KYKLOS 4.0 newsletter #7

KYKLOS 4.0 – https://kyklos40project.eu

October 2023

An Advanced Circular and Agile Manufacturing Ecosystem based on rapid reconfigurable manufacturing process and individualized consumer preferences.

In this edition of the KYKLOS 4.0 Newsletter, discover the latest news about the 2nd round of the **KYKLOS 4.0 Open Calls** and recent KYKLOS 4.0 **communication and dissemination activities**.

KYKLOS 4.0 **Open Call #2**

We are thrilled to bring you the latest edition of the KYKLOS 4.0 Project Newsletter, highlighting the exceptional progress and solutions that have emerged from our funded experiments. As we continue to pave the way for circular economy solutions, we're excited to share with you the remarkable outcomes achieved by our sub-granted projects.

We are proud to announce that the KYKLOS 4.0 Project's dedication to promoting circular economy principles is yielding important results. Our funded experiments have not only demonstrated the feasibility of circular practices but have also provided tangible solutions that address real-world challenges. Here's a sneak peek at some of the exceptional projects from KYKLOS 4.0 Open Call #2:

ANATOLIA

ANATOLIA is delivering a predictive maintenance tool for PV (photovoltaic) plants. The tool is a set of tools under one framework and builds upon components of KYKLOS 4.0 circular economy services. The main goal of ANATOLIA is to facilitate energy efficiency in the pilot areas of PV plants with clear circular economy indicators. ANATOLIA's innovation lies in its use of high-resolution weather intelligence tools at the site location and exploring satellite data to replace expensive on-site instruments. By doing so, it provides the necessary information to plant operators in a scenario in which they are supported with a Decision Support System (DSS). ANATOLIA increases energy efficiency and sustainability in the PV industry through the implementation of its predictive maintenance tool.

ARACOWELD

ARACOWELD uses augmented reality technology to allow features such as contextual or on-the-spot training, real-time operator machine/process monitoring, and simple operator task confirmations and malfunction reporting in the context of welding using collaborative robots. The sub-granted project is utilizing the AR-based content editor for the creation of step-by-step operative workflows, ensuring the complete training of the operator to proficiently perform a task. Moreover, ARACOWELD also uses the AR-based reconfiguration tool to implement a virtual panel, enabling seamless monitoring of the welding process.

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The project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 872570

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ARETRO

ARETRO developed and validated an AR web-based interface constructor that enables the design, creation, and customization of AR interfaces for an industrial machine/product, simply by using a web browser and drag-and-drop functionality, no code required. It simplifies the construction of Augmented Reality interfaces that add new layers of information, effectively expanding the machines capabilities that were not available when the machines were originally designed and built. ARETRO uses KYKLOS 4.0 Augmented Reality content services and a Maintenance Scheduler component that fits into the overall goal of ARETRO.

ATILIUS

The ATILIUS project goal is the design, manufacturing, and testing of the fluidic subsystem of REGULUS-50-I2, a space plasma thruster for small satellites and CubeSats. The new ATILIUS design enhances the efficiency of operations, and printability, lowering the environmental impact by using powders produced from scrap. KYKLOS 4.0 services are used to monitor the impact and the processes. More specifically, the Rapid Prototyping Module is used to verify and enhance the printability of the first breadboard by controlling the chosen parameters. The whole process is monitored through the LCA Simulations Engine to quantify the environmental impact of the production and of the product.

CE4Con

The goal of the CE4Con project is to develop a new range of services to support building envelope components (BECs) manufacturers in the design and production of new products with recycled composite materials as well as in offering end-of-life construction products and components that can be reused and recycled to generate new entities and materials. More specifically, CE4Con assists in the selection of appropriate materials for the process/product under development considering sustainability aspects and offers support for waste description, material auditing, product disassembly, and material pre-treatment to facilitate recycling. KYKLOS 4.0 components are the key to supporting manufacturing companies along the design and end-of-life phases. CE4Con uses the PLM module, the LCA Simulations Engine and Blockchain based Auditing Platform.

DLP4CME

DLP4CME project objective is designed to provide end-to-end traceability, transparency, and trust of every manufactured product during its life cycle in an edge-based decentralized circular supply chain. Furthermore, Digital Lifecycle Passport allowed us to build secure human-oriented data-driven analytics services on top (ground-to-cloud) trusted data collected from a decentralized secure edge network deployed across the manufacturing supply chain. To accelerate the prototype development, testing and validation processes and reduce the time-to-market of future versions improving the project's results, DLP4CME has selected two technical components from the KYKLOS 4.0 collaborative platform: the blockchain-based auditing platform and the web 3D Modelling Component.

DYBLI-ML

DYBLI-ML provides a user-friendly MLOps solution for fault detection in electric motors for industrial production lines, with a long-term vision of a device-agnostic ML dashboard to predict failures. The project built a community ecosystem for exchanging trained ML models, reducing redundant work, and improving accuracy.

KYKLOS 4.0 provides the ML models in Data Reduction Techniques & Fault Dependency Model and the Deep Learning Toolkit in, which can be added to DYBLI-ML full-fledged IoT platform, Monidas. This enhances their solution and allows for dynamic model storage and retraining pipeline. The Maintenance Scheduler provided by KYKLOS 4.0 enables real-time support and validation of their ML models, ensuring that the solution is accurate and reliable.

EasyPrint

EasyPrint provides a smart design service to develop personalized products following an environmentally friendly process. The EasyPrint platform enables customer-oriented design for additive manufacturing products where customers provide specific requirements for a single customized product and 3D printing manufacturers convert them into product specifications.

The project integrates the Web3D Modelling Component for product customization and visual simulation and tests the Rapid Prototyping Module to provide the best possible combination of materials, processes and specifications submitted by the user. The LCA Simulations Engine is tested to measure the environmental impact of the products and services across all life cycle stages, so as to suggest to the user the most eco-friendly product configuration.

ERMES

The ERMES solution enhances and optimizes maintenance service of production equipment/machine tools through seamless integration of AI-powered process mining techniques and smart scheduling. The final goal is setting up process paths that require minimal costs, resources, and time. The project selected the Maintenance Scheduler component to support the experiment in improving the downstream tasks.

MaChAwAI

MaChAwAI aimed at easier, safer, faster, and accurate out-of-laboratories material testing improved by AI to accelerate materials innovation and building growing trust in new materials and applications. The project is integrating the Rapid Prototyping Module.

MainSol

MainSol creates a new generation of the predictive maintenance solutions for middle-sized solar power plants which uses the advanced AI and data analytics methods for predicting/analyzing not only the trends in generated solar energy, but also the status of the entire solar and manufacturing infrastructure enabling a holistic predictive maintenance. The solution adopts KYKLOS 4.0 services and components from the category Product Optimization, in particular Predictive Maintenance service in order to enable advanced data analytics for industry 4.0, leading to more informed decisions. The LCA Simulations

Engine component is used for enabling LCA-based calculation over the real-time data. It extends existing AI-based services on streaming data (namely, fast thinking - a service for detecting unusual behavior) with the product life cycle context.

POET4POEM

POET4POEM developed and validated three software components for manufacturing operations management: (1) resources, energy, and scrap tracker, (2) planning and scheduling component which minimizes the energy usage and maximizes reuse of scrap, (3) energy, resources and produced scrap anomalies monitor to plan maintenance operations. The project uses three KYKLOS 4.0 components that help the system with monitoring of the Footprint (LCA Simulations Engine), establishing reliable communication (KYKLOS 4.0 Back-End) and authorization (KYKLOS 4.0 identity provider).

PUMP

PUMP applies energy monitoring tools and advanced Machine Learning models to analyze the patterns in electrical loads of machinery equipment, disaggregate component loads and detect deviations from normal operations in a food processing plant, aiming for energy efficiency and maintenance planning optimization, enhancing its circularity approach. PUMP utilizes various KYKLOS 4.0 technical components, combining them with the already developed tools and technologies of the PUMP partners to maximize the efficiency and enhance the overall solution. More specifically, the LCA Simulations Engine component, the Maintenance Scheduler, and the Decision Support System.

RoboWeldAR

RoboWeldAR is an innovative, self-navigating robotic welding solution that revolutionizes the ship newbuilding and repair industry by automating highly custom tasks in agnostic environments and by performing high quality and safe welding tasks, while providing technicians with the ability to monitor and easily insert custom welding trajectories. The project uses KYKLOS 4.0 Front end, AR-based content editor and AR based re-configurator tool to design the solution, visualize it and display sensor information to the operator of RoboWeldAR.

ROCTex

ROCTex focuses on the textile industry and on garment manufacturing, developing a digital solution that enables producers to increase their energy efficiency and their agility, reduce their waste during production and collect data across the product life cycle to enrich its digital product passport. ROCTex adopts the Monitoring and resource optimization with Decision Support System of KYKLOS 4.0 and leverage three promising components, namely: the LCA Simulations Engine, the Data Manager and the Decision Support System in order to accelerate the digitalization of the industry, the majority of which consists of small businesses with limited resources. These components allow them to develop more holistic services and explore various hypotheses simultaneously.

SMARTER-MAN

SMARTER-MAN consists of a disruptive digital industry 4.0 solution for smarter manufacturing of elastic cords and will bring major benefits to the textile industry like reduced lead times and machine downtime with improved asset utilization, less waste generated and lower manufacturing labor costs, and

ultimately an optimized product quality leading to enhanced price-performance ratio of the new added value products to sell to the targeted customers, with greater delivery reliability.

VirtFuse

VirtFuse develops an edge-based digital twin model of vacuum infusion in the next generation of manufacturing companies. More specifically an RGBT (RGB+Thermal) camera records video of the resin vacuum infusion system (RVIP). The video is converted into discrete features (heat and movement). The data from these discrete features, temperature sensor and curing level sensor are gathered for the AI training. The dashboard shows the optimized catalyst/resin ratio for the next infusion cycle. An AI model does this prediction which needs an appropriate dataset to be trained. VirtFuse integrates the Decision Support System component, the LCA Simulations Engine and Maintenance Scheduler.

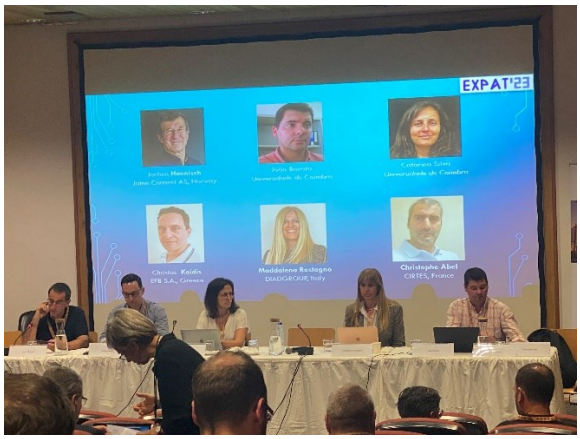
The KYKLOS 4.0 Project is dedicated to advancing circular economy solutions that reshape industries and contribute to sustainability. Each funded experiment is a testament to the power of collaboration, innovation, and commitment to a greener future. We encourage you to explore the detailed project profiles on our website and gain insights into how these experiments are making a significant difference.

KYKLOS 4.0 **Events**

During the last months, the project consortium partners participated in several workshops and events to promote KYKLOS 4.0 solutions and achievements, and to exchange knowledge with the research community and industry stakeholders. Get an idea below:

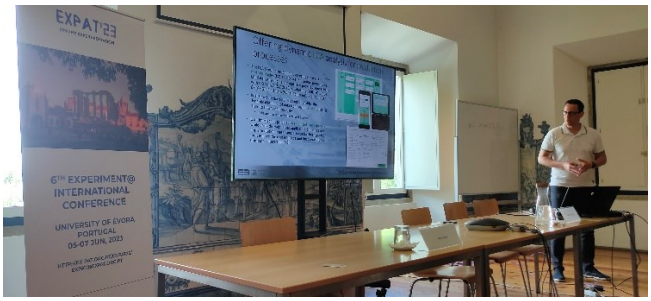
EXPAT'23

KYKLOS 4.0 participated in the 6th Experiment@ International Conference (EXPAT'23) that took place in Evora, Portugal 05-07 June 2023. KYKLOS 4.0 organized a panel session titled "Data-Driven Circular Manufacturing" which focused on the industry 4.0 technologies paving the way to circular manufacturing and contributing significantly to reduce all forms of waste. The panel, moderated by project coordinator Mr. Jason Mansell (TECNALIA), consisted of representatives from project partners JOTNE (Jochen Haenisch), CIRTES (Christophe Abel), DIAD Group (Maddalena Rostagno), University of Coimbra (João Barata and Catarina Silva) and EFB (Christos Koidis) who discussed about the benefits of circular manufacturing and the challenges and opportunities of business ecosystems operating with real-time data. More information can be found here.



Photos from KYKLOS 4.0's "Data-Driven Circular Manufacturing" panel session.

Also, in "Smart Industry & Sustainability" session, Jason Mansell (TECNALIA) presented the project's solutions and achievements, while EFB and UC represented by Christos Koidis and Lorena Petrella, provided insights on KYKLOS 4.0's Life Cycle Assessment (LCA) and Fault Diagnosis services, respectively.



Photos from "Smart Industry & Sustainability" session presenting KYKLOS 4.0 solutions and achievements.

The Manufacturing Partnership Day

KYKLOS 4.0 participated in the Manufacturing Partnership Day event organized by EFFRA on September 26th. In KYKLOS 4.0 booth we displayed communication materials referring to the project as well as a video promoting KYKLOS 4.0 solutions and benefits. In the presentation session, Jason Mansell, project's coordinator who represented KYKLOS 4.0 in the event, highlighted the contribution KYKLOS 4.0 Circular Manufacturing Framework to circularity towards creating a sustainable path for circular manufacturing. More information about the event can be found here.

Photos from KYKLOS 4.0's presence at "The Manufacturing Partnership Day".

Snapshots of KYKLOS 4.0 video presented at "The Manufacturing Partnership Day".

KYKLOS 4.0 **Final Event**

Since the introduction of the EU Circular Economy Action Plan (CEAP), the European Union (EU) has been committed to transitioning towards an increasingly Circular Economy (CE). The relevance of a circular economy has grown within the EU's policy framework, particularly with the implementation of the European Green Deal, which outlines a roadmap towards a sustainable economy and society. As a key component of the European Green Deal, the new CEAP, adopted in 2020, serves as the European Commission's (EC) response to pressing issues of energy and material inefficiency that have significant environmental impacts.

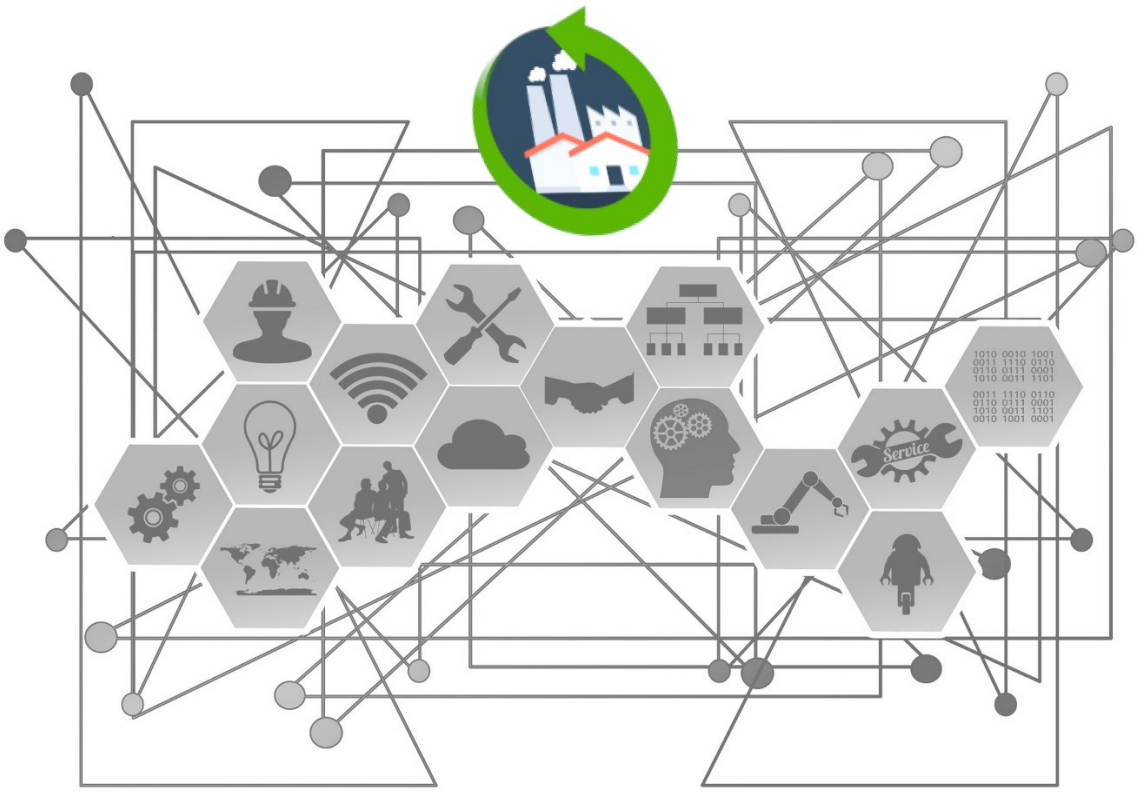
At the forefront of advancing EU policies towards a Circular Economy, KYKLOS 4.0 has emerged as a successful project funded by the EU's research and innovation program Horizon 2020. The KYKLOS 4.0 innovative Circular Manufacturing (CM) Ecosystem is built on cutting-edge cyber-physical systems (CPS) and Artificial Intelligence (AI)-based technologies, incorporating novel production mechanisms and algorithms. Its goal is to produce personalized products with extended life cycles while enabling energy-efficient and low-material-consumption production processes, leading to reduced greenhouse gas emissions and air pollutants. Through testing in eight large-scale pilots, the KYKLOS 4.0 Ecosystem has demonstrated its technical, environmental, and economic viability, reshaping intra-factory processes and services.

At the KYKLOS 4.0 Final Event, the key achievements of the project will be showcased. Participants will be able to delve into the KYKLOS 4.0 Ecosystem, which paves the way for circular manufacturing by enabling the redesign and upgrading of production processes for enhanced sustainability and efficiency. The audience will also learn about the KYKLOS 4.0 KPIs on environmental impact, productivity, and circularity, as well as how these metrics combined to cutting-edge technologies empower informed decision-making and contribute to more sustainable manufacturing processes. Finally, KYKLOS 4.0 will introduce the KYKLOS 4.0 Marketplace offering advanced CM solutions based on sustainability criteria.

The event will also focus on the successful knowledge transfer and capacity-building initiatives undertaken by KYKLOS 4.0. In addition to the project's own pilots, a €3 million cascade funding program has supported over 50 EU-based third parties, enabling them to interact with the KYKLOS 4.0 Ecosystem and successfully integrate its cutting-edge technologies. By bringing together actors and beneficiaries across the value chain, the project has facilitated the adoption and customization of digital technologies by suppliers within their respective environment.

Join us at the KYKLOS 4.0 final event and witness the transformative power of collaborative innovation and technology adoption in shaping a more sustainable future for manufacturing industries!

For more information and registration: https://kyklos40project.eu/kyklos-40-event/



Download KYKLOS 4.0 updated presentation, leaflet, and poster

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