EUROPEAN COMMISSION
Community Research

BIO-ENERGY
Enlarged Perspectives
Budapest, 16-17 October 2003

SIXTH FRAMEWORK PROGRAMME

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Alternative of Biomass Utilisation in the Central Europe, especially in the Czech Republic

VŠB-Tecnical University of Ostrava, Czech Republic
Dr. Dagmar Juchelková
dagmar.juchelkova@vsb.cz

Objectives

To increase (in the real time) of percentage of the biomass utilisation on the whole energy production in the Czech Republic is necessary to utilise the existing energy units.
The most sustainable units are the fluidised bed boilers (near 30 units in the CZ).
Preparation of mixtures (multi fuels and alternative sorbents - non limestone basis) is a good combination of sawing of primary sources, reduction of emissions and utilisation of alternative (by-products or renewable) sources.

Challenges / problems addressed

Necessary to increase the participation of the renewable sources on the whole energy production. Presently is the percentage whack of renewable sources near 2 %. In the 2010 should be 6-8 %. The most perspective sphere is unitisation of biomass - combustion or co-combustion, resp. gasification.
The Czech Republic has a big among of brown coal and the possibility to find best solution of multi fuel basis is highly required.
Reduction of emissions and better utilisation of by-products is in the centre of interest.

Project structure

We would like to collaborate with some industry company to realise our ideas and to implement our experiences.
We have presently a good collaboration with many Czech Energy companies.
Suggestion of project structure:
- detailed analysing of existing dates from the energy companies, potential of biomass and alternative desulphurisation sorbents, etc.
- choosing a suitable unit(s)
- application of knowledge (design of special diagnostic methods of flue gas elements, etc.),
- approach of impact of suitable units in the Central Europe

Expected impact and exploitation

- Reduction of emissions,
- Utilisation of alternative desulphurisation sources,
- Increasing of biomass utilisation (min 3 %) under real condition,
- Development of new workplaces by the preparation of mixtures.

Results or progress to date

Measurement of the

- temperature, - pressure, - emissions, - influence of fuel contents on the efficiency and other parameters, - monitoring of the alternative fuels (biomass) and alternative sorbent (SO2) possibility , - whole monitoring of the existing units, on the various real units

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Budapest, 16-17 October 2003

Biogas as a Renewable Source of Energy

Bio-Genezis Kft., Hungary
Mr. Istvan Barta
bio.genezis@chello.hu

Objectives

1. Establish a biogas plant in Tiszavasvári for the utilisation of the organic fraction of MSW, pig slurry, slaughterhouse waste and green energy crop.
2. Establish a complete energy cropping system from seedling preparation of Miscanthus sp. (laboratory) till the end use of heat and power (combustion, co-generation).

Challenges / problems addressed

The most problematic part of biogas production is the fermentation of cellulose. Therefore, the digesters shall be equipped with a special pre-fermenting digester (bacteria, and enzyme treatment).
Another aim of the technology development is to enable the treatment plant to handle wastes with as high TS content as possible.

Project structure

We started a co-operation for the elaboration of the project with SME-s in Hungary, Germany and Poland. Further co-operation is required in the field of high solids anaerobic digestions (dry technology).

Expected impact and exploitation

Expected results:
- decrease the organic content of MSW to be landfilled,
- cost effective treatment of hazardous slaughterhouse waste,
- energy recovery, renewable source of energy,
- job creation (energy cropping).

Results or progress to date

Possible project partners are identified.
Site is purchased

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Catalytic gasification of biomass

Wroclaw University of Technology, Poland
Prof. Wlodzimierz Kordylewski
wlodzimierz.kordylewski@pwr.wroc.pl

Objectives

The principal objective of the project is to evaluate data and parameters for the process of gasification of lignocellulosic biomass using alkali metals and alkali-earth metals catalysts.
The main problem with the use of a fuel gas from gasification of biomass for power generation and synthesis are condensable compunds present in tar. Therefore the most actual task is to develop a technology for cleanup of a product gas from tar.
The proposed method of tar reforming lies on the wet ipregnation of lignocellulosic materials with alkali metals and alkali-earth metals. Some of them (calcium) are known as a very effective catalyst of combustion and gasification of low rank coals

Challenges / problems addressed

Problems addressed
1. Effectiveness of impregnation of lignocellulosic biomass with alkali metals and alkali-earth metals by the ion-exchange mechanism.
2. The influence of impregnation of lignocellulosic biomass with alkali metals and alkali-earth metals on the content of pyrolytic gas.
3. The influence of impregnation of lignocellulosic biomass with alkali metals and alkali-earth metals on structure of a char and its reactivity.

Project structure

1. Demineralizastion of selected lignocellulosic materials.
2. Impregnating of the demineralised biomass with the selected alkali meals and alkali-earth metals.
3. Studies on the pyrolysis efficiency of the prepared biomass.
4. Studies of gasification efficiency of the prepared biomass.

Expected impact and exploitation

Expected impact
1. Increase of the efficiency of biomass gasification due to enhancement of char reactivity.
1. Improvement of a product gas quality by the catalytic decomposition of tar in the gasification stage.

Results or progress to date

1. Studies on demineralization of lignocellulosic materials (straw and wood).

2. Investigations of the influence of calcium addition into straw and wood on the effectiveness of its devolatilization.

3. Investigations of the influence of the initial water content in lignocellulosic materials on the autogasification efficiency.

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Developing indices and modelling for predicting combustion behaviour and ash deposition of biomass firing and cofiring for both gasification and combustion systems

Wroclaw University of Technology, Poland
Prof. Wieslaw Rybak
rybak@pwr.wroc.pl

Objectives

Biofuels or biofuel-coal mixture have the potential to replace coals but operational and environmental problems may dramatically affect the combustion and gasification systems. To focus on the problem of biofuels application one requires detailed in advance knowledge of the typical combustion/gasification behaviour of these fuels. The project reviews the ability to predict the combustion/gasification of biofuel or coal and biofuel blends based on the properties of the pure fuels.
The goal of the research project will be to develop a series of indices to reliably predict the combustion/gasification performance of biomass and biomass-coal mixture in utility systems. The general objective of this project will be to utilise modelling tools and indices methods to provide key information to aid in optimising conventional and advanced power system design and operation conditions for efficiency, with minimal air pollutant emissions, while utilising wide range of these fuel properties.

Challenges / problems addressed

Major challenges related to firing and cofiring biomass are:
* the risk of slagging, fouling, agglomeration and chlorine corrosion. The analysis of the ash characteristics should be the first step in choosing the combustion system and combustion conditions of a given biomass or biomass blend.
* lower efficiencies and increased amount of unburned carbon in fly ashes firing in an existing installation,
* changes in the efficiency and maintenance of the flue gas clean-up system (deNOx, ESP, FGD, hot-gas filter).
* lower marketability of solid residues (bottom and fly ash); above these four factors limit the percentage of biomass that can be cofired.
* knowledge fundamental combustion/gasification mechanisms and interaction between biomass and coal particles in mixture
* no methodology for predicting the combustion/gasification behaviour of these fuels in conventional and advanced power system.

Project structure

The project will be divided into seven tasks: biomass and blends preparation (grinding behaviour), combustion behaviour (ignition and flame stability, carbon burnout), ash transformation (slagging, fouling, corrosion, errosion), pollutant emissions parameters (NOX, SO2, toxic metals), flue gas clean-up system performance, bench-, pilot- and full scale experiments and developing indices and modelling for predicting combustion behaviour and ash deposition of biomass firing and cofiring for both gasification and combustion systems. The parameters required to calculate the indices consist of parent fuel and blends analysis results determined by CCSEM and chemical fractionation methods, proximate, ultimate, and coal ash chemical analysis, grindability. Boiler specifications and operating conditions, such as the boiler/gasifier type (PC, cyclone, FBC), combustion conditions (conventional or low NOx), operating load, and furnace dimensions, are also used as input parameters. Fuel and Energy Division (WUT) has a long time experiences in conduction research aimed at the development of practical, cost-effective strategies and predictions for effective combustion and reducing the emission from combustion and gasification systems.

Expected impact and exploitation

The aim of the project is to provide reliable methods to characterise the preparation and combustion performance of blends of coal and biomas. This includes a detailed understanding of the fundamental processes, which are to be considered when using biofuels together with coal. Besides the direct implications, which can be obtained from the numerous experimental investigations, the collected data are used for the development of the indices methods and mathematical models, which can be used to predict the behaviour of an unknown fuel before application on industrial scale. The indices method at least provide a relative ranking of combustion performance of biomass blends in power station boilers. The tools will help in making the cofiring technology easily available to the industry at an optimal ash disposal, cost and plant efficiency producing minimal air pollutant emissions and utilising a wide range of fossil fuel properties. Tools generated during the program will provide utilities with the technical and economical information necessary to reliably evaluate fuel switching or fuel purchase. Individual utilities must respond quickly and effectively to changing fuel markets.

Results or progress to date

Data generated during the program will provide:
* developing a series of indices to reliably predict the propensity of a given fuel or blends to cause operational problems and combustion/gasification performance.
* developing a computer tool to calculate and display a relative ranking of combustion performance of biomass/blends in power station boilers.
* more information related to the effect of the physical and chemical properties of the fuels on their processing as well as the combustion,gasification.
* new information on the combustion behaviour of the fuels for handling, grinding, combustion, burnout, slagging and fouling, grindability, emissions, opacity, SCR and ESP performance, ash disposal, and overall plant efficiency.

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Development of a low cost biological drying technology for wood chips prior incineration

Mr. Bela Kolos Bartha
bbartha@freemail.hu

Objectives

Wood chips are an important bio-energy resource for sustainable and CO2 neutral energy generation under European climate conditions. They can be burned in most of the common incineration and gasification plants.
Wood is a natural product with changing qualities. Especially the specific calorific value, mainly dependent on the moisture content, is important for an optimal incineration process. Dried wood chips have higher caloric value and improved storage and handling properties.
Drying with biological produced energy can be an additional advantage of the wood chip based bio-energy chain both in environmental and economic manner.
The Dome Aeration Technology (DAT), a composting technology developed in Germany and utility pattern protected in Hungary, provides a high potential for a cost effective biological drying process of wood chips, by using the natural thermal advection only. Modifying the process conditions the target crossover from composting to drying is possible.

Challenges / problems addressed

There are several technical drying technologies for wood chips, requiring high financial resources and considerable inputs of external energy. Furthermore, they increase the minimum rentable plant size. In the opposite, uncontrolled natural drying processes in common windrows are limited by the climate conditions especially in wintertime and require storing facilities for the output material.
A new method of drying wood chips could be the controlled and optimized biological drying, realised with the DAT. The energy, needed for the evaporation process, origins from the metabolism activities of the omnipresent micro organisms. The windrows according to the modified DAT can be covered with adequate natural materials. The cover layer allows both drying and storage inside the DAT windrow. The energy effectiveness of the DAT is warranted by the fact that energy production and water evaporation are simultaneous processes occurring on the same place. By modifying the DAT to a drying process the boundary conditions must be adapted and optimized by laboratory and field experiments.

Project structure

The main organic components of fresh wood, lignin and cellulose, are slowly biodegradable. Only the fast biodegradable components like starch and saccharides can be used as energy source for the drying process. Their concentration and specific kinetics of degradation influence the energy generation and therewith the moisture reduction. Experiments with different wood types and chip sizes are necessary to find out the parameters: drying time and achievable moisture content at the end of the process. The project is structured into two main parts: laboratory experiments in simulation reactors (ca. 1m³) and the scale up by field trials (a few 100m³). The reactor experiments should investigate the potential of energy, released by the micro organisms during the biological decomposition of the fast degradable components. With the results the necessary drying time and proper windrow dimensions can be estimated. The field experiments should result in the validation of the reactor experiments and in the optimization of the process monitoring. For the first part a partnership with research organisations would be favourably. The field trials should be carried out with prospect users of the technology, primarily wood chip generator.

Expected impact and exploitation

The environmental impacts caused by transportation, storage and usage of wood chips can be minimized by a decentred drying process. Using the DAT, no special machines and no roof constructions are needed. The process can be simply handled and flexibly adapted to changing throughputs and is also suitable for discontinuous production. The process costs are dependent exclusively on the throughput. The only additional components of the DAT are inexpensive, easy-to-fit and reusable steel constructions to be built into the windrow. The drying process can be easily monitored. The DAT can be applied next to the wood chip generator, so that no wet material has to be transported. Because of the windrow cover, the dried chips can be stored without additional housing facilities, for several months after the end of the biological drying process.
Dried wood chips achieve higher prices compared to fresh material. By using the DAT this surplus can be flexible realized near the place of generation, e.g. in rural areas. Especially for future member states, with their considerable resources of renewable energy, provides this technology a suitable step of the bio-energy chain.

Results or progress to date

The DAT has been developed and successful applied in composting of garden refuses. A field trial in Siofok, Hungary, showed that with proper choice of the initial conditions even old woody material could be partly composted. Simultaneously an explicit drop of the moisture content took place. By changing the initial conditions and the windrow dimensions the DAT can be qualified to a drying technology. Other results doesn't exist yet, since the proposed research project needs a modification of the Dome Aeration Technology.

For better coordinating of the further development and the adaption of the technology on other fields the utility pattern protection was applied and given for the author in Hungary last year.

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High Temperature Air/ Steam Gasification of Biomass for Hydrogen-Rich Gas Production

Gdansk University Of Technology, Poland
Prof. Jan Stasiek
jstasiek@pg.gda.pl

Objectives

The Division of Heat Technology at Gdansk University of Technology undertakes numerical, experimental and theoretical work in various areas of energy conversion and heated fluid dynamics. The group has considerable experience in mathematical modeling of combustion, gasification, heat and mass transfer, two phase flow and use a renewable energy sources for different applications (mainly biomass, pellets). Various experimental technique have been used at the Division of Heat Technology (e.g.: high temperature gasification of the coal in combination with MHD generator and ceramic regenerator, liquid crystals thermography, two-phase flows in micro-tubes, simulation of flows in heat exchangers etc.).
Our aim is to develop an outstanding energy-saving and environmentally friendly technology for the 21st century, focused on significant reduction in primary energy consumption and simultaneous contribution to environmental preservation by use of renewable energy resources. All these issues can be addressed when the High Temperature Air/Steam Gasification (HTA/SG) technology is applied. Therefore the objective has been to advocate the international establishment of a new concept for innovative, modern technology.

Challenges / problems addressed

New and advance high temperature gasification technology based on slugging-gasifier, ceramic honeycomb regenerator and innovative hybrid adsorption membranes could offers numerous advantages for the thermal conversion of biomass and wastes among other for hydrogen rich gas production. Most biomass and wastes offer significant challenges due to significant variation in composition both spatially and temporally. Furthermore the average heating value associated with the biomass and waste is not uniform. Any technology used for the biomass and waste must be insensitive to any variation in its composition. Efficient conversion of biomass and waste into hydrogen rich gas of high heating value offers many advantages. The characteristic variation in the biomass and waste stream can be much reduced by converting into a fuel stream. An advanced gasification system, proposed in this project to being developed, utilises high-temperature preheated air/steam to convert biomass and wastes into synthetic fuel gas and value added by-products. Also the production of H2 from gasification product can be enhanced with the use of a H2 hybrid adsorption membranes.

Project structure

It is planned to take a more holistic approach to the develop of High Temperature technology, which has great potential to dramatically change the economics of the biomass and solid municipal waste gasification technology. To this end it will bring together some of the leading groups in Europe and will greatly enhance the European competitiveness with respect to USA and Japan in this critical area. All results, including better understanding of energy conversion issues, should have a major impact on environmental protection by utilization biomass and hazardous wastes.

Expected impact and exploitation

It is generally accepted that the utilization of renewable energy sources (i.e. biomass) for the production of energy offers significant energy savings compared to more conventional processes The proposed topic is highly multi disciplinary and will seek to bring together all aspects of process development, materials characterisation, process modelling, testing and quality evaluation. It is clear that such a programme could not be run on a national basis given that the required skills exist throughout the EU. The topic will impact on the environment as it is generally accepted that advanced processes for renewable energy systems generally offer significant savings in energy production and energy plant operational costs compared to more conventional processes (i.e. fossil fuels).

Results or progress to date

This topic was presented during previous Call. We'd like to improve the proposal to meet all thresholds.

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Integration of Bio-Energy into Heat and Power Generation

Czestochowa University of Technology, Poland
Dr. Rafal Kobylecki
rafalk@is.pcz.czest.pl

Objectives

The objective of the studies on bio-energy at Czestochowa University of Technology (CzUT) is to promote the use of bio-energy in power industry. This should result in more efficient use of the energy sources, and decrease of the emission of carbon dioxide (green house gas) and sulffur oxides.
Due to Polish market situation, mainly use of the energy from biomass is taken into consideration. At CzUT two main ways of the use of bio-energy are developed: 1/ biomass co-combustion with coal and 2/ advanced gasification of biomass + combustion of the outlet gases.
In order to overcome the technical barriers of co-combustion and gasification of biomass in large fossil fuel fired power plants, both the above ways focuse on providing comprehensive data for production of power from biomass with high efficiency and reliability and at low cost. It is expected that the results will provide important data for increase of the use of bio-energy for power production.

Challenges / problems addressed

The main problems addressed are:
i) elaboration of an energy-efficient and cost-effective scheme of biomass utilization,
ii) innovative involvement of environmental and energy aspects, such as reduction of fuel and sorbent consumption, or reduction of pollutants (CO, CO2, NOx, SO2, PM, PAH, DXN, heavy metals, etc.),
iii) contribution to the knowledge regarding biomass co-combustion and gasification, as well as its application, with special respect to large-scale circulating fluidized bed (CFB) boilers,
iv) development of the knowledge on special characteristics of biomass and its impacts on boiler performance and on CFB gasification process (including studies on agglomeration, fouling, corrosion, ash reuse, etc.),
v) development of the knowledge on land reclamation concepts and land life cycle analysis.

Project structure

The works are done in full cooperation with main Polish power producers (Turów Power Station, PKE - Southern Power Holding, Tychy Heat and Power Station, Ostroleka Heat and Power Station). By doing this CzUT group has an access to large-scale units and facilities and can perform large-scale experimental tests.
The works are divided into the following sections: 1/ Lab and semi-industrial-scale mixing and co-combustion tests (agglomeration, fouling, corrosion, emission of CO, NOx, SOx, PM, PAH, DXN, etc.), 2/ Full-scale tests in large utility boilers (the main parameters measured are: pressure drop and fluctuations, solids flux and concentration, temperature, gas and solids velocities. Suction of solids and gas + analysis, as well as studies on the effect of operational conditions on boiler performance, including mixing and heat transfer, are also conducted), 3/ Ash reuse studies, 4/ Modeling of fluidized bed co-combustion and gasification, 5/ Socio-economic assessments.

Expected impact and exploitation

The results provide an innovative comprehensive RTD approach for biomass utilization at large scale combustors and improved understanding of boiler data in order to optimize the combustion process.
The following other issues are also exploited:
1) model and complex solution for biomass co-combustion and gasification at large scale CFB plants, 2) environmentally safe utilization of bio-waste, 3) direct application of the solutions to other enterprises, 4) solutions of agricultural problems, 5) comprehensive knowledge for the design of a prototype large scale CFB gas generator, 6) use of fluidized fly ash as solids material for CFB gasifier, 7) application of FB ash as a medium for alkali capture in the gasifier, 8) solution to environmental problems of CO2, SO2 and NOx emission, 9) studies on environmental impact on a macro-scale through imission control network.

Results or progress to date

The current main results are:
1) data on laboratory and large-scale experimental tests with respect to the problems addressed above
2) data on biomass and sorbent preparation and the ideas of biomass and sorbent feeding systems
3) boiler operational data and verification of the measurement data by computer simulations
4) description of the technologies of reuse of fluidized bed ashes (e.g. for road constructions, in cement/concrete industry, to produce new very reactive sorbents for dry desulfurization, or as a medium to synthesize zeolites)
Majority of the results are already adopted by the industry.

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Integration of Bio-Energy into Heat and Power Generation Network in Euroregion 'Neisse-Nisa-Nysa'

Czestochowa University of Technology, Poland
Prof. Wojciech Nowak
wnowak@is.pcz.czest.pl

Objectives

The objective is to assess the hitherto insufficiently known features of biomass combustion and advanced gasification to provide comprehensive data for production of power from biomass with high efficiency and reliability and at low cost. The project has its focus on identifying, investigating and overcoming the technical barriers of co-combustion and gasification of biomass in large fossil fuelled power plants.
In addition, the project is intended to integrate the research with an investigation on the limiting system boundaries for the regional biomass system. Thus, although the focus is on co-combustion and gasification aspects, the project investigates the entire biomass chain within the region of application, i.e. biomass production, planning, logistics, as well as combustion in laboratory, semi-industrial and full scale units, and ash properties.
It is expected that the results will be considered as a model and guidelines for how to increase the use of biomass for power production

Challenges / problems addressed

The problems addressed in the project can be briefly formulated as:
i) development of biomass production plan and biomass supply chains taking into consideration logistics and economical aspects, ii) elaboration of an energy-efficient and cost-effective scheme of biomass utilization, iii) adaptation of unused green areas, iv) innovative involvement of environmental and energy aspects (reduction of pollutants, coal consumption as criteria for the design methodology of a complex biomass flow system), v) socio-economic studies to ensure cost-effectiveness and sustainability, vi) contribution to the knowledge regarding biomass co-combustion and gasification, as well as its application with special respect to large-scale circulating fluidized bed (CFB) boilers, vii) application of innovative technologies of biomass gasification, viii) developing knowledge on special characteristics of biomass and its impacts on boiler performance and on the CFB gasification process operation and ix) contribution to the knowledge regarding development of land reclamation concepts, management scenarios and land life cycle analysis.

Project structure

Two options are considered: co-combustion of biomass with coal, investigated in a real large scale CFB combustor, and a conceptual design of CFB gasification of biomass combined with afterburning of the outlet generator gas in a PC unit or gas turbine. The works are divided into the following Work Packages (WP):
WP 1: Biomass availability and potential consumers.
WP 2: Lab-scale and semi-industrial co-combustion tests.
WP 3: Modeling fluidized bed co-combustion.
WP 4: Modeling and design of biomass gasification.
WP 5: Full-scale tests in a large utility boiler with co-combustion.
WP 6: Socio-economic assessment and environmental impact.
WP 7: Dissemination of results.
WP 8: Communication, coordination, reporting.

Expected impact and exploitation

The results provide an innovative comprehensive RTD approach for biomass planting, supply and utilization at large scale combustors and improved understanding of boiler data for combustion process. Beside that, the following issues are also exploited: 1) application of RES in power production enterprises, 2) model and complex solution for biomass co-combustion and gasification at large scale CFB/PC plants, 3) environmentally safe utilization of bio-waste, 4) direct application of the solutions to other enterprises, 5) cross-border regional integration and plans for large scale logistics biomass-to-power plant supply scenarios, 6) solutions of agricultural problems, 7) comprehensive knowledge for the design of a prototype large scale CFB gas generator, 8) alternative power generation system based on biomass gasification/gas turbine concept, 9) use of fluidized fly ash as solids material for CFB gasifier, 10) application of FB ash as a medium for alkali capture in the gasifier, 11) delivering data for arrangement of the procedures of Green Energy Certificate awards, 12) solution to environmental problems of CO2, SO2 and NOx emission, 13) studies on environmental impact on a macro-scale through imission control network installed around the area investigated.

Results or progress to date

The project is planned for 36 months. The results are presented and submitted in the form of deliverables. The deliverables contain: 1) data on biomass availability in the region, potential logistics and possible consumers, as well as information on the economical issues, 2) technical rules of biomass storage, shipment and economic evaluation, 3) list of power plants and case study of plant operational conditions, 4) report on the results of laboratory and semi-industrial co-combustion and gasification tests, 5) software program and computer simulation results, 6) description of conceptual design of biomass gas generator, 7) data on biomass preparation and the idea of biomass feeding system, 8) boiler operational data and verification of the measurement data by computer simulations, 9) establishment and description of a system for certification of energy from biomass, and finally, 10) report and technology implementation plan.

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Waste biomass and Biomass Gasification for energy production

Wroclaw University of Technology, Poland
Dr. Halina Kruczek, Prof Zbigniew Gnutek.
hkruczek@pwr.wroc.pl; zbigniew.gnutek@pwr.wroc.pl

Objectives

- Co-combustion of biomass in PC, CFB, stoker boilers.
- Production of clean gas fuels from biowastes and waste:
- gasification of solid biomass at the presence of catalysts to improve efficiency
- pyrolisys & gasification of biomass and biowastes to produce suitable fuel to Fuel Cell.
- Development of biomass boiler technology.
- Energy and exergy analysis of conversion process from plant biomass to bio-fuel.

Challenges / problems addressed

In order to achieve the best results available lab scale and semi-technical scale experimental equipment should be used to investigate the important sub-processes
Selection of local biowastes and calcium compounds and analysis to preliminary determination gasification condition
Determination of the process kinetics and the operating condition
Determination of reactivity of selected biowastes in air, oxygen and steam
Evaluation of operational parameters of biowastes gasification on the base experimental investigation using co-current and counter current gasifiers with different agents
Determination of efficiency of gasification at presence of calcium catalysing compounds in different configuration
Semi technical scale tests of gasification of biowastes
Selection of local biowastes and calcium compounds and analysis to preliminary determination gasification condition
Determination of the process kinetics and the operating condition
Determination of reactivity of selected biowastes in air, oxygen and steam
Evaluation of operational parameters of biowastes gasification on the base experimental investigation using co-current and counter current gasifiers with different agents
Determination of efficiency of gasification at presence of calcium catalysing compounds in different configuration
Semi technical scale tests of gasification of biowastes

Project structure

Industrial partners to overview:
- sources of biomass
- description of product and process requirements
- evaluation of technical concept using of fuelgas

Research partners to evaluate:
- biowaste charateristics and catalysis compounds

Gasification tests
- analysis of results of the gasification investigation with product gas
- comparison with alternative process
- modelling of gasification process with different agent and parameters

Expected impact and exploitation

Evaluation and implementation of gasification technology of biowaste to production energy in local scale by use conventional boilers and gas turbine .
Adaptation of gasification technology to incineration of wastes - unsolved problem in Poland

Results or progress to date

Experience in gasification in fixed bed of wastewood and evaluation of unit to production of heat and electrical energy in hybrid system

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Biofuels from farming resources: biomass, wastes and oils

Institute of Food Research, Romania
Prof. Vasile Nicolic
ica@sunu.rnc.ro

Objectives

Research of the technologies to producing biofuels (methane, ethanol and biodiesel) from farming resources: biomass, wastes and rape / soybean oils.

Challenges / problems addressed

Enhancement of performing biotechnological processes for producing biofuels from farming resources.
Clean environment.

Project structure

Association of Biofuels into Romania
Education and Research Ministry
University of Agriculture Sciences and Veterinary Medicine, Bucharest
European partners

Expected impact and exploitation

Positive environmental effects by pollution decrease.
New oppotunities for country agricultural development. Positive economic effects: new jobs and energy consumption decrease.

Results or progress to date

The project is in progress. We have already built the pilot equipments.

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Budapest, 16-17 October 2003

An Estimation of the Liquid Bio-Fuels Production in Poland Until 2020 : Market Modelling Issues

Centre for Decision Sciences and Forecasting, Progress & Business Foundation, Poland
Prof. Andrzej Maciej Skulimowski
ams@agh.edu.pl

Objectives

The results of the bio-fuels-related research carried out at the Progress and Business Foundation are summarised in the yearly updated reports on"BIo-Diesel Production Capacity in Poland" and "Bio-Ethanol Production Capacity in Poland", which cover also the market issues, such as terms of trade, economical environment of bio-fuels in Poland, and interaction with othe markets, especially those for fossile fuels and agricultural feedstock used for non-bio-fuels purposes.
To obtain more adequate foresight results, in our reports we take into account the specific features of bio-fuels foresight methodology, such as discrete-time control models, where the control parameters describe the external economical influence factors, such as taxes, subventions, export/import regulations, demand. Using the presented approach yields an adequate market model, whereas two coupled equilibria, one related to the agricultural market, the other one related to liquid fossil fuels market can be calculated.

Challenges / problems addressed

The direct use of the scenario approach to the bio-fuels production foresighting may often lead to a confusion due to a great deal of uncertainty factors to be considered. The latter may describe the political and legislative situation concerning bio-fuels, fiscal policies, climate changes, emergence of new propulsion technologies, willingness of farmers to engage in new markets etc. Such future processes to be modelled are rarely by known probability distributions, which would enable simulation via Monte Carlo techniques. Specifically for modelling bio-fuels markeets and production potential, we have developed hybrid models, which combine both quantitative and qualitative techniques. Exchange rates, fossile fuel prices, market rape-seed and other feedstock prices, total demand for liquid fuels etc. are stochastic processes, which are dealt with appropriate forecasting tools. Constraints imposed by market laws are taken into account during the forecasting process as well.

Project structure

The primary target audience of this project are companies interested in developing bio-fuels production in Poland and other countries with a similar structure and weather conditions of agriculture. We would like to offer applying the original methodology developed at the P&BF to establish feasibility studies and economic plans for concrete bio-fuels investment project. The next target groups are local and governmental authorities and agencies promoting bio-fuels production and implementation. Finally, other research institutions from all EU Member and Future Member States, as well as from the remaining Candidate Countries are welcome as partners in common projects dedicated to bio-fuels, bio-energy and renewable (wind and water) energy. Progress and Business Foundation actively seeks co-operation possibilities with partners from the above mentioned groups, in the 6th FP, national research projects as well as we wish to provide our expertise to industry partners within commercial projects.

Expected impact and exploitation

Production and use of liquid bio-fuels have been in the recent time a subject of political and scientific discussions at virtually all decision-making and public media levels in Poland, with no clear conclusion drawn so far. A new modelling methodology applied to elaborate the P&BF bio-fuels reports helps to overcome the conceptual and economical modelling difficulties, creating thus a base for rational decision-making processes in the legislation and individual investments. Our yearly updated liquid bio-fuels reports for Poland are thus indispensable source of background information for the policy makers and persons responsible for any future as well as present bio-fuels project to be carried out in Poland. Consequently, as a result of rational decisions concerning bio-fuels, the farmers may get a source of additional and sustainable income, the bio-fuels production plants may emerge as a new industrial infrastructure in the rural areas, and the transport will get a source of rebnewable energy sources. Last but not least, the rational implementation of liquid bio-fuels will be beneficial to the environment by supplying transport with greenhouse-effect-neutral fuels and smaller emmission of other gases, including those endangering human health.

Results or progress to date

The P&BF Foundation has been active in the field of Poland's bio-fuels market and production potential modelling since 1998. In 2002 we have prepared the report on liquid bio-fuels production potential in Poland, on the order of ESTO, which became a base for elaborating the ESTO Study on "Techno-Economic Feasibility of Large-Scale Production of Bio-Fuels in EU-Candidate Countries". This Study has been recently approved by the European Commission. At present the P&BF's research on bio-fuels production potential and market modelling is carried out in three streams: BIo-Diesel Production Capacity Forecasting, Bio-Ethanol Production Capacity Forecasting and Bio-Fuels Market Modelling Methods. Moreover, an adequate attention is paid to the methodology of decision support and the appropriate use of foresight and forecasting techniques. A dedicated methodogy of businessplan elaboration for bio-fuels-related enterprises has been developed as well.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass as economic facilitator to convert geothermal energy into an efficient CHP plant

Institute of Turbomachinery, Technical University of Lodz, Poland
Dr. Pawel Hanausek
phanaus@p.lodz.pl

Objectives

The project goal is to redesign and reconstruct an existing geothermal heating station (6 MWth) in the central Poland with the purpose to achieve the profitability of the station. In the present system, the geothermal water (70 deg. C at the outlet of the production hole) can only be partly utilized in the summer period and must be supplemented with additional heat (fossile fuel fired boilers) to fulfill the requirements of the local district heating system in the winter period. That structure results in red figures in the accounts of the station. A new energy conversion system is being ellaborated under the present project in which the geothermal energy is combined with the local biomass resources and potential. That system incorporates biomass combustion boilers, for which the geothermal energy serves as preheating input, and a condensing steam turbine generator of a special design. As result, the geothermal energy is fully utilized all over the year and the production of electrical

Challenges / problems addressed

energy (maximum in summer, minimum in winter) together with the proper supply of heat for the local consumers generate the clear profitability of the station. Problems to be solved are: supply of the respective amounts of biomass from the surrounding area, adaptation of the condensing steam turbine, monitoring and control system for the station. Usage of biomass in the new system will positively contribute to solution of severe unemployment in the area under consideration.

Project structure

The project is based on participation of several local institutions and companies, and will also look for partners from abroad to supply proper equipment. At the present stage of the project the following main partners are involved: the Regional Fund of the Environment Protection (owner of the station), the Technical University of Lodz (supplier of the system outlay) and its commercial unit TURBOSERVICE, Baltic Renewable Energy Centre in Warsaw (expertise in biomass utilization). Application for funding from the European Union will be submitted to finance the framework of the project.

Expected impact and exploitation

The population of the local town is waiting for the positive results of the project. At present, price for the heat delivered from the station is still controlled by the State but prospective deregulation in the energy sector and fear of possible heat price increases block further development of the geothermal energy usage under the present system. Prospects of the large scale biomass utilization are exciting for the surrounding farmland community.

Results or progress to date

At present several project versions are being checked both in the technical and economic aspects. Calculations show good convergence and the final version shall be presented in the poster.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Association of Biofuels into Romania

Association of Biofuels into Romania, Romania
Prof. Iosif Tripsa
tripsa@asticontrol.ro

Objectives

- Logistic help to the Romanian researchers, producers and users of bioenergy.
- Complex studies of bioenergy systems able to ensure the production of fuels,
- Thermochemical conversion (Gasification and pyrolysis) of biomass.
- Technical - economic characterisation of biofuels,
- Additive effect of biofuels for enhancement of conventional fuels,
- Ensure of the Romanian partnership with similar foreign associations, including in the E. U. projects.

Challenges / problems addressed

Our main R. & D. activities are:
- agricultural and non agricultural resources;
- biomass from fast growing plants;
- slaughter house and public food waste utilization;
- biodiesel technologies and high / low capacities equipments;
- biogas technologies and high / low capacities equipments.

Project structure

Our Romanian partnerships consist of 6 chemistry departments in Universities;
8 Chemistry Research Institutes; 5 agronomic departments in Universities;
7 Agronomic Research Institutes; 10 farms producing seeds;
7 oil producing enterprises.
We want to participate in EU research projects and to establish partnership with all interested organisations.

Expected impact and exploitation

- Enhancement of the production and utilisation of bioenergy in Romania;
- Better participation of Romanian specialists into European Co-operation in the field of bioenergy.

Results or progress to date

Set up of our Association was in July 2003 and the official recognition of our juridical personality was in September 2003
We are in this event for the first time and we need your help to improve our Activity

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Integrate ecological system for co-generating and producing bio-diesel fuel from vegetal unrefined oil

S.C. MASTER S.A., Romania
Mr. Valeriu Moisescu, Mr. Cristian Petcu
mastersa@xnet.ro

Objectives

The research team of S.C. MASTER S.A. former National Institute for Thermal Engines (before '89) has an important experience in the domain of bio-fuels especially in producing biogas generators of 400 kVA. Starting 2001 our research team focused on the development of new and renewable sources of energy as alternatives to the classic ones, for obtaining a diminution of petroleum distillate based fuels consumption and gas emissions. One of our most important projects is the application of bio-diesel fuels to co-generating diesel units, using different blends of petroleum-based fuels with bio-fuels obtained from vegetable unrefined oils.

Challenges / problems addressed

The main challenge of the project is the transformation of a medium or large sized agricultural farms that are obtaining rapeseed, soybean and/or sunflower, from "preponderant energy consumer" to "preponderant energy producer", because:
- It may provide electric energy to the national energetic system;
- It will produce fuels that may be used in car transports.

It must be emphasized that this kind of system will contribute also to the significant reduce of technological costs of growing rapeseed, soybean and/or sunflower, because of the decreased expenses for providing the petroleum based fuel necessary. With an adequate dimensioning of the system it is possible to provide over than 20% of the fuel necessary for a farm, with the bio-diesel fuel produced just into the farm.

Project structure

Research and development of a co-generation unit powered both with bio-diesel and fossil diesel fuel or blend involved two stages of the project: at the first stage was built one experimental co-generation unit of 35 kW. Also, our most important Romanian partner ICECHIM Bucharest built the experimental pilot installation for obtaining bio-diesel fuel and glycerine from vegetal unrefined oil.
At the end of the second stage, will be achieved the "Integrate ecological system for co-generating and producing bio-diesel fuel from vegetal unrefined oil" as a compact unit: a co-generation unit working with an installation for obtaining bio-diesel fuel and glycerine.
Romanian partners:
MASTER S.A. - Bucharest, UNIVERSITY "POLITEHNICA" - Bucharest, ICECHIM - Bucharest, IPROCHIM - Bucharest, INTERAGRO - Bucharest, ROMAN S.A.- Brasov, VIROMET S.A. Victoria, SIN S.A. Bucharest, Association of Biofuels into Romania.

Expected impact and exploitation

Promoting the economy improvement, promoting the trade, promoting the small and medium sized enterprises, promoting the occupation of the work force, promoting the agriculture, promoting economic partnership, promoting professional training are the most important problems benefits. The achievement of this project will produce effects, first of all, through the environment, considering the low level of gas emissions obtained by burning of bio-fuels. If consider the costs of imported petroleum and the dependence of the global oil market, it is obvious that the importance of the renewable fuels as bio-diesel has an exponential increase.
This project will contribute, for sure, to the increasing of level of business for the medium and large size agricultural farms that grow rapeseed, soybean and /or sunflower.

Results or progress to date

At the end of this project the "Integrate ecological system for co-generating and producing bio-diesel fuel from vegetal unrefined oil" will be able to produce min. 2 tones per day of bio-fuels, working in co-generating regime, or in insulated one, with low gas-emissions: CO: max. 5.0 g/kWh; HC: max. 1.0 g/kWh; NOx: max. 6.0 g/kWh; PT: max. 0.3 g/kWh, using different blends of petroleum-based fuel with bio-diesel.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biofuels: Research Activities at the Department of Agricultural Chemical Technology, BME

BME, Department of Agricultural Chemical Technology, Hungary
Dr. Kati Réczey
kati_reczey@mkt.bme.hu

Objectives

The objective of this poster presentation is to summarize ongoing research activities at the Department of Agricultural Chemical Technology of BME aimed at developing technologies for the production of biofuels to be applied in the transportation sector utilizing lignocellulosic biomass. The 'Non-Food Research Group' has been involved in various national and international R&D projects in the field of alternative fuels for over 20 years. Furthermore, our participation in several networking projects made us possible to broaden our spectrum in national and international relations. The primary interest of the 'Non-Food Research Group' is to study the possible utilization of a large variety of agricultural, agro-industrial, forestry and industrial lignocellolosic residues and by-products for the production of fuel ethanol based on enzymatic conversion of cellulose.

Challenges / problems addressed

In contrary to the well established starch based ethanol production, conversion of lignocellulosics to ethanol has numerous challenging aspects, mainly due to the complex chemical composition and low enzymatic digestibility of raw materials. In order to be cost competitive with traditional fuels, raw material utilization has to be maximized. Via studying: factors affecting pretreatment techniques applied to lignocellulosics for improving digestibility, process alternatives for cellulose saccharification and fermentation, and cellulase production supporting cellulose hydrolysis data can be provided for economic analysis addressed at economic viability of fuel ethanol production. The concept of biorefinery is also studied in order to identify high value compounds and thereby establising economocally favorable processes, which can be executed by carefully designed fractionation technologies.

Project structure

Our ongoing research projects are carried out via national and international consortia. In order to address the specific challenging issues of lignocellulose based fuel ethanol production, experts representing universities, research insitutes and industrial partners of different European countries (Denmark, Finnland, Italy, The Netherlands, Sweden and Hungary) are gathered in a still running EU 5th FP project. Raw materials available in northern (willow, spruce) and southern (corn-stover) regions of Europe are studied. Within the frame of a national project utilization of agricultural residues (corn-fiber, wheat bran) for production of value added products are studied via gathering the basic knowledge for establising biorefineries.

Expected impact and exploitation

The key impact of introducing alternative fuels into the transportation sector is rather obvious in terms of carbon-dioxide emission reduction. In Hungary production capacity of ethanol has to be increased cost competitivelly, as by the year 2004 MTBE blend in gasoline is to be 100% repleaced by ETBE. Furthermore, due to EU regulations agricultural land used to grow crops for food industrial applications has to be reduced, which in return will result in a significant loss of income. Utilizing the surplus of area for growing energy crops will provide a secure alternative solution for farmers to balance their economic shortfalls.

Results or progress to date

Most of the ongoing research programs in which the 'Non-Food Research Group' is actively participating are in their rather early stages. However, based on the knowledge and data gathered so far, the concept of biorefinery seems to be viable option for Hungary in order to improve the economy of corn-kernel and wheat processing via integrating corn-fibre and wheat bran processing into existing technologies. It can also be said that Hungary has all the necessary means (land available, variety of agricultural products, technical knowledge etc.) for decreasing carbon-dioxide emission by increasing the contribution of biomass originated fuels.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Hydrogen producing and consuming enzymes in phototrophic bacteria.

Department of Biotechnology, University of Szeged, Hungary
Prof. Kornél Kovács
Kornel@nucleus.szbk.u-szeged.hu

Objectives

Understanding the molecular details of biological hydrogen catalysts is necessary for designing such biocatalysts and exploting the high bioconversion yield possessed by microorganismsm in large scale practical systems. In addition to disclosion of the regulation of biosynthesis and the sophisticated molecular assembly of the sensitive redox enzymatic catalysts, the molecular structural details responsible for the stability should be determined. With this knowledge catalysts of optimum performance can be designed using this biomaterial and hydrogen production can be achieved in living and-or artificial systems. Alternatively, hydrogen utilizing enzymes are good candidates for catalysts in fuel calls.

Challenges / problems addressed

Hydrogen is a strong candidate as a major future energy carrier because it is the cleanest known energy source and because it is easily stored and utilized in various, commonly known technologies. The overwhelming majority of industrial hydrogen is produced from fossil fuels today, clearly a technology that will run short of supply within the next 20-30 years. Biology offers a viable solution as several microorganisms are capable of efficient metabolism (production and/or consumption) of hydrogen. The key enzymes involved in hydrogen metabolism are sensitive redox enzymes, fit for the biological function but may not be the catalyst of optimal performance for industrial hydrogen production. The future of biological hydrogen production depends not only on research advances, i.e., improvement in efficiency through genetic engineering, but also on economic considerations, social acceptance and the development of hydrogen energy systems.

Project structure

Hydrogenases have been characterized from numerous microorganisms. Much is known about their structure and biosynthesis, but the overall chain of biological events is far from being understood. Continued research on hydrogenases will provide information on the molecular element responsible for the stability of certain enzymes. Hydrogenase, as isolated from soem microbes, can be employed directly in artificial hydrogen generation systems. Living microorganisms convert sunlight or biomass into hydrogen, these systems are ready for practical development. and commercialization

Expected impact and exploitation

Biological hydrogen production is the most challanging area of biotechnology with respect to controlling global environmental and energy production needs. Hydrogen based economy will improve the quality of life, will preserve our biosphere and allow sustainable development of mankind. Biological hydrogen production systems are likely to become practical reality within the next 5-7 years.

Results or progress to date

Enzymes participating in hydrogen metabolism of photosynthetic bacteria have been isolated, characterized and the molecular biology of various types of such enzymes if well understood. Mutants showing altered hydrogen metabolism and therefore outstanding hydrogen production activity have been isolated.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biogas production as an upstream technology in waste water treatment

KUKK, Hungary
Dr. András Kovács
kukkkatz@axelero.hu

Objectives

Small scale Waste Water Treatment (WWT) with upstream anaerobic degradation step for producing biogas on the expense of carbon dioxide produced in aerobic biodegradation. The proposed RTD is structured to study and recommend technology for improving the energy balance of farm and SME food industrial –bakery, pastry, distillery, restaurants, slaughter houses, dairy - sector economies. Both the aerobic and anaerobic techniques are known, RTD work will focus on chemistry and chemical engineering aspects, will include agro-technical and soil chemistry disciplines. Small scale biogas refining will also be addressed.

Challenges / problems addressed

Effluents of small scale food industrial units and effluents in farm economies are characterised by high loads of organic constituents. COD level of such streams may range between 10000 to 50000 mg O2/l. Such effluents cannot be directly discharged into community sewer systems. It is a common practice to flocculate and separate a sludge phase, which is hauled to deposits and to treat the liquid stream in aerobic WWTs. If we convert only 50% of the organic constituents into biogas and the remaining loads are submitted to improved aerobic degradation the following benefits are expected
Conventional: 80% degradation in aerobic step, 50% conversion in anaerobic decay of sludge
Proposed: 50% degradation in anaerobic step, 95% conversion in improved anaerobic
There are no commercial technologies at the proposed scale. The challenges consist in concluding to a BAT process technology that is affordable for farm and SME, especially in rural areas.

Project structure

There is already a consortium composed of two Hungarian universities and two SMEs for concentrating on energy balance improvement on the example of a “palinka” distillery. A research plan has been formulated for dealing with byproducts of this distillery, that are discharged in a septic system. We have set objectives of using these streams in: biodiesel production technology, in biogas production and in energy rationalisation together with improving the aerobic degradation procedure. Small scale pilot facility is envisaged with a biogas plant, WWT plant on the basis of biofilter principles and sludge conditioning for agro-technical assessment.
The consortium is interested in bringing this topic to deeper analysis and broader applications by joining an EU FP 6 biomass research consortium

Expected impact and exploitation

Halving the carbon dioxide emissions of small scale WWT along with multiple biogas production.
Bringing economies to scale of biogas production closer to SME and farm scale applications.
Improved, efficient and affordable WWT system for communities of less than 2000 inhabitants;
Refined biogas can be employed such like natural gas, with no risk of frequent maintenance and repair.
SMEs and farm scale economies can meet environmental standards and can stay in business.

Results or progress to date

Preliminary experiences have proven the concept. An improved, biofilter based WWT system at laboratory scale can tackle the problem of too high COD content without the need of diluting it with other effluent sources.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Ecological biodiesel and glycerine obtained through chemical processing of the renewable resources

Research Institute for Analytical Instrumentation, Romania
Dr. Mircea Chintoanu
icia@mail.dntcj.ro

Objectives

The EU Commission has set a political objective of 20% substitution by alternative fuels in the road transport sector in the year 2020 and this, correlated with the restrictions imposed by the preservation of the environment, has given an impulse to our institute regarding the new sources of unconventional fuels. In addition, Romania possess lands with a high agricultural potential that are available for obtaining high energetic level crops representing the raw material for bio-fuel obtaining.
Our objectives are to obtain alternative ecological fuel through an innovative, cost-efficient and safe technology; identification of the organizational, economic, operational, technical factors which can lead to the substitution of the classical fuels with an ecological alternative fuel from renewable energy and to develop promotion methods for alternative fuels usage into the urban transport.

Challenges / problems addressed

The main problems to overcome are to obtain the alternative ecological fuels and to find the promotion methods for their large-scale integration into the urban transport.
Scientifically: development of new and renewable energy sources as alternative to the traditional ones; drawing-up a cost-efficient and safe technology for alternative ecological fuel production [using as raw material the new biomass resources (energy crops) or residues]; analysis of the effects appeared on technical conditions of the engine as a result of the new fuel usage.
For the economy: sustainable development of the agricultural sector; assessment of the paths for biodiesel to reach the Romanian market (the social and economic aspects associated to innovative infrastructure for the alternative fuels production and distribution).
The society: to find the best ways for promoting the ecological, alternative fuels in the urban transport in order to develope cleaner and more energy efficient transport-solutions.

Project structure

We would like to collaborate with SMEs, research institutes or some industry companies to realise our ideas and to implement our experiences.
We have presently a good collaboration with many research institutes and universities from Romania, Europe (UK, Germany and Hungary) and USA.
Suggestion of project structure: a partnership (SMEs, reasearch institutes or universities)

Expected impact and exploitation

Development of the recyclable materials sector: 20%
Decrease of the mineral oil products import: 15%
Reduction of emissions: 25%
Development of new workplaces (within the chain: biofuel production –distribution)
Integration of alternative fuels into the urban transport system

Results or progress to date

Today our institute has obtained an ecological biodiesel using rape crops at the laboratory level and, we expect to complete the project results by:
* A cost-efficient and safe technology for alternative biofuel production and glycerine purification (resulted as by-product);
* Installation for biodiesel and glycerine obtaining;
* Necessary modifications of the diesel engine so as to use biofuel;
* Increase of the farm and agricultural exploitation efficiency;
* Turning to good account of the agricultural fields.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biological methods to remove sulphur from diesel fuels

Oil and Gas University of Ploiesti, Romania
Prof. Vasile Matei
vmatei@mail.upg-ploiesti.ro

Objectives

1. Bio-catalytically sulphur removing at constant experimental conditions from four gas-oil cuts with variable sulphur content (from 80-1250 ppm) under the action of two bacteria: Pseudomonas and Methylomonas.
2. Experimental study of removing sulphur compounds from Diesel fuels by bio-catalysis, heterogeneous catalysis and mixed catalytically method (biological and heterogeneous).
3. Supported biocatalysts preparation.
4. Bioreactor improvement the for a better mass transfer.

Challenges / problems addressed

Reducing sulphur compounds from Diesel fuels by bio-catalysis leads to the alignment at international specifications concerning environment protection and improve life quality.
Microorganisms are capable to reduce sulphur hetero compounds concentration from oil cuts, part of them being metabolised and the other transformed in water-soluble compounds.
The activity of biocatalysts is higher in the first 24 hours and after that it decreases significantly. The problem of catalysts deactivation is very serious and that is why it is necessary to support the biocatalysts in order to facilitate the regeneration and avoid the biocatalysts dispersion in organic phase or aqueous solution phase.

Project structure

Because of its interdisciplinary aspects, the experimental study of bio-catalytically sulphur removing can be realized only with a complex team, including specialists in biology, physical chemistry of petroleum, catalysis and refining.
The project is focused on laboratory studies concerning sulphur removing by bio-catalysis from Diesel fuels as well as heterogeneous catalysis.
The studies emphasized the sulphur removing at significant conversions by bio-catalysis and suggest, for optimal results, a mixed method bio-catalytically and heterogeneous catalysis.
Partnership: Association of Biofuels into Romania

Expected impact and exploitation

Removing sulphur by biological and heterogeneous catalysis, leads to the decrease of pollutant emissions (SOx) and life quality improvement.
Biological catalysis at low temperatures (around 30 ºC at normal pressure), without hydrogen, reduces the costs even in the case of mixed technologies (contact catalysis and biological catalysis).
Using bio-catalysis we can remove those compounds that are not eliminated by hydro-fining such are benzotiophene, di-benzotiophene and alkyl di-benzotiophene.
The reaction products in bio-catalysis do not contain H2S and that is an economical advantage and a friendly environment process. Also CO2 emissions are minimal.
Biocatalysts can stand high aromatics hydrocarbons concentrations.

Results or progress to date

The experimental results show significant conversions of sulphur compounds and suggest the development at larger scale at the project of biological sulphur removing alone and combined with hydrodesulphurisation in heterogeneous catalysis.

The activity of biocatalysts is higher in the first 24 hours and after that it decreases significantly. So, to obtain better results and to decrease the reaction time this process must be improve by: increasing catalysts activity; microorganisms protection by adding “biological protection additives” to avoid catalysts deactivation; the development of a new microorganisms generation to remove sulphur from different sulphur compounds and to have a better activity and a better selectivity.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass logistic chain assessment and the biomass market development in Poland

EC BREC/IBMER, Poland
Mr. Grzegorz Kunikowski
gkunikow@ibmer.waw.pl

Objectives

The overall objective is to transfer European experience and research know-how in the field of biomass market development and elaboration/assessment of biomass supply systems to Poland. This have cover the following areas: wood fuels and waste in forestry and wood industry, agricultural residues (straw, hay, others) together with the development and implementation of energy crops and short rotation coppice (SRC) willow and poplar recognized as most suitable for Poland due to favourable environmental, climatic and economical conditions.

Challenges / problems addressed

In the RECEPOL project research staff of RECEPOL have develop the draft discussion paper on possible application of expert systems in Polish conditions and it will be forwarded for review to the associated partners. Researches will took part in training on: biomass logistics chain assessment, environmental impact of biomass resources utilization, fuel transport and handling, economical analysis of fuel production and supply chain and in practical usage of selected DSS systems or models appropriate for practical usage in Poland.

Project structure

In project RECEPOL there have been four main steps:
- Information and knowledge exchange about bioenergy models and decision support systems
- Training in the theory of biomass logistic chain assessment
- Training in selected decision support systems and/or models
- Development of concepts for further international research

Expected impact and exploitation

The general result will enable to strengthen research capacities of EC BREC in the area of planning and assessment of biomass supply chain and will help in the networking on a specific scientific subject. It will help also with acquiring necessary knowledge and collating EU best practice on fuel supply systems, which will be practically useful for the future elaboration of "The National Bio-energy Development Programme for 2003-2006" that is now to follow the National RES Strategy for Poland.

Results or progress to date

The models and decision support systems review and the assessment was done on the basis of internet contacts with associated partners to the RECEPOL. Research staff of RECEPOL have develop the draft discussion paper on possible application of expert systems in Polish conditions and it will be forwarded for review to the associated partners. This short report gives the general background, rises the common understanding of the problem and shows the ways of its practical solution. It helps in the identification of research and technological problems to be cover by further training and scope of the problems to be cover under partners collaboration including forestry fuels chain logistics assessment, agricultural residues chain logistics, feasibility elaboration for wood recovered fuels (briquettes, pellets), elaboration of logistics for SRC willow/poplar implementation, analysis of environmental benefits/risks and feasibility evaluation.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Energy Forest Project

Geo-Montan Ltd., Hungary
Mr. János Horváth
montan@axelero.hu

Objectives

The main objective of the project is to develop a consistent methodology for predicting the potential size of biomass production on low-quality agricultural lands, analyse the socio-economic, agricultural and environmental impacts of energy-forest planting and design a decision support system.

Challenges / problems addressed

Increasing reliance on renewable energy is an important priority, since it can prevent future imbalances in the energy market and decrease environmental pollution. What is more, overproduction constrains agricultural activities, creates a surplus of land and labour and has repercussions on rural communities. We promote the more rational use of low-quality lands and highlight the potential advantages of energy-forest planting.

Project structure

The consortium consists of five members.
Geo-Montan – Budapest, CRES – Thessaloniki, - VZ GLS – Praha, GIG – Katowitze, Geonardo – Budapest. The project is co-funded under the 5th Framework Programme.
The project is made up of five work packages, which are dedicated to dissemination, land classification, optimal selection of plantation types, societal effects of biomass planting, and recultivation issues related to mining sites.

Expected impact and exploitation

Our research will help stakeholders to consider planting energy crops a real alternative by supplying them with hard data. By influencing public opinion we will help to create a better climate for future initiatives. Biomass production will help create jobs and retain rural population. Its ecological benefits include the reduction of harmful emissions, improved soil protection, and amelioration of the microclimate.

Results or progress to date

Based on our assessment energy-forests planted on low quality lands representing 1.79 million hectare in Hungary could yield up to 14.3-25.1 million tons of biomass which is equivalent to 265-444 PJ. Since the annual Hungarian energy consumption amounts to 1040 PJ, 25-45 % of the total consumption could come from energy-forests.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Energy Parameters of Biomass

VŠB-Tecnical University of Ostrava, Czech Republic
Prof. Pavel Noskievic
pavel.noskievic@vsb.cz

Objectives

The term of biomass energy implies energy generated from a wide variety of woods to crops. The majority of technologies start with an idea of a universal equipment that would be aesily fuelled by any material whatsoever. Nevertheless it is a common knowledge that there are major differences between energy crops, which also concerns wood. The exploitation of biomass specific properties might be of advantage for modern technologies development.

Challenges / problems addressed

An effectivite technology development for cogeneration with biomass gasification asks for a qualified survey of biomass relevant properties, which would facilitate adjoining of suitable biomass and its production to appropriate or available technologies. This objektive implies project individual goals and tasks.

Project structure

* to define relevant parameters and the methodology of measurement
* to prepare chosen numer of useful sorts of biomass
* to perform extensive and highly qualified investigations by means of the state-of-the-art technologies
* to perform investigations under conditions making for compatibility and easy inter-comparability of results
* to summ-up the results

Expected impact and exploitation

The knowledge of specific biomass parameters will help to technology development and its early application with all, technical, ekonomic and social positiv impacts.

Results or progress to date

* are known results of measurement of different sorts of wood by controled combustion (flue gases composition)
* collaboration is planed in the Czech Republic - controlled combustion, gasification in fluidized and solid bed gasifier
* a few results are available.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Environmentally friendly technology for biohydrogen as an energy supplier for small enterprises

Department of Biotechnology, University of Chemical Technology and Metallurgy, Bulgaria
Prof. Milka Krysteva
krysteva@uctm.edu

Objectives

Creation of a technology for obtaining biohydrogen based on a module biosystem fed with by-products of the enterprises producing wine brandies as well as sugar. It is aimed at utilizing the by-products of the enterprises for their own energy needs. The composition of the by-products determines the application of two modules: one utilising the sugars by anaerobic fermentation (dark fermentation) and another making use of the organic acids by photofermentation. The necessary installations will be built on the enterprise areas and solar energy will be used for photo fermentation.

Challenges / problems addressed

The main problems to overcome are : utilisation of waste biomass for energy production; new approach for energy production with the use of bacteria and sun;
We would like to collaborate in the following directions: (i) improvement of the productivity of the microbes used; (ii) perfection of the bioreactor constructions and scaling up; (iii) simulation of the processes in the separate modules with a view to optimising the parameters; (iv) automation of the separate stages of the continuous processes; (v) transformation of the hydrogen obtained into heat; (vi) economic calculations and management.

Project structure

We have presently a collaboration in the field of bioenergy production with the group of Prof.J.L.Phelouzat from ENSAM- Paris, Prof.F.Mavituna from UMIST-Manchester as well as Prof. J.Kas from Institute of Chemical Tehnology- Prague. We are interesting in collaboration also with the groups from the countries which cultivated grape and sugar beet as well as with some industrial companies to realise our ideas and to implement our experiences. In this aspect our suggestion of project is on: experimental construction (prototype) of two module unit in the region of a small enterprise producing brandy.

Expected impact and exploitation

We expect with this technology to utilise an unused waste which will realise an energy economy on one hand and a reduction of different harmful emission in the atmosphere on the other hand. The new energy unit will develop new workplaces in the frame of the enterprise.

Results or progress to date

Our laboratory results to day consist of:

Covalent immobilisation of a bacterium of the genus Clostridia to a synthetic support of acrylonitrile-acrylamide using hydroxymethyl groups preliminary introduced into the polymer under strict anaerobic conditions. The conjugated bacterium was viable and capable of multiplying in nutritious medium. The continuous process was organised with immobilised bacterium. This system can work continuously for at least three months, no change of the immobilised bacteria was observed. The other module was used for photo fermentation of the organic acids in the vinasse in the presence of a bacterium of the genus Rhodobacter. Significant intensification of the process was found in the presence of another micro organism which probably formed a community with the Rhodobacter for joint usage of the substrate and co-metabolism.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Integrated system for biodiesel production and use in the agricultural farms

University of Agricultural Sciences and Veterinary Medicine from Cluj-Napoca, Romania
Prof. Alexandru Naghiu, Prof. Liviu Al. Marghitas
alnaghiu@yahoo.com

Objectives

- Developing an integrated system for biodiesel production and use in the agricultural farms from Transylvania.
- Studying all the integrated system elements and establishing the optimization measures.
- Determination of the impacts (economical, environmental and social) of induced by the proposed system.
- Establishing the most feasible mode for the implementation of the proposed system.

Challenges / problems addressed

- Determination of the most feasible sort of rape for the Transylvanian farm conditions (cold and long winters);
- Establishing the most suitable rape crop technology in the given conditions;
- Analysing the correlation with the zootechnical sector: animal fodder, bee keeping, etc.
- Studies concerning the advantages and disadvantages of the crude oil and metilester use in the case of the decentralised (production & use) systems;
- Reduction of environmental pollution;
- Studying the market challenges;
- Improving the farmers life quality (increasing the family income).

Project structure

The bio-energy scientific field is developed by a team from the University of Agricultural Sciences and Veterinary Medicine from Cluj-Napoca in partnership with the engineering departments from the partner universities Hohenheim-Stutgart (Germany) and Bologna (Italy), Romanian National Institute for Mechanization in Agriculture and with private farmers from Transylvania. It has the support of the local/county authorities, also.
The bio-energy working team includes specialists from very different fields: mechanical engineers, agronomy engineers, animal breeding engineers, chemists, environmental engineers, etc. It refers to: agronomical approach; technical approach; environmental approach; economical approach and social approach.

Expected impact and exploitation

- Creating “biofarms” using clean/renewable energy sources and a network of these farms;
- Replacement in high percent (>20 %) of the mineral fuels used in the agriculture at national level;
- Exclusive use of the biodiesl for supplying the engines used in the protected areas;
- Improve the economic situation of the farmers;
- environmental protection improvement.

Results or progress to date

The first steps were made years ago starting with rape oil technology. There were studied several sorts of winter rape in different crop technologies. The crop yield and oil content were determinate in each variant.

A decentralized oil mill was installed in farm working conditions and it was started an oil production.

There were made tests with the rape oil supplying the tractor engines produced in Romania and it was studied the oil degradation in time.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

New bio-fuels for off-road and specific customer applications in Poland

Warsaw University of Technology, Faculty of Material Science and Engineering, Poland
Prof. Krzysztof Jan Kurzydlowski
kjk@inmat.pw.edu.pl

Objectives

The major general objective of the programme carried out by Warsaw University of Technology in collaboration with Central Naphtha Laboratory and a number of industrial partners is to increase the use of bio-fuels in Poland. More specifically, at this stage, the efforts are concentrated on bio-diesel for off-road applications (e.g. copper mining) and for city transportation. Since high concentration of bio-components (well exceeding 5%) may have adverse effect on materials of the storage/distribution infrastructure and engines, the specific objective of the project is to develop of such fuels for particular users who own a sufficiently large fleet of diesel driven vehicles and/or machines.
It should be noted that such bio-fuels to a large degree are country/user specific due to the effect of climate (temperature, humidity) and technical specifications of the storage/distribution infrastructure and engines in use. The aim of the programme discussed here is to address general rules for developing bio-fuels and special applicable in a given type of application conditions. The experimental part of the programme covers production, blending, storage of bio-diesels and their effect on engines and environment.

Challenges / problems addressed

The major challenge in the programme is to prioritize and reduce the number of potential problems to the manageable size. One of the questions addressed is stability of bio-diesel. Different types of additives are tested also from the point of view of biological degradation in various storage conditions. Another issue of importance is degradation of engineering materials exposed to high concentration of bio-components. Tests are currently carried out on specimens of materials typical of storage/distribution infrastructure and engines of use in Poland. Modern methods of materials science and engineering will be applied to detect possible materials degradation and evaluate its kinetics. Third, the research efforts are also directed towards the evaluation of environmental effect of bio-diesel fumes in the conditions of restricted ventilation encountered in mining.

Project structure

The programme is divided into 2 projects implemented by a consortia organized by Faculty of Materials Science and Engineering of Warsaw University of Technology and the governmental Central Laboratory of Naphtha. In one of the projects an industrial research institute for copper mining is involved. Both projects include the biggest refineries in Poland. Research part of the programme is financially supported by grants from the State Committee for Scientific Research.

Expected impact and exploitation

It is expected that the programme will increase substantially the amount of bio-diesel sold in Polish market. The refineries involved in the project plan to start distribution of bio-fuels on a large scale in 2004.

Results or progress to date

At this stage laboratory tests on bio-diesels stability and their effect on pre-selected engineering materials are in progress. Experimental testing of various blends of bio-fuels in urban transportation and in mining will start before the end of 2003.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Potential raw materials for bioethanol production in Hungary

West-Hungarian University, Hungary
Mr. Gábor Réczey
gabor@reczey.com

Objectives

To find a beneficial way in the bioalkohol production and to realise a positive energy balance. In our Institute we are basically interested about the agricultural crops and by-products, like corn cob or corn stalk as raw materials for bioethanol. Our goal is to make an analyses on the bioethanol production, which steps are economical and which are not.? How can we decide which is the right way and how big production is needed to cover the expenses. In my poster presentation I would like to sum up the potential raw materials, which could be used in Hungary for bioethanol production.

Challenges / problems addressed

The real challenge is to find an economical way to use bioethanol instead of the fossil fuel. One of the major interest is the energy balance (input-output) and to compeer the coast of the bioethanol production with the fossil fuels. The main problem is that the clean air and water has no economical value, which makes hard to calculate the real advantages. However our Institute tries to calculate from the other side back: how much money we need to spend on the human health and environment protection if we keep using fossil fuels.

Project structure

We don't have any EU Project yet and our Institute dind't started with any other bioenergy research. However our institute has a good relation with the Budapest University of Technology and Economics, who have several EU projects in the field of Bioenergy. We have the opportunity to be updated with the latest news on the bioethanol production, which makes us possible to calculate with the latest data. The 4 years long project we are running in our Institute has two major parts: firs is to collect all the data and information and to calculate the present and future value of the bioethanol. In the second part we would like to publish a study book about it and organise a course for the local farmers about the reform fuels and possibilities.

Expected impact and exploitation

The major result of the research is already the interest from the farmers: What do I need to plant to be able to produce bioethanol? When do I need to turn to this non-food production and how fare I can go on this? We would like to present a realistic calculation, which is clear to the people who are involved like agricultural workers and farmers. Our Institute will also organise consultations with the farmers, to update them about the set aside program in the EU and the avaible NON-FOOD projects. All of these activities are based on the economical calculations about the bioethanol.
A poster presentation will be a perfect opportunity to present our work and to look for partners in whole Europe.

Results or progress to date

Our Institute started last year here at the West-Hungarian University with this project and we are still looking for partners. However during the first year we established a database about the bioethanol production. Our first milestone will be an energy-balance calculation on different raw materials and the target is to make a present and future analyses on the bioethanol production.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Sustainable Development of Semi-closed Cycle Biodiesel Fuel Production

Lithuanian University of Agriculture, Lithuania
Prof. Prutenis Janulis
agrotech@nora.lzua.lt

Objectives

The aim of project - development of new technology for biodiesel fuel production consuming small amounts or external energy and utilizing produced wastes.
Tasks: to investigate processes of separation and purification of fraction containing small amounts of saturated fatty acids from animal fat wastes; to determine the parameters of chemical and thermal treatment of meat-fat-bone mass; to investigate the process of anaerobic digestion of meat-fat-bone mass and manure seeking to produce biogas and biofertilizers for rapeseed; to investigate kinetics of esterification of acid oil and fat and to determine the main technological parameters of esterification and transesterification of fat wastes fraction and rapeseed oil; to determine the FAME quality and influence of various antioxidants and depressants on oxidation stability and CFFP; to evaluate Life cycle parameters of cycle: animal - manure - animal wastes - biogas - biofertilizer - rapeseed ultivation - biodiesel fuel

Challenges / problems addressed

The problem is addressed for sustainable development of biodiesel fuel production. The aim is to create technology for biodiesel fuel production with small external energy input and waste utilization. The cycle of such production involves rapeseed growing, usage of meal and cake for animal feeding, usage of slaughterhouse wastes, dead animals and manure for production of biodiesel fuel, biofertilizer, biogas and electricity. Final products are biodiesel fuel and meat.

Project structure

Consortium for this project could be formed of the following Lithuanian Institutions: Lithuanian University of Agriculture (Institute of Environment and Institute of Agriculture Engineering) and Klaipeda University. Results could be introduced in Cooperative agricultural company "Bioenergija".
Partner from Poland - Institute of Heavy Organic Synthesis
Potential other EU partners from Austria and Greece.

Expected impact and exploitation

Social benefits are in expanding area of agricultural production for non food uses. The introduction of such innovative technology would lead the decrease of environmental pollution through minimization of wastes and emissions of greenhouse gases. Preliminary Life Cycle analysis showed of greatly decrease (nearly of 40 %) consumption of external energy. The cost of biodiesel fuel production would decrease by 28-35 %.

Results or progress to date

Processes of rapeseed oil esterification and transesterification by methanol and ethanol have already been investigated. Results were introduced in SME.

Biogas and biofertilizer production from the selected renewable organic wastes was investigated (international research project Lithuania - Latvia - Taiwan).

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Bioenergy in Poland - state of art

EC BREC/IBMER, Poland
Wisniewski G., Rogulska M., Pisarek M., Ganko E.
eganko@ibmer.waw.pl

Objectives

The present contribution of RES to the primary energy has been estimated at 2.9%. In 2002 bioenergy generation has been estimated at the level of 105 PJ/a heat and 548 GWh/a electricity. Bioenergy is the major and dominant component in RE production as Poland posses large biomass resources.
EC BREC mission is the development of technologies, creation of proper policies, regional strategies for the support of RE implementation projects. EC BREC plays the role of key institution responsible for implementation of the renewable energy state policy.

Challenges / problems addressed

National RE action plan and resulting Development Strategy of Renewable Energy Sector… calls for 7,5% contribution of renewable energy to the primarily energy balance in 2010 and 14% in 2020, as development targets for renewables. Such increase would require additional production of 340 PJ of 'green energy' in 2010, i.e. growth by 235 PJ compared with 1999, assuming the energy needs in 2010 at 4570 PJ. Biomass has been recognized as the most promising and important RE in Poland, at least for the next 10 years. To reach the goals set by Strategy the use of biomass as an energy source has to be increased significantly in Poland in the nearest future.
Lack of experience in utilisation of RE systems in broad scale, the ongoing economy transformation period, unstable trends in the energy sector, surplus of power produced from fossil fuels and state financial problems create real threats. These problems must be addressed while development of further activities to reach the assumed goals.

Project structure

ECBREC has been currently providing various EU and bilateral projects supporting the analysis of bio-energy development prospects in Poland. ECBREC works in close collaboration with key governemental institutions sa. Ministry of Economy, Min. of Environment, Energy Regulation Agency and market players. The examples of projects include: (1) Elaboration of expert report being base for Development Strategy for Renewable Energy Sector in Poland; 2000 – 2001 (2) Development of Renewable Energy Act for Poland; 2003; (3) Bilateral project "Sustainable Energy in Poland: The Role of Bio-energy"system analysis of the bio-energy proscpects 2002-2005 (4) TRECKIN – Network of organisation working in the field of Tradable Green Certificates 2002-2004 (5) RECEPOL – Renewable Energy Centre of Excellence and Competence in Poland 2003- 2005.
The key objective is to create proper legal framework for bio-energy sector development. It is also very important to support the liberalisation of energy market,development of local green energy markets both for heat and electricity. This is to analyse and create best conditions for the bioenergy implementation. Most important biomass resources sectors analysed are forestry and agriculture as well as municipal sector. Establishment of proper incentives or support system for agriculture development and energy crops cultivation states as one of major priorities.

Expected impact and exploitation

It was estimated that achieving the Strategy goals could lead to reduction of GHG's emissions of 18 Mtons/a and would lead to the additional 30-40 thous. jobs/a of direct employment. Creation of local biomass energy market is expected to support the local economy. Energy crops implementation is regarded as an interesting option for traditional agricultural systems facing the problem of cost inefficiency of food production.

Results or progress to date

The draft version of Renewable Energy Act for Poland, prepared by the EC BREC, is now at the process of consulting in the Polish parliament. Also we are currently assisting the local and regional governments in elaboration of strategies, inventories, and identification of investment possibilities in utilisation of renewable energy sources on local and regional levels. EC BREC staff is also strongly engaged in several research projects of EC relating renewable energy sources.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Alternative Use of Arable Land in Hungary

Institute of Environmental Management, Hungary
Dr. Norbert Kohlheb
kohlheb@nt.ktg.gau.hu

Objectives

Energy biomass production could be one of the most fruitful land use alternatives. Arable biomass production however has its special characteristics regarding soil quality, climatic and marketing conditions. As biomass production has to be a profitable business for farmers our research team broke with the common assumption, that biomass production is possible only on marginal areas of lower soil quality.
Our objectives are twofold: Firstly, to provide GIS-aided information about agricultural land, to explore the potential for biomass production considering factors like production site conditions, demand patterns (e.g. natural gas network), and placement of biomass-fuelled power plants. Secondly, to provide for the Hungarian Government with a schema for an effective subsidising system that helps to spread energy biomass production and use under Hungarian conditions.

Challenges / problems addressed

The accession of Hungary to the EU will cause a shift in land use patterns mostly in the direction of extensification. The main driving force for this change being the CAP, and the decreasing competitiveness of Hungarian farmers compared to their western-European counterparts. Due to this fact an appreciable amount of land will be set a side or used for purposes other than food production.
The estimation of agricultural areas suitable for energy production depends not only on soil and climatic conditions but on the economic conditions of other crops competing for the same land. For this reason a precise definition of the potential biomass cultivation areas requires great circumspection.
For appropriate policy advice we need a more-or-less complete picture about the current market situation of energy biomass, which is challenging.

Project structure

In this research project we have taken an area based economic approach.
Our team is composed of researchers mostly from our institute, but we also have experts from outside.
Initially, we will attempt to define areas suitable for energy biomass production, and than by analysing market and economic conditions of both producers and consumers of biomass and energy we shall set up an effective subsidy scheme.

Expected impact and exploitation

Using the subsidy system created by our team the production and use of biomass energy will increase and the Hungarian economy will become less dependent from the oil economy.

Results or progress to date

We have already mapped suitable areas for energy plantations and collected market information from prominent Hungarian biomass-fuelled power plants.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Amaranth Phytomass for Energy and Multifunctional Uses

Technical University in Zvolen, Slovak Republic
Viglasky J., Huska J.
viglasky@vsld.tuzvo.sk

Objectives

The determination of cultivation conditions and yield of giant amaranth (Amaranthus L.) in chosen countries of the EU is the primary goal of the potential project. The specific objectives include:
* establishment of test fields for cultivation as well as harvesting-experiments and data collection;
* determination of suitable methods and equipment for harvesting, drying and storage of amaranth;
* gathering data on the energy and industry utilisation opportunities of amaranth;
* development of techno- and socio-economic market-driven implementation strategies.

Challenges / problems addressed

Amaranth species have long since been growing and used as resource of healthy food. Industrial exploitation and production of biofuels has lead to a demand for new varieties. For that reason a plant cultivation program was started in 1998 at the Slovak Agricultural University in Nitra with the goal to develop varieties for industrial use.
The main problem:
* plants flowered, but even in November, when the first frost started were not producing seeds.

Project structure

Investigation of cultivation conditions of giant amaranth to reach the generative growth phase of plant. Amaranth phytomass as a raw material should be evaluated for:
* production of different biofuels and energy applications.

Expected impact and exploitation

The amaranth agro-environmental system can be a key link in the sustainable production of agriculture.
It will play an important role as raw material source for industrial biofuel production as well as environmental protection in this century. Energy generated from amaranth based biofuels has a potential to reduce GHG (CO2) emissions and decreasing dependence on drying up supplies of fossil fuels.

Results or progress to date

For the first field trials, seeds of giant amaranth (Amaranthus cruentus L.) had been brought from Peru. The actual and potential amaranth yield has been investigated for the Slovak climate and soil conditions.
Preliminary results: Yields of giant amaranth phytomass by our field trials overstepped value of 250 tonnes of GM or 50 tonnes of DM per hectare and growing season.
Amaranth could be characterised as a high-energy multipurpose C4 plant, fits the bill as a true „4F crop" (Food, Feed, Fuel and Fibre) as well as being a short cycle, drought and salinity tolerant crop.
Several successful applications in industrial production and energy sector of amaranth show promise, though research still remains to be carried out.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass and biofuel usage as a factor for improving the quality of environment in Poland

Institute of Agricultural Engineering, Agricultural University of Wroclaw, Poland
Prof. Józef Szlachta
szlachta@imr.ar.wroc.pl

Objectives

The Institute of Agricultural Engineering on Agricultural University in Wroclaw has been conducting research studies on the fields of biomass and biodiesel potential as a fuel for many years. The studies were aimed on improvement of biomass burning technology and, in the biodiesl area, on their usage as a fuel for tractors.
The aim of the poster is to present energy virtues of different biomass fuels (straw, willow) and rape-oil biodiesel taking under consideration their environmental impact. Those alternative fuels are expected to have an increasing share as a source of energy production in Poland. A legal bill which is conducted in polish parliament at the moment will oblige fuel producers to add 3-5% of bio-components to every vehicle fuel sold in the country.
There is a big potential to use straw and willow wood as fuels, especially in small, local power plants, which can have a very positive impact on environment, create many new jobs in less developed areas and improve the economic situation of farmers. Saying that it is very important to control the technological regime of burning biomass. Researches conducted in a few straw power plants show that the emissions of particulates, SO2, NO2 are much lower than in conventional coal power plants, though the emission of CO could be even 4 times higher, if the technological regime was not obeyed.

Challenges / problems addressed

Research studies, technology development and promotion of biomass and biodiesel as ecological fuels require large financial investments. It is necessary to build a test installation for burning the biomass with proper measuring – controlling unit to develop the best possible technology of burning the biomass. The research would aim on increasing the efficiency of biomass processing. There is still a need to improve also the technological regime of the burning process in order to achieve low level of CO emission. Another problem is to supply a good quality of biomass, i.e. straw with law humidity. Increased usage of biomass is determined by finding and introducing new conversion technologies, for example gasification and pyrolysis.

Project structure

On the field of bio-energy studies, the Institute cooperates with Technical University in Wroclaw and the Institute for Buiding, Mechanization and Electrification of Agriculture in Warsaw, but also with commercial organisations, for example “Ekobioenergetyka” from Kondratowice, near Wroclaw.
There is a need of cooperation between polish and foreign research institutes, biomass producers, biomass-fueled power plants. The efforts of partners in the project should focus on improving the quality of the biomass itself and finding and introducing more efficient and environmental friendly technologies of bio-energy conversion.

Expected impact and exploitation

Improved technology of biomass conversion which will result in increased environmental care. It will also benefit in new, locally built ecological power plants, which will create new job opportunities and will improve the economical status of farmers. The researches conducted in the Institute should also increase the awareness of the dependence between heavy metals contents in the soil, in the straw and finally gas emissions in the burning process. Using a biomass as an energy source would benefit in decreasing the greenhouse gases emissions.
From the economic point of view increased number of biomass power plants would decrease the price of energy on polish market.
In polish conditions biomass fuels are the cheapest available source of energy. 1 GJ of energy produced from burning straw costs around 10 – 11 PLN (2,5 Euro).

Results or progress to date

The institute is well prepared methodically to conduct next researches in the bio-energy area. It has a group of scientists investigating thermal processes, having good theoretical background for bio-energy conversion.
In the area of biomass burning processes, described in the poster, initial researches have been already conducted, main areas of possible improvements have been identified. The project is at the stage of finding partners interested in cooperation and sources of financing.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass for Energy in Poland

Gdansk University Of Technology, Poland
Prof. Piotr Kowalik
pkow@pg.gda.pl

Objectives

In order to increase the biomass utilisation In Poland several demonstration plants were constructed and monitored. Resources of Polish biomass are divided into two groups: the primary fuels for direct combustion, such as wood, straw or organic waste and the secondary fuels after upgrading, like biogas, bioethanol and pyrolytic gas. Biogas may be produced by anaerobic digestion from sewage sludge, animal manure or solid waste dumps. The bioethanol is produced from potatoes or grains and mixed with petrol to obtain liquid fuel for cars (3.5% of bioethanol, 96.5% of ordinary petrol). Pellets from biomass may be combusted with black coal as a co-firing solution. Our objectives were to promote the demonstration plants with the high replication potential on Polish market.

Challenges / problems addressed

There are several reasons exist which constitute barriers for the introduction of the biomass into energy market in Poland. They are the following: (1) the lack of knowledge that the production of heat energy and electricity from the cheap residual biomass is very economical and may compete easily with the conventional fossil fuels; (2) too low prices of the conventional fossil fuels, without considering external negative influences of combustion of coal, oil and natural gas on the environment and on the human health; (3) slow progress with the technological development of the most efficient production of heat and power from biomass; (4) difficulties with selling the produced heat energy and electricity into the state electrical grid or to the district heating distribution pipes. There are no detailed regulations on the tariffs of heat and power from renewable energy sources; (5) the lack of experience how to use renewable energy in the obligatory local energy plans for communes in Poland.

Project structure

The most important point should be the dissemination of knowledge on the existing pilot and demonstration solutions. Until now there is a limited number of the success stories and positive solutions of RTD but in the future there should be more and more demonstration installations and commercial replications. Our partners are the producers and users of wood boilers, straw boilers, sewage sludge boilers, pellet producers for co-firing in the CHP plants of the region of Northern Poland. We collect and disseminate the knowledge about existing plants.

Expected impact and exploitation

The production of heat and power from biomass is very promising, if we take into account the existing positive demonstration plants. Additional arguments are: very good technical parameters of the boilers, very good economical results with relatively short pay-back period of investments if the residual biomass is used and the very positive ecological results with low level of the emission of flue gases to the atmosphere.

Results or progress to date

It turns out that the biomass is much more environment friendly than any other fossil fuel. Progress in technology, economy and ecology is quite promising. We are currently working on the pelletising of sewage sludge from the waste water treatment plant of Gdansk (0.5 mln inhabitants) to be used in the CHP of Gdansk in the co-firing technology, 2% of sludge pellets and 98% of black coal. We expect to complete it by year 2004.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

How to bring environmental, economic and social energy for over 500 villages in rural Slovakia?

CEPA - Center for Environmental Public Advocacy, Slovak Republic
Dr. Daniel Lešinský
lesinsky@pobox.sk

Objectives

1. To save public funds generated in rural areas through conversion of heating in 25 public buildings from coal and electricity to biomass.
2. To enhance economic self-sufficiency of rural areas through the use of local biomass potential for local energy needs.
3. To protect the environment through significant cuts in carbon emmissions in rural regions.
4. To test a pilot micro-regional project before its broader introduction to other regions.

Challenges / problems addressed

- To develop a proper financing scheme for the project involving public and private funding.
- To set up a proper institutional framework among the project partners.
- To prepare conditions for transfer of the model to other regions.

Project structure

Project leader: Center for Environmental Public Advocacy (CEPA), a non-governmental organization focused on sustainable use of public finances, public interest law, and regional development.
Municipal partners: 10 municipalities located around Banska Bystrica, Central Slovakia.
Governmental partners: Danish Environmental Protection Agency and Slovak Ministry of the Environment (potential participation at Joint Implementation scheme)
Expert and scientifical partners: the Forestry Research Institute (development of the fuel cycle), the Slovak Energy Agency (consultations on financing), Slovak Environmental Agency (consultations on regional development aspects), the Department for Environmental Enginering, FEE at the Technical University in Zvolen (combustion processes, emissions).
NGO partners: Energy Center Bratislava and local civic associations ELIAS and HROCHOT.
Project started in autumn 2002 and first wood-chips-based boilers are planned to be instaled in 2004.

Expected impact and exploitation

Modernization: Public buildings will be equiped by modern and efficient heating systems. Most of the currently used boilers and heat distribution systems require serious reconstruction anyway.
Sustainability: the project will prove an alternative to fossil fuel and electricity-based heating in regions with no access to natural gas as well as rural regions that have already been gasified.
Savings: Municipal expenses for heating of public buildings will decrease. The price for heat generated from wood-chips will be significantly lower compared to heat from gas (energy audits show the difference of approximately 15% - howevere, this difference will even increase substantially after the liberalization of gas prices in January 2004).
Emmissions: the total carbon dioxide emissions will be reduced by approximately 8.5 thousand tons in 10 years.

Results or progress to date

Final concept of the pilot project is finished and introduced to all participating villages.
Regional partnership is being developed. Contacts with project partners are established.
Energy audits for all participating villages are completed by independent energy company. Audit of biomass potential is made.
Funds for project preparation and coordination for 2003 are raised.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass Sources for Energy in Slovakia

Technical University in Zvolen, Slovak Republic
Prof. Tibor Lukác
lukact@vsld.tuzvo.sk

Objectives

Industry as well as agriculture are in Slovak Republic of very unfavourable structure from the point of view of the energy consumption. Most of inhabitants live in the countryside in the houses with individual local heating. In Slovakia there are no important sources of fossil fuels.
On the other side Slovakia belongs among the most timbered countries of Europe (41 % of forests). In spite of this fact approximately only 0,5 % absorbed power is produced from the wood. Governmental energy policy is aimed at increase of energy production from wood to 1 – 1,5 %, and strategically up to 4-5% till the year 2006.

Technical University in Zvolen is author of the project BIOMASS in the forestry – complex utilization. The project focuses on identification, quantification as well as definition of disposable dendromass sources. Particular aim is to create energetic schemes (models) on the basis of wood suitable for Slovakia, including implementation of the pilot project (app. 500 kW) in selected locality.

Challenges / problems addressed

New support systems for the utilization of renewable energy sources are being created in Slovakia. The advantage is taken from subsidiary programmes of EU, ministry of education, ministry of land management, etc.
As for intensification of secondary sources utilization it is necessary to create following cardinal measures:
1.In the social area the legislative should be worked out (standards, rules) and motivation systems (taxes, dotations)
2.From the point of view of research it is necessary to optimise economic balance of present technologies and to project energetic utilization of Slovak Republic free land after EU admission
3.The basic economic problem are missing free sources for financing of perspective projects

Project structure

There are 4 basic segments:
- science, research: terrain activities, statistical analyses
- education: enlightenment, popularization, courses
- economy, legislative: standards, economic models, instructions
- implementation: connection of individual activities into larger units and particular projects

We have good cooperation with local as well as central organizations of forestry, staying in contact with support EU funds (SAPARD, ISPA), we are cooperating with SME (e.g. KOVACO), large energetic producers (e.g. SES TLMACE), energy producers and also with several small foreign enterprises abroad (WOODPACK, Switzerland). We welcome especially investors cooperation altogether with the experience obtained during the construction of 200 – 1000 kW heating systems

Expected impact and exploitation

Dendromass utilization for energy includes all positive for the environment protection (e.g. carbon “C” circulation, emissions decrease, etc.). It enables rural development from the point of view of available and relatively cheap energy and certainly decrease the percentage of unemployment.

Results or progress to date

The first quantity project results are worked out. We carry out the preparation activities for the exhibition of local heating system (in cooperation with the agency SAPARD) and small processing unit for the biofuel production. In 2004 we would like to start the implementation in the middle Slovakia region.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Integration in the Bio-energy Research and Applications in Bulgaria

Technical University of Sofia - Research and Development Sector, Bulgaria
Ivanov I., Krusteva A.
ivec@tu-sofia.bg, krusteva@tu-sofia.bg

Objectives

1) Selection and analysis of the Bulgarian and European law- and regulations basis and evaluation of the theirs supporting functions for the research's and application's development by the economical, environmental and social conditions in the country;
2) Design and creating of an integral information panel and web-site with view to more efficiency interaction and joint investigations and applications;
3) Identification and quantification of the appreciable sources of biomass in the country, theirs applicability, energy potential, possibilities and efficiency of its utilization;
4) Development of the microbiological investigations on the processes during the storage and working of the biomass and waste.
5) Development of the investigations and improvement of the technologies for the biomass's and waste's utilization in the energy- and industrial sectors, public utilities, etc.

Challenges / problems addressed

Green houses gases global problems on the one hand and increasing of the energy efficiency on the other hand are the main reasons the bio-energy not only to appear, but to take up significant place on the European and national energy market. Biomass and waste are used to produce energy in the EU and also in the New Associated States (NAS), especially in Bulgaria, too. The increased use of biomass and waste was promoted to ensure energy independence in the 1980s, it is currently used as a complementary tool to meet CO2 emission targets and contribute to local regional development, especially in the rural areas. The renewable biomass has a great potential to make a significant contribution to Bulgaria's short-and medium-term targets (i.e. energy supply, environmental protection and regional development), it is more likely that bio-energy will continue to be high and to increase in the next years.

Project structure

The foreseen Integration Project's structure will consist of:
1) Scientific Governing Board (SGB) by the TU of Sofia - Research and Development Sector (TUS-RDS), composed of 1 member designated by each partner, will review the progress made by the Integration Project (IP), in terms of progressive integration, and make recommendations of future orientations.
2) Management team (MT), which shall be in charge on behalf of the SGB, of the day-today management of the IP. The MT is composed of the Coordinator heading the team, Scientific Coordinator and Technical Assistant. The MT shall notably monitor the progress made in IP, promote the collaborative work, etc.
3) Foreseen Partners of IP - departments and laboratories from Technical University of Sofia, Bulgarian Academy of Sciences, Sofia University - Faculty of Biology, University of Forestry, University of Chemical Technology and Metallurgy, ERATO Holding plc and other working in this field Bulgarian institutions.

Expected impact and exploitation

Integration of efforts of researchers and laboratories occupied with investigations in the fields of waste management and environmental protection, modelling, optimisation and control of microbiological and biotechnological processes, utilization of the wood- and food- industrial waste, household waste, agricultural waste, waste water treatment sludges, etc., utilization of gas methane and production of thermal- and electrical energy, production of bio fuel, creating new wood composition materials, etc.;

Creating of an integral information panel and web-site, collection, sum up and presentation of the research results, and improvement of theirs transfer to real applications;

Contribution to local regional development, improvement of the energy ensure and reduction of the expenses for energy supply, development of the social conditions, creating a new work places, etc.

Results or progress to date

In the frame of the European Project "ERA Bioenergy" (ENK CT 2001- 80526) a team of TUS-RDS, as subcontractor of Centre for Renewable Sources (CRES) from Greece, carried out studies on the national bioenergy research and technology development (RTD) policies, institutions, etc. The results of this and also from previous national and municipalities studies and projects for briquettes production from wood waste, models of the anaerobic digestion of organic waste, biogas-technologies for regenerative energy supply, utilization of the waste lignocelluloses biomass from forestry, industry and agriculture, creating a new buo-fuel, new wood composition materials, etc. are good basis and show the reasonable needs of integration of the further research on the bio-energy investigations and development of theirs applications.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass use for district heating and electrical co-generation

Institute Jozef Stefan, Slovenia
Dr. Fouad Al-Mansour
fouad.al-mansour@ijs.si

Objectives

Objective of the action is the promotion of biomass use for energy purposes, both for district heating and electrical co-generation, by means of small-medium plants located in the vicinity of forest areas. A widespread and efficient use of biomass is basic to reach the objective of the European energy policy: "to double the primary energy production from renewable sources by 2010".
The aim of the project is to speed up the process of RES utilisation by pursuing two targets: to produce a handbook on the state of the art on the matter, in which some typical plants' design is outlined and a methodology of project financial analysis is described.

Challenges / problems addressed

Substantial amounts of biomass are available for energy uses in mountain areas in Europe, as residuals of wood farming and by-products of relevant industry. Its best use is, at present, for small or medium district heating systems, in the neighbourhood of biomass production areas.
Such systems, from a size of few hundreds of kWth up to 20 MWth, have been implemented until now only in areas where favourable market and cultural conditions exist.

Project structure

The project was coordinated by FAST - Federazione delle Associazioni Scientifiche e Tecniche, Italy.
Partners on the project are:
- Energie Tirol, Austria
- Institute Jozef Stefan, Slovenia

This is an Altener project : Cluster 20 "Wood fired CHP".

Expected impact and exploitation

The project will increase the information about the new technologies for district heat and electricty production from wood biomass. On this matter, the decision makers, mainly local authorities, generally lack the necessary technical knowledge as well as the tools for an economical and financial assessment of this kind of projects.
The dissementaion of the produced documents will encourage the investors to increase installation of district heating and CHP plants from wood biomass.

Results or progress to date

A document (review) of the technologies for heat and power production from biomass was prepared within the project. The document is therefore intended to create the first overview of commercially available technologies for heat and power production from biomass.

The other documet produced by the project is "Handbook for small-medium biomass district heating and CHP projects". The aim of this handbook is therefore to address specifically the needs of decision makers at regional and at local community level, who are interested in understanding how the biomass resources available in their territory may be effectively exploited for energy purposes.

Also a simple mathematical model for the project analysis was developed, to identify potential priority projects, falling within the heat generation, and the combined heat and power priority areas of ALTENER II.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

INTUSER Project - what does the enlarged Europe know about energy, environment and sustainability

Innoterm Energetics Ltd., Hungary
Mr. Krisztian Edocs
krisztian.edocs@innoterm.hu

Objectives

INNOTERM Energetics and Environmental Protection Development Ltd. was founded as an engineering office with a production plant background in 1989 in Budapest, Hungary. The company's main goal is to design environmental and user-friendly energy supply systems, herewith trying to contribute to sustainable development. During the past decade INNOTERM has been constantly developing new services. Our core competences include: International Project Development, Studies / Developments in Connection with Biodiesel, Designing of Complex Energetic Systems, Energyaudits.
The overall objective of our INTUSER project (Information Network on the Technology of Utilisation and Sustainability of Energy Resources) is to raise public awareness of the benefits and possible drawbacks of the utilisation of various energy resources (including bio-energy - biopower, bioheat, biofuels), and hence to bridge the gap between science and the public. One important part of the project is a study that provides a cross-national, comparative analysis of public understanding of and attitudes towards nuclear, renewable and fossil-fuel energy sources. Furthermore, we plan to organize a platform of highly intensive and moderated discussions (the so-called "Arena"), where parties involved will have the chance to defend their own points of view about energy sources.

Challenges / problems addressed

As the main objective of the INTUSER project is to bridge the gap between the scientific community and the general public, as well as that between the MS and ACC concerning the sustainable utilisation of various energy sources, it intends to address the major issues of public concern towards sustainability in an enlarged Europe. The first and maybe most important step of the project had been the comparative cross-national study analysing the knowledge base of the society, which enabled the consortium to clarify issues of low public understanding. Further separate workpackages had been devoted to the presentation and discussion of every energy source, such as RES, fossil and nuclear, whereas bio-energy and all forms of renewable energies will be dealt with separately in two large WPs.

Project structure

The INTUSER project's scheduled duration is 3 years, and the project is financed by the European Commissions 5th Framework Programme. The project is coordinated by the Hungarian SME "INNOTERM Energetics Ltd." and includes 9 additional principal contractors coming from MS, ACC and EFTA states and different sectors of the energy industry. More specifically, the following organisations take part of the project: Geonardo Ltd. (HU), Slovak University of Technology Bratislava (SK), COMTAG Plc. (CH), Institudo de Soldadaura e Qualidade - ISQ (PT), Centre for Renewable Energy Sources - CRES (GR), University of Sheffilld (UK), Bluwaters (A), European Photovoltaic Industry Association - EPIA (B) and the IESD at De Montford University (UK). The work is organised into 8 WPs, from which 2 are horizontal WPs devoted to project management and to dissemination.

Expected impact and exploitation

So far the consortium had been able to carry out a detailed analysis in different member as well as associated candidate states about the public understanding of, and attitudes towards nuclear, renewable and fossil-fuel energy sources, herewith having a unique database at hands that helps the consortium, as well as other parties (e.g. the EC), to promote understanding and communication between the public, energy policy-makers and the scientific community in the EU and the ACC. With the help of this data we will aim to steer our promotional activities towards issues of generally low understanding.

Results or progress to date

The main (up to now) and maybe most interesting part of the project, the knowledge base analysis shows significant deviances between the public perceptions of bio- as well as other forms of energy. Among several remarkable and presentable results of the project it is to mention that only 55.4 % of all people surveyed across Europe consider biomass as a renewable form of energy. Accordingly, the consortium wishes to actively help working on these figures when caring out the work foreseen in the 5th WP of the project.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Biomass: Reclaiming Our Oldest Energy Source - Activities of the Geonardo Ltd related-to the bioenergy utilisation

Geonardo Ltd, Hungary
Mr. László Ádám
laszlo.adam@geonardo.hu

Objectives

Our main goal is to classify energy plants and low quality agricultural land to help farmers, and decision-makers to choose the best types of biomass and planting sites for growing energy crops.
We shall analyse the socio-economic implications and environmental effects of biomass planting and design a new computerised database to support decision-makers.
Since advocating biomass planting and renewable energy related research is one of our main priorities, the consortium operates a website, organises meetings, and publishes a newsletter.
The lessons learned will be summed up in a comprehensive final report entitled 'Energy Forests for Re-cultivation', which will be available in hard-copy format.

Challenges / problems addressed

Increasing reliance on renewable energy is an important priority of the European Union, since it can reduce the dependence on import and prevent future imbalances in the energy market.
What is more, increasing productivity in the agricultural sector and unfavourable market conditions such as overproduction constrain land use and acreage dedicated to plant cultivation. This decline in traditional agricultural activities creates a surplus of land and labour and has repercussions on our rural communities.
We would like to promote a more rational use of low quality agricultural land and present energy forest planting as a viable alternative to unprofitable agricultural activities. We intend to offer would-be entrepreneurs guidance and help them cope with major investment risks.

Project structure

The consortium carrying out this project consists of five members from four different countries, two research and educational institutions and three SMEs. The project is fully funded and was made possible by a grant from the budget of the European Union's 5th Framework Programme. The 18 month long collaboration officially started in December 2002, and the first preparatory stage has been completed by May 2003.
Execution is divided into six blocks, so called 'work packages' each of which is either focused on a specific field of research or related to project management. Each work package has a strict deadline and an organisation which will be responsible for its execution.
Work package 1 and 2 are dedicated to project management and dissemination. Scientific work will start in work package 3 (Land classification) with the characterisation of potential planting sites. Work package 4 (Energy forest plantation) deals with the optimal selection of biomass types. Work package 5 (socio-economic outcomes) will discuss the effects of biomass planting. Since work package 6 (The recultivation of open cut mining sites) is very important in some parts it will stretch over almost the entire duration of the project.

Expected impact and exploitation

We hope that biomass planting will gain more acceptance and popularity, and the risks and start-up costs involved could be reduced significantly.
Our research will help stakeholders to consider planting energy crops a real alternative by supplying them with hard data. By influencing the public opinion we will certainly contribute to a better climate for future initiatives.

Results or progress to date

The project was launched in December 2002 and four and a half months later we can report progress on two fronts.
At our start-up meeting we agreed to focus on three reference areas, one in Poland, Hungary and the Czech Republic. We have reviewed so far the Hungarian literature with a special emphasis on little known pioneering experiments carried out by timber companies and forestry engineers in the past, and in the case of Poland we have characterised the most common biomass types.
As regards to software development we have defined the bare-bones of the proposed database and the corresponding land classification methodology. Our earliest results will be made public in our first newsletter coming out in mid-May.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

The work of a National Governmental Agency in supporting bio-energy deployment

The Polish National Conservasion Egency (KAPE), Poland
Ryszard Wnuk, Grzegorz Chronowski
rwnuk@kape.gov.pl , gchronowski@kape.gov.pl

Objectives

Achievement of the sustainable energy policy objectives is mainly possible through increase of energy efficiency of the economy and renewable energy sources (RES) deployment to the Poland's gross energy consumption. The strategic objective of Poland is to increase of the share of energy from RES in primary energy balance to 7.5% in 2010 and to 14% in 2020. That means generation of 340 PJ from RES in 2010, which compared to the year 1999 will require increase of the operational capacity of RES sector by additional 235 PJ. Achieving mentioned capacities would require implementation of many new instruments and measures in different RES sub-sectors. Biomass is the most promising renewable source of energy in Poland of technical potential estimated at 895 PJ/year. The effectively utilised waste wood, forest residues and straw should play important role to achieve goals of sustainable energy policy including environmental and social (employment increase) effects.

Challenges / problems addressed

The real knowledge about the potential, role and nature of renewables in Poland is still low. Modern technologies are unfamiliar to potential users and investors. Lack of knowledge about possible applications at domestic, industrial and financial level is widespread. Reliable and accessible information systems and database on RES are required.

Project structure

KAPE aim is to stipulate the effective biomass utilisation and its wide local application for heat and power generation. The crucial is KAPE participation in four ALTENER projects (which programme Poland joined in 2002): BIOHEAT II, REPROMO, BIOXCHANGE, REACT and other EC projects relevant to the RES development and promotion: SAVE "Energy Bus", OPET Buildings, RTD 5.FP (SUSTELNET, ENIRDGnet).
In framework of projects as above KAPE is developing and promoting governmental, regional, local and individual initiatives on biomass. KAPE is involved in activities leading to biomass utilisation development through i.e.: assisting the Polish government in the creation and realisation of the energy efficiency policy (PHARE, REACT); development of investments projects in the field (BIOHEAT II, REPROMO); co-operation with international organisations leading to gain their support and assistance (all projects); organisation of technical assistance and financial consultation for energy consumers willing to implement biomass projects (BIOHEAT, OPET Buildings); organisation of promotional campaigns and promotion of modern technologies (Energy Bus, others) and by compiling and disseminating all information relevant for RES actions in CEE; by forging alliances around concrete RES actions out of manufacturers, financial institutes and project developers (REPROMO).

Expected impact and exploitation

The realisation of mentioned above projects will bring benefits by preparation of different methods, tools and measures for overcoming the barriers of biomass utilisation development. The expected social effect should be pointed out in form of local market development (i.e. wood fuels production decreasing unemployment, environmental benefits and positive impact for tourism resort development). Capacity building of stakeholders will increase.

Results or progress to date

Realising the mentioned above projects KAPE in particular identified a few dozen case studies of biomass utilisation and disseminated them (WebPages, publications); prepared 3 brochures promoting the biomass utilisation in large buildings and prepared the database comprises of one hundred relevant to RES companies, manufactures and institutions, which available on the KAPE homepage.

The awareness and information campaign will be continued in forms of conference, seminars, etc. In framework of BIOHEAT II project 10 investment projects will be initiated and supported by feasibilities studies provided by KAPE experts.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Estimating the carbon sequestration of tree plantations by an accounting model developed for the Hungarian conditions

Forest Research Institute, Hungary
Dr. Zoltán Somogyi
somogyiz@erti.hu

Objectives

Wood is an "old-new" renewable source of energy. Recently, it has also been valued as a renewable carbon pool, or carbon sink. By afforesting former agricultural lands and producing wood for fuel, large amounts of emission from fossile fuel can be avoided. This, in turn, can contribute to the mitigation of climate change, which is one of the greatest challanges in the coming decades.
The cultivation of forests and plantations for biofuel requires proper knowledge on the amount of wood that can be produced on a unit of land, as well as the amount of carbon that is fixed in the forestry system. The objective of our work is to provide possible end-users with up-to-date knowledge on tree biomass and carbon-related issues, as well as decision making tools by (1) integrating existing knowledge to model tree growth and the carbon cycle of forests and forestry, (2) improving our knowledge on the processes constituting the carbon cycle, and (3) exploring opportunities of afforestations.

Challenges / problems addressed

The carbon cycle of forests is extremely difficult to explore due to the dimensions of trees and soils, as well as the timescales involved. In addition, the accounting of the amount of carbon fixed in afforestations is further dependent on the regulations of the Kyoto Protocol and the Marrakesh Accords. Both issues are considered in the current work of the Intergovernmental Panel on Climate Change (IPCC), which is to develop good practice guidance on the national greenhouse gas inventories. Being a lead author of that guidance, I have a rather good view on problems and possible solutions involved.

Project structure

Previous work to develop CASMOFOR, a country-specific carbon accounting model, was financed by the Ministry of Agriculture and the Ministry of Environment. Current work to develop methods of carbon inventory of afforestation projects is done in the framework of Carbo-Invent, an EU FP5 funded research project, as well as in cooperation with the Department of Plantation Forestry of the Hungarian Forest Research Institute. A separate project on soil carbon related issues has been just started together with the Department of Forest Site Studies of the West Hungarian University. I am also an active partner of the COST E21 action ("Contribution of forests and forestry to mitigate greenhouse effects").

Expected impact and exploitation

From a pure scientific viewpoint, the result of my efforts is a better understanding of the carbon cycle of the Hungarian forests and forestry. From a practical point of view, our forest carbon inventory system is further developed through new measurements (such as biomass expansion factors and soil characteristics), and afforestations can be better planned. This is true for all afforestation projects either financed from domestic budget, or jointly implemented (JI) by an EU country and Hungary. The afforestations themselves improve local climate, generate jobs, contribute to landscape and rural development, and of course are also sources of biofuel.

Results or progress to date

A country specific (i.e. Hungary-specific) carbon accounting model, CASMOFOR, has been developed. It contains a knowledge base of existing information on carbon cycle, a spreadsheet type accounting model, a program shell in order that the use of the model is user friendly, and an extensive help system. The knowledge base contains all existing Hungarian specific information on tree growth, silvicultural systems, and available biomass expansion factors. The help system, both in English and in Hungarian, contains general description of the model, as well as relevant information concerning the carbon cycle and the climate change process. As a next step, a test area is being established in the Great Hungarian Plain, where the model will be tested, new measurements are planned, and where the recommendations of the good practice guidance (see above) will also be tested.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Estonian Wetlands Biomass Resources for Energy Production

Archimedes Foundation / Estonian Biomass Association, Estonia
Kask Ü., Pärnamäe E., Habicht M.
Ykask@sti.ttu.ee, enn@erakyte.ee, mari@ise.ee

Objectives

We see wetlands as important basis for the sustainable development. Beside the biodiversity and landscape functions they can be widely used for wastewater treatment and energy/material production.
Wetlands (mires, swamps, fens, bogs, moors, coastal and floodplain wetlands) are common features in the Estonian landscape covering approximately 30% of the country's total area (4,522,726 ha). Beside the traditional biodiversity and landscape values we consider the Estonian wetlands also as a resources for energy sector.
The potential of plants of wetlands as a fuel has been left undiscovered, although this is generous energy source because of the high productiveness and relatively high energy value of the plants growing there (up to 18 MJ/kg).

Challenges / problems addressed

Most of the fuels that are being used to produce thermal and electrical power are non-renewable. Biomass is the most suitable renewable energy resource in Estonia. Hitherto - one kind of biomass - plants of wetland - has almost not been used. There are plenty of wetlands in Estonia that have reasonably high productivity of biomass. The area of Estonian wetlands is approximately 26 000 hectares. Wetlands are characterized by rich flora, which gives a remarkable amount of biomass. Thickets of reeds as well as natural bush are the most suitable for energetic raw material.
One advantage to use the plants of wetland (reed, cattail) in energy production is the fact that these plants will disengage from water in the end of their growth period and will need no extra drying.

Project structure

The project should be of interest to potential partners especially from the Nordic countries - Finland, Denmark and Sweden. We are looking for cooperation both with research and industrial sectors. The project might include different phases starting with additional investigation and ending with demonstration.

Expected impact and exploitation

Implementation of technologies of processing and using the biomass of wetlands in energy helps to create new jobs in agriculture as well as in other sectors of economy and evolve the regional development. The local currency circulation will improve and there are also possibilities in increase of capital expenditures and export potential.
There could be significant reduction in the emission of solid particles into the atmosphere, if the biomass of wetlands would be used to produce thermal and electrical power.
Co-burning biomass that is harvested from wetlands with other fuels is useful from different point of views. Lower expenditures and higher effectiveness in major stations allows to use biomass and decrease SOx ja NOx emissions.

Results or progress to date

In recent years the Institute of Power Engineering of Tallinn Technical University has carried out numerous tests on combustion characteristics of different wetland plants and estimated the Estonian wetlands biomass resources for energy production.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Forest fuel production technology and economy in Lithuania - the example of Rokiskis forest enterprise

Lithuanian Forest Research Institute, Lithuania
Dr. Jonas Saladis
josalit@centras.lt

Objectives

1) Estimation of forest fuel resources potential to be used for boiler houses in Rokiskis forest enterprise
2) Establishment of demonstration objects in pre-commercial, commercial thinnings, final cuttings and ash utilization areas of Rokiskis forest enterprise;
3) Assessment of technological and economical aspects of forest fuel production in different types of cuttings;
4) Evaluation of ash handling methods.

Challenges / problems addressed

Attention to logging residues as fuel in boiler-house in Lithuania is increasing. It is dependent on objective to decrease using of expensive fossil fuels as oil, gas and coal which usually is imported from foreign countries. At the same time it will decrease the emissions and improve the environment conditions. In resolutions of international conferences as Madrid declaration it is recommended to increase the use of local renewable energy sources to 12-15 %.

Project structure

Striving to accelerate forest fuel production in Lithuania in 2000 it was started Swedish-Lithuanian Wood Fuel Development Project Phase I. Swedish and Lithuanian specialists in this research were involved. The demonstration area in North Eastern Lithuania - Rokiskis forest enterprise - was chosen as a result of that research.
Current research was done in Rokiskis forest enterprise. It is the input of Lithuanian Forest Research Institute to the Joint Swedish-Lithuanian Wood Fuel Development Project Phase II.
Research was supported by Swedish Energy Agency and Department of Forests and Protected Areas of Lithuanian Ministry of Environment.

Expected impact and exploitation

With increasing and sharing of knowledge in forest fuel production it was expected to increase of the production in both industrial and private forest entertrpices, the increased use of forest fuel in municipal boilerhouses and acceleration of rural development due to increased employment.

Results or progress to date

Totally 12 demonstrations areas were established during project: 10 demonstration areas for forest fuel technology and 2 demonstration areas in ash from forest fuel utilisation. Forestry and technology issues, economy of forest production, inflence of different factors on forest fuel price were researched. 7 seminars for decision makers, foresters, education and reearch institutions, municipals, associations and other interested persons were organised.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Influence of agrotechnical, soil and climatic factors on perennial crops yield value

Agricultural University of Lublin, Poland
Prof. Bogdan Koscik
tech_roslin@inr.edu.pl

Objectives

Workers of University in Lublin are interested in both current situation and perspectives of alternative plants cultivation especially in Poland. The great amount of existing species of energy plants gives us the choice that is the best for our climate and soil, however we take up research about:
- grasses (Miscanthus sacchaliflorus, Spartina pectinata, Andropogon gerardii) - we have five years old experimentation existing
- other species like Helianthus tuberosus, Sida hermaphrodita and Salix viminalis - we starting the analysis this year

Challenges / problems addressed

There are wide perspectives for cultivation of alternative crops in the entire world. These crops can be utilized for different purposes for example energetic and industrial ones. Some plants are used for natural environment protection. In Poland the main aim of cultivation of perennial crops seems to be directed on:
- biomass production, which can be utilized as a local source of energy,
- reducing CO2 emissions, stopping erosion and removal of unwanted chemical combinations from soil and water
- important influence on social-economic problems (high Polish unemployment on rural areas)
- management of fallow land

Project structure

We are looking for possibilities of approach to European projects both new and still existing ones.

Expected impact and exploitation

The target of industrial use of biomass is much desired. That is what we try to make possible in Polish conditions. Firstly it protects the natural environment and secondary solves some social-economic problems.

Results or progress to date

Agricultural University of Lublin has been experimenting with perennial grasses for five years. We have experimentation results concerning cultivation of perennial grasses in different soil, different agrotechnical methods, and taking into account different climatic conditions. The study is also carried out in a biological sewage – treatment plant belonging to Lenczyn Power Industry (different energy plants cultivated like: Salix viminalis, Helianthus tuberosus and Sida hermaphrodita) where unrefined sewage is used as fertilizer. In that case biological and physical soil conditions are observed as well. At the same time morphological measurements of the plants are carried out, and samples of plant material are taken to determine basic chemical properties. The plants will be cut when they ready to use as a source of energy. All the basic analysis concerning both theoretical and practical fuel value of the biomass will be done both in laboratories and in furnaces of the heating plant.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Implementation of Biomass co-generation in East Central-European Countries

National Contact Point , Institute for Fundamental Technological Research, Poland
Dr. Kucinski Jacek
jacek.kucinski@kpk.gov.pl

Objectives

The overall goal of the project is a collaboration between leading European laboratories in the field of biomass and waste processing towards their implementation for cogeneration with provision for extension for multigeneration in the Eastern Central Europe (ECE) region. Interaction with other laboratories and dissemination of „best practices" has been foreseen.
This might help to networking of laboratories working in different aspects of biomass/waste processing. Such actions might provide an opportunity to get acquainted with different aspects of biomass being the major prospective in Renewable Energy Sources (RES) in ECE Countries. The expected result of the project is to increase share of renewable energy in the energy balance in the countries taking part in the project (Poland, Slovakia, Hungary).

Challenges / problems addressed

According to the EU policy the share of renewable energy sources (RES) should be gradually increased. In the new eastern EU members the major RES will be biomass. These countries do not have potential for large scale wind, solar, geothermal or other RES based generation. Unfortunately, the utilisation of the biomass has been low so far.
Following EU directives municipal waste has to be processed and not stockpiled as it has been a case in that region. There has been many reasons behind the main being lack of sufficient funds and adequate technologies.
There are lot of common points in the biomass and waste processing. Therefore, we are targeting both potential RES.
There was the same economic system in the region for nearly half a century. The ACC/ECE countries have therefore a lot of similarities in their energy systems, particularly a very low share of renewable energy sources.

Project structure

The project membership consists of twelve (12) organisations, mainly R&D institutes and technical universities, from three ACC/ECE countries (Poland, Hungary and Slovakia) together with similar organisations as well as municipal (waste treating) companies and SME's in Italy and Spain.
The project will be coordinated by IFRT -Inst. for Fundamental Technological Research of the Polish Academy of Science, National Contact Point. in cooperation with EC Baltic Renewable Energy Centre and Electotechnical Institute in Warsaw
The responsibility for the project is vertical as well as horizontal:
The vertical responsibility is the responsibility of the project co-ordinator, to make sure that all tasks of the project will be realized, according to timetable (2 years).
The horizontal responsibility will be addressed through the 8 workpackage leaders, analysis auditing and consortium agreement.

Expected impact and exploitation

Implementation of biomass for heat supply from water boiler of the Lublin-Wrotkow CH Plant will improve the environmental performance. The utilisation of solid biofuels is the fastest growing branch of the renewable energy sector in Poland.

Advanced technologies wil be compared fo such aim. IIn partcular, the main benefits of an over-heated water centralized system over a direct flame gas burners remote system will be outlined: (1) accuracy of the control; (2) production, control and regulation of the energy in only one location; (3) easy maintenance; (4) no pollution; (5) suitable for energy recovery.

Results or progress to date

Project submitted to EU Commission on 26/06/2003; approval pending.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Plant for biomass burning by co-generation

Iprochim S.A., Romania
Dr. Nicolae Sdrula
nicolae.sdrula@iprochim.ro

Objectives

The incineration of bio-waste consists of mass burning of the waste in a single chamber, achieving complete combustion. Incineration can minimize the volume of waste as much as 90%. Today the most utilized type is those with burning on grate. Other performant types are those with burning in fluidised bed or complete gasification with cycle gas turbine plus steam turbine.
Bottom and ash fly are the main by-products of the incineration. Bottom ash is discharged together with non-condensible material, from the end of the grate into a water tank for cooling.
The ash is then disposed on the landfill site.In the last time, the research is carried out on whether bottom ash can be recycled in the construction industry. Ten percent of the total volume of bottom ash is fly ash. Fly ash contains highly toxic chemicals including dioxines, furans and heavy metals.
In order to avoid the pollutants to be exhausted inthe air, the burning plants (incinerators) are provided

Challenges / problems addressed

The new system is realised as an integrated system containing as main deivices an incinerator and an gas filter.
The grained, dried waste is introduced in the first chamber of the incinerator where also hot gravel is feeded.
The main revendication of the incinerator are the transmision of heat and purification of fly or bottom ash through the continuous mouving bed gravel.
The most part of waste is volatilized, pyrolysed or burned at 500-600 ? C.
The formed vopours, containing fly ash are than purified by ash and condensed.It results an Bio-Oil liquid which can be further utilized as bio-fuel.
The heavy liquid part(Tar) is burned into final combustion chamber at 1200 ? C.
The resulting gases are than condensed and purified and sent into atmosphere, while the heat is recovered.

Project structure

In order to put in application such a project a consortium to accomplish all the necessary steps is provided.
The main step in order to put the ideea in application on the industrial scale is to perform firstable a pilot plant, where the necessary measurements and tests can be achieved by the interested parts.

Expected impact and exploitation

During the process the dangerous gases are not formed.The system is continuosly and the waste dosage is controlled.The by-products can by used.The recovery of heat is very high.

Results or progress to date

The provided system can to retain more than 99.9 % of the fly and bottom ash.
The maintenance of the system is easily.
The costs of the whole process are reduced compared with existing systems.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Research, Modelling and Optimisation Of Biogas Production From Single And Complex Substrates Of Organic Wastes

Institute of Microbiology, Bulgarian Academy of Sciences, Bulgaria
Prof. Ivan Simeonov
ISSIM@microbio.bas.bg

Objectives

Anaerobic treatment of organic wastes (AD) for biogas (source of energy) production is a way to substitute fossil fuels and to reduce disposal of waste in landfills. Economic evaluation of biogas plants has reveal that these plants can only survive economically if special incentives are applied.
The objectives of this project are developing methodologies and techniques for low-cost optimization on the basis of obtained new knowledge about the process of AD of single and complex substrates of organic wastes (mixtures of activated sludge and cattle manure, mixture of milk whey and cattle manure, ect.) in the case of stimulations of the process by different substances (glucose, acetic acid and some biosurfactants). These results will be used to develop new mathematical and neural models for control and optimisation of the anaerobic digestion.
As a result, more efficient biogas technologies will be developed.

Challenges / problems addressed

The problems to be solved are:
1. To choose the most effective stimulating substance.
2. To calculate the optimal concentration and the proper time sequence for the addition of an appropriate stimulating substance.
3. To develop new methodologies and techniques for low - cost optimization of the AD.

Project structure

1. Experimental studies in laboratory conditions.
2. Development of new mathematical and neural models of the AD.
3. Development of new control and optimization algorithms.

Expected impact and exploitation

Expected results:
1. Increased level of biogas flow rate.
2. Increased level of depolution rate.
3. Increased stability of the AD.

Results or progress to date

New results of the work conducted many years in a multidisciplinary team (including microbiologists, biochemists, engineers and mathematicians) in the field of anaerobic treatment of organic wastes have been obtained. A stress has been placed on the possibility to stimulate and stabilize this very complex (and sometimes unstable) process by the addition of some stimulating substances (acetate or/and glucose in appropriate quantities) These manipulations have been introduced as new control inputs in different kinds of models (deterministic and neural) of this process. New sophisticated control algorithms have been developed.

These results have been presented in more than 20 scientific publications.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

The role of manganese in stimulation of plant growth

Research Centre of Earth Sciences, Laboratory for Geochemical Research, H.A.S., Hungary
Márta Polgári, Zoltán Szabó, Tamás Vígh
polgari@geochem.hu

Objectives

The economic Úrkút manganese ore deposit in the Transdanubian Range currently covers 8 km2 . During exploitation, in the course of enrichment by washing of the manganese oxide ore, about 2.5 Mt Fe-Mn-ooze was formed, and deposited on the surface around the mining area. Extensive researches has been carried out so far in order to utilize this ooze but no economic solution was developed for its processing. Field observations showed that the vegetation becomes virulent on the Mn-tailings. Cotton wood forest becomes giant in a relatively short time. We consider that the biomass growing on lands fertilized by Mn ooze can reach large volume in a short time, so our objectives are to examine the effect of the Mn tailings on different plant groups.

Challenges / problems addressed

Though field observations confirmed the giant growth of special plants, detailed research was not made on the effect of Mn-Fe-ooze (tailings) and the connected trace elements. Scientifically the determination of the different tree species would be important, and the explanation of mechanism in the plant biology would be foundamental. It would be important to study the interaction of Mn-Fe-ooze and biosphere on selected plant species, trees, especially on cotton wood. We are looking for partners for this complex research. From economic point of view the utility of Mn ooze as a row material is important for agricultural purposes.
The tailings of the manganese mining in the vicinity of villages and towns has a serious risk for the society, for the reservoir of drinking water.

Project structure

The Laboratory for Geochemical Research of the Research Centre of Earth Scences, Hungarian Academy of Sciences coordinates the research on the lithosphere, hydrosphere and biosphere foundamental elemental interactions and processes. In general the Laboratory has 50 years practice in complex interpretation of earth sciences in both inorganic and organic approaches. Expertness of the Laboratory provides complex interpretation of different environmental problems.
We would like to collaborate with agricultural firms and forest research and some industry company to realise our ideas and to implement our experiences.
We have presently a good collaboration with many Hungarian and foreign research laboratories, departments of earth sciences of universities. We would like to expand to industrial directions.
Suggestion of project structure:- detailed study on the effect of Mn and other trace elements on wood species; and application of knowledge in these interactions.

Expected impact and exploitation

Pedagogical evaluation and utility analysis of the Fe-Mn-ooze indicates that ooze is valuable for agriculture and may play important roles in Mn, Fe and trace element supplies. These investigations have shown that the Fe-Mn-ooze does not negatively pollute the environment, but stimulate the plant growth, creating renewable bio-energy source. With the utilization of the ooze for agricultural purposes the tailings would be used as row material fertilizer, and would disappear from the vicinity of village and town populations. At the same time its effect would increase biomass utilization.
If the stimulating effect of manganese on plant growth, on cotton wood would be proved, this material would be used as a source of Mn, Fe and trace element supplies in forests. As a result the volume of biomass would be inreased, which would represent renewable source of bio-energy.

Results or progress to date

In the sence of the present project the Laboratory has basic data on mineralogy and main and trace element content on the Mn-Fe ooze and has preliminary results on the effect of the ooze on the biosphere (agricultural experiments).

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Romania's biomass resources and potential

National Research and Development Institute for Energy - ICEMENERG, Romania
Ms.Carmencita Ciomaga, Dr. Pompiliu Budulan, Dr. Vasile Rugina
cciomaga@icemenerg.ro

Objectives

1. To produce clean energy, especially from the renewable sources of energy and integrate them into the energy system- including storage, distribution and utilization. Research activities will focus on diminishing costs, improving performance and reliability of the new renewable sources, integrating renewable energy into the existing decentralized sources.
2. Energy saving and increase in energy efficiency generation. Research will focus on the opportunities for the local producers to utilize renewable energy sources and improve building energy efficiency.
3. Alternative fuels for engines.The goal is to integrate alternative fuels (bio-fuels, natural gas and hydrogen) in the urban transportation system, to develop strategies and management means for transforming the market for alternative fuels for engines.

Challenges / problems addressed

1. Development of feasibility studies for the replacement of liquid fuels or natural gas burnt in the urban heating installations in more than 110 towns and municipalities in the Carpathians and Subcarpathian zone, by wood fuel - wood wastes from wood processing, forestry and fuel wood
2. Development of research and feasibility studies for the agricultural waste collection, from the agricultural farms of the medium and great size and their utilization instead of hydrocarbons in the urban heating power plants in the plain
3. Development of research relating to combined coal-biomass combustion, development of studies and research on biomass gasification technologies and electricity generation, eventually cogeneration by means of gas turbines or gas engines.

Project structure

The projects were conducted under EU research programmes and currently under national research program.
- COST E 31 – Management of recovered wood
- “Evaluated of Advanced Coal Based Systems for Power Generation” - IFRF IJmuiden, The Netherlands
- "The Feasibility of Electricity Production from Biomass by Pressurized Gasification Systems" - ENEL Italy
- "Decentralized Production of Electricity from Biomass" - NRI, United Kingdom
- "Development of a Clean and High Efficiency Prototype Plant for Biomass Cogeneration by Combustion in an Atmospheric Fluidised Bed Combustor and Heat Conversion into Electricity by a Stirling Engine V-160" - CIEMAT, Spain
- Renewable Energy System for Rural Application in Romania – Folke Centre – Denmark
- Strategy on Renewable Energy Sources in Romania; - Improvement and development of District Heating Networks in Europe – LDK – Greece

Expected impact and exploitation

In the last decade the preoccupations of the decision - makers at the national level have been oriented towards restructuring the energy sector and creating an energy market integrated in the European market. It is expected that the Government will adopt a strategy for the efficient utilization of the renewable energy sources potential in the near future to align our country to the strategies of the EU. In 2001, the Romanian Government adopted the medium term (2001 - 2004) "National Strategy for the Energy Sector Development" where the research, development and technological dissemination are mainly focused on renewables.

Results or progress to date

On the short and medium term:
- To surpass the barriers to renewable energy sources utilization: the barriers of costs, system efficiency, and the institutional barriers
- To harmonize Romanian regulations and procedures in the field with the EU regulations
- To integrate renewable energy sources in the "traditional" energy systems

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Wood waste- re-discovery of a cost effective and clean energy resource in Romania

ENERO- Center for Promotion of Clean and Efficient Energy In Romania
Mr. Cristian Tantareanu
crit@icemenerg.ro

Objectives

- Energy conservation through utilisation of wood waste, replacing fossil fuels for heat generation at local level
- Reduction of environment pollution due to the dumping of wood waste to the rivers
- Reducing of costs for heat generation in public buildings and dwellings.

Challenges / problems addressed

In Romania, more than 700 thousand cubic meters of wood waste are simply thrown away, polluting the environment.
On the other side, the heat supply using obsolete and inefficient fossil fuels thermal plants causes big problems to local authorities in many settlements.
Wood waste utilisation, mainly sawdust, for small district heating systems or local heating systems, is a good opportunity to solve part of these problems

Project structure

.First project approached in the field was the replacement in the Campeni city DH system, of the old boilers running on liquid fossil fuel, with new modern boilers running on sawdust. The project was co-financed by PHARE funds.This sucessful demo project, is followed now by a programme called SAWDUST 2000, also enjoying PHARE funding, who will replicate the Campeni success story in other 5 small cities.
The recent participation of ENERO, as Romanian collaborator to the FP5 project "ERA bioenergy strategy- short term measures to develop the European research area for bioenergy RTD", coordinated by Joanneum Research, Austria, helped to analyse the existing bioenergy potential of the country, including sawdust, and to identify opportunities for future RTD activities in the field.

Expected impact and exploitation

The Campeni project uses about 2,300 wood waste /year, thus way reducing the former CO2 emissions by more than 1,000 tonnes/year. Development of a market for small and medium thermal plants using wood waste in Romania, will improve the population living standard, at the same time improving the environment conditions, rising the tourism potential and finally helping the economic development of these usually under-privileged areas.

Results or progress to date

The Campeni project has already several years of succesfull operation.
The SAWDUST 2000 project is in the construction phase of the wood waste plants in five locations.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Sustainable Sweet Sorghum Production on the Hungarian Great Plain

Research Institute of Debrecen University, Hungary
Mr. György Chrappán
lazanyi@helios.date.hu

Objectives

In the agricultural production there are possibilities in Hungary to increase production with considerable energy savings, on the one hand, and produce energy, partly as a substitute for hydrocarbon, on the other. The production and processing of sweet sorghum show some promise in this respect. The interest in producing alcohol from the biomass has grown all over the world, and many authors consider it as the most economical way of utilizing the biomass. Observations concerning the utilization of sweet sorghum for distilling purposes were first reported in Hungary by Löffler and Papi-Balogh in 1868. Sweet sorghum cultivation on the Great Hungarian Plain is linked with the name of Surányi, who elaborated a technology for sweet sorghum production (Surányi 1941, 1942). The juice squeezed from the defoliated stem with a roller press contained 14-17 per cent sugar. The fresh juice was either fermented into alcohol, or stored as syrup.

Challenges / problems addressed

The experiment was carried out with hybrids produced at the Research Institute of the Debrecen University in Karcag. The nutrient demand of sweet sorghum was satisfied by applying liquid manure from specialized pig farms. 60-70 t/ha green forage yield was attained even in the case of adverse soil condition. The juice squeezed from chopped plant contained 14-17 per cent of sugar and was processed into alcohol by a simple procedure on the spot. Squeezed plant material was preserved and feeded by ruminants. Juice extraction varied between 30-40 %. and sugar content of the juice ranged from 9.58% to 15.85%. Fermentable sugar yield was as high as 3500-3600 kg/ha and ethanol produced 1300-1500 l/ha. The ethanol application was performed with a "water in oil" type emulsion in a rate of 9.5% alcohol by adding cotenzydes.

Project structure

Sweet sorghum is considered as a camel among crops, owing to its wide adaptability, its marked resistance to drought and salt effected soils. Further efforts are required to introduce sweet sorghum to Hungarian agriculture. Farmers of Great Hungarian Plain are interested in the preliminary results and working together to carry out a feasibility study in the framework of a EU project to demonstrate the importance of sweet sorghum in regions with less favourable soil condition to produce bioethanol for use as a transport fuel. The objectives of this study is to examine the possibility of introducing sweet sorghum to local agriculture as well as the social and economic impact.

Expected impact and exploitation

Expert in rural development see sweet sorghum as a key crop for sustainable agricultural in farming areas that suffer from aridity and soil salinity. Technical Cooperation Programme is required to set up pilot farms for the different soil condition proposed to use as set aside. There are still some gaps in production and processing technology. Specialists are needed in sweet sorghum agronomy, processing, and in ethanol production to fill the gaps and produce ethanol in a rentable way. This will lay the groundwork for a an agro-ecological system of sweet sorghum that will promote livestock farming and processing industries, provide many new jobs and protect the environment.

Results or progress to date

New sweet type of sorghum is used mainly as livestock fodder. Its high rate of photosynthesis produces leafy stalks up to 5 metres tall that make excellent silage. The stalks are also rich in sugar, which can be processed into syrup or distilled to produce ethanol. Its water requirement is one-half that of sugarbeet, and its growing period is short enough to allow harvesting in continental climat of Great Hungarian Plain. Sweet sorghum has a real potential to become an energy crop in Central Europa. it produces up to 7,000 litres of ethanol per hectare - makes it highly attractive for countries like Hungary.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Szarvasi-1 energygrass - grass for the future

Agricultural Research and Development Institute, Hungary
Zanowszky J., Zanowszky Z.
janowszky@szarvas.hu

Objectives

The Agricultural Research and Development Institute /ARDI/ is specialized on the development of turf, fodder and industrial grasses, grass-seed production and technological research for the utilization of grasses.
ARDI was first in Europe to begin the breeding of grasses suitable for industrial utilization /energetical, source of industrial fibre, raw material of paper industry/.
The purpose of the breeding program was to develop grass varieties, which (i) yield high drymaterial mass, with good quality cellulose and (ii) are suitable for utilization in the energetical, paper, fibre, and textile industry, as well as for feeding.
The most perspective multifunctional grass variety is the "Szarvasi-1" energygrass.

Challenges / problems addressed

Analyse the impact of the market penetration of new and sustainable energy technologies are based on the large scale cultivation of a non-food crop as the "Szarvasi-1" energygrass.
Promote the comprehensive introduction of the adequate technological background.

Project structure

The Agricultural Research and Development Institute, Szarvas cooperates with the following Hungarian Institutes/Organizations in connection with the "Szarvasi-1" energygrass: ÉGSZÖV Rt., Budapest; Research Institute for Paper Industry, Budapest; Chipboard Factory, Mohács, Szent István University, Gödöllo.
International partners are ARGE Biogas Ltd, Austria; Danish Technological Institute, Denmark; Technical University of Wien, Austria.

Expected impact and exploitation

With the eastern enlargement of the EU and the adoption of the decision of the CAP reform of 1992 by the new Member States it is estimated that 6-8 million hectare low grade soil arable land will be withdrawn from agricultural production, herewith predestined to cause social tensions, and farmers will have to find alternative agricultural activities to make a living. An enlarged EU is striving to reach its strategic goal laid down in the White Paper for a Community Strategy and Action Plan, concerning the future of Renewable Energy in the European Union, with a target to doubling their use by 2010, reaching a total consumption of 12 %.
It is understood that only such new technologies /e.g. the production and utilization of "Szarvasi-1" energygrass/ are capable to foster significant changes, which are able to meet all the above mentioned criteria at the same time.
The production of the "Szarvasi--1" energygrass result a new agricultural main product, provide possibility for the farmers in the disadvantageous regions. The "Szarvasi-1" energyrass is a multifunctional plant for the multifunctional agriculture.

Results or progress to date

The breeding work of the Institute resulted two grass varieties suitable for industrial utilization. These industrial grass varieties excellently tolerate the extreme ecological conditions, which was confirmed by national and foreign examinations.
The energetical experiments proved that the combustion characteristics of the pellet - briquette and gas /biogas, pyrolisis gas/ produced from the "Szarvasi-1" energygrass are good.
Laboratory tests were conducted for the utilization in the paper and fiber industry. The wood as raw material can be replaced partly or entirely by "Szarvasi-1" energygrass in the manufacturing of paper and chipboard.
It should be noted that the "Szarvasi-1" energygrass is a valuable fodder-plant as well according to the livestock-farming experiments.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

The potential of fuel wood resources from Poland's forests

Department of Forest Technology, Agricultural Unviersity of Poznan, Poland
Prof. Henryk Rozanski
henrykro@au.poznan.pl

Objectives

It seems there are potential wood resources, still not utilized, in Polish State Forests that can be used for energy production purposes. Scots pine (Pinus sylvestris L.) is the prevailing tree species in Poland and the standard final felling method applied in pine stands is the clear cut. After the main round wood assortments are taken away from the clear cut area, it is still covered with logging residues that must be either crushed to pieces and mulched with the soil or taken away to make the outplanting of new pine seedlings possible. The logging residue can be perceived as a potential source of energy, as it can easily be collected, chipped and forwarded to a heating plant. However, in order to plan such operations, it is necessary to find out how much material of this kind can be expected on a logging site and what negative consequences this may constitute for the future productivity of the site if the branches, twigs and needles are taken away.

Challenges / problems addressed

The most important challenge is to identify the bulk of logging residues that are left behind afret clear cutting. Another important problem is the negative effect of logging residues harvesting on the site, due to the depletion of the site's nutritional potential.

Project structure

The bulk of the logging residues was determined through measurements. The measurements were carried out in 9 pine stands, from 94 to 104 years old, to be harvested by the clear cut method. The test stands were located in different areas in western Poland, on typical conifer sites. Sample trees in each of the selected stands were extracted from the soil, the wood was divided into basic wood assortments, based on the wood diameters, and weighed

Expected impact and exploitation

The results will allow to determine the possible input of the forestry sector to the fulfilment of the country's obligations concerning the production of energy from renewable sources which is planned to achieve 7,5 % of the total energy production by 2010.

Results or progress to date

As the measurements show, an average adult pine tree can give the following: 578 Kg stem wood, thicker than 14 cm in diameter, 41 Kg round wood, thicker than 7cm, (industrial wood, piled up in stacks), 54 Kg branch thin wood, 59 Kg twigs with needles, and 166 Kg roots with the stump. Assuming that there are, on average, about 400 trees per hectare, we can get as much as: 21,6 t/ha thin branches, 23,6 t/ha twigs, and 66,4 t/ha stump wood with roots. As the above numbers show, the potential amount of pine logging residue biomass that can be utilized for energy productions purposes amounts to 45 t/ha (the above ground part) plus 66 t/ha (the below ground part). If we now multiply these numbers by the average yearly clear cut area in Poland, which is around 25 000 ha, we get the following results: 540 000 t (432 000 m3 solid) branch wood, 590 000 t (472 000 m3 solid) twigs, 1 660 000 t (1 328 000 m3 solid) stump wood with roots. This means that the above ground pine biomass from clear cuttings, which can be used for energy production purposes (logging residue) can theoretically reach 1 mln m3. However, the amount of 1,6 mln m3 stump wood, which is usually left in the ground today, cannot not be regarded as a sources of biomass easy to reach, both for technological as well as ecological reasons.

BIO-ENERGY
ENLARGED PERSPECTIVES

Budapest, 16-17 October 2003

Wood Fuel Resources in Wood Processing and Sawmilling Industry: Analytical Estimation

Kaunas University of Technology, Lithuania
Baltrusaitis A., Pranckeviciene V.
Antanas.Baltrusaitis@ktu.lt, Vilija.Pranckeviciene@ktu.lt

Objectives

By the end of 2010 biomass utilization on the whole energy production in Lithuania will reach 12-14 %. Considerable resource for that growth will make increased utilization of wood fuel accumulated in the sawmill sector. We consider that well-founded usage of that potential require reliable estimation methods. Latest research at Department of Mechanical Wood Technology (Kaunas University of Technology) was directed to ascertain, optimise and prognosis of wood fuel resources in Lithuania. We believe that our experience in calculations and modelling of material balances in wood processing industry would be important and interesting for partners in different countries.

Therefore our main objectives are participation in creating calculable, flexible and reliable methods for estimation of wood fuel resources adaptable for changing annual production outputs.

Challenges / problems addressed

The main problems to overcome are verification of figures on potential of wood processing waste. Available in different Lithuanian statistics and reports figures are controversial and thus need considerable revision and correction. Sciential methods for calculation of suitable for wood fuel sawmill residuals based on realistic technologies and production scales is one of the possibilities for estimation and verification of present-day and future statistical data from the industry.

Project structure

Our intention is to exchange knowledge and collaborate with research institutions and some industry companies to make our ideas well serving the purpose in Lithuania also realistic and implemental for usage in other countries. Presently we have fruitful cooperation with some research and industrial institutions in Baltic and Scandinavian countries.

For various projects where structure includes optimisation and simulation of biomass and especially wood fuel resources our experience and knowledge could be applied and implemented.

Expected impact and exploitation

Increasing of wood fuel utilization and development based on realistic simulation and modelling of material balances for different production capacities;

Possibility to apply detailed planning and optimal logistics for collection of wood waste accumulated in different production units and areas;

Well motivated development of densified wood fuels (pellets, briquettes) using reliable volumes of sawdust and shavings;

The societal benefits include founding new production units and creation of workplaces;

Reduction of emissions and utilisation of RES.

Results or progress to date

Currently our Department of Mechanical Wood Technology has achieved substantial refinement of models for evaluation of material balances and wood fuel resources for different production scales. Initial estimations disclosed minimum annual volumes of wood waste accumulated in Lithuanian sawmills as large as 460 thou.m3 of sawdust and 495 thou.m3 chips. Our current work focused on further improvement of developed simulation models and verification of significance of various influential factors.