EPOS WP 3 - EPOS tool development

Lead: École Polytechnique Fédérale de Lausanne

Technology and management database for cross-sectorial IS

D3.3

KORONA INZENIRING DD (Korona d.d.)

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Summary

WP3 is the core of the EPOS project, aiming at the development of a tool for cross-sectorial symbiosis. The main focus of this WP is on developing the methodology as well as a prototype tool (box) for analysing and optimising flexible energy use and material flow integration in cross-sectorial industry clusters. The aim is to use the existing AM Dunkirk (FR) district cluster for building and testing the EPOS tool, taking into account technological as well as non-technical considerations.

Deliverable 3.3 is the result of actions described in Task 3.4: "Technology cross-check" and related subtasks 3.4.1 and 3.4.2. Within this deliverable, a technology database for the EPOS tool was created (Figure 1). The 34 generic technological options, for process integration and optimisation of cluster, included in the EPOS tool database, were selected though an iterative selection process, based on process by-product reusability, technological maturity and economic viability.

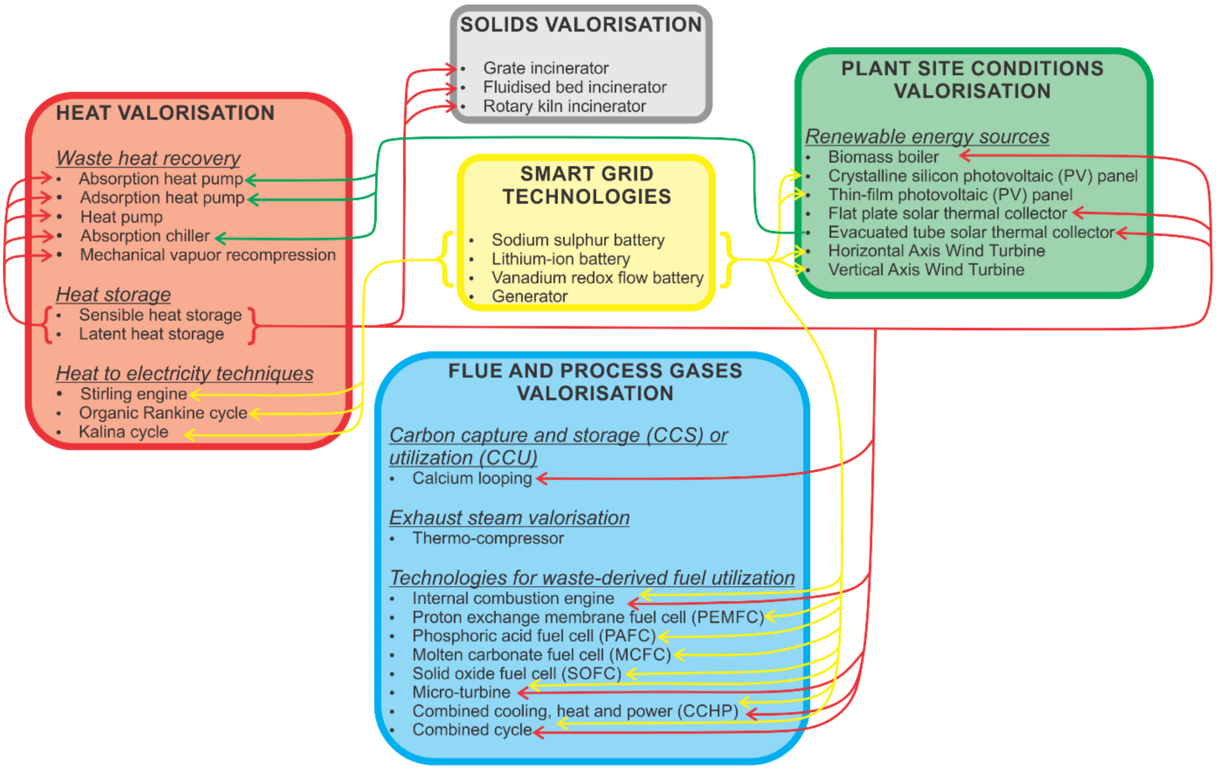


Figure 1 EPOS tool technology database

From the created database, 3 key enabling clean and emergent technologies were identified and put forward with the potential of being readily deployable at the industrial sites and clusters. The selected technology options cover key areas for a successful transition to Industry 4.0. Namely, carbon capture and storage, hydrogen economy readiness, increasing the level of energy autarky of industrial sites, and improvement of manufacturing processes energy efficiencies (Figure 2).

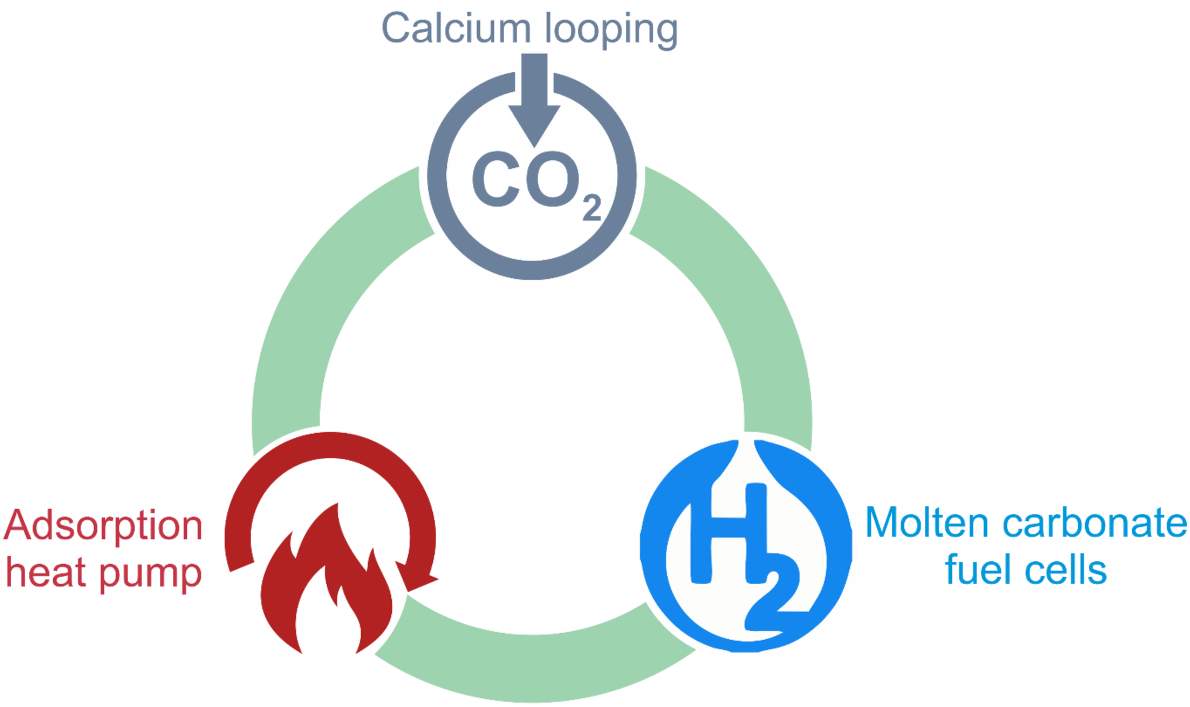
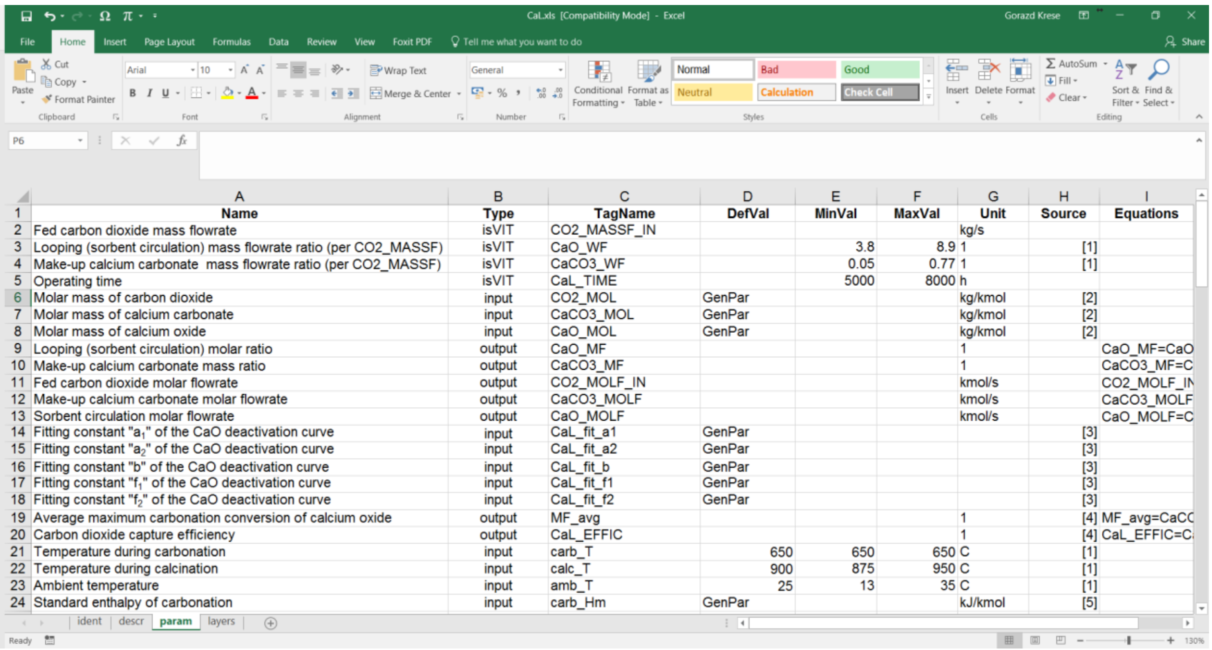


Figure 2 Robust breakthrough technologies

As a foundation for creating and updating the EPOS tool technology database, a rigorous modelling methodology was defined, which includes the model identification, description, parameter definition, mathematical formulation, layer definition and economic assessment of the modelled technology options.

To ensure traceability and transparency of the technological solutions included in the EPOS tool database, the so-called model blueprint (Figure 3), i.e. a spreadsheet that sums up the entire modelling procedure of a technological option, was developed. In the final step, the model blueprints were implemented in Osmose. Hence, the goals of this deliverable where achieved.



	Name	Type	TagName	DefVal	MinVal	MaxVal	Unit	Source	Equations
2	Fed carbon dioxide mass flowrate	isVIT	CO2_MASSF_IN				kg/s		
3	Looping (sorbent circulation) mass flowrate ratio (per CO2_MASSF)	isVIT	CaO_WF		3.8	8.9	1	[1]	
4	Make-up calcium carbonate mass flowrate ratio (per CO2_MASSF)	isVIT	CaCO3_WF		0.05	0.77	1	[1]	
5	Operating time	isVIT	CaL_TIME		5000	8000	h		
6	Molar mass of carbon dioxide	input	CO2_MOL	GenPar			kg/kmol	[2]	
7	Molar mass of calcium carbonate	input	CaCO3_MOL	GenPar			kg/kmol	[2]	
8	Molar mass of calcium oxide	input	CaO_MOL	GenPar			kg/kmol	[2]	
9	Looping (sorbent circulation) molar ratio	output	CaO_MF				1		CaO_MF=CaO
10	Make-up calcium carbonate mass ratio	output	CaCO3_MF				1		CaCO3_MF=C
11	Fed carbon dioxide molar flowrate	output	CO2_MOLF_IN				kmol/s		CO2_MOLF_IN
12	Make-up calcium carbonate molar flowrate	output	CaCO3_MOLF				kmol/s		CaCO3_MOLF
13	Sorbent circulation molar flowrate	output	CaO_MOLF				kmol/s		CaO_MOLF=C
14	Fitting constant "a_1" of the CaO deactivation curve	input	CaL_fit_a1	GenPar				[3]	
15	Fitting constant "a_2" of the CaO deactivation curve	input	CaL_fit_a2	GenPar				[3]	
16	Fitting constant "b" of the CaO deactivation curve	input	CaL_fit_b	GenPar				[3]	
17	Fitting constant "f_1" of the CaO deactivation curve	input	CaL_fit_f1	GenPar				[3]	
18	Fitting constant "f_2" of the CaO deactivation curve	input	CaL_fit_f2	GenPar				[3]	
19	Average maximum carbonation conversion of calcium oxide	output	MF_avg				1	[4]	MF_avg=CaCO
20	Carbon dioxide capture efficiency	output	CaL_EFFIC				1	[4]	CaL_EFFIC=C
21	Temperature during carbonation	input	carb_T	650	650	650	C	[1]	
22	Temperature during calcination	input	calc_T	900	875	950	C	[1]	
23	Ambient temperature	input	amb_T	25	13	35	C	[1]	
24	Standard enthalpy of carbonation	input	carb_Hm	GenPar			kJ/kmol	[5]	

Figure 3 Model blueprint