



Zero emission organic by-product processing with wide feed flexibility and economical added value carbon negative end product applications.

February 10, 2011

History and Proven Results

BACKGROUND:

- 1972-1979 Edward Soméus: University of Lund, Sweden (Natural and Earth sciences, graduated in 1978, M.Sc., Environmental Scientist and Engineer).
- 1980 The 3R technology idea: horizontally arranged indirectly heated systems (indirectly heated rotary kiln for low temperature carbonization of organic substances and activation of char)
- 1980-1986 Pre evaluation: scientifically research, laboratory bench tests

THE 3R DEVELOPMENT

- 1986→ Evaluation of competitor state-of-the-art, evaluation of patents, initial market research for future full scale application feasibility
- 1986-1989 Pilot Plant engineering concept design (LángCarbon Ltd. – est. 1989 - a joint venture with Lang Machine Works (established in 1875). New name of the LángCarbon Ltd. is Terra Humana Clean Tech Engineering Ltd.). RTD and development key word: use no exotic design and materials.
- 1989-1990 Manufacturing of Pilot Plant novel components, such as the indirectly heated rotary kiln of 0,5 m³/h continuous capacity and the off-gas treatment. Other full scale components are commercially available.
- 1988-1990 Full scale industrial application feasibility study and pre design
- 1990-1994 **PILOT - RESEARCH PLANT TESTS - PROVEN RESULTS:** confirmed proof of evidence for main components for the technical and economical efficiency of the construction, focused on test of 3R technology specific design elements: (1)indirect heat transfer, (2)achieved very high material core temperature 750 °C in carbonization phase, (3)separation of carbon – gas-vapour phase, (4)sealings and air tight construction, (5)continuous input and output, (6)flexible operation mode, (7)high operational safety (8)high carbonization efficiency and high end product quality (BET 600 – 1100 m²/g).
- 1993→ **PCT patenting program:** Method and Apparatus for Treatment of Waste Materials, Including Nuclear Contaminated Materials (patented in the USA, 1998, No. 5,707,592). Sole inventor: Edward Someus

1994-2001	Full scale detailed engineering design and work out of alternative industrial applications (detailed engineering design for 0,8 m³/h, (5760 m³/year throughput) and pre design for 4 m³/h and multiple reactor installations).
1999-2003	Process method and industrialized full scale technology engineering design development of animal bone charcoal integrated solid state fermentation and formulation biotechnology.
2002	EU FP5 NNE5/363/2001 Clean Coal project for specific energy application of combined coal and biomass “towards zero emission” programme (three years programme starting from August 1, 2002, total cost € 2,25 million).
2003 June 23	Patent application. Phosphorus recovery from animal bone charcoal for biocontrol and natural P supply purposes. Sole inventor: Edward Someus
2004 June 23	PCT patent application for worldwide all countries
2004 August 19	ISO 9001 and ISO 14001 certified for subjects: Research, development and implementation of pyrolysis technologies. Application of pyrolysis technologies for production, surface modification and regeneration of carbon products.
2004	EU compatible Authority permitting of industrial operations for the 3R installation in West Hungary (Polgardi). The industrial plant meets the requirements of the US EPA U.S. RCRA Miscellaneous Units 40 CFR 264 Subpart X as well.
2004 December	Finalization of the comprehensive <1 m³/h feed capacity 3R carbonization industrial demonstration and production plant's erection for wide feed flexibility Clean Coal energetic material industrial treatability study applications and commercial production of refined carbons.
2005 Jan – July	Successful execution of Clean Coal pilot testing (industrial scale coal and biomass throughput). Development of pre-design concept for conversion of raw pyrolysis gas-vapor to syngas and conversion of raw pyrolysis oil to transport quality fuel oil.
2005 March	The RTD project EU FP6 514082 PROTECTOR is EC contracted and starting March 1 (12 partners from 8 countries). The low input farming RTD and demonstration project is aiming to develop biocontrol agents against soil borne plant pathogens in the vegetable cultivations and provide natural plant nutrition. (42 months programme, total cost € 2,63million).
2005 September	Completion of the final scientific and technical report submission for successfully completed NNE5/363/2001 EUFP5 project.
2006 February	The EU Commission DG Transport and Energy accepts final scientific and technical report for NNE5/363/2001 and congratulates for the achieved results.
2006 October	ISO 9001 and ISO 14001 certified for agro biotechnology.
2007→	PROTECTOR field testing in different climatic and soil conditions (IT, NL, DE, IL, HU)

2009.	The EU Commission accepts final scientific and technical report for PROTECTOR FOOD-2005-514082. Success story: EU-Agrinet publication.
2009. March	Formulated 3R-AGROCARBON microbiological substance product permit application for open soil and green/glass house organic, low input and conventional cultivation. Date of Authority registration of the AGROCARBON product: 31. March, 2009.
2009. June	EU-CIP-ECOINNOVATION grant agreement for large scale industrial application and market replication of Agrocarbon technology and product. (2009-2012).
2009 October	Successful laboratory testing of 3R syngas and transport fuel bio-oil.
2010 July	Construction of small production demonstration unit for 3R syngas and transport fuel bio-oil catalytic conversion process.
2010	AGROCARBON: application development completed and successfully full scale tested. Full scale design for 30,000 m ³ /year throughput industrial capacity Agrocarbon processing is completed.
2011 February	AVAILABLE FOR LICENSING AND TECHNOLOGY TRANSFER.

- **3R APPLICATIONS:**

- **Agro:** plant and/or food grade animal bone (category 3) based biomass carbon biorefinery conversion.
- **Energy Biomass:** plant and/or animal MBM organic waste to solid (bio-carbon) and liquid (bio oil transport fuel) energy.
- Other applications are for cases by case considerations.

- **3R TECHNOLOGY MAIN ELEMENTS:**

- **CARBONIFEROUS MATERIALS-to-REFINED CARBONS:** carbonization process (main technology), indirectly heated horizontally arranged rotary kiln vacuum pyrolysis.
- **CARBON BIO-CARRIERS:** solid state fermentation and formulation, biotech process, where specific and biotech adaptable carbon is used as solid carrier for soil microorganism for purpose of accelerated and plant available mineral dissolution, develop controlled microbiological environment in soils with effects of plant growth promotion and biocontrol by effects. Objective: safer food production for less cost.
- **CARBON-to-LIQUID FUEL (biomass-to-liquid fuel):** catalytic conversion of raw pyrolysis gases/oil liquids to high grade liquid bio-fuels.