Industrial production of Biofuels in Slovakia: Perspectives for Advanced Biofuels and Biorefinery Development

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What are advanced Biofuels

According to the draft of the revised Fuel Quality Directive (98/70/EC) and Renewable Energy Directive (2009/30/EC) the advanced biofuels are biofuels produced from following materials:

- Biomass fraction of mixed municipal waste, but not separated household waste
- Bio-waste as defined in Article 3(4) of Directive 2008/98/EC from private households subject
- Biomass fraction of industrial waste not fit for use in the food or feed chain
- Animal manure and sewage sludge
- Palm oil mill effluent and empty palm fruit bunches.
- Tall oil pitch.
- Crude glycerine.
- Bagasse.
- Grape marc and wine lees
- Nut shells
- Husks
- Cobs cleaned of kernels of corn
- Biomass fraction of wastes and residues from forestry and forest-based industries
- Other non-food cellulosic material as defined in point (s) of the second paragraph of Article 2. (= agriculture residues, low-starch content energy crops, etc.)
- Other ligno-cellulosic material as defined in point (r) of the second paragraph of Article 2 except saw logs and veneer logs (=e.g. woody energy crops)

*according to the most recent proposal of ENVI Committee of European Parliament

Nowadays we consider the ethanol path (based on cellulosic and/or waste materials) as more promising for the development of advanced biofuels than the production of biodiesel-like or diesel drop-in biofuels.
History of ENVIEN International

- 2004 - Slovak Republic is accessing the European Community
- 2005 - ENVIRAL: Construction was started
- 2007 - ENVIRAL: Successful commissioning
- 2008 - MEROCO: Construction was started
- 2009 - MEROCO: Successful commissioning
- 2010 - ROSSI Biofuels: Acquisition of Hungarian FAME producer
- 2010 - Poľnoservis: Construction was started
- 2011 - Poľnoservis: Successful commissioning
- 2011 - BIODIZEĽ Vukovar: Acquisition of Croatian FAME producer
- 2012 - Ethanol Energy Vrdy: Joining the Czech JV Ethanol producer

- ??? - Second generation biofuel production facility
We are making Ethanol for long time

- Ethanol production in our area in Leopoldov since 1911
- 2002 commissioning of the potable ethanol production facility (biggest and most modern in Slovakia in that time)
- 2004-2007: utilizing our ethanol production experience in the new field - biofuels

Our gradual learning curve in the field of ethanol production provides us with the strong expertise and potential for the production of cellulosic ethanol
ENVIEN International - Key figures

- 6 production facilities in 4 countries producing 150,000 tons of ethanol + 300,000 tons of biodiesel annually
- 400+ employees
- 470M EUR reported consolidated revenues in Y2013
- 425M EUR estimated consolidated revenues for Y2014

ENVIEN International as the leader in the biofuels industry in Central Europe region is motivated to keep its leadership in the production of advanced biofuels too.
Key aspect(s) for the industrial production of advanced biofuels

- IEA expects 9 billion liters of advanced biofuels production in 2018
- EC is trying to limit the food-crop based biofuels

- Key success factors of advanced biofuels production
  - Feedstock availability
  - Clear and stable solution for the off-take (not disposal) of by-products
  - Availability of suitable, reliable and mature technology
  - Clear and stable policy framework = predictable market conditions
  - Required investments vs. available financing
Cellulosic Feedstock
Main challenge & key opportunity

- Standard size plant requires cca. 300,000 MT of cellulosic material annually
  - Wheat straw, corn stover, energy crops, etc.
  - 300,000 MT = 400,000 bales of straw
  - 1 bale consumed every 70 seconds
  - 1 bale harvested every 10 seconds

- Benefits for the farmers / agriculture sector
  - Increased diversity, decreased risk
  - New product, new customers, new market, additional income & profit
    300,000 MT of wheat straw = min 10,000,000 EUR.
  - Possibility to utilize currently out-of-production land for the planting of energy crops

- Challenges
  - How to collect and transport efficiently this amount of biomass
  - Many innovations and new practices have to be discovered and implemented by farmers
  - Farmers have to act actively - biomass production is their core business

Shift towards second generation biofuels is challenging for the producers, but it is bringing new opportunities for the agriculture.
Technology is there and ready

- Good progress made in last few years
- Licensors / technology suppliers are finally ready to offer complex technologies backed by guarantees
- Reference commercial plants are already existing and running
- Efficient conversion exists already, however further gradual improvements in the conversion yields and cost are expectable and inevitable.
How to get value from the cellulosic ethanol by-products

- Ecologically sustainable & economically viable solution for by-products (especially salty syrup / vinasse) needs to be implemented
- Utilization of lignin is key prerequisite for profitable production
  - If lignin is utilized for energy generation, generated energy is exceeding the consumption of cellulosic ethanol process
  - Additional demand for heat necessary on site, otherwise the 2G project cannot reach economical profitability
  - Electricity generation is also solution, however additional administrative and technical challenges exist
European Policies - missing part

- Policies* are under revision since 2012 without precise outcome so far
  - Process is taking too long
  - Loss of confidence in the industry

- Current expectations:
  - Revision of the Directive to be completed within 2015
  - Transposition to national laws in 2016-17
  - Mandate for advanced biofuels (0,5-1,25%e) for period until 2020

- Pending uncertainties:
  - How stiff would be mandate for advanced biofuels
  - Missing definition of sustainability criteria on collection of agricultural residues from fields
  - What to expect after 2020? Unclear vision for 2030...

* FQD (98/70/EC) and RED (2009/30/EC)

Long lasting and complicated revision process of European legislative acts generated uncertainties for the European advanced biofuel industry.

Industry players in USA and South America have achieved some progress and gained competitive advantage compared to European ones in the meantime.
Huge investments are necessary

- *Expected CAPEX for 80kt ethanol = cca. 200M EUR*
  - 3x-4x more than in 1G ethanol

- Financing - stability & certainty is necessary
  - Market Demand must be confirmed with policies
  - Reliable technologies backed with guarantees
ENVIRAL is ready for cellulosic ethanol

- Reviewing the technologies since 2012
- Concept of the project is already prepared as the extension of our existing biocomplex in Leopoldov
- Several test plots of energy crops planted in 2014

Once the policies are adopted, the implementation of the project could commence
Existing biofuels producers have good starting position for 2G biofuels

- Existing infrastructure
  - ethanol storage & loading + transport connections
  - laboratories
  - experienced maintenance & construction management teams

- Proven successful track-record in ethanol production brings us
  - Financing: easier access to it
  - Sales: Existing relationships with customers
  - Operations: Skilled & trained management team & workforce

- Synergic effect improving GHG emission savings balance
  - 1G production facilities can consume excessive heat energy generated from lignin, what is significantly increasing the savings of GHG emissions as the consumption of natural gas (or any other fossil fuel) in 1g production process is significantly reduced

- Industry experience is helpful in arranging necessary permits and other formal & administrative requirements (e.g. excise tax permits)
Biorefinery developments & trends

- Worldwide push to limit the effects of CO$_2$ on global climate
- More attention on achieved GHG emissions savings, not only on blended volumes
  - already implemented in legislation of several European countries
- Wide introduction of GHG emissions savings based pricing formulas
- Attention achieved GHG savings in the process -> ethanol has better compared to biodiesel
  - Ethanol has 60-90% less GHG emissions than fossil fuels
- Higher integration of the various production processes into biorefinery complexes
- Co-processing the biomass in biomass-to-liquid processes in the traditional petroleum refineries
Thank you for your attention!