Business strategy: from the Pro.E.Sa project to the investments for plants constructions

Ing. Dario Giordano, Torino 2 marzo 2010
Summary

• 40,000 t/y – First Plant

• PROESA™ Technology Key Features

• Chemtex Capabilities

• Roll Out To The Market of PROESA™ Technology
40,000 t/y First Plant

2006-2008
Scouting, testing and development of technology on lab scale

2009
Construction and tests on continuous pilot plant

2010
Construction of First Plant
40,000 t/y

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40.000 t/y First Plant- Key Features

- Production based on Arundo Donax and Wheat Straw available locally
- Plant will incorporate all technology features developed during the R&D project phases
- Plant will demonstrate at commercial scale the new pretreatment technology (PRIT)
- Plant will incorporate innovative Hydrolysis and fermentation step as part of the BIOLYFE FP7 Project
- Plant will sell Dry Ethanol to major oil company/ies
40,000 t/y First Plant – Some numbers

- Around 300,000 t/y of wheat straw available today in the agricultural area around the plant;
- 4000 Ha ONLY of the lower quality land to be converted to ArundoDonax to supply the plant;
- 70 Km from nearest refinery;
- 51,000 ton of CO2 emission saved per year;
- 40,000 t/y Ethanol = 6,800 car without CO2 emission.
40.000 t/y First Plant

PROESA™ TECHNOLOGY
Cellulosic Ethanol

4 YEARS DEVELOPMENT
FROM THE IDEA GENERATION PHASE
TO THE WORLD LARGEST UNIT
PRODUCING CELLULOSIC ETHANOL !!!
40,000 t/y First Plant

PROESA™ TECHNOLOGY
Cellulosic Ethanol

THANKS TO OUR STRATEGIC PARTNERS & SUPPLIERS
PROESA™ Technology Key Features

- Harvesting
- Pretreatment
- Lignin
- Hydrolysis
- Distillation
- Fermentation
- Ethanol
- EtOH beer

3rd Bio-Ethanol Conference

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CAPABILITY TO USE
A LARGE VARIETY OF BIOMASS AS COLLECTED
PROESA™ Technology Key Features

CAPABILITY TO USE A LARGE VARIETY OF BIOMASS AS COLLECTED

Pre-treatment pilot plant can be fed with several material with a size up to 5 cm.

Different feedstocks show a similar behaviour in pretreatment
PROESA™ Technology Key Features

UNIQUE PRETREATMENT PRODUCING HIGH QUALITY LOW COST SUGAR FROM CELLULOSIC BIOMASS

RUNNING ON A CONTINOUS PILOT SCALE IN RIVALTA LAB SINCE JUNE 2009
PROESA™ Technology Key Features

UNIQUE PRETREATMENT PRODUCING HIGH QUALITY LOW COST SUGAR FROM CELLULOSIC BIOMASS

Bar chart showing glucose and xylose process yield for different biomass sources under M&G Process and Std Steam Explosion conditions.
PROESA™ Technology Key Features

UNIQUE PRETREATMENT PRODUCING HIGH QUALITY LOW COST SUGAR FROM CELLULOSIC BIOMASS

Possibility to use different kinds of biomass without hardware changes and just adjusting process conditions

High recovery yield for Cellulose and Hemicellulose

Only steam used. No chemicals. Low cost operation (Capex and Opex)

Low sugar degradation and low level of contaminants (furfural, HMF) and possibility to reduce acetic acid concentration via state of the art technology

High quality low cost sugar released
PROESA™ Technology Key Features

HIGH EFFICIENCY IN VISCOSITY REDUCTION AND ENZYMATIC HYDROLYSIS

Unique patented process design assure a quick viscosity reduction

Combination of pretreatment technology and enzyme selection assure an high conversion of sugar
Available MO’s will assure fermentation of C5 and C6 simultaneously in a SSF set up.
The fermentation time will be comparable to fermentation time of first generation plants.
The beer will contain more then 6% of EtOH, assuring an efficient conversion and low cost during the separation steps compared to other 2° gen EtOH technologies.
PROESA™ Technology Key Features

ENERGY INTEGRATION THANKS TO HIGH EFFICIENCY LIGNIN BURNING

Lignin coming out from the process has enough energy content to supply all plant requirement.

Design of each plant will include a power generation unit.

Lignin coming form the PROESA™ technology is free from Sulfur, Chlorine and Ammonia and can constitute an unique base for producing chemical from biomass.
PROESA™ Technology Key Features

... Summarizing:

CAPABILITY TO USE A LARGE VARIETY OF BIOMASS AS COLLECTED

UNIQUE PRETREATMENT PRODUCING HIGH QUALITY LOW COST SUGAR FROM CELLULOSIC BIOMASS

HIGH EFFICIENCY IN VISCOSITY REDUCTION ENZYMATIC HYDROLYSIS

SIMULTANEOUS FERMENTATION OF C5 AND C6 SUGAR

ENERGY INTEGRATION THANKS TO HIGH EFFICIENCY LIGNIN BURNING
Chemtex Italy
Tortona, Rivalta

Chemtex China
Shanghai, Beijing

Chemtex USA
Wilmington (NC)

Chemtex India
Mumbai, Bangalore

Employees: 900

CHEMTEX is the engineering company of

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Chemtex Technology Portfolio

Renewables
- Bio - Ethanol from Cellulosics
- Bio - Ethanol from Corn, Cassava
- Bio - Ethanol to EO / MEG
- Bio-Diesel, Glycerine Purification
- Biomass Gasification
- Combined Heat & Power Microgeneration
- Mechanical Biological Treatments for SRF
- Biogas recovery solutions for landfills
- Waste Water treatments for heavy metal recovery
- WW treatments for Gas and Oil process water

Environmental

Fibers
- Polyester / PET, NGSS, Horizontal SSP
- Carbon Fiber Pre-Cursor
- Acrylic Fibers
- LNG, LPG recovery, SYNGAS, SRU, LNG Storage Tanks
- Coal Mine Methane Gas Recovery

Petrochemicals

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Chemtex for PROESA™ Technology

- Extensive experience in technology transfer project
- Flexible project structure according to the market/client requirement
- Good IP position with more than 10 patent applications covering all the main process steps
- Capability to support client also in the development of the agronomic supply chain
Chemtex for PROESA™ Technology

Global Reach

Tortona (AL)
Roll Out To The Market of PROESA™ Technology

Design Support
Data collection
Testing activities
Analytical support
Continuous development

Technology reference site
Partnerships with OEM
Continuous demonstration
Training for customer
Base for integrated biorefinery

Identify markets & key Customers
Continue Scale up
IP Protection
Optimize design - Localization
Improve efficiencies
Sustained Revenues (Projects & Licensing)

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Roll Out To The Market of PROESA™ Technology

Large market opportunity:

From 60 million ton to 120 million ton considering only US, Brasil and EU

> 600 plants
**FLEXIBLE:**
Feedstock can be widely selected: energy crop and agricultural wastes

**LOW OPEX:**
possibility to produce cost competitive EtOH in almost any geographical area

**UNIQUE:**
Patented technology will assure protection of technological advantages

**LOW CAPEX:**
unique simplified flow schemes

**WHY PROESA TECHNOLOGY?**

**PROVEN:**
Continuos pilot since June 2009
Industrial scale start up Q3 2011

**COMMITTED PARTIES:**
Technology competitiveness is sustained by Chemtex and its partners continuous development effort

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Roll Out To The Market of PROESA™ Technology

It is possible to build profitable plant at:

**40,000 t/ly capacity:**
Incentive for first/innovative technology
Presence of state/regional incentive
Very low cost raws

**150,000 – 200,000 t/ly Capacity**
@ this capacity technology will produce ethanol competitive with brasilian ethanol and gasoline.

Production Cash cost (raws, enzymes, additives, personnel): < 300 Euro/ton
Estimated investment cost of <1000 Euro/ton installed

Very good ROI, IRR even at 40 Euroc/Lt ethanol value.
Opportunities, feasibility studies, planning of next generation biofuels installation...

CALL US!!!