2</sub> TOOLBOX: EMPOWERING THE GROWTH OF CCU HUBS ACROSS EUROPE

AXELERA is engaged in the Task 6.3 “Derisking and Market Readiness in four emerging CCU hubs for Replication.” The objective of this task is to facilitate the emergence of CCU hubs.

In the context of PYROCO<sub>2</sub> project, one of the objectives of AXELERA is to facilitate the emergence of local CCU hubs, first in the AURA valley region, and then elsewhere in the most promising locations across Europe. To do so,

AXELERA created a [toolbox](#) to enable replication of the best practices and to facilitate the emergence of systemic CCU hubs and related investments. Partner clusters will have the possibility to use the content of this toolbox to engage their local stakeholders. Most of the tools provided could be also adapted to the country and local market.

The toolbox is divided into 7 files regrouping the most significant information to understand:

1. CCU in the EU market
2. EU Regulations
3. Existing technologies
4. Fundings opportunities
5. Replication of CCU hubs in other regions
6. Roadmaps (business cases)
7. HR Trainings
8. Enjoy reading!



Want to learn more about PYROCO<sub>2</sub>?  
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## PYROCO<sub>2</sub> Partners



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