



1st Periodic Report

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“Publishable Summary of Project results and status” (month 1-12)

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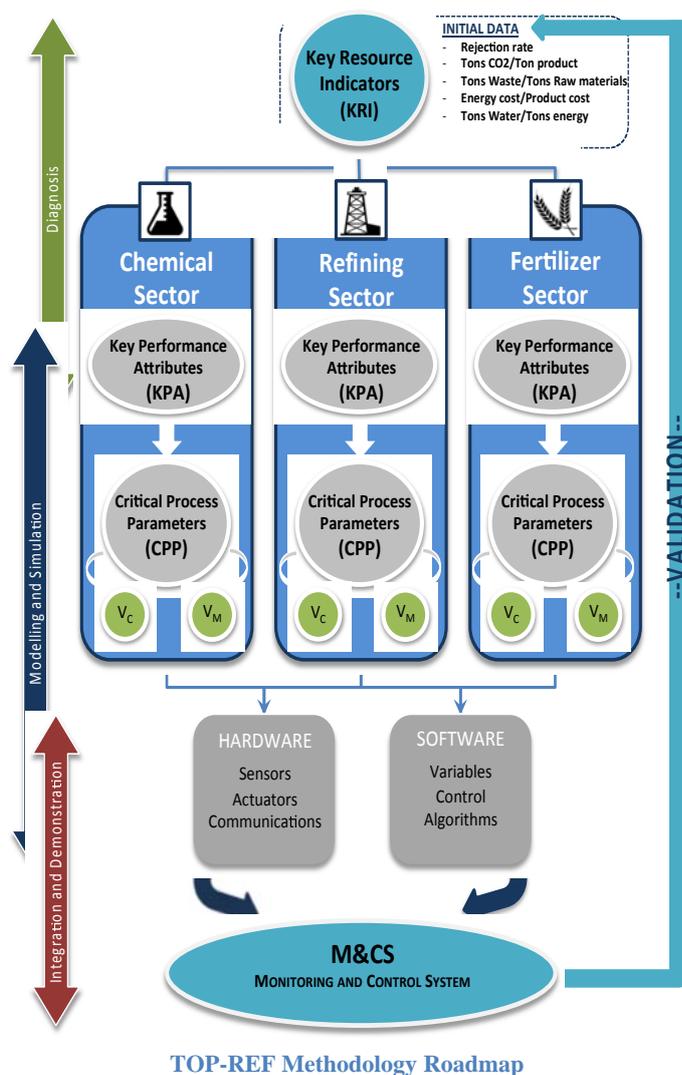
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1. Publishable Summary

The European Union is facing major challenges such as the economic crisis, sustainability and the competition with emerging economies. In this context, the TOP-REF project is willing to contribute to a smart and sustainable growth while promoting a more efficient, greener and competitive economy based on knowledge and innovation¹. The activities and the implementation of the results of TOP-REF will improve the resource efficiency within the EU intensive industry. Specifically, it is expected a rise in the **efficiency in the use of energy, water and raw materials by up to 20%**, while reducing production costs by up to 15%. Furthermore, it will contribute towards achieving the targets set by the European industry association **SPIRE**, which aims to reduce the use of non-renewable raw materials by 20% and of fossil fuels by 30%.

Moreover, one of the initiative's key goals consists in considerably reducing the environmental impact linked to these processes, which takes the form of **CO₂ emissions**, harmful substances and waste generation, among others.

Ultimately, the final goal is to contribute to **drive Europe to a leadership position** in energy efficiency in industries by means of the promotion of a more efficient, greener and competitive economy based on knowledge and innovation.



To achieve these goals, TOP-REF will develop and demonstrate a robust, **resource-efficiency focused and cross-sectorial methodology**. This methodology will be validated by the development and testing of **non-invasive, real time and on-line monitoring and control tools** adapted to three specific energy and resource intensive processes from the Fertilizer, Refining and Chemical sectors

In order to guarantee TOP-REF impacts, **specific Key Resources Indicators (KRI) will be developed and standardised** to foster the greening and the competitiveness of the European process industry. The indicators, based among others on life cycle studies, will help to measure the decoupling of environmental impacts from the economic growth and the use of resources.

In the figure aside may be found a diagram with the roadmap of the methodology driving to the development of the Monitoring and Control tool

¹ COM (2012) 2020 final. A strategy for smart, sustainable and inclusive growth

Contributions to the roadmap of SPIRE

TOP-REF is directly linked with SPIRE₂ in this sense the activities of the project support and enhance the implementation of several Key Actions (KA) of the roadmap of SPIRE: <http://www.spire2030.eu/>

The specific contributions to each Key Action of the roadmap are included in the project deliverables in a dedicated section. Below are included the **main KAs which the project is contributing to**.

- KA 2.3: Process monitoring, control and optimization. Methodology tools and indicators addressing specifically resource efficiency in industry
- KA 2.4: More efficient systems and equipment.
- KA 2.5 New energy and resource management concepts (including industrial symbiosis)
- KA 4.1: Systems approach: understanding the value of waste streams
- KA 5.2: Methodologies and tools for cross-sectorial Life Cycle and Cost Assessment as well as novel social Life Cycle Assessment of energy and resource efficiency solutions

Main outcomes achieved in the first period of the project

1. First set of KRIs, including an innovative exergy indicator

The main outcome achieved in the first period is the selection and definition of a first set of KRIs. The headline KRIs are: Material Efficiency (kg/FU), Direct Primary Energy Consumption (J/FU), Gross Water Use (m³/FU), Net Water Use (m³/FU) and the Resource Exergy Indicator (resources: materials, energy and water) (J/FU).

The indicator on Direct Energy Consumption will help quantify the energy efficiency of existing operations and facilities, and will give information regarding the efficiency increase or decrease accomplished through changes made in the processes. Moreover material efficiency and water use indicators give straightforward information about the reduction of material and water use and will help measure resource availability. Finally, the exergy KRI is an innovative and overarching indicator that allows measuring the quantity and quality of all consumed resources (including all the above, i.e. energy, water and materials).

The KRIs have been defined with a comprehensive scope over the concerns of the whole EU society: industry, policy makers, citizens, public authorities, etc.; by considering the KRIs impacts in the environment, production rates, economics and competitiveness. At the end of the project the KRIs will be the basis of new standards or a supplement to existing standards to be used by EU stakeholders.

2. Development of a novel methodology for audit and diagnosis

Because of the lack of any European regulation that takes into account water, raw material and wastes TOP-REF is willing to set the basis for a proper and homogeneous methodology to audit and diagnose the resource efficiency of the processes. This methodology, which is based on Thermoconomics², will provide the information to support a better decision making process to tackle the - implementation of more efficient systems and equipment. The methodology has been applied to the fertilizer industrial case.

² A discipline based on the combination of Economics (cost) and Thermodynamics (Second Law, and the concept of exergy)

3. Other outcomes related to the project development

In addition, other results addressing to establish the knowledge and methodology of the project have been achieved, and are summarized below:

- Definition of the boundary conditions of the processes and excel questionnaire to gather industrial data.
- Benchmarking of current sectorial tools and indicators
- Synergies and common points between processes and sectors.
- Identification of process outputs' constraints and requirements for each processes, including a KPA calculator for fertilizer process and thermal processes of DCI and PETROGAL

Project website: www.toprefproject.eu

2. Core of the report for the period: Project objectives, work progress and achievements, project management

2.1. Project objectives for the period

The project objectives for the first period with their related tasks are presented in Table 1

	Objective	Task
Process Knowledge	To assess the boundary conditions and alignment of the information required for the development of the project.	2.1
	To assess the similarities, the differences and the possible synergies of the sectors and their associated processes.	2.4
	To study the main constraints that the products implied in each process would present.	3.2
	To break down the product requirement found and to determine the KPAs of each process.	3.3
KRIs development	To draw a map of the available key resource indicators and existing mechanisms for assessing the processes' efficiency.	2.2
	To assess a set of KRIs from TOP-REF with the following requirements (Cross-sectorial): <ul style="list-style-type: none"> • Easy to use and to understand • Provide information to take well informed decisions at different at short and long term • Easy to compare and to establish process performance goals • Flexible and replicable to different sectors and processes. 	2.3
Audit and diagnosis	To study the environmental and economic aspects along the project duration in order to determine TOP-REF's real capacity of improvement. (in progress)	2.5
	To establish a common basis of the methodology for the audit and diagnosis in order to assure that the results achieved in the project, and the subsequent global methodology, will be comparable and replicable.	3.1
Modelling and Simulation	To bring new model software tools for resource efficiency management in process industry (in progress)	4.1
	To align and establish the modelling and simulation approach to be used in the whole project (in progress)	4.1 & 4.2
	To model and simulate each of the processes in TOP-REF according to the approach previously established. (in progress)	4.2

Table 1 Objectives for the period with their related tasks

2.2. Work progress and achievements during the period

The project is progressing according to the planning included in DoW (Annex I). Two main phases can be distinguished within the project structure. The first phase corresponds with the first period; it is an "horizontal" phase within the project and focuses on the definition of "knowledge of the project" to establish a solid base of definitions, boundary conditions and data that will support the execution of the rest of the project, as well as the development of the KRIs and the methodology for audit and diagnosis.

The next phase of the project will be based on a “vertical” approach by the modelling and simulation of the processes of each demo site. Moreover it will include the development and test of the M&C for each sector. Finally, a third horizontal phase could be included addressing the validation and the multisectorial replicability of the results within the WP7. In the section **¡Error! No se encuentra el origen de la referencia.** the deliverables and milestones achieved in the period according to the DoW (Annex I) are included.

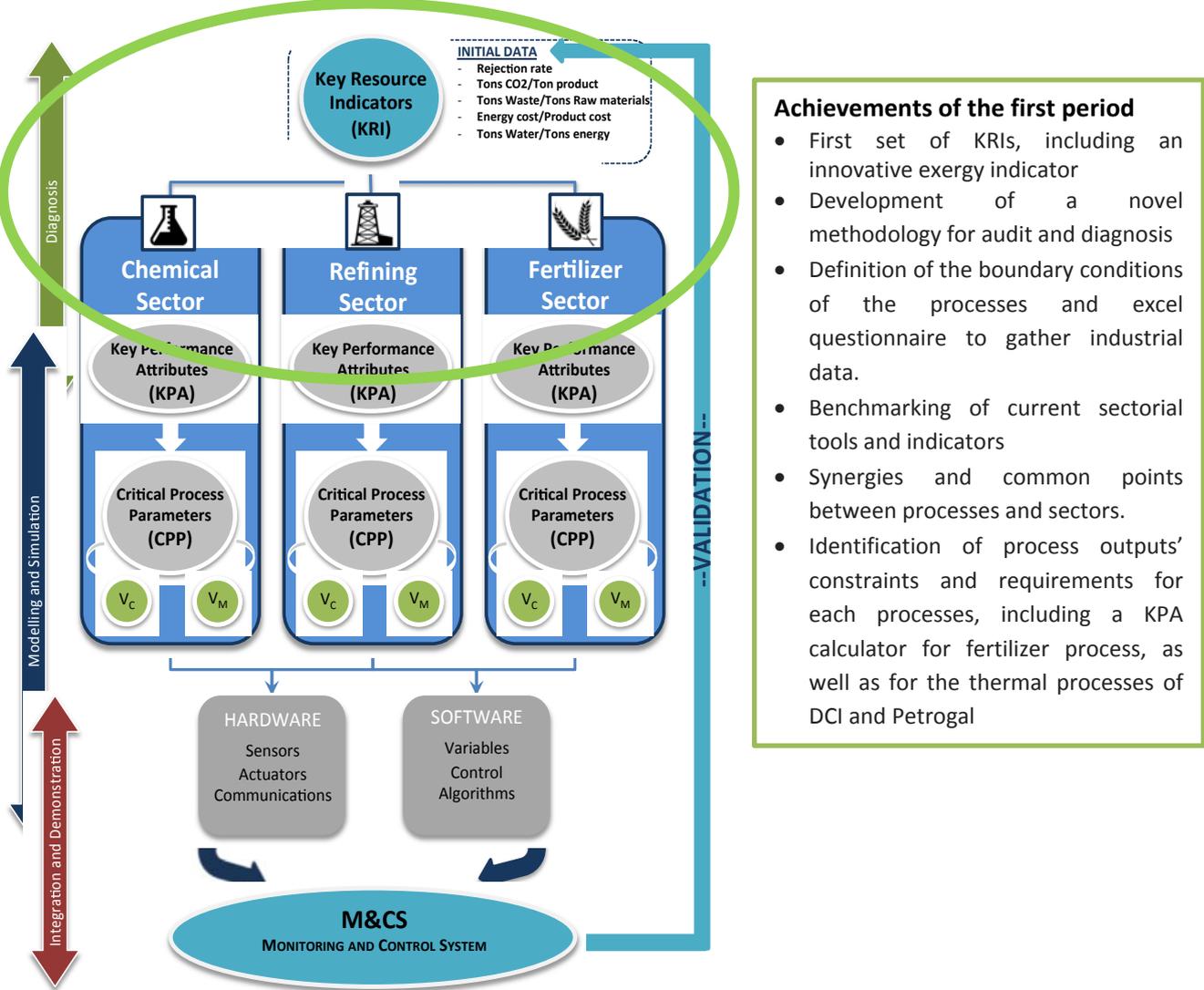


Figure 1: Achievements of the first year period