

**Waste Heat Recovery for Power  
Valorisation with Organic Rankine Cycle  
Technology in Energy Intensive  
Industries**

**TASIO**

**H2020-EE-2014-1-PPP**

**GA 637189**



**tecnalia** Inspiring  
Business

# Title: Waste Heat Recovery for Power Valorisation with Organic Rankine Cycle Technology in Energy Intensive Industries

Acronym: TASIO

H2020-EE-18-2014-1-PPP

Grant Agreement GA 637189



## Participants:

TECNALIA RESEARCH & INNOVATION (Spain)  
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01<sup>st</sup> Dec. 2014- 31<sup>st</sup> May 2018 (42 months)

# EE 18 2014/2015: New technologies for utilization of heat recovery in large industrial systems, considering the whole energy cycle from heat production to transformation, delivery and end use

- **Specific Challenge**

... replicable technologies to recover and use process heat, which are adaptable to various types of industrial processes, or to recover heat from material flows from industrial processes (e.g. waste streams, by-products, intermediates) or from surplus heat in plant perimeters.

- **Scope**

...a complete validation in real production conditions is preferred with demo sites where pilot systems will be tested in industrial facilities. The activities are expected to be implemented at TRL 4-7

- **Expected Impact**

Design development and demonstration of economically viable solutions and technologies allowing recovering at least 15% of process heat ...

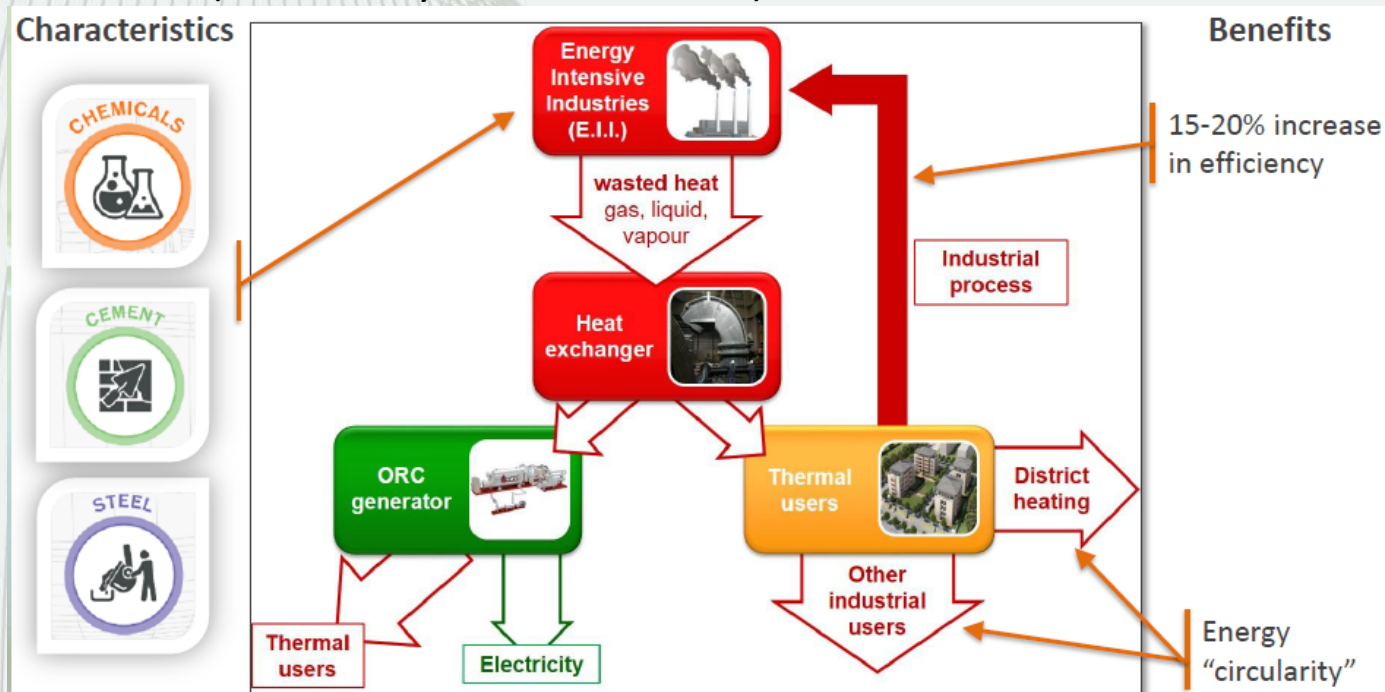
- **Type of Action**

Research & Innovation Actions

**Waste Heat Recovery System (WHRS):** a system of components installed to recover thermal energy from a heat source.

heat exchanger + **heat carrier medium circuit** + ORC unit+ cooling unit

**Organic Rankine Cycle (ORC):** closed thermodynamic cycle to convert heat into mechanical energy and eventually into electricity with a close circuit employing a working fluid different from water and metal (siloxane hydrocarbons, etc.).



The objective of TASIO is to eliminate the heat carrier medium circuit **by developing an innovative solution of Direct Heat Exchange** aimed at heat recovery for electricity generation through an ORC .

## Technical Objectives.

- To design and develop a new generation of ORC for heat recovery adoptable in different EII processes to transfer heat directly from the flue gases to the organic fluid of the ORC system thanks to a Direct Heat Exchange concept, increasing the overall efficiency and reducing costs.
- To demonstrate the performance of the whole Waste Heat Recovery (WHR) system, a complete validation in real production conditions is planned in this project by means of a demo installation that will be tested in the cement industrial facility.
- To develop and validate through a pilot scale test a WHR system to recover and transform the thermal energy of the flue gases of EII into mechanical energy for internal use (compressors).
- To develop new heat conductor and anticorrosive materials to be used in parts of the heat exchanger in contact with the flue gases.
- To design and model a new integrated control systems for the addressed sectors.
- To analyse the adaptability / replicability of the developed WHR system to other industrial sectors.

## Economic Objectives.

To increase economic feasibility of Waste Heat Recovery System with ORC through these activities:

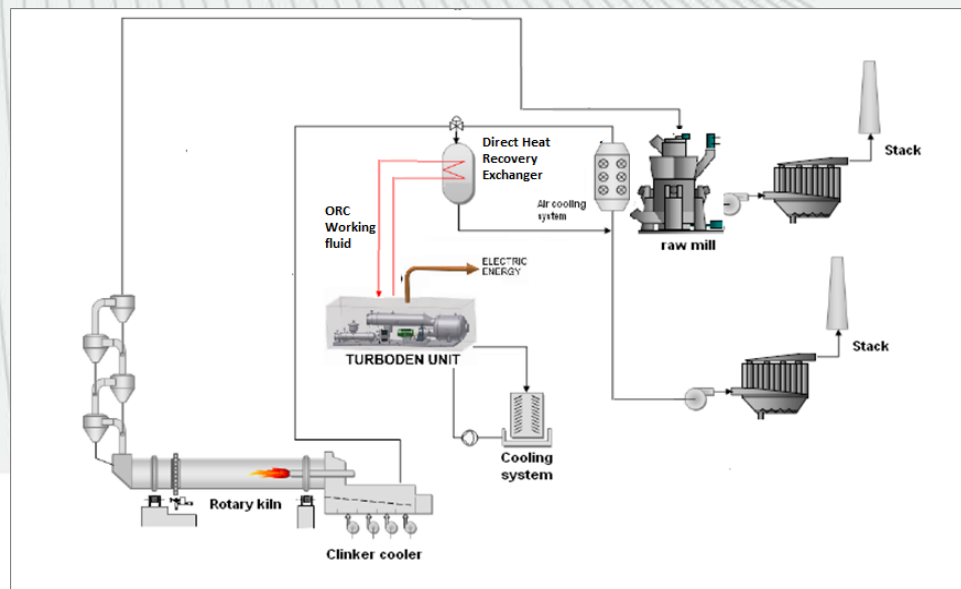
- Decreasing total investment costs reducing the complexity of heat exchangers and avoiding intermediate heat carrier circuit up to 10%;
- Increasing the efficiency of the heat exchangers through technical and design solution and by means of innovative materials/coating up to 15%.

## Societal and Environmental Objectives.

- TASIO aims to increase economic feasibility of waste heat recovery systems with ORC technology reducing investment costs and improving energy efficiency;
- Projects that will be developed exploiting TASIO results will increase energy intensive industry sustainability, reducing their consumption of electric energy, that is a “noble” energy source;
- Reducing electricity consumption implies also reducing primary energy consumption;
- Assuming an average emission factor per power generated in EU, every kWh of electricity generated by a ORC unit in a WHRS avoids 460 kg of CO<sub>2</sub>;

## Main aspects. Tasks. Innovative aspects.

- **Direct Heat Exchange** solution suitable for cross sectorial applications in EI industries
- Foreseen increase in the efficiency of the process 15-20%
- Selection/development of innovative materials and coatings.
- Reduction of the overall costs while increasing efficiency of the ORC technology.
- Complete validation in real production conditions. **DEMO site**
- Pilot scale test of the WHR system to recover and transform the thermal energy of the flue gases of EII into mechanical energy for internal use (compressors).



# Expected outcomes. Results.

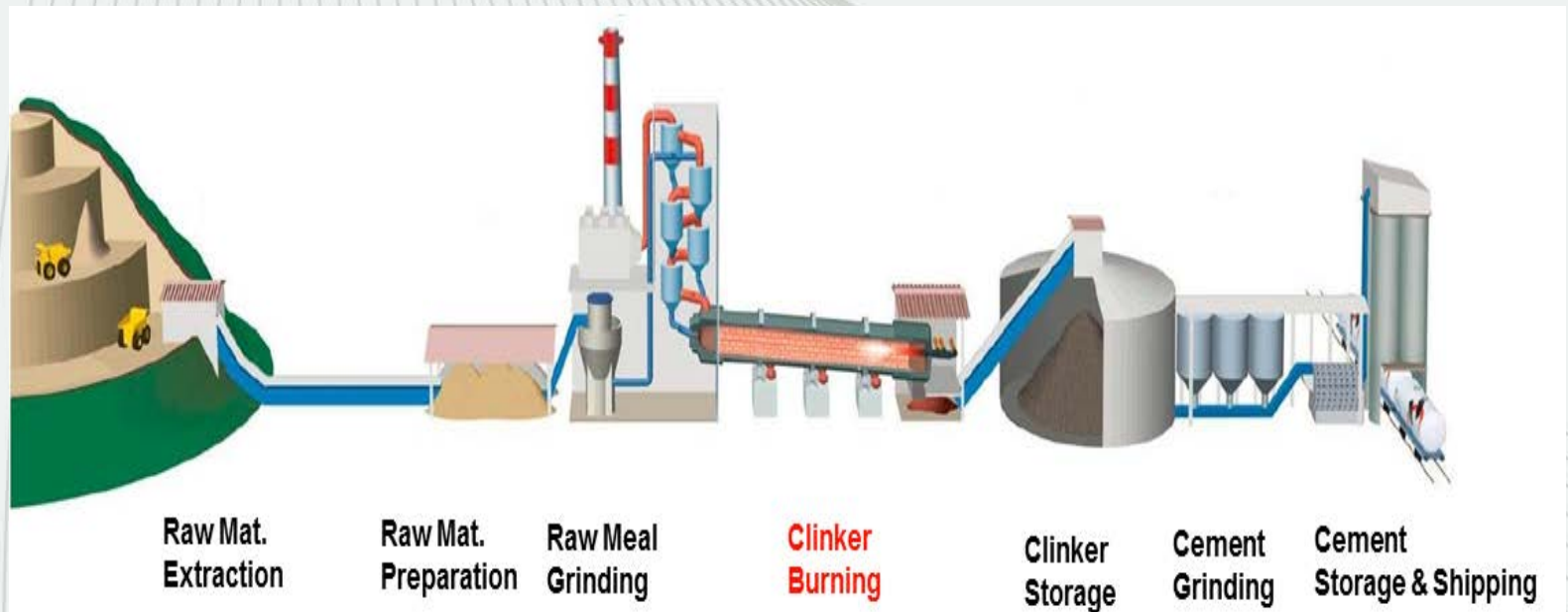
New Heat exchanger

New Generation of ORC Turbogenerators

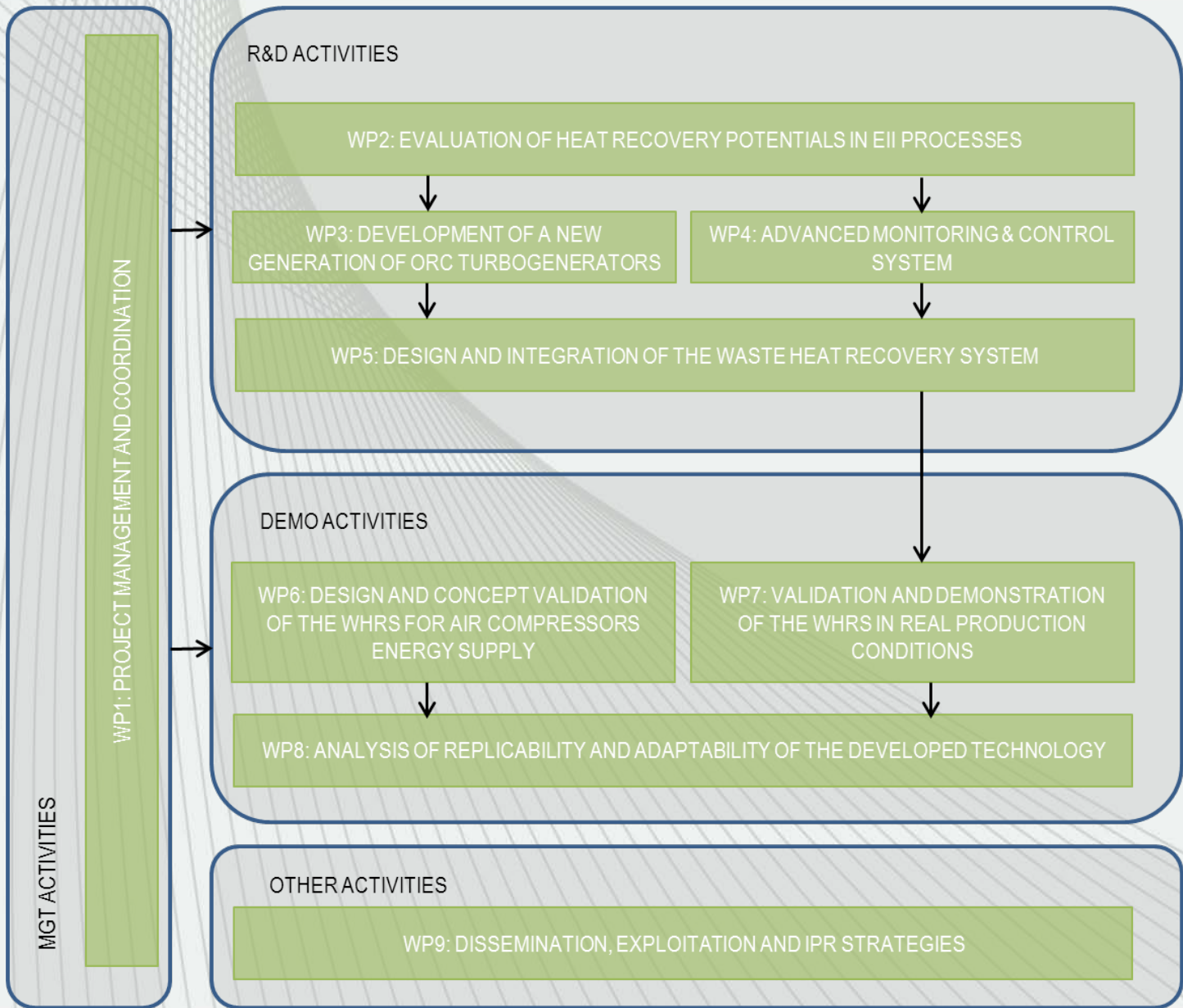
Advanced Monitoring & Control System

WHRS for Air Compressors Energy Supply

DEMO site







# Muchas gracias

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