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Life-cycle optimization of industrial energy efficiency by a distributed control and decision-making automation platform

Repository of BP on Energy Efficiency

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INTRODUCTION

In the ever-evolving field of industrial sustainability, the push towards energy efficiency represents both a significant challenge and a substantial opportunity for the manufacturing sector worldwide. Recognizing the critical importance of this issue, a consortium of industrial, academic, and research entities has embarked on a concerted effort to establish a comprehensive repository of best practices dedicated to enhancing energy efficiency across various manufacturing landscapes.

This initiative, spearheaded by a collaboration of experts, is not just an aggregation of theoretical knowledge but a practical guide born out of real-world applications, innovations, and solutions tested across diverse manufacturing environments. The goal is to democratize access to advanced knowledge and methodologies that can lead to significant reductions in energy use, mitigate environmental impacts, and foster sustainable practices within the industry.

The foundation of this repository rests on a multi-dimensional methodology that values practical applicability, collaborative insights, and the flexibility to cater to a broad spectrum of manufacturing processes. It stands as a evidence to the collective wisdom, dedication, and innovative spirit of the contributing partners, pooling together their extensive knowledge and experiences to create this essential resource.

BEST PRACTICES AND RELEVANCE TO LIFECYCLE PHASES and STAKEHOLDERS

	Distribution	Manufacturing	Plant manager	Commercial department	Store Manager	Transport Manager	Factory Owner	OT Maintenance	Production section	Warehouse manager
										

ENERGY EFFICIENCY IN DEMAND FORECASTING AND PRODUCT ASSORTMENT

1.Demand forecasting and assortment optimization with carbon footprint evaluation

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ENERGY-SMART INVENTORY MANAGEMENT

2.Inventory optimization with LCA

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3.Inventory sharing with waste and overstock reduction

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TRANSPORTATION EFFICIENCY AND CO₂ REDUCTION

4.Calendars and transportation optimization with CO₂ emission assessment

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PRODUCTION PROCESS AND ENERGY CONSUMPTION OPTIMIZATION

5.Energy data measurements and analysis

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6.Product – process correlations

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7.Digital twinning and process optimization

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8.Cogeneration system optimization

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9.Plant life cycle assessment and control (LCAC)

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METHODOLOGY

In order to establish a repository of best practices, a procedural methodology was adopted starting from existing activities on energy efficiency (EE) and business best practices and ensuring a systematic and efficient approach to recognizing and categorizing best practices across various industries.

1. EE Principles Integration and Analysis: The process begins with an analysis and integration of the defining principles of best practices within the manufacturing sector. This foundational step ensures that the repository reflects the latest conceptual understandings.

2. Stakeholder Engagement: Following principal integration, the methodology involves collecting application cases through engagement with partners and stakeholders. This step is crucial for acquiring a wide range of practices from which best practices can be identified.

3. Selection of Best Practices: This phase focuses on evaluating the collected practices to separate genuine best practices from more common procedures. Only practices that meet the established criteria are selected.

4. Elaboration and Categorization: Selected best practices are then elaborated upon and organized into macro-areas related to their industries. This organization helps in structuring the information in a manner typical for database building in the sector.

5. Repository Construction: The final phase involves constructing a digital repository that houses these validated best practices, designed for easy access and practical implementation.

The created repository summarizes the key findings from E2COMATION experience over 4 years of activities, especially relying on activities undertaken at pilot sites: KEAS and ROYO (furniture manufacturing sector), MAHOU (beverage sector), and CONDIS (distribution sector).

The Best Practices, conceived using the experience and inputs from these four pilots, are not limited to the reference factories, but they have been designed with a view to be relevant in other applications and industries. By working on-site and implementing the solutions developed by the project, the E2COMATION team had the opportunity to validate its methodology and

measures in a real environment and, where necessary, to undertake corrective actions.

To create this repository, we a set of specific qualifying principles was defined, essential in ensuring that each practice not only meets the criteria for effectiveness and applicability but also aligns with broader goals of sustainability, innovation, and regulatory compliance within the manufacturing industry:

1. Replicability: This principle evaluates whether a best practice can be applied not just within the initial sector but also adapted for use in other sectors. It emphasizes the practice's potential for wide-ranging impact across the manufacturing industry.

2. Efficiency: Best practices must demonstrate clear performance enhancements over conventional processes. This involves showcasing tangible improvements in energy usage, operational efficiency, or resource utilization, contributing directly to the overall sustainability of manufacturing operations.

3. Innovation: The focus here is on the application of novel organizational and business models or the integration of cutting-edge technologies. Practices considered innovative are those that offer new solutions or approaches to existing challenges, potentially setting new standards in energy efficiency.

4. Market Compliance: It is crucial that best practices are viable within current market conditions. This principle ensures that practices not only offer an economic return but also are realistically implementable within the existing economic and industrial framework.

5. Relevance: This ensures that best practices highlight the advantages of sustainability and cost savings over traditional approaches. Practices should make a compelling case for their adoption based on their environmental and economic benefits.

By basing the selection and definition of best practices on these qualifying principles, the goal is to compile a repository that serves not only as a benchmark for energy efficiency but also as a practical guide for the manufacturing industry. This guide will assist in navigating the complexities of implementing sustainable and efficient practices. This strategy ensures that the advocated practices are not only innovative and effective but also aligned with the real-world constraints and opportunities encountered by the industry.



ENERGY EFFICIENCY IN DEMAND FORECASTING AND PRODUCT ASSORTMENT

#1 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

DEMAND FORECASTING AND ASSORTMENT OPTIMIZATION WITH CARBON FOOTPRINT EVALUATION

The primary challenge in developing an advanced demand forecasting and product offer planning system is integrating diverse datasets like historical sales, consumer preferences, product attributes, and carbon footprint assessments. This integration requires sophisticated technology and advanced analytics. Moreover, there's a need to balance maximizing profits and customer satisfaction with reducing environmental impact. A key task is identifying and promoting substitutable products with lower carbon footprints, as products with higher footprints typically consume more energy throughout their lifecycle. The challenge lies in achieving business goals while supporting environmental sustainability.

PRACTICAL SOLUTION

In the E2COMATION project, practical experience was gained with the partner CONDIS using advanced demand forecasting systems that integrate carbon footprint evaluations into product offer planning. This initiative involved classifying products by their CO2 emissions using Life Cycle Assessment (LCA) techniques. This approach enabled CONDIS to optimize their assortment by promoting products with lower environmental impacts.

STAKEHOLDERS:



Store Manager



Commercial Department

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★

MARKET

In the retail market, this best practice fosters economic returns through increased material recycling. This is a result of considering the entire carbon footprint of the final unit of product (package included).



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS

The product mix of the total commercial offering aligns with the total customer demand in terms of product needs and preferences, indicating that the proposed solution is economically sustainable. Additionally, it evaluates the CO2 emissions of the entire product assortment and suggests alternative products with similar characteristics but lower carbon footprints.



LEVERS

Technical: Data availability & Data quality

Technological: Availability of efficient hardware for calculation

Behavioral/cultural: Managerial attitude to adopt new solutions.



METHODOLOGY

Use of advanced demand forecasting systems and product offer planning, incorporating carbon footprint assessments.



TOOLS/TECHNIQUES

Technology elements: Math-optimization model, Optimization algorithm.

Business specific elements: Product carbon footprint classification through LCA.

PHASE OF LIFECYCLE:



Distribution

SECTOR OF REFERENCE:



Retail



ENERGY-SMART INVENTORY MANAGEMENT

#2 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

INVENTORY OPTIMIZATION WITH LCA

Optimized inventory management presents a challenge in ensuring products are available in the right quantities at the right time, crucial for minimizing working capital and reducing waste and energy consumption. This system must integrate a Life Cycle Assessment (LCA) of electric energy used in handling operations tailored to various product categories such as fresh items, meat, beverages, and dry products. Such integration shows how warehouse energy consumption is linked to broader supply chain activities, including transportation and manufacturing. The challenge is to manage product flow efficiently to prevent overstock and congestion, which lead to increased energy use and operational inefficiencies.

PRACTICAL SOLUTION:

In the E2COMATION project, CONDIS implemented an advanced demand forecasting system that integrates carbon footprint assessments using Life Cycle Assessment (LCA) techniques. This approach enabled them to classify products based on their CO2 emissions. Thanks to this innovation, CONDIS was able to optimize their product assortment by promoting those with lower environmental impacts. The main goal was to minimize the carbon emissions associated with each product, considering the entire lifecycle from production to disposal.

STAKEHOLDERS:



Warehouse Manager

BENEFITS:

ENVIRONMENTAL ★★ ★

ECONOMIC ★★



MARKET:

In the retail market, this best practice fosters economic returns through:

Better orders management to suppliers in terms of costs of the orders.

Spending less energy (or better use of current available energy) for inventory operations.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

Through an inventory optimization approach, it can be determining the optimal reorder policy to ensure a smooth flow of products, resulting in energy savings in handling and storage. This approach reduces peaks in incoming quantities, lowers average inventory levels, and maintains desired service levels. As a result, there is reduced exposure to unnecessary stock arrivals and less waste, lower energy consumption for product management (handling, storage, cooling), and availability of products when needed.



LEVERS:

Technical: Data availability & Data quality
Technological: Availability of efficient hardware for calculation

Behavioral/cultural: Managerial attitude to adopt new solutions.



METHODOLOGY:

Optimized inventory management integrating CO2 emissions assessments through Life Cycle Assessment of electric energy for individual handling operations within the warehouse.



TOOLS/TECHNIQUES:

Technology elements: Math-optimization model, Optimization algorithm

Business specific elements: Flexible inventory management system, Continuous Improvement practices

LIFECYCLE PHASE:



Distribution

REFERENCE SECTOR:



Inventory

#3 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

INVENTORY SHARING WITH WASTE AND OVERSTOCK REDUCTION

The inventory sharing module bridges the gap between manufacturers and distributors, ensuring alignment with commercial constraints and product availability to minimize stockouts or excess inventory. However, it also models CO2 emissions for each unit of overstocked or unsold products, highlighting the environmental costs of supply chain inefficiencies. This system emphasizes the need for sustainable practices by reducing waste and energy consumption in storage and refrigeration, thus tackling both commercial efficiency and environmental impact.

PRACTICAL SOLUTION:

In the E2COMATION project, CONDIS implemented a solution involving an inventory sharing module that connects producers and distributors within a single framework. This system facilitates coordinated optimization, simultaneously reducing stock levels and minimizing CO2 emissions. This innovative approach addresses both commercial efficiency and environmental sustainability, effectively reducing waste and energy consumption associated with excess inventory and inefficient storage practices.

STAKEHOLDERS:



Commercial Department



Plant Manager

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★



MARKET:

In the distribution sector, the best practice in inventory sharing can contribute to reduce inventory cost and mitigate operations risk, with its corresponding economic advantages.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

The main environmental impacts are related to the reduction of carbon emissions and reduction of generated waste in the form of unsold products. The social impacts are mainly associated with the improvement of the supply chain resilience due to the use of shared information between different actors.



LEVERS:

Technical: Data availability & Data quality
Technological: Availability of efficient hardware for calculation
Behavioral/cultural: Managerial attitude to adopt new solutions.



METHODOLOGY:

Collaboration between manufacturer and distributor to align orders with commercial constraints and product availability, promoting sustainable practices.



TOOLS/TECHNIQUES:

Technical: Data availability & Data quality
Technological: Availability of efficient hardware for calculation
Behavioral/cultural: Managerial attitude to adopt new solutions.

LIFECYCLE PHASE and REFERENCE SECTOR:



Distribution



TRANSPORTATION EFFICIENCY AND CO₂ REDUCTION

#4 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

CALENDARS AND TRANSPORTATION OPTIMIZATION WITH CO2 EMISSION ASSESSMENT

The issue at hand centers on optimizing routes to curtail emissions and augment resource utilization. Vehicles are classified based on their CO2 emissions, adhering to European or national standards, and the CO2 emissions per vehicle route are now a crucial metric to minimize. This strategy integrates strict adherence to emissions regulations, vehicle load optimization, and the embrace of sustainable alternatives, thereby serving dual purposes: bolstering economic efficiency and fostering environmental sustainability. The environmental footprint is an intricate outcome of multiple interdependent factors such as distance traveled, vehicle class emissions, vehicle capacity, and traffic conditions. This holistic approach not only addresses immediate environmental concerns but also sets a precedent for sustainable practices in transportation logistics.

PRACTICAL INNOVATION:

In the E2COMATION project by CONDIS, key environmental solutions include:

Categorization of Vehicles by CO2 Emissions: Vehicles are classified by their CO2 emissions following European or country-specific standards.

Assessment of CO2 Emissions per Vehicle Route: The project aims to minimize CO2 emissions for each vehicle route, integrating this goal into route planning.

These initiatives enhance sustainability in transportation logistics, balancing environmental impact with economic efficiency.

STAKEHOLDERS:



Transport Manager - Planner

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

MARKET:

In the retail market, this best practice for transportation operations supports the economic return in term of “less km, less fuel, less maintenance”.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

By enhancing solution quality, significant reductions in CO2 emissions can be attained. This includes reducing the number of vehicles, decreasing travel distances, and achieving near-100% vehicle capacity utilization. Moreover, by expediting the optimization process, which reduces server computation time, this method can further contribute to lower energy consumption and decreased CO2 emissions from data centers.



LEVERS:

Technical: Dynamic fleet availability, Data availability & Data quality

Technological: Availability of efficient hardware for calculation

Behavioral/cultural: Managerial attitude to adopt new solutions.



METHODOLOGY:

Optimization of routes and emissions reduction, vehicle categorization by CO2 emissions, assessment and minimization of CO2 emissions per vehicle route.



TOOLS/TECHNIQUES:

Technology elements: Math-optimization model, Optimization algorithm.

Business specific elements: Vehicle emission category classification.

LIFECYCLE PHASE:



Distribution

REFERENCE SECTOR:



Transportation



PRODUCTION PROCESS AND ENERGY CONSUMPTION OPTIMIZATION

#5 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

ENERGY DATA MEASUREMENTS AND ANALYSIS

Retrofitting aging industrial equipment with advanced energy measurement capabilities presents a significant challenge. The integration involves incorporating new meters and sensors into existing systems, adhering to IoT standards like MQTT and OPC-UA. This process must be managed without interrupting production continuity, using lightweight software that aggregates data from both real and simulated sensors, minimizing the need for additional physical meters. The architecture includes multiple layers that facilitate data analysis and can be accessed through APIs, enabling the implementation of sophisticated services. This complex setup is essential for gaining accurate insights into each component's energy consumption on the production line, crucial for enhancing energy efficiency and awareness without disrupting operational flow.

PRACTICAL INNOVATION:

In the E2COMATION project at MAHOU, a new solution has been implemented to integrate energy measurement systems into industrial operations. This solution features a layered architecture that allows for the gradual addition of services, ensuring scalability and adaptability. Importantly, it accommodates legacy devices that are not IoT-ready, enabling them to be incorporated into the data acquisition system. This innovative approach allows older equipment to connect seamlessly, enhancing energy monitoring and optimization across the production line without major hardware upgrades.

STAKEHOLDERS:



Factory Owner



OT maintenance team



LEVERS:

One lever for the adoption of this Best Practice is a legal / cultural one. Especially in Europe, there is a growing awareness of the importance of achieving a more environmentally friendly production process. Reducing energy consumption or optimising the resources used is therefore a must and is also recognised by European and local government regulations. To achieve this goal, a fundamental step is to have a precise knowledge of the energy consumption of each piece of equipment along a production line, both to have an initial fingerprint of the existing situation and in order to quantitatively measure the improvements of optimisations and equipment replacements.



METHODOLOGY:

Adding energy measurements to existing and even legacy equipment, integrating this data into a multi-layered and modular architecture for analysis and correlation.



TOOLS/TECHNIQUES:

The key factors of this BP are technological and are:

- A complementary data-acquisition system constituting a CPS-iser layer.
- A scalable architecture of digital services, where only those useful for the end-user are deployed.

LIFECYCLE PHASE and REFERENCE SECTOR:



Manufacturing

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★

#6 Best Practice

REPLICABILITY ● ● ○

MAGNITUDE ● ● ●

PRODUCT – PROCESS CORRELATIONS

Maximizing plant efficiency hinges on reducing production failures to cut down on material and energy waste. Key to this challenge is the use of technical and analytical tools with cross-correlation capabilities that identify pre-failure data patterns and the root causes of issues. Insights from plant workers are crucial for pinpointing specific problems and establishing a "fingerprint" for early issue detection. This allows for integration with real-time systems that automatically adjust and correct issues, enhancing operational effectiveness. However, various events during production can lead to failures or inefficiencies, resulting in significant material, energy, or time waste. Early identification of these root causes is critical to preventing waste and improving overall efficiency.

PRACTICAL INNOVATION: In the E2COMATION project at KEAS, TrendMiner has been implemented as an innovative solution to enhance plant efficiency. This visual analytics tool is specifically designed for plant workers, rather than just data science experts. It merges the practical plant knowledge of the workers with simple visual analytics of both historical and live data. This integration significantly enhances the workers' ability to conduct data-driven analysis and optimize production processes. By empowering plant personnel with this technology, TrendMiner facilitates a more intuitive and effective approach to identifying and addressing production inefficiencies and failures.

STAKEHOLDERS:



Production Operator



Shift Eng.



Production chief

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★



MARKET:

Failures in production lead particularly to a waste of material and energy. The decrease in costs due to material and energy waste minimization might be evaluated during the validation phase.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

The expected impact is significant waste reduction by efficiently diagnosing and preventing production failures through cause analysis and future alerts based on identified problem fingerprints.



LEVERS:

Adding more sensors enhances correlation detection, improving root cause analysis. TrendMiner's AI features offer further automation and data analysis support, though they demand a deeper understanding of the tool, plant operations, and AI itself. However, the key to maximizing effectiveness lies in user expertise—combining plant experience with TrendMiner training boosts analysis quality.



METHODOLOGY:

Identifying production optimizations to avoid failures, thus saving energy and materials through process data analysis and correlation.



TOOLS/TECHNIQUES:

TrendMiner enables plant workers to analyze production issues, identifying "fingerprints" to alert on potential future problems. Effective use requires extensive sensor data, basic math and analytics skills, and knowledge of the production process and machinery.

LIFECYCLE PHASE and REFERENCE SECTOR:



Manufacturing

#7 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

DIGITAL TWINNING AND PROCESS OPTIMIZATION

Harnessing digital tools for decision-making and process control is critical in industries like wood-based panel refining, where there is significant reliance on electrical and thermal energy. Digital twins play a key role, allowing for the simulation of process adjustments to enhance energy use and product quality without halting production. The approach involves collecting data, analyzing processes, and deploying data-driven models for real-time updates to optimize productivity and sustainability. However, finding optimal settings that balance energy efficiency with production performance manually is complex, as each adjustment impacts multiple performance indicators. This complexity underscores the urgent need for sophisticated digital solutions to effectively manage and optimize such intricate industrial processes.

PRACTICAL INNOVATION:

In the E2COMATION project at KEAS, a comprehensive solution has been implemented for optimizing industrial processes. This solution integrates real-time updates and engineering insights into predictive models using neural networks, which enhances predictive control in industrial settings. Additionally, it innovates in preference articulation within multi-objective optimization, focusing on managing uncertainty and making precise approximations. This approach improves operational efficiency and decision-making in energy-intensive industries like wood-based panel refining.

STAKEHOLDERS:



Production Operator



Shift Eng.



Production chief

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★



MARKET:

The DSS software market, worth billions annually, grows due to data complexity, real-time decision needs, and tech advancements like AI. Specifically, the pulp and paper sector, valued at USD 351.53 billion in 2021, is expected to reach USD 372.70 billion by 2029, growing at a 0.72% CAGR from 2022 to 2029.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

Reduction in the energy consumption, reduced burden on operators. Improved standardization in process management by supporting decision makers and operators with intelligent tools that can encapsulate operational experience.



LEVERS:

Increasing sensorisation and automation in plants, increasing available data, advances in AI technologies, increasing availability of computers to train and deploy the digital twins, increasing need to support operators in increasing turnover, increasing product quality requirements, increasing attention to sustainability issues.



METHODOLOGY:

Employing digital twin technology to simulate and optimize manufacturing processes, enhancing energy efficiency without the need for physical changes.



TOOLS/TECHNIQUES:

Power and quality sensors, timestamped lab tests for consistent quality mapping, data streams and protocols like MQTT, machine learning, and factory visits for domain knowledge.

LIFECYCLE PHASE and REFERENCE SECTOR:



Manufacturing

#8 Best Practice

REPLICABILITY ● ● ●

MAGNITUDE ● ● ●

COGENERATION SYSTEM OPTIMIZATION

The challenge centers on optimizing the use of gas turbines within the electrical grid, balancing numerous factors to devise daily operational plans. This includes aligning production needs like electricity and steam with economic factors such as fuel costs and market prices, while considering operational limits like turbine availability. Additionally, real-time turbine control is necessary to adjust for unexpected changes in load, aiming to maintain planned energy exchanges efficiently and cost-effectively. This requires a sophisticated approach to manage variability and ensure seamless operations in energy management.

💡 INNOVATION:

The solution to the challenge of optimizing gas turbine usage within the electrical grid has been practically addressed in the E2comation project by KEAS through a model-based approach. This approach integrates both production and economic aspects to manage turbine operations effectively. It employs online recursive optimization techniques to provide adaptive strategies that adjust based on real-time measurements. Additionally, the use of prediction models plays a critical role, enabling the building of accurate forecasts for various demand profiles. This comprehensive method allows for proactive adjustments and ensures efficient and cost-effective management of energy resources.

STAKEHOLDERS:



Production Operator



Shift Eng.



Production chief

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★

📈 MARKET:

Minimize the overall energy-related cost. It will be evaluated during the validation phaser.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

Minimization of the energy related costs and reduction of environmental impact by limiting the over-production of thermal and electrical energy. Optimization of the operational cost.



LEVERS:

Environmental regulations that limit the energy usage or the need to maximize energy performance and reducing the operating costs. Enhanced digitalization actions with increased plant sensorization, as well as the availability of advanced mathematical tools, facilitate the adoption of advanced managing tools, like STEG.



METHODOLOGY:

Optimizing the operation of cogeneration systems for improved energy efficiency, balancing production requirements with economic and environmental criteria.



TOOLS/TECHNIQUES:

Sensorization and availability of data for modelling; features, flexibilities, and benefit schemes of the energy market; availability of historical market data for building price/load forecasting tools.

LIFECYCLE PHASE and REFERENCE SECTOR:



Manufacturing

PLANT LIFE CYCLE ASSESSMENT AND CONTROL (LCAC)

The challenge lies in integrating monitoring and marketplace functionalities to optimize operational analysis and efficiency within a production system. This process involves tracking and comparing production trends, focusing on environmental and economic impacts using real-time data and monthly statistics. The marketplace component then attributes specific impacts to each production batch, aiding informed decision-making and sustainability efforts. Each production stage differs in energy use and materials, requiring precise environmental monitoring to identify key impact drivers. This complexity of data management and real-time analysis presents significant challenges in ensuring both operational efficiency and environmental compliance.

PRACTICAL INNOVATION:

The practical solution applied in the E2comation project by KEAS involves a dynamic integration of shop floor data with variable costs, supported by the LCAC tool's real-time monitoring and assessment methods. This system empowers firms to make informed decisions, enhances sustainability efforts, and ensures compliance with global standards. By synthesizing real-time data from production processes with ongoing cost analysis, the model provides a comprehensive overview that allows companies to adjust operations promptly and effectively, thus optimizing both environmental impact and economic performance.

STAKEHOLDERS:



Production Operator



Shift Eng.



Production chief

MARKET:

The economic return is given by the knowledge of environmental information on production, which can be used as an attractive lever for customers as well as for product/process certification.



ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS:

Gaining insight into the specific impacts of industrial production can drive sustainable development, balancing environmental conservation, economic prosperity, and social well-being.



LEVERS:

Environmental regulations; national standards; market competitiveness.



METHODOLOGY:

Monitoring environmental performance, energy and resource consumption, as well as economic impacts of the overall production plant.



TOOLS/TECHNIQUES:

Sensorization, data availability, data streams and communication protocols.

LIFECYCLE PHASE and REFERENCE SECTOR:



Manufacturing

BENEFITS:

ENVIRONMENTAL ★★★★★

ECONOMIC ★★★

SOCIAL ★★