



**ECO-innovation** |   
WHEN BUSINESS MEETS THE ENVIRONMENT

CIP Eco-innovation  
Pilot and market replication projects  
Call 2009

Agreement Number: ECO-09-256180-WS-REC  
WS-REC

DESIGN AND CONSTRUCTION OF A ELV-WINDSCREEN RECYCLING LINE

Deliverable D.8.4.

Layman's Report

Start date of the project: 1<sup>st</sup> April 2011

Duration: 3 years

Organisation name or lead contractor for this deliverable: Lurederra



<b>Project: ECO-09-256180-WS-REC</b>		
<b>Dissemination Level</b>		
<b>PU</b>	Public	✓
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for member of the consortium (including the Commission Services)	

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## 1. Introduction

WS-REC, with contract number ECO-09-256180-WS-REC, is a project that was co-funded by the CIP Eco-Innovation Programme and which started the 1<sup>st</sup> of April of 2011 and ended the 30<sup>th</sup> of March of 2014.

The general aim of the project, namely to construct an industrial line for the recycling of windscreen from end-of-life vehicles, with a recycling capacity up to 350 tonnes per year in order to treat and recycle the volume of waste PVB.

The recycling line involves very innovative technologies and takes the advantage of the new process developed in Lurederra which enables to separate small pieces of glass from PVB. This last advanced process is in itself extremely innovative, since no process can recycle PVB from windshields in an industrially feasible manner.

As a result, a PVB product with similar characteristics as the commercial PVB is obtained.

## 2. Background

The European Community produces every year more than 8 million of tonnes of waste due to the end of life vehicles, from which more than three quarters are recycled. The rest, almost a 25% are land filled. In 2000, a new directive, Directive 200/53/DC, related to the management of end of life vehicles was implemented. The directive states that by January 2006, the reuse and recover of all ELV should be increased to at least 85% (reusing and recycling a minimum of 80%), while by 2015 this percent should be increased to at least 95% in regards to reuse and recover (reusing and recycling at least 85%).

End of life vehicles waste streams are mainly composed by metals (76% of the total weight), glass (up to 3%) and others: rubber, batteries, plastics, etc. Annually around 270.000 tonnes of ELV-glass wastes, mainly from windscreens, are generated in Europe. Windscreens are made of a layer of clear plastic, such as polyvinyl butyral (PVB) which acts as impact absorber laminated between two layers of glass. The PVB represents almost a 10% of the windscreen's weight and its recovery is considered to be rather expensive attributable to different aspects, such as its difficulty to be removed or its materials separation and recycling.



### 3. Project

#### 3.1 Project Overview

The European Community produces every year more than 8 million of tonnes of waste due to the end-of-life vehicles, from which more than three quarters are recycled. The rest, almost a 25%, are landfilled. In 2000, a new directive, Directive 2000/53/EC, related to the management of end-of-life vehicles was implemented. The directive states that by January 2006, the reuse and recover of all ELV should achieve at least 85% (reusing and recycling a minimum of 80%), while by 2015 this percent should be increased to at least 95% in regards to reuse and recover (reusing and recycling at least 85%).

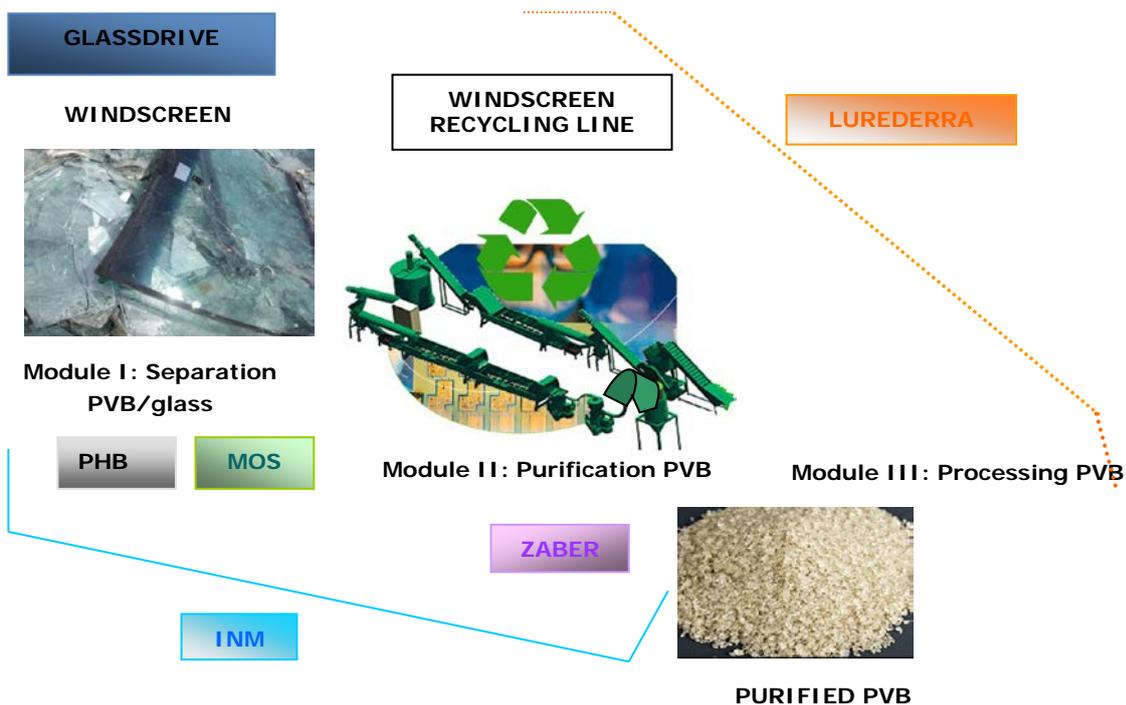


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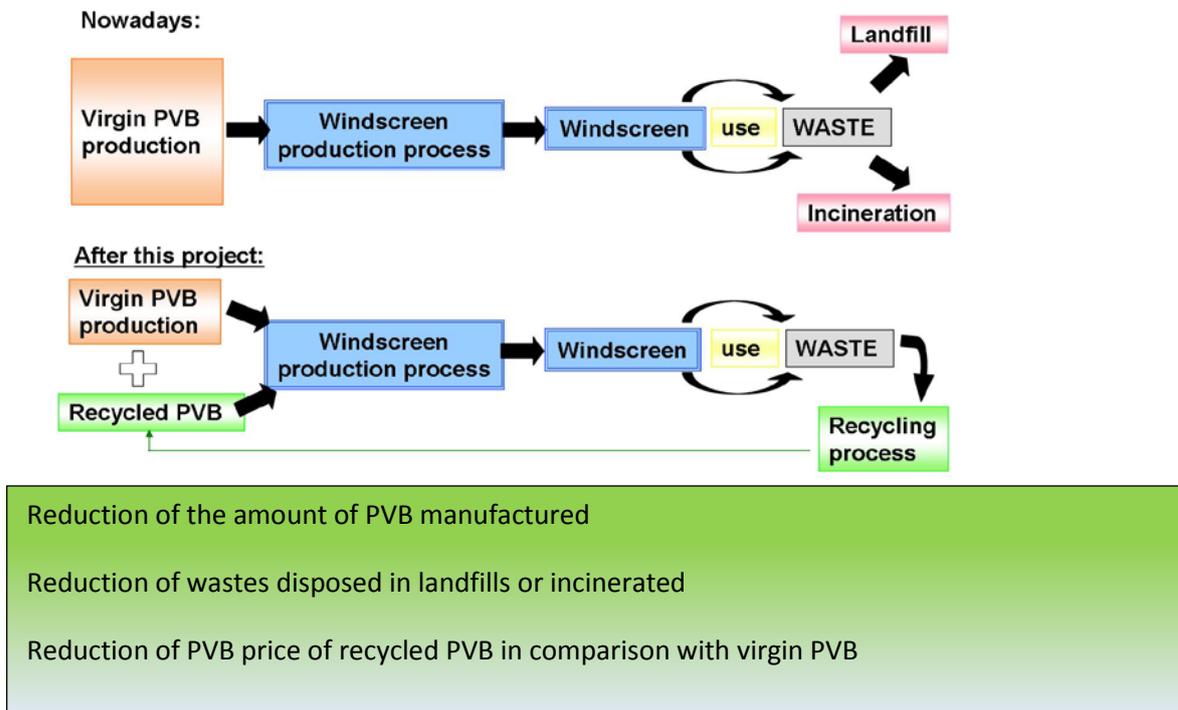


### 3.2 Specific Objectives

The general aim of the project, namely to construct an industrial line for the recycling of windscreen from end-of-life vehicles, with a recycling capacity, up to 350 tonnes per year, in order to treat and recycle the volume of waste PVB generated by almost 20 million of people, taking the advantage of the new process developed in Lurederra which enables to separate small pieces of glass from PVB, is in itself extremely innovative: no process can recycle PVB from windshields in an industrially feasible manner. As a result, a PVB product with similar characteristics as the commercial PVB will be obtained.



### 3.3 Benefits of the innovative solution



### 3.4 Consortium

The consortium is therefore composed of six companies which are very complementary, consisting of one car glass repair and windscreen waste manager (GlassDrive), one company with a high expertise in recycling systems (PHB), an organization with deep experience in specific machine design and optimization (MOS), an advanced technological centre with a strong background regarding plastic materials and their recycling as well as project management (Lurederra), an expert machinery designer and constructor to assemble the required lines for separation glass-PVB, purification of PVB and PVB processing (INM) and a company specialized in energy engineering and machine innovation (Zaber).



## 4. Results

### Recycling process

The three main stages of the recycling process of PVB are described below:

- Module I: Windscreens are shredded and pollutants and other elements (rubber and coloured band) are removed. Big pieces of glass are removed in this step.



The amount of glass in adhered to the PVB is less than 2%.



- Module II: Removal of glass and other pollutants from plastic surface. As a result, glass-free material is obtained.



After the reactions take place, the PVB is totally free of glass.



- Module III: Purified PVB flakes are transformed to commercial format, depending on the clients' requirements.



Characteristics of recycled PVB

Mechanical Property	Material		
	Recycled PVB building sector	Recycled PVB automotive sector	Commercial PVB
Hardness Shore A	86	86	85
Density (g/cm <sup>3</sup> )	1,075	1,070	1,064
Tensile strength (Kgf/cm <sup>2</sup> )	266	269	273
Elongation at break (%)	209	201	203

FORMAT		PRICE (€/kg)	APPLICATION
Liquid Format	Organic solvent	2-2,5	For the fabrication of coatings both in paper and cardboard: packaging material, filter, etc.
	Aqueous Emulsion	2,73	For the fabrication of coatings in textiles: curtain, awning, upholstery, carpets, etc. For the fabrication of temporary coatings for the protection of construction sites, for protecting products during delivery, installation or maintenance, etc. For the fabrication of paint, varnishes and ink or the formulation of coatings for concrete and interior or external bricks..
Solid Format	Flakes	0,751	Fabrication of the sole of shoes, pavements, rubber sheet, rubber seals, conveyor belts, etc.
	Pellet	1,67	Fabrication of thermoplastic compounds for boots or shoes' accessories, cables, floor, carpets, technical components, toys, pipes, components for children playground, etc.

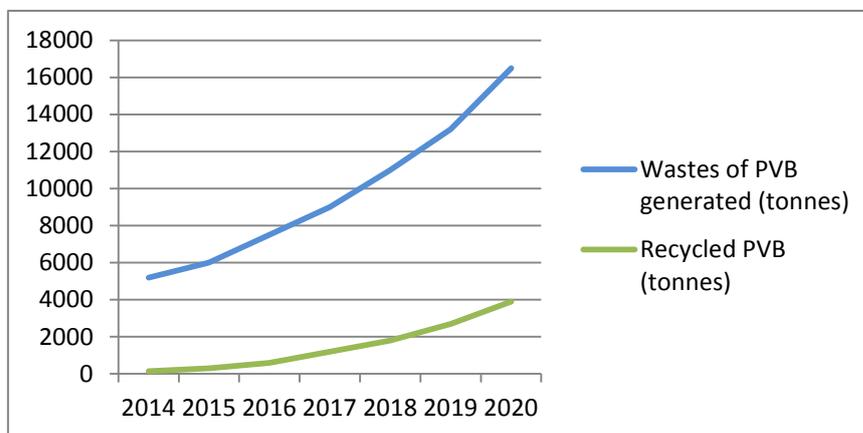
## 5. Market

It is estimated that Europe generates approximately more than 9 million of End-of-Life vehicles per year. This means that more than 9 million of kilograms of PVB are also disposed per year, always without taking into account those windscreens that are currently removed from vehicles due to fracture. Hence, there is about 18,000 tonnes of PVB available from car glass in total.

The technological development proposed within this project is clearly directed towards some target groups regarding several exploitation opportunities or possible benefits, such as:

- Manufacturers of PVB
- Providers of windscreens: scrap yards, replacements garages, among others.
- Waste management companies such as glass recovery companies, plastic recycling companies, among others.
- Laminated glass Manufacturers

Recycled PVB as well as the recycling line are not only of great interest for the windscreen industry, but also to other manufacturing industries and sectors. In this sense, and despite the fact the recycling line was constructed taking into account the characteristics, the consortium would also extend its recycling field, incorporating laminated glass wastes from other sectors such as construction. Moreover, the recycled PVB would also be sale to other industries which are interested in using recycling raw materials in their processes.



In the following years the amount of PVB recycled will be steadily growing due to increased ELV number. According to a forecast of the Association of Plastic Manufacturers in Europe over 12 million ELVs will be discarded in 2015. Hence at the same market share of 30% over 6,000 tonnes of the recycled PVB will be produced. This volume can increase even more if use of laminated glass for side and rear windows becomes more widespread. The trend to replace toughened glass side and back windows in new vehicles with semi-toughened laminates for enhanced safety and security is increasing and it involves 4-5 fold higher consumption of the PVB containing material.

## 6. Contact details

For further information consult our website:

[www.ws-rec.eu](http://www.ws-rec.eu)

Or our Project coordinator:

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