BIOLYFE PROJECT

Second generation BIOethanol process: demonstration for the step of Lignocellulosic hYdrolysis and FErmentation

Arianna Giovannini

Biolyfe - Description

Lignocellulosic ethanol is one of the most promising second generation biofuel technologies. Even though different conversion technologies are available on the market, there are still challenges to overcome before launching a large scale industrial production.

- The BIOLYFE project, supported by the EU Commission through the FP7 funds, aims at improving critical process steps and demonstrating the industrial-scale production of second generation bioethanol, covering the whole supply chain, from feedstock sourcing via fuel production to product utilisation.
- In the framework of the project the first industrial demonstration-scale plant in the world for the production of bioethanol from lignocellulosic biomass was engineered and constructed in Crescentino (VC, Italy) with a capacity of 40,000 tons per year with a dry biomass input of about 180,000 tonsper year.
- The plant is designed to produce bioethanol through hydrolysis and fermentation of cellulose and hemicellulose starting from lignocellulosic biomass (agri-cultural by-products or energy crops not suitable for food consumption).

Biolyfe - Scientific focus

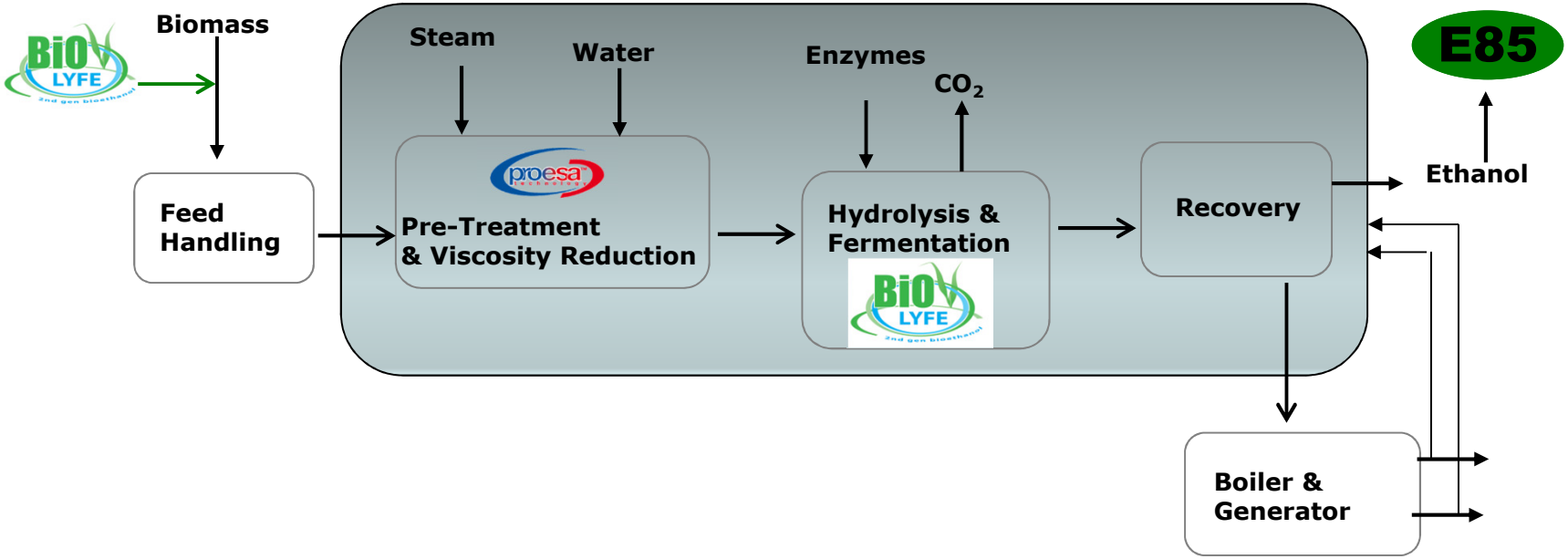
The BIOLYFE project specifically seeks technologies which have the highest undiscovered potential to enhance the technical and economic feasibility of the hydrolysis process and the complete conversion of all sugars into ethanol through an optimized fermentation process.

The main objectives of BIOLYFE are to develop at industrial scale:

- investigation of energy crops in relation to feedstock supply and pretreatment;
- enzymatic hydrolysis in a viscosity reducing step of pretreated material;
- efficient hydrolysis of the chosen pretreated lignocellulosic raw materials: BIOLYFE project aims to minimize the enzyme loading;
- simultaneous saccharification and co-fermentation of derived C_6 and C_5 sugars to ethanol with a yield of 75% and a final ethanol concentration exceeding 5% within 72 h fermentation time (most likely around 7-8%);
- efficient integration of hydrolysis and fermentation processes at industrial demonstration scale

Biolyfe – Scientific focus

- Construction, start up, operations and data collection for industrial scale up of demo scale plant (40.000 tonEtOH/y)
- environmental, social and economic assessment;
- market assessment.



Biolyfe - Partnership

Agriconsulting IT

Univ. Lund-SE

ENEA - IT

Novozymes DK

WIP – DE (ETA - IT)

biochemtex IT (*Coordinator*)

IUS – DE (IFEU-DE)

EC-FP7

BIOLYFE: Demonstrating large-scale bioethanol production from lignocellulosic feedstocks

Timing and Activities

Basic design of enzymatic hydrolysis and SSF reactor

Preliminary and detail design of complete industrial demo plant

Plant construction and assessment of test

Year 1 | *Year 2* | *Year 3* | *Year 4*

Work done

CO -ORDINATION (*and* DISSEMINATION)

Selection and supply of feedstock

Selection of enzymes cocktails

Selection of microorganisms

Basic design of enzymatic hydrolysis reactor

Basic design of SSF reactor

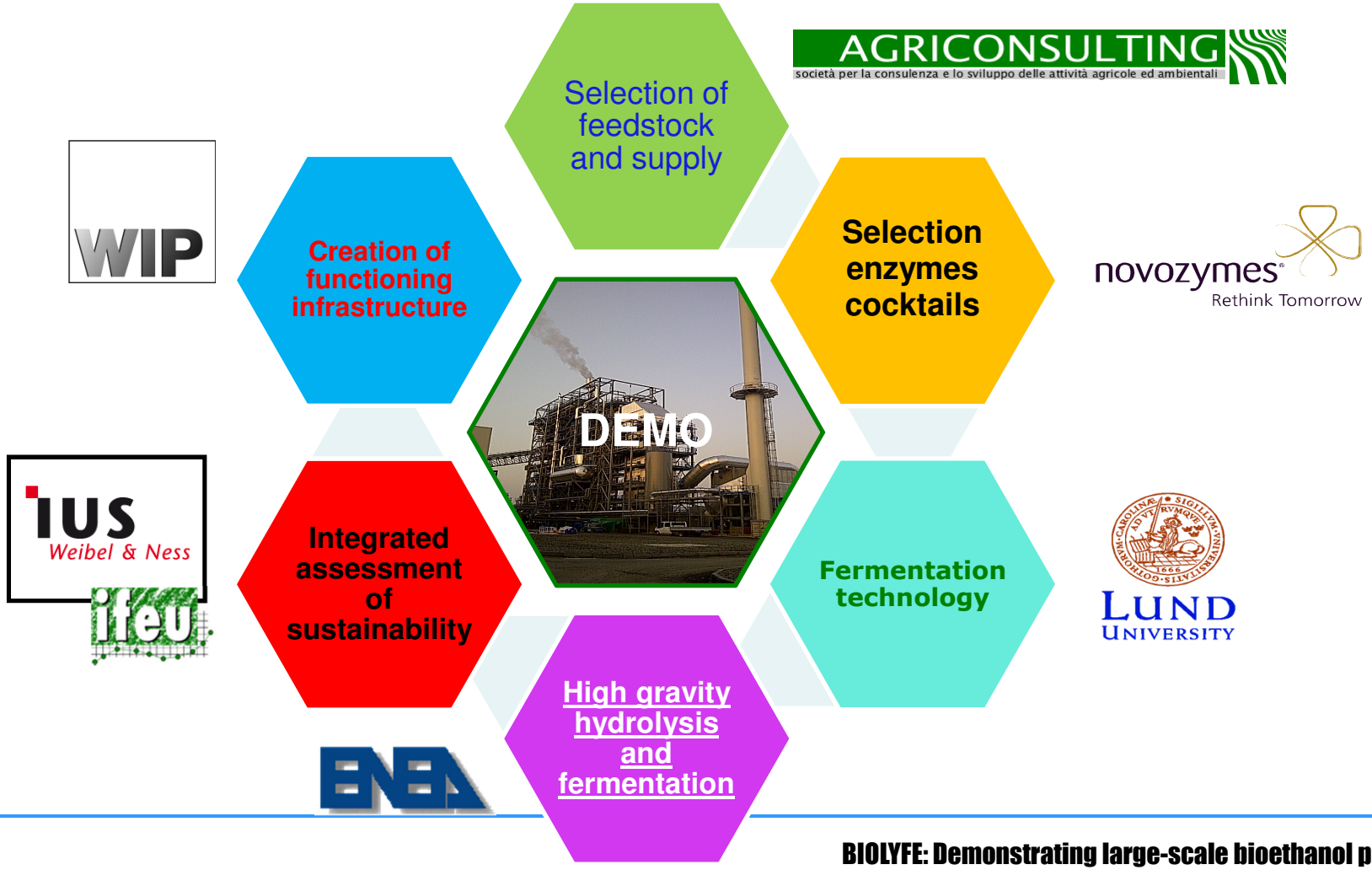
Detail design of the complete industrial demo plant

Plant construction and plant testing

Investigation of the critical levels for ethanol parameters with regard to vehicle endurance/ performance

Set up of a functioning infrastructure to demonstrate the distribution and the use of 2nd generation bioethanol

Biolyfe - Main Activities



Selection supply and pretreatment of feedstock

AGRICONSULTING
società per la consulenza e lo sviluppo delle attività agricole ed ambientali

- Agronomy: Field experimentation.
- Certification system of the biomass origin.
- Biomass supply for the demo unit.

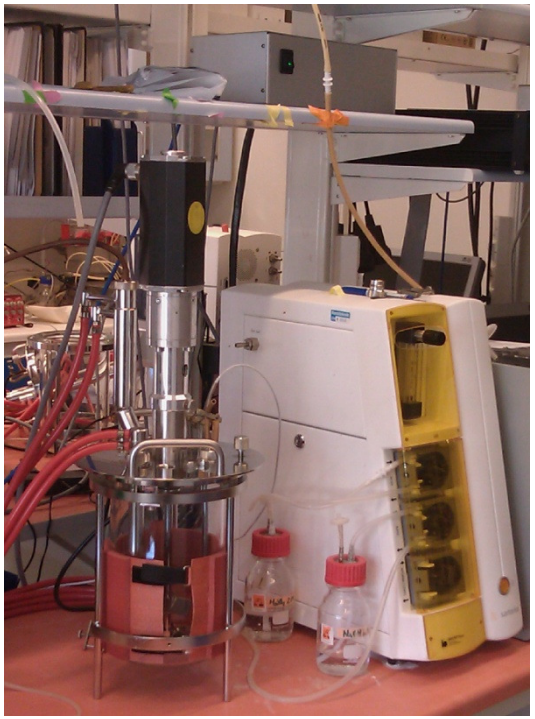
Selection enzymes cocktails

novozymes
Rethink Tomorrow

- Supply of optimised enzyme cocktail for demo plant.
- Follow operative condition and parameters in the demo plant.

Fermentation technology

LUND UNIVERSITY



- Defining process strategies for efficient xylose conversion
- Feed strategy of hybrid SHF/SSF process.

biochemtex

SEVENTH FRAMEWORK PROGRAMME

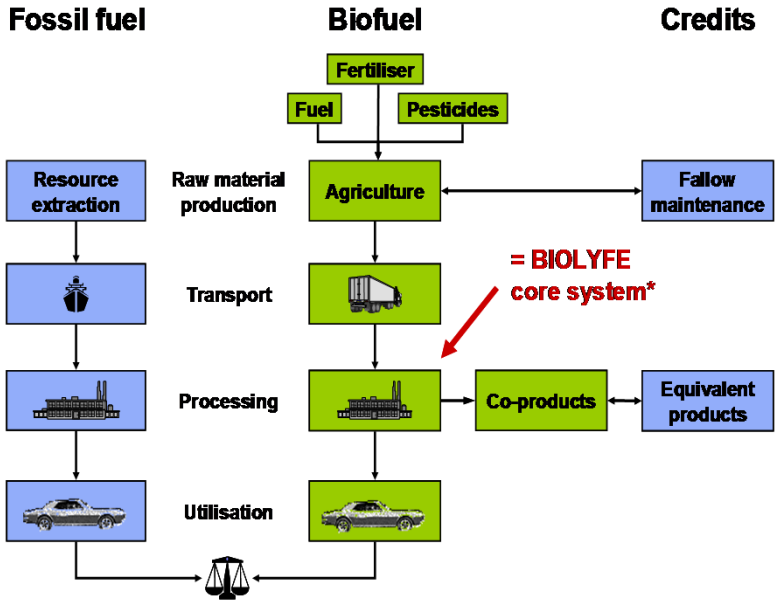
Hydrolysis and fermentation scale up

- Effect of the pretreatment on the biomass hydrolizability
- effect of various feeding strategies on the cellulose hydrolysis
- performances of the enzymatic blends provided by Novozymes
- effect of the reactor geometry and mixing
- process strategy (SSF, SHF, hybrid process)
- resistance of some yeast strains at industrial relevant process conditions

Integrated assessment of sustainability

IUS Weibel & Ness

ifeu *



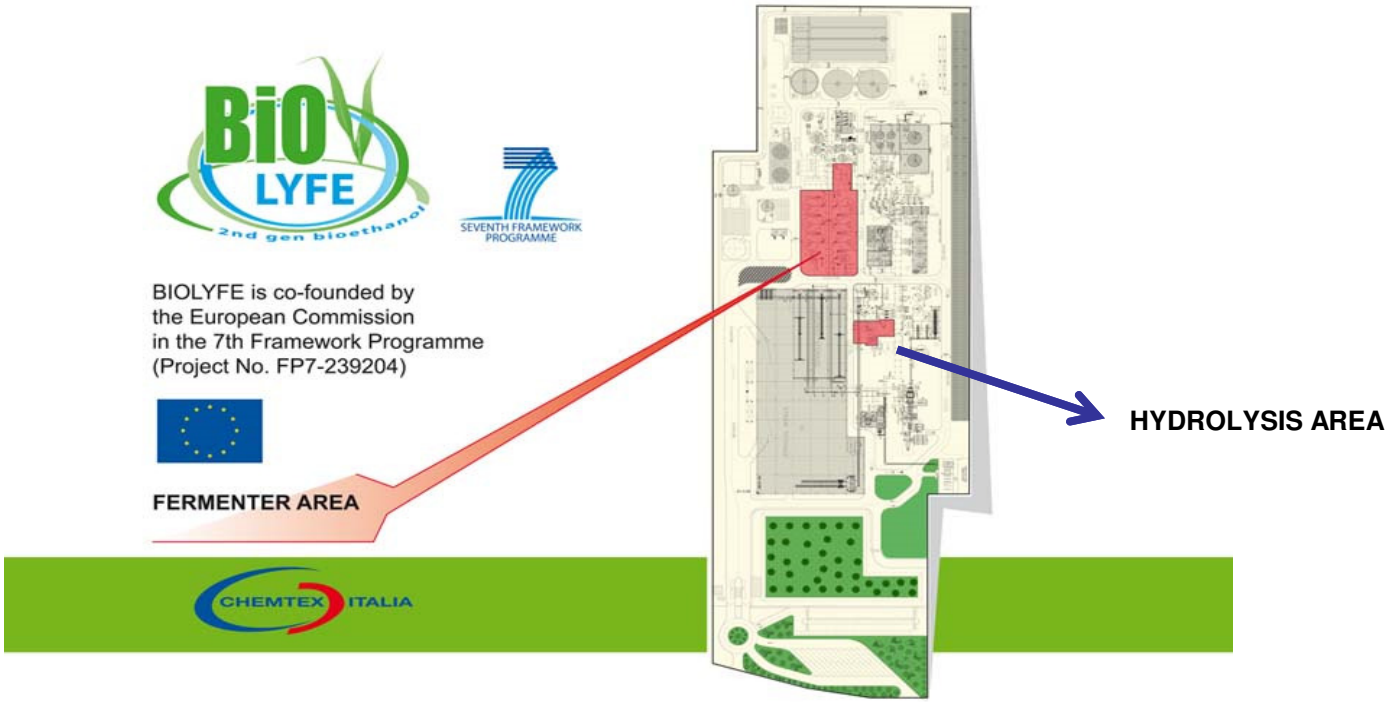
- Integrated assessment of sustainability.
- Technological, environmental, economic and social aspects
- *SWOT analysis*

*: on subcontract basis

Creation of functioning infrastructure

- Creation of functioning infrastructure.
- Mobilization of FFV fleet.

- Demo plant engineering, construction, start up.
- Data collection.



Thank you, for the attention.

EC-FP7