

STORHY FINAL EVENT

HYDROGEN STORAGE SYSTEMS FOR AUTOMOTIVE APPLICATION

PSA POISSY, JUNE 3-4, 2008



Vehicle Recyclability and LCA of the Carbon Fibre Recycling Processes

Objectives

- ❖ Compliance with the EU Directive on end-of-life vehicles (ELV-Directive)
- ❖ Guarantee that hydrogen vehicles (and their storage systems) are designed to fulfil all requirements (incl. end-of-life) for sustainable personal transportation.

Achievements

Description of Product / Process developed:

Three main "products" were developed regarding vehicle recycling:

- ❖ 1) Vehicle recyclability calculation considering the contribution of the fuel storage system to the total recyclability quota
- ❖ 2) Design aspects of H₂ vehicles and storage systems that potentially influence recyclability
- ❖ 3) Simplified LCA of the recycling processes developed for the recycling / recovery of Carbon Fibre (CF)

Product / Process performances:




- ❖ 1) a. Recyclability quota for different vehicles and fuel storage system concepts. b. Potential increase of an end-of-life vehicle value if (recycled) material sorting is improved.
- ❖ 2) List of material compatibility and design actions with potential to positively influence the end-of-life treatment of future vehicles.
- ❖ 3) Comparison of the environmental impact of the two CF recycling processes developed: Fluidised Bed and Microwave Pyrolysis.

Added value / State-of-the-art:

- ❖ The recyclability evaluation of H₂ vehicles (& storage systems) pointed to further development needs in the end-of-life vehicle treatment. It also presents the economic gain potentially generated by increased purity of (recycled) materials.

Recyclability Quota:

Influence and Contribution of Vehicle Concept and Fuel Storage Systems

[% in weight]	Fuel Storage Concept	
	Conventional Storage	Hydrogen Storage
Vehicle Concept		
		
Average 2040 veh.	91,0%¹ (1,1%)²	88,2%¹ (5,2%)²
Aluminium Intens. Veh.	83,1%¹ (1,3%)²	80,4%¹ (6,4%)²
Composite Intens. Veh.	64,8%¹ (1,2%)²	63,9%¹ (5,7%)²

1 = Entire vehicle recyclability quota (in weight %)

2 = Storage contribution to the vehicle recyclability quota

Simplified LCA of CF Recycling Processes: Fluidised Bed vs. Microwave Pyrolysis

	Fluidised Bed	Microwave	Advisable Process (UCPTE)
Inputs			
Energy (gross calorific value) [MJ]	114.63	66.59	Microwave
Energy (net calorific value) [MJ]	107.89	63.65	Microwave
Outputs			
Acidification Potential (AP) [kg SO ₂ -Eq]	0.04	0.03	Microwave
Eutrophication Potential (EP) [kg Phos]	0.04	0.01	Microwave
Global Warming Potential (GWP 100 y)	6.45	3.44	Microwave
Photoche.Ozone Cre.Pot.(POCP)[kg E	3.41E-03	1.74E-03	Microwave
Radioactive Radiation (RAD) [DALY]	2.12E-08	2.30E-08	Similar

Future Perspectives

- ❖ Improvement / further development of end-of-life vehicle technologies and concepts, as well as material separation technologies. This is necessary in order to recycle the high value materials used in H₂ vehicles (and storage systems) into high quality material so that the recycling loop is closed and a contribution to a sustainable personal transportation is made.
- ❖ Design of products should consider, when feasible, the compatibility of materials used together.

Partners	<ul style="list-style-type: none"> ❖ Ford Research Center Aachen GmbH ❖ University of Nottingham ❖ Dynetek Europe ❖ PSA Peugeot Citroën 	 
		 

Website	www.storhy.net
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