



AIMPLAS
EXCELLENCE IN PLASTIC

DEMONSTRATION PLANT PROJECT TO PRODUCE POLYLACTIC ACID (PLA) BIOPOLYMER FROM WASTE PRODUCTS OF BAKERY INDUSTRY



LIFE+ 10ENV/ES 479

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**V INTERNATIONAL SEMINAR
BIOPOLYMERS AND SUSTAINABLE COMPOSITES
March, 6th 2014**

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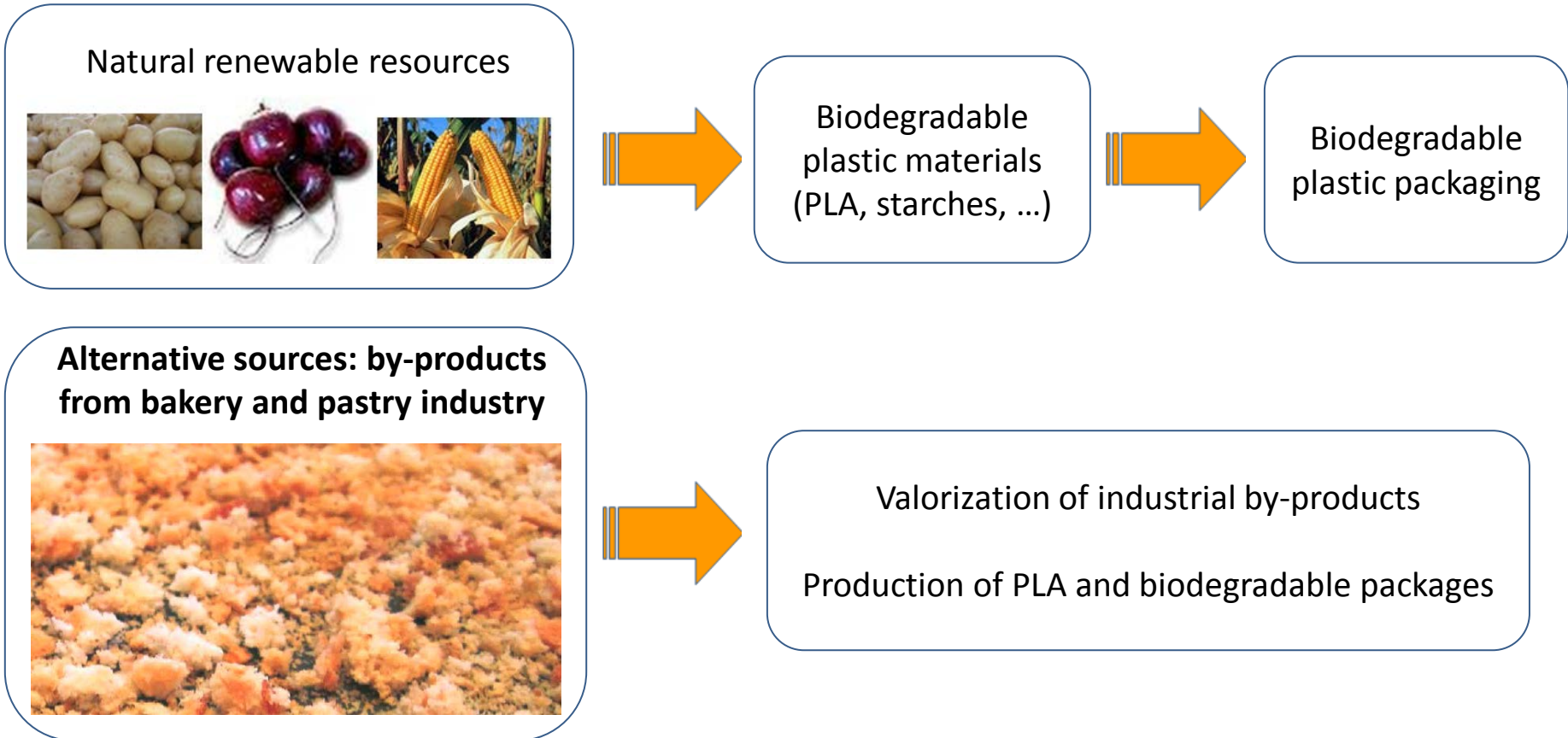


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01. The project

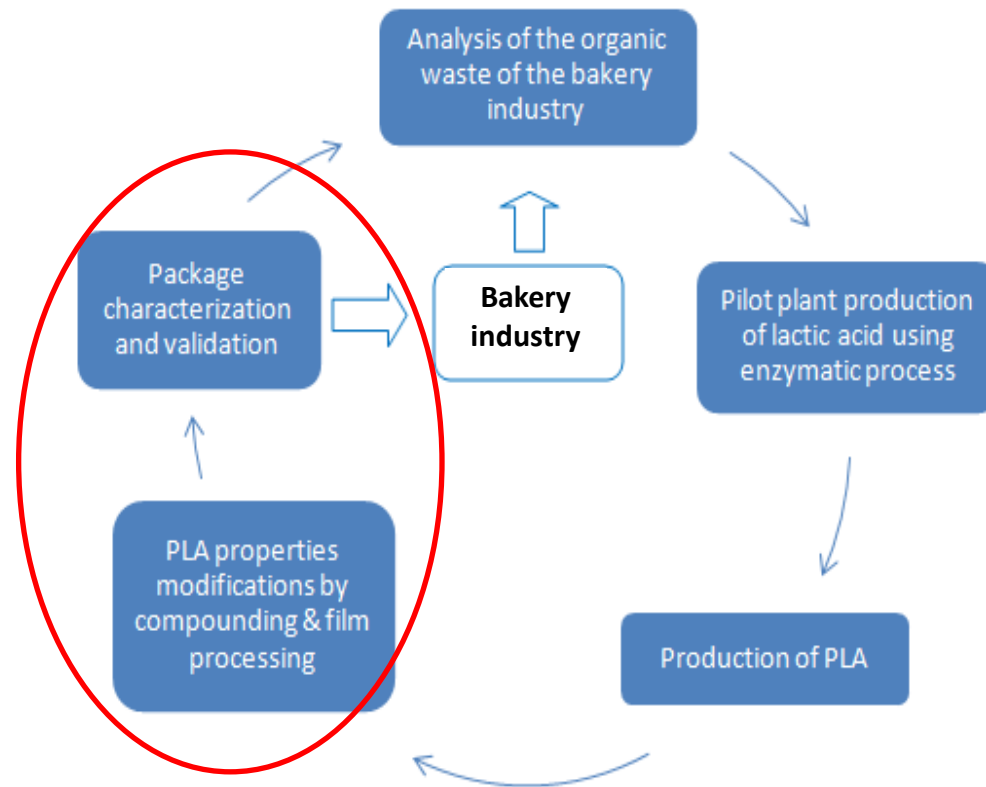




01. The project

OBJECTIVES

- To demonstrate, at pilot plant scale, the viability of PLA production using bakery waste as raw material.
- To produce new PLA packages for bakery and pastry products, closing the life cycle.



02. The consortium



Co-ordinator beneficiary:

Instituto Tecnológico del Plástico
(Valencia, España)



Associated beneficiaries:

Instituto Tecnológico de Cereales de Castilla y León
(Palencia, Spain)



Leibniz-Institute for Agricultural Engineering
(Potsdam, Germany)



Biocomposites Centre – Bangor University
(Bangor, UK)



03. Results



BY-PRODUCTS SELECTED

Industrial by-products

- Bread crust
- Sponge cake



From traditional small bakery companies in Spain

- Expired bread





03. Results

LACTIC ACID (LA) PRODUCTION

Up-scaling: reactor (1 L – 55 L - 600 L)

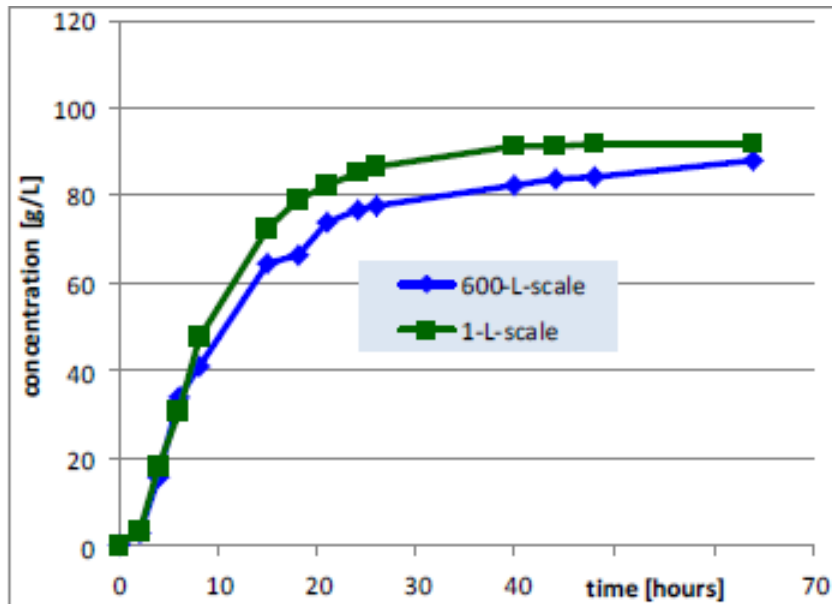
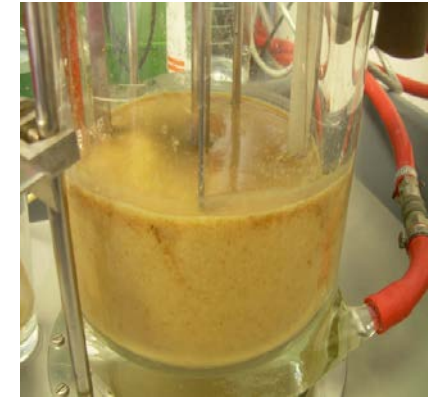


Figure. Sodium lactate production vs fermentation time



Yield: 0,34 kg LA / kg by-product

(between 0,2 and 0,4 for other biobased products)



03. Results

PLA PRODUCTION

Up-scaling: reactor (0,5 kg – 10 kg)

| Scale | PLA | Melting point (°C) | MFI (g/10 min) | Mw (Da) |
|-------------|--------|--------------------|----------------|---------|
| Lab | PLA9 | 140 | 166 @ 128 °C | 11.500 |
| Lab | PLA12 | 165 | 33 @ 190 °C | 95.850 |
| Lab | PLA26 | 178 | 8 @ 190 °C | 248.000 |
| Pilot plant | PLA 38 | 170 | 7.0 @ 190°C | 560.000 |

Yield: 77%

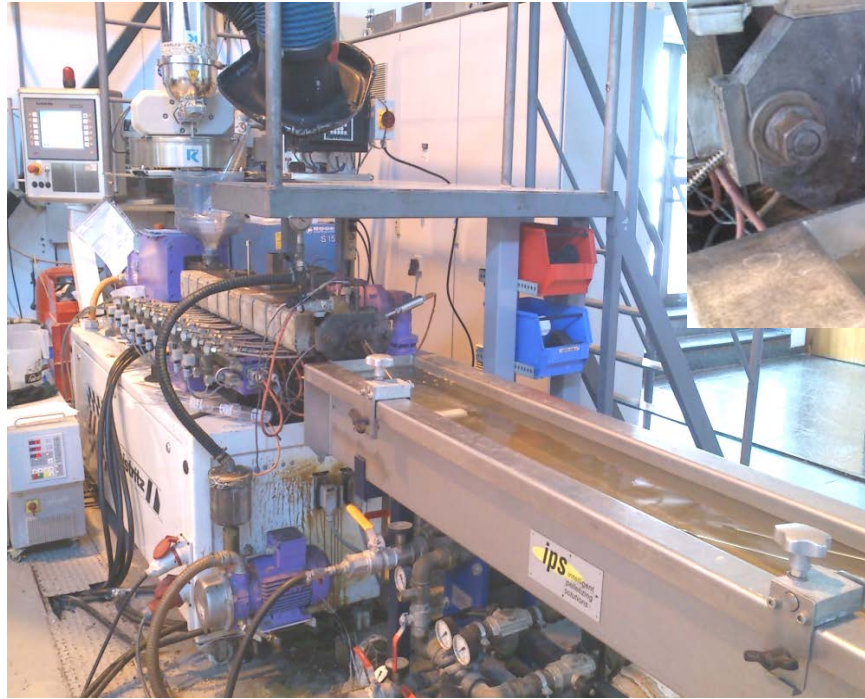
Improvements are possible by optimization of certain steps



03. Results



PHYSICAL MODIFICATIONS OF PLA - COMPOUNDING





03. Results

PILOT PLANT PROCESSING

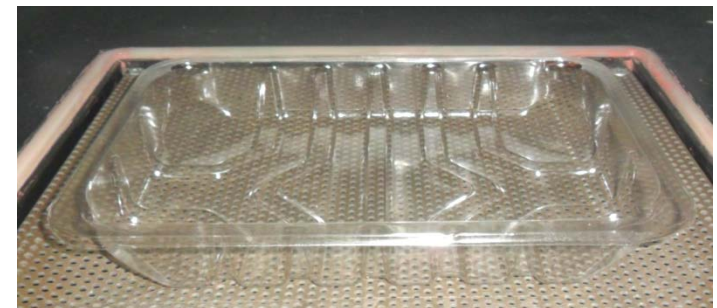
Film extrusion and thermoforming



Flat film extrusion



Blow film extrusion



03. Results



PLA FILMS CHARACTERIZATION



Barrier properties

| | OTR (cm³/m²*day) (21°C, 50% R.H.) | WVTR (g/m²*day) (38°C, 90% R. H.) |
|----------------|--|---|
| Commercial PLA | 387 | 136 |
| PLA38 film | 362 | 114 |

Mechanical properties

| | Tensile strength (Mpa) | | Elongation at break (%) | |
|----------------|-----------------------------------|--------------|------------------------------------|--------------|
| | Long | Trans | Long | Trans |
| Commercial PLA | 55,4 | 51,5 | 1,7 | 1,5 |
| PLA38 film | 62,3 | 54,7 | 2,8 | 1,7 |



BREAD4PLA

04. MATCH POINT

16:55h COFFEE BREAK - BREAD4PLA Match Point

www.bread4pla-life.eu

Register for project newsletter subscription and free
Technological Watch Service (TWS)



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Thank You

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