

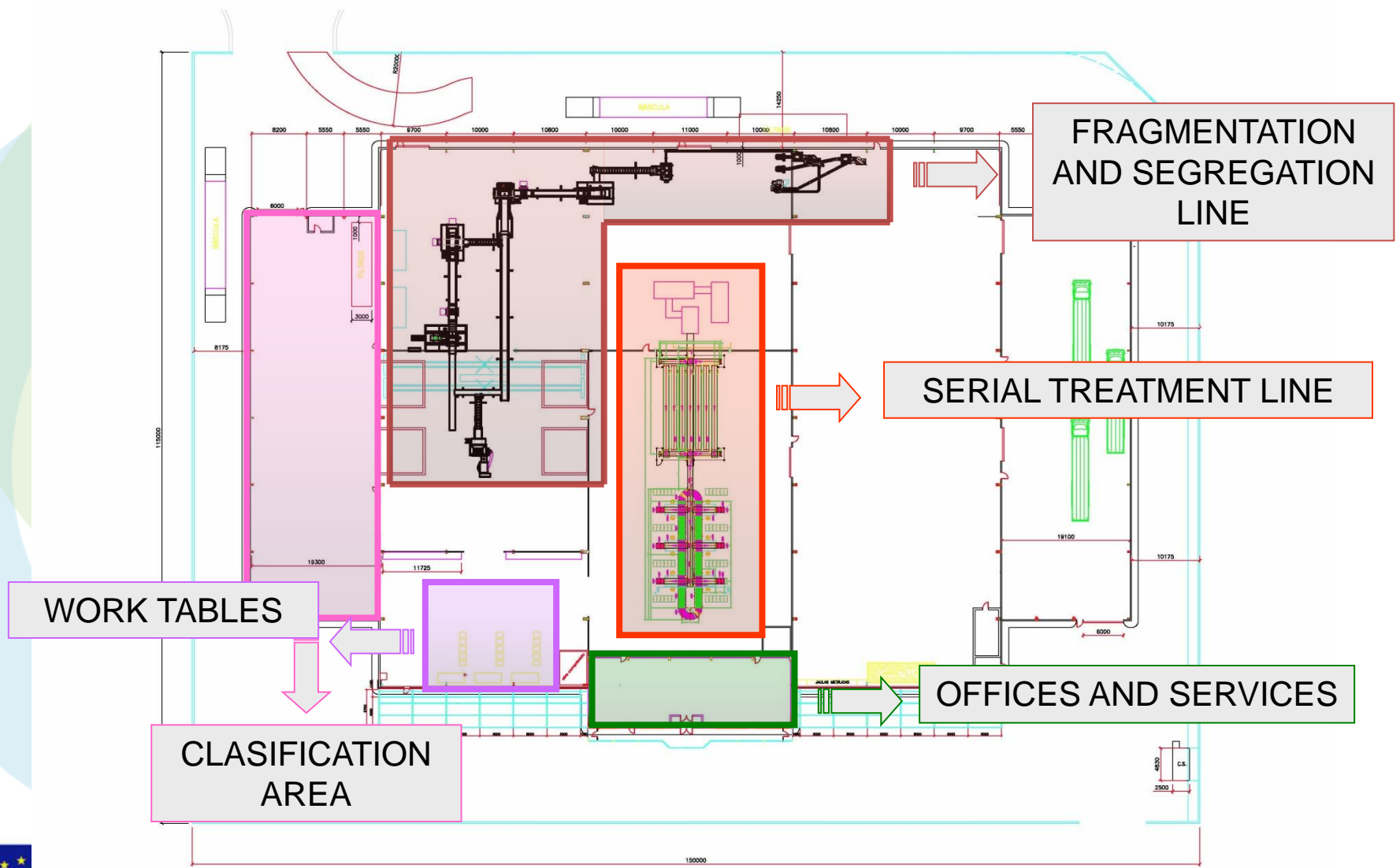


Hty TechCycling

New technologies for the phase of recycling and dismantling:
Detail on the specific processes followed at recycling
center



Global scheme of current plant





Global scheme of current plant

SEGREGATION AND WEIGHING





Global scheme of current plant

SEPARATION WORK TABLES



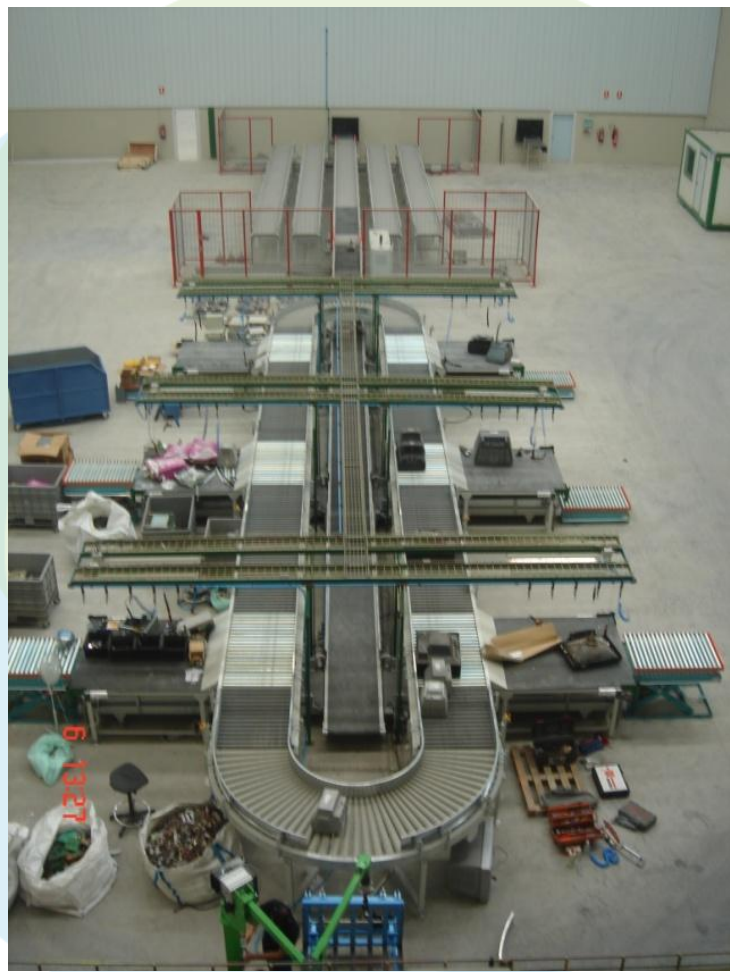
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Global scheme of current plant

SERIAL TREATMENT LINE



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Global scheme of current plant

FRAGMENTATION AND SEGREGATION LINE



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Global scheme of current plant

Super Chopper



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Global scheme of current plant

Shredder





Global scheme of current plant

FOUCAULT



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Global scheme of current plant

GRANULATORS



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Global scheme of current plant

DENSIMETRY



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New technologies in recycling phase

CHEMICAL PROCESS

Device	Component	Material	Critical aspect	Recovery technologies		Device Abbreviations		
				Existing ^a	Novel ^b	SOFC		
SOFC	Anode	YZS	Cost; supply risk	HDT	N/A	PEMFC	Solid Oxide Fuel Cell	
		Ni; NiO	Hazard	HDT; HMT	N/A			Polymer Electrolyte Membrane Fuel Cell
	Cathode	LSM	Hazard; supply risk	N/A	N/A		PEMWE	
	Electrolyte	YZS	Cost; supply risk	HDT	N/A			AWE
	Interconnects	Ni; NiO	Hazard	HDT; HMT	N/A			
LSC		Hazard; supply risk	N/A	N/A				
PEMFC	Anode	Pt	Cost	HMT; PMT	SED; TD; AP	Recovery Abbreviations		
	Cathode	Pt	Cost	HMT; PMT	SED; TD; AP	AD	Alcohol Dissolution	
	Electrolyte	Ionomer	Cost; hazard ^c	N/A	AD; AP	AP	Acid Process	
PEMWE	Anode	Ir; Ru	Cost; hazard	HMT; PMT	TD	HDT	Hydro Treatment	
	Cathode	Pt	Cost	HMT; PMT	SED; TD; AP	HMT	Hydro Metallurgical Technology	
	Electrolyte	Ionomer	Cost; hazard ^c	N/A	AD; AP	PMT	Pyro Metallurgical Technology	
	Bipolar plates	Ti	Cost	HMT	N/A	SED	Selective Electrochemical Dissolution	
AWE	Anode	Ag	Cost	HMT	N/A	TD	Transient Dissolution	
	Cathode	Ni; NiO	Hazard	HDT; HMT	N/A			

Table above summarizes the existing and novel recovery technologies applicable to critical materials of FCH stacks: the existing technologies for PEMFCs, PEMWEs, AWEs and SOFCs are focused mainly on hydrometallurgical and pyrometallurgical recovery of precious metals used in the stacks as catalysts for the conversion process.

New technologies in recycling phase

CHEMICAL PROCESS

Existing ones

- hydrometallurgical,
- pyro-hydrometallurgical

Novel processes

- Alcohol dissolution (AD)
- Acid process (AP)
- Selective electromechanical dissolution (SED)
- Transient dissolution (TD)



New technologies implementation in current plants

Permissions and authorizations for new implementations (permissions differs from Country to Country)

- **procedure which requires lot of time**
- **identification unified in all member states**
- **efficient and productive (how much can be recovered by a product)**
- **Knowledge of the process- Design Staff**
- **Civil Works and installation**
- **Insurance**
- **Operation Staff**



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New technologies implementation in current plants

Economic and financial evaluation

- **Investment costs - sustain for the new installation**
- **Financing**
- **Revenues**

MATERIAL OUTPUTS

Find opportunities to use recycled material

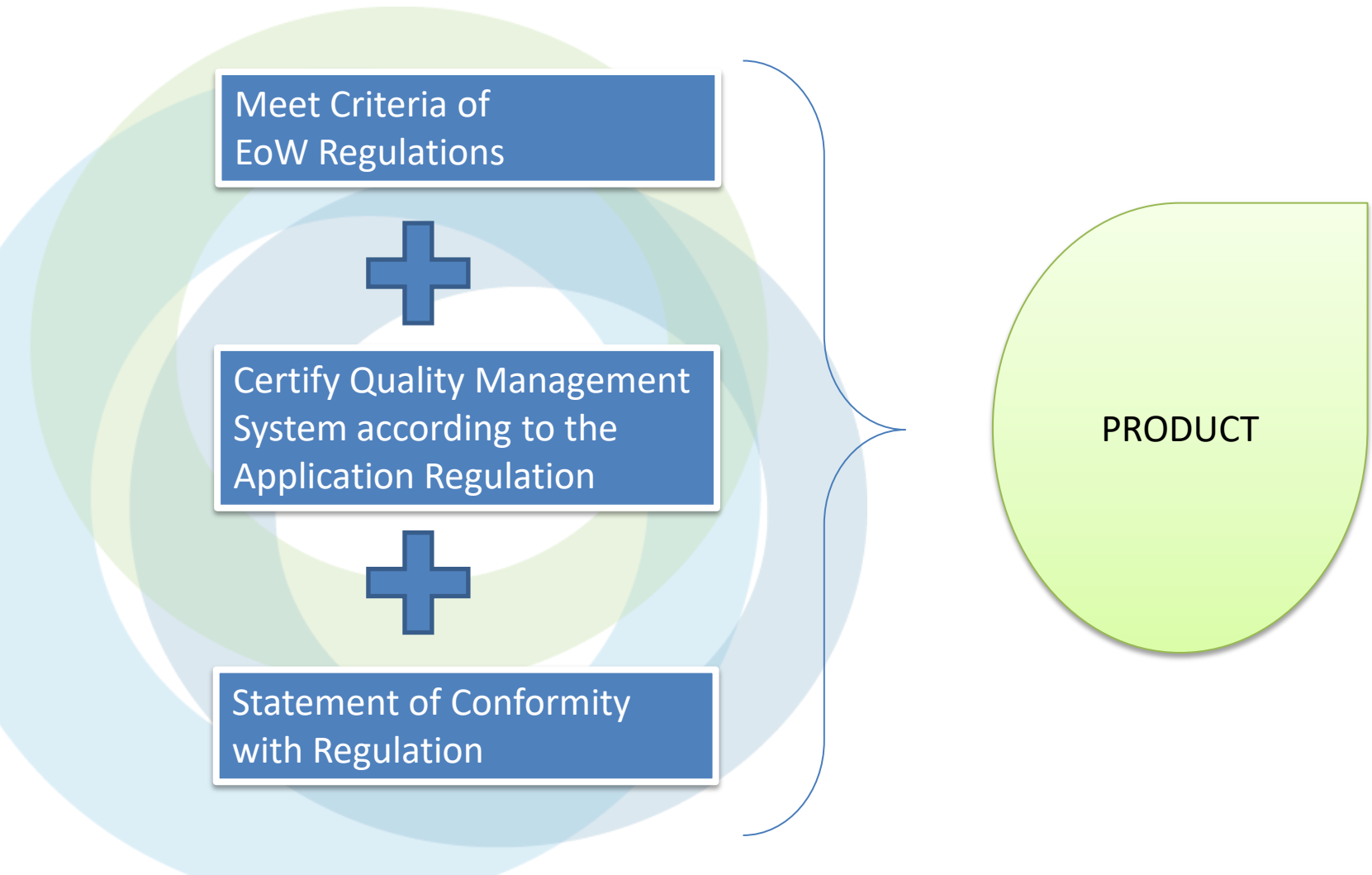
- **Traditional output**
- **New AUTHORIZED ways**
- **End of Waste**



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END OF WASTE



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