



LIFE 14 ENV/IT/000744

**PLA4COFFEE**

# BACKGROUND

In 2010 it was estimated that 10 billions of capsules were sold in the world, a tenth of them in coffee-loving Italy. In Italy alone, 12.000 tons of capsules (plastic/aluminium + coffee grounds) were disposed of in landfills and incinerators (Zero waste Europe), meaning that for 10 billion capsules we reach the astonishing amount of 120.000 tons of waste worldwide (plastic/aluminium + coffee grounds), of which about 70.000 tons in Europe, accounting for about the 60% of the world coffee capsules market. This amount is comparable to the weight of a 30-story building or to the weight of Godzilla.

At the present time the standard materials to produce capsules are Polyethylene (PE), Aluminum (Alu), Ethylene Vinyl Alcohol (EVOH), and Polyethylene terephthalate (PET). Considering the European market it is possible to estimate that about 60% of the capsules are produced in aluminium and about 40% in plastic.

Since all the above mentioned products are not biodegradable and produced by consuming non renewable resources as well as a great amount of energy and, therefore, when landfilled or incinerated, are responsible of an environmental impact today no longer sustainable, the introduction of biodegradable/compostable PLA coffee capsules will have outstanding environmental benefits.

# OBJECTIVES

The project will demonstrate potentials of new PLA based formulations to be scaled for the production of environmental friendly coffee capsules and many other consumer goods. At this purpose, the initiative will be mainly aimed to:



- Convincing coffee capsules producers that the use of new bio-based materials can meet the specifications required by the reference market;



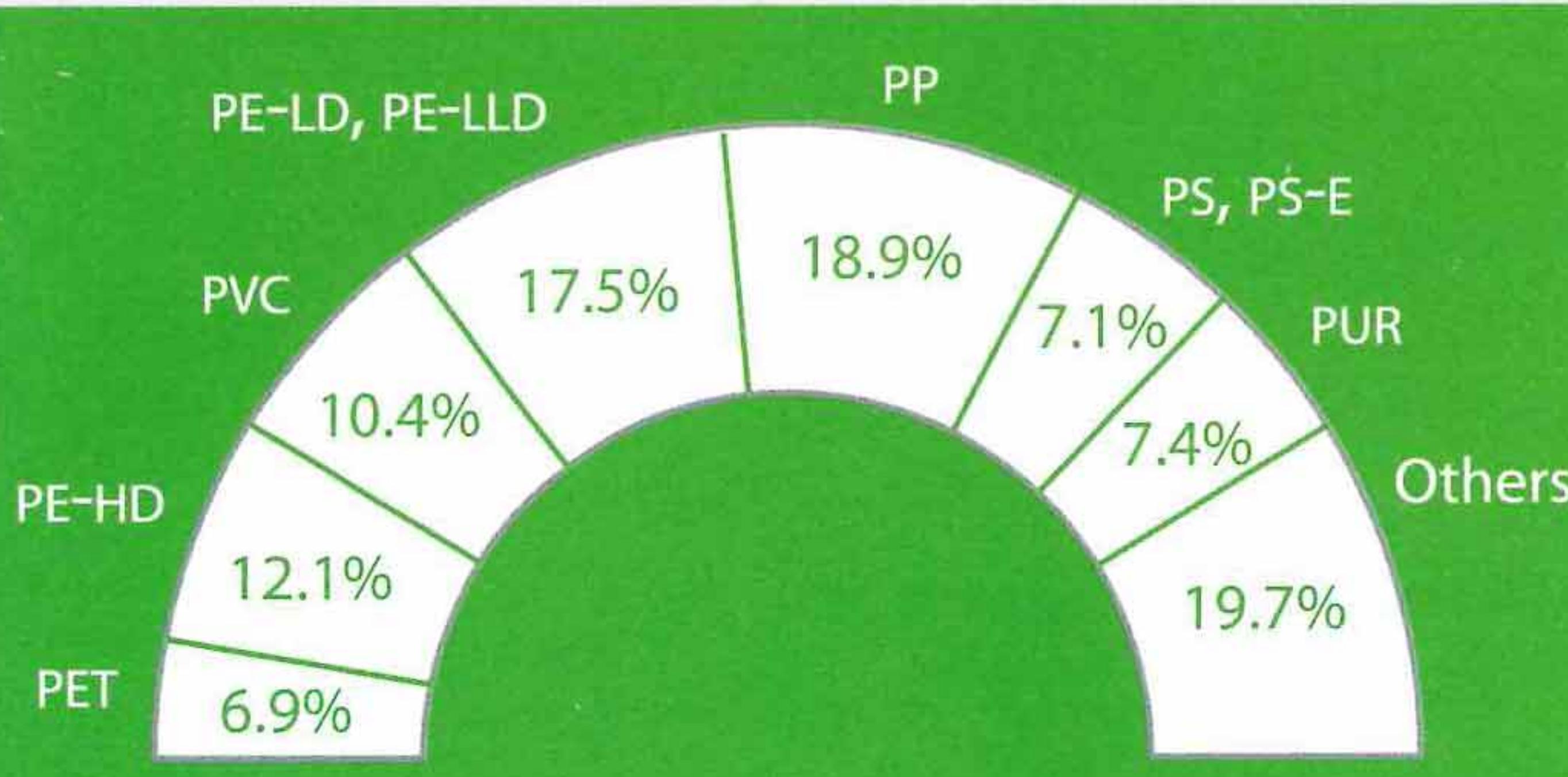
- Demonstrating how an industrial innovation can ensure new productions with reduced environmental impact while safeguarding economic growth.

# RESULTS

The technical results, expected within the two years of the project, can be summarized as follow:

- Prototypes of new coffee capsules with 100% fossil feedstock reduction and the same, if not improved, performances;
- A fine-tuned PLA based formulation to meet processing conditions and performance criteria;
- A specifically designed pre-industrial compounding plant;
- Molding and compression technologies adequately adapted to the new material and demonstrating the feasibility of the new solution to the whole plastic industry;

From the environmental point of view, given the ever growing market of non-recyclable plastics, it is expected that the scale-up on industrial scale of the new PLA based material will allow a significant save of raw petrochemical sources, pollutants related to the productions of conventional PE, PET and aluminum production processes and of plastic wastes in landfill or incinerators.



The widespread use of conventional plastics is responsible of an environmental burden today unbearable.

The development of custom-built and sustainable formulations based on green polymers as PLA for single-use, durable and semi-durable application is a promising and an eco-friendly approach to face this issue.

# ENVIRONMENTAL BENEFITS

The full industrialization of the new PLA bio-based material will allow the attainment of impressive environmental benefits by saving:

- 70.000 tons of waste from landfill or incinerator in Europe, assuring Biodegradability of the product at end of life for billions of coffee capsules;
- 15.000 tons of oil used in coffee capsules production process, meaning 100% reduction of fossil feedstock in capsules production process;
- 405.000 tons of CO<sub>2</sub> eq related to PE, PET and aluminium production process;
- 20.000 tons of bauxite and others dangerous pollutants used in aluminium production process.

The environmental benefits will be even bigger taking into account the whole European plastic market.

In fact, considering that 25 Mt of plastic are not recyclable today in the future it will be possible to save each year about 25 Mt of waste from the landfill.

Additionally, considering the use of the new PLA in the whole amount of plastic produced each year in Europe, about 50 Mt, we can save 100 Mt of oil used for producing plastic and 35.000 Mt of CO<sub>2</sub> eq derived from polyethylene and polyester production processes.

## ENVIRONMENTAL ISSUES ADDRESSED

### THEMES

Eco-friendly products – Coffee capsules  
– Compounding industry

### KEYWORDS

Compostable coffee capsules,  
Poly(lactic acid), Eco-friendly solutions

### TARGET EU LEGISLATIONS

Waste



# BENEFICIARIES

## COORDINATOR

### • AROMA SYSTEM S.R.L. TYPE OF ORGANIZATION: SME

**Description:** Leader in coffee capsules production.

Since 1988 Aroma System S.r.l. manufactures one-way degassing valves capable of restoring the correct pressure inside sealed flexible bags when the product packed is recently roasted coffee. Our experience in the coffee sector finds its modern expression in a rigid, durable and practical new form of capsule, in full accordance with the current lifestyle of the single serve. The capsule is able to enhance the extraction process: from traditional mocha to espresso.

## PARTNERS

### • API Applicazioni Plastiche Industriali SpA (API)

#### TYPE OF ORGANIZATION: SME

**Description:** Leading plastic compounding company based in Veneto region and involved, since its foundation in 1956, in the plastic field. It is specialized in the creation, development and engineering of: polymeric alloys and thermoplastic elastomers compounds, Thermoplastic Polyurethanes TPU, Biodegradable and Renewable Bioplastics, suitable for injection and co-injection moulding, extrusion, coextrusion, calendering, coagulation, casting and blowing film.

### • TOR VERGATA ROME UNIVERSITY

#### TYPE OF ORGANIZATION: PUBLIC RESEARCH ORGANISM

**Description:** The initiative include a research team of the Department of Enterprise Engineering (DEE).

The DEE has several laboratories with many instruments and machines (such as universal testing machines, presses, ovens, machining systems, 3D surface analyser, DSC, DMA, spectrophotometer, micro-indenter, nano-scratch, micro-tribometer, thermo camera, SEM, laser systems, furnaces etc). Other useful machines are the rheometer, the coordinate machine and the injection moulding press.

### • IPCB-CNR

#### TYPE OF ORGANIZATION: PUBLIC RESEARCH ORGANISM

**Description:** The Institute for Polymers, Composites and Biomaterials (IPCB-CNR), [www.ipcbcnr.com](http://www.ipcbcnr.com), recently established by merging the Institute for Polymer Chemistry and Technology (ICTP) and the Institute for Composite and Biomedical Materials (IMCB), is focused on: synthesis, chemical modification and characterization of polymer based materials; development of composite and nanocomposite materials with structural and programmed functional properties.

## CONTACT DETAILS

DISSEMINATION ACTION LEADER

Pietro RUSSO

[+39] 0818675249

[pietro.russo@ipcb.cnr.it](mailto:pietro.russo@ipcb.cnr.it)

[pla4coffee.wordpress.com](http://pla4coffee.wordpress.com)

## ADMINISTRATIVE DATA

DURATION - 16/07/2015 to 16/12/2017

TOTAL BUDGET - 2'502'695 Euro

**LIFE-PLA4COFFEE** project is an initiative proposed and financed under the LIFE 2014 Programme of the European Union.

EU CONTRIBUTION - 1'501'610 Euro

### PROJECT LOCATION

Aroma System Srl, Bologna - *Italy*

API Spa, Mussolente (Vi) - *Italy*

Tor Vergata University, Roma - *Italy*

IPCB-CNR, Pozzuoli (Na) - *Italy*

