RETROFEED

Implementation of a Smart RETROfitting Framework in the Process Industry towards its Operation with Variable, Biobased and Circular FEEDstock

Technical Overview

Retrofeed
smart retrofitting in process industry

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869939.

Outline

- Project info and objectives
- Project overall concept
- Actions for each end-user
- Synergies and complementarities
- Final remarks

Outline

- Project info and objectives
- Project overall concept
- Actions for each end user
- Synergies
- Final remarks

RETROFEED: Implementation of a smart RETROfitting framework in the process industry towards its operation with variable, biobased and circular FEEDstock

- **Coordinator:** Fundación CIRCE - Centro de Investigación de Recursos y Consumos Energéticos
- **Total cost:** 15,454,951.88 €
- **EU contribution:** 9,912,915.33 €
- **Call:** H2020-CE-SPIRE-05-2019
- **Type of action:** Innovation Action (IA)
- **Duration:** 42 months (01.11.2019 - 30.04.2023)
- **Consortium:** 18 partners
- **Countries:** ES, PL, IT, CZ, TK, PT, RO, BE, HR, SE

Retrofeed
smart retrofitting in process industry

Main objective

RETROFEED main objective is to:

enable the use of an increasingly variable, bio-based and circular feedstock in process industries through the retrofitting of core equipment and the implementation of an advanced monitoring and control system, and providing support to the plant operators by means of a DSS covering the production chain.

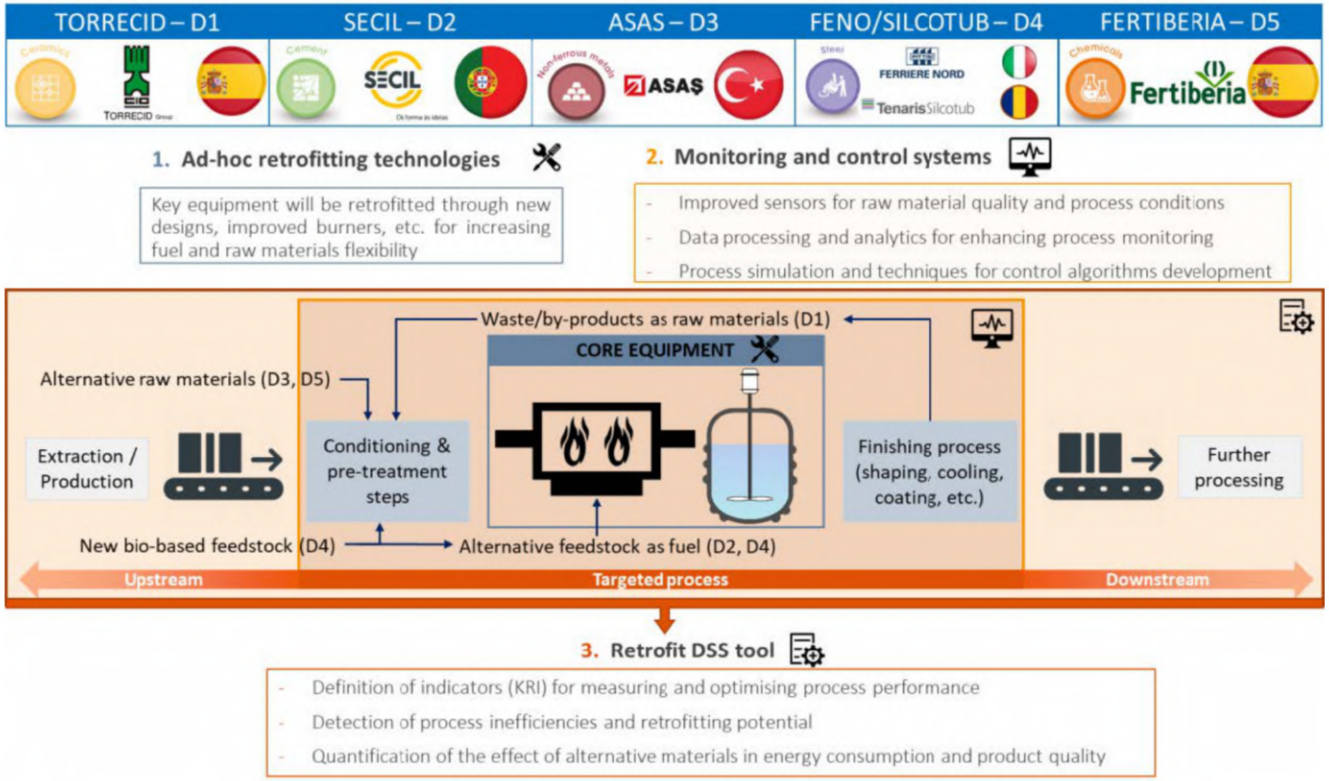
This approach is demonstrated in **five Resource and Energy Intensive Industries - REIIs**

AGROCHEMICAL	ALUMINIUM	CEMENT	CERAMIC	STEEL

Outline

- Project info and objectives
- Project overall concept
- Actions for each end user
- Synergies and complementarities
- Final remarks

Overall concept



- Core equipment retrofitting
- Improving M&C system
- Development of new sensors
- Development of Digital Twins
- Development of Decision Support Systems
- TRL 7 solutions

Outline

- Project info and objectives
- Project overall concept
- Actions for each end user
- Synergies and complementarities
- Final remarks

CORE EQUIPMENT – FRITS FURNACE

REII: TORRECID
Location: Alcora (ES)
Sector: CERAMIC

Retrofitting actions

- Smart combustion control
- Feeding system enhancement
- Redesign of the flue gases recovery system
- Sensors implementation

Goals

- Energy and material savings
- Optimization use of fuel and combustion air
- 4 to 6-fold reduction of material waste
- Improved M&C system

CORE EQUIPMENT – ROTATORY KILN

REII: SECIL
Location: Maceira-Liz (PT)
Sector: CEMENT

Retrofitting actions

- Full-scale multi-fuel burner design
- Image based combustion diagnosis tool
- Alternative fuels properties determination
- Real time clinker optical characterization

Goals

- CO_2 emissions reduction
- Substitution 60-80% fossil fuel
- Reduction of 5% of specific energy consumption
- Increment in energy efficiency
- M&C improvement

CORE EQUIPMENT – MELTING FURNACE

REII: ASAS
Location: Akyazi (TK)
Sector: ALUMINIUM

Retrofitting actions

- Delacquering system
- O_2 injection system
- New burner head design
- O_2 and TOC analyzers

Goals

- 50% increment in the amount of scrap
- Reduction of the energy consumption 15 times
- More efficient combustion
- Reduction of the GHG emissions
- Improved M&C system

CORE EQUIPMENT – ELECTRICAL ARC FURNACE

REII: FERRIERE NORD - SILCOTUB
Location: Friuli (IT) - Zalau (RO)
Sector: STEEL

Retrofitting actions FERRIERE NORD

- Burner modification for feeding biochar and plastic grains
- Injection system

Retrofitting actions SILCOTUB

- Feeding injection system

Goals

- Reduction of GHG emissions
- Use of alternative feedstock and waste streams: dust and sludges
- M&C system improvement

CORE EQUIPMENT – PHOSPHOROUS REACTOR

REII: FERTIBERIA
Location: Huelva (ES)
Sector: AGROCHEMICAL

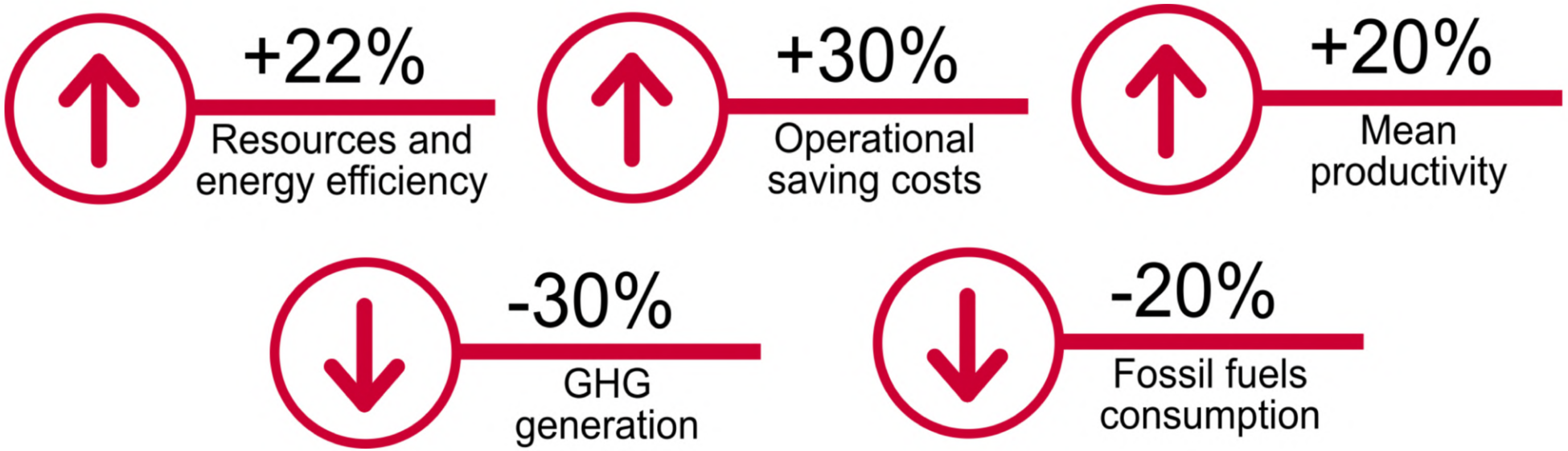
Retrofitting actions

- New design of a reactor for alternative phosphorus sources

Goals

- Replace 10% of the currently used phosphorous sources
- Recover valuable raw materials from wastes
- Reduction of cost
- M&C system improvement

Main goals expected



Outline

- Project info and objectives
- Project overall concept
- Actions for each end user
- Synergies and complementarities
- Final remarks

Potential Complementarities

- **SECIL** sensor for heat calorific → FENO and SILCOTUB
- **SECIL** sensor for clinker structure → TORRECID frits
- **SECIL** sensor for combustion diagnosis → ASAS and TORRECID
- **SILCOTUB / SECIL** dust recovery → ASAS and TORRECID
- **ASAS** delacquering and emission control systems → FENO and SILCOTUB
- **FTIB** exothermic reaction as heat source → other sectors

Potential Synergies

Recovery of industrial grade lime from TCID's wastewaters to be used in virtually all other production processes	Lixiviation of EAF dust using wastewaters generated from steel polishing, to separate heavy metals and recover valuable species for plant growth such as zinc, iron, and manganese	Valorisation of ASAS slag containing aluminium and aluminium oxide, as raw material for TCID, slag forming agent in FENO and SILCOTUB's EAFs and steel killing (removal of excess oxygen)
The oxide from ASAS may be turned into salts FTIB employs in the fertiliser production process, such as aluminium sulphate	Utilisation of waste frit produced at TCID as raw material for the steel sector: typically consisting of silicon, magnesium, aluminium, among others	The slag produced at the steel production facilities with high content in aluminium and other metal oxides, may serve as a raw material for the ceramic frits process

Outline

- Project info and objectives
- Project overall concept
- Actions for each end user
- Synergies and complementarities
- Final remarks

Final remarks

- Make industries more flexible to the new production scenario
- Digital and mechanical revamping actions will be carried out in 5 REIIs focused on the core equipment
- DSS will integrate different models to support decision-making process
- Synergies and complementarities have been identified
- To facilitate the EU's industries the transition to a more sustainable and responsible production practices incorporating bio-based and circular economy concepts

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869939.

www.retrofeed.eu

@retrofeedEU #retrofeed

www.linkedin.com/company/retrofeed

Project coordinator
Ana Isabel Gonzalez Espinosa,
Fundación CIRCE
aigonzalez@fcirce.es