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1138th Conference

6th World Congress on

BIOFUELS AND BIOENERGY

September 05-06, 2017 | London, UK

Keynote Forum

Day 1

Biofuels Congress 2017

Janea A Scott, J Bioremediat Biodegrad 2017, 8:5(Suppl)
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Janea A Scott

California Energy Commission, USA

Developing an advanced biofuels industry in California: The alternative and renewable fuel and vehicle technology program

In September 2016, California put into law statewide goals to reduce greenhouse gas (GHG) emissions including 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. To help achieve these goals California has a number of policy initiatives including the Short-Lived Climate Pollutant (SLCP) Reduction Strategy and the Low Carbon Fuel Standard (LCFS). The SLCP Reduction Strategy identifies a range of options for accelerating short-lived climate emission reductions including regulation, incentives, and other market supporting activities. The SLCP Reduction Strategy was approved in March 2017 with implementation beginning in January 2018. The LCFS which has been in place since 2009 is designed to encourage the use of cleaner low-carbon fuels by creating market incentives for near-term GHG reductions, and has a goal of reducing the overall carbon intensity of fuel within the transportation sector 10 percent by 2020. With California's transportation sector accounting for 37 percent of the State's overall GHG emissions, achieving California's climate goals will require significant technological and market changes within the transportation sector. To help transform California's transportation market, the California Energy Commission administers the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) which provides up to $100 million annually to develop and deploy a portfolio of alternative fuel and advanced vehicle technologies, including the production of biofuels. Biofuels including gasoline substitutes, diesel substitutes, and biomethane are anticipated to provide immediate and long-term opportunities to reduce both GHG emissions and petroleum use. Through the ARFVTP the Energy Commission has awarded $167 million to 59 biofuel projects, ranging from bench-scale to commercial production, with the goal of expanding the production of low-carbon, economically competitive biofuels from waste-based and renewable feedstocks in California.

Figure 1: CleanWorld's anaerobic digester biorefinery which processes 40,000 tons of food waste annually for the production of biomethane for transportation applications.

Biography

Janea A Scott was appointed to the California Energy Commission by Governor Edmund G Brown Jr. in February 2013 and reappointed in January 2016. She is the Energy Commission's public member, and is the Lead Commissioner on Transportation and Western Regional Planning. She also leads adoption of recommendations by the Energy Commission's SB 350 Barriers Study to expand access to the benefits of clean energy and transportation for low-income Californians, including those in disadvantaged communities—as well as small businesses in disadvantaged communities. Before joining the Energy Commission, she worked at the US Department of the Interior's Office of the Secretary as Deputy Counselor for Renewable Energy. She also worked as a Senior Attorney in the Environmental Defense Fund's Climate and Air Program.

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Goetz M Richter, J Bioremediat Biodegrad 2017, 8:5(Suppl)
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Goetz M Richter

Rothamsted Research, UK

Biomass resource optimization tools in the food-fuel-environment context

Multiple and increasing demands for renewable resources affect the bio-economy as a whole but escalate in particular around bioenergy and biofuel. For many reasons, perennial crops, like short-rotation coppice (SRC), Miscanthus and grassland are attractive choices. The purpose of this talk is to illustrate in three examples the use of advanced mathematical optimization tools to increase the production and performance of whole systems exploiting synergies and calculating trade-offs.

Methodology: (1) A process-based model (PBM) for simulating trait and environmental effects on plant growth is to optimize G x E solutions for low-input SRC. (2) Up-scaled PBMs using scenario simulations for different crop systems were used to estimate available biomass resources and the yield gap resulting from fertilizer and livestock reduction. (3) A whole systems optimization framework, the Bioenergy Value Chain Model (BVCM) is presented that allows evaluating the biomass flow through the value chain under market and ecosystem constraints.

Findings: The PBM for SRC-willow identified a limited number of robust trait-related parameters that can be used to accelerate the selection and breeding process. An environmental (pedo-climatic) scenario analysis enabled us to ascertain the best variety for droughty environments with the highest water use efficiency and least impact on water resources. For UK grassland system we estimated a yield gap of 6 to 20 million tons of exploitable biomass when recommended N-fertilizer would be applied. Extending these results to the BVCM additional biogas from grassland biomass trade-offs from increased nitrous oxide emissions are calculated.

Conclusion: PBM for plant growth will be extended to optimize SRC traits for the industrial scale land reclamation of heavy metal contamination. Recommendations for best combinations of genotype x environment x management can be derived from these simulations and scaled up to optimize land use between bioenergy, food and other ecosystem services.

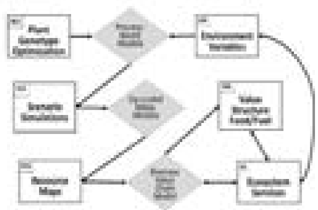

Fig: Modelling Tool Cascade

Biography

Dr Goetz Richter holds degrees in Agricultural and Environmental Sciences and has established himself as agricultural systems modeller with track records in climate change impact assessment, CC adaptation and mitigation using arable and perennial crops. Funded by Defra, the European Commission and RCUK, his group develops models for Soil-Plant-Atmosphere interactions at various scales, as tools for breeders to improve perennial biomass crops. For industry and policy-makers he provides agricultural feedstock maps for the bio-economy, used in the whole system optimization, e.g. for the Biomass /Energy Value Chain Models, initially funded by The Energy Technologies Institute and since 2013 by EPSRC. He optimizes process models using a Bayesian approach to improve our understanding of the Gene x Environment x Management interaction. He recently won an Innovate-UK project "Advancing Earth Observation Applications in Agriculture" which will enable to validate yield forecasts and assess the yield gap at the landscape scale.

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Markus Brautsch, J Bioremediat Biodegrad 2017, 8:5(Suppl)
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Markus Brautsch

University of Applied Sciences Amberg-Weiden, Germany

The assessment of CH_4 and N_2O emissions in biomass CHP systems

The CO_2 balances of Biomass CHP systems are decisively influenced by the supply chains of fuels as well as a plant's efficiency. Another important influencing factor is the N_2O and CH_4 emissions which enter the exhaust gas due to incomplete combustion. It is necessary to record the emissions of methane and nitrous oxide, which are produced during the combustion. For the purpose of calculating CO_2 equivalent emissions, the recommended factors of 298 for N_2O and 23 for CH_4 are taken into account. Against this background, the λvalues of the different combustion processes and the exhaust gas fractions of N_2O and CH_4 are measured. The C, H, N, O mass fractions of the respective biogenic fuel mixes are calculated by the measured volume quantities, which can be converted into specific mass fractions by the standard densities and the molar masses. The comparison shows that N_2O emissions have negligible influence. The emission value of CH_4 depends on the combustion process, the gas-fuel ratio and the compression rate. The lowest CH_4 emissions of 6.38 - 27.23 g/h are shown by liquid fuel operation, regardless of the used fuel (biodiesel, rapeseed oil, palm oil, soy bean oil). The highest emission levels show up in the dual fuel operation with bio-methane with maximum gas ratios in low-load operation with 5561.79 g/h - 6505.08 g/h, because of unburned fuel fractions. The combustion of wood gas in Gas-Otto operation shows comparatively low emissions at 28.6 g/h.

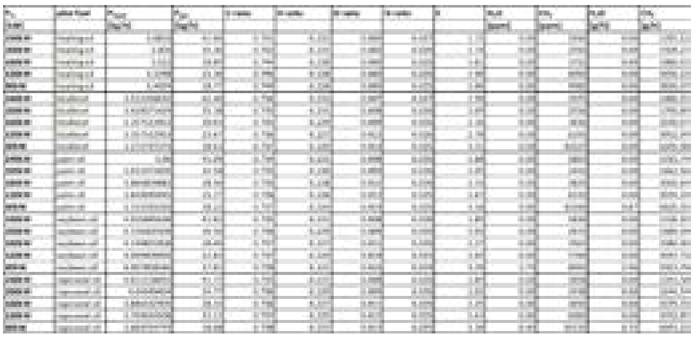

Figure 1: The mass flow of N_2O and CH_4 in dependence of the electrical power for a MAN D 26 common rail CHP system (compression rate 16:1) with dual fuel operation

Biography

Markus Brautsch is Full Professor for Thermodynamics, Energy Technology and Renewable Energies at the Technical University of Applied Sciences Amberg-Weiden since 1998. He is the Founder of the Institute of Energy Technology and the Bavarian Center of Excellence for Combined Heat and Power Generation. In 2014, he was appointed Guest Professor at the Jiangsu University of Science and Technology in China. He is Guest Lecturer at the Renewable Energy Center in Mithradam (India) and the University of Santa Caterina (Brazil) .

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Day 2

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Nallusamy Sivakumar, J Bioremediat Biodegrad 2017, 8:5(Suppl)
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Nallusamy Sivakumar

Sultan Qaboos University, Oman

Production of ethanol from pretreated waste paper through separate enzymatic hydrolysis and fermentation

Waste paper is considered as one of the major components of municipal and industrial wastes and has the potential to be used as an excellent alternative feedstock for ethanol production. In this study, the effect of various pretreatments on efficient hydrolysis of waste office paper and newspaper into sugars and subsequent production of ethanol through fermentation was studied. The shredded papers were soaked in deionized water (5 % w/v), milled and dried at 60°C for 24 h. The dry matter was then milled again to remove most physical barriers of cellulose structure. The prepared waste papers were subjected to various pretreatments using sulphuric acid, phosphoric acid, sodium hydroxide and hydrogen peroxide at a concentration of 0.1, 0.5 and 1% (v/v). Pretreatment with H_2O_2 (0.5 % v/v) at 121°C for 30 min was considered as the most effective method as it increased the available cellulose, produced a high sugar yield, high delignification and less inhibitors formation. The effect of single (37 FPU/g solids) and two enzyme mixture (37 FPU + 25 CBU/g solids) was carried out using 2% (w/v) solid loadings. The solid loadings experiment was done by loading 1-4% (w/v) solids with 37 FPU + 25 CBU/g solids of enzyme loadings. The enzymatic hydrolysis of pretreated office paper and newspaper with 3% solid loadings resulted in the sugar yield of 23.48 and 13.12 g/L with hydrolysis efficiency of 91.8 and 79.6 %, respectively. Further, the hydrolysates of office paper and newspaper were used as a substrate to produce ethanol through fermentation using *Saccharomyces cerevisiae* resulted about 11.15 and 6.65 g/L with the productivity of 0.32 and 0.28 (g ethanol/L/h), respectively. Thus, the improved yields achieved through the pretreatment with 0.5% H_2O_2 and subsequent ethanol production suggested that the wastepaper could be used as a potential feedstock for bioethanol production.

Figure 1: Different stages of pretreatment of waste paper

Biography

Nallusamy Sivakumar has expertise in Microbial Fermentation. His areas of research interests are enzyme production, bioenergy, biofuel and bioprocessing. He is working on the possible utilization of different waste materials as alternative, cheap and renewable substrates for the production of microbial enzymes and other value added products. He established the Bioprocess Lab in Sultan Qaboos University and supervising the team of students working in bioprocessing. He is also working on bioactive compounds. In this, he is concentrating on the effect of different plant extracts and their essential oils on pathogenic bacteria and their possible mode of action.

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Aurangzeb Akram, J Bioremediat Biodegrad 2017, 8:5(Suppl)
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Aurangzeb Akram

Imperial College London, UK

Organic shock loads effects (with and without alkalinity) in submerged anaerobic membrane bioreactors (SAMBRs): Changes in feed strengths at constant hydraulic retention time (HRT)

High strength wastewaters including effluents from distillery, brewery, sugar and maize products industries require treatment before discharge into aquatic environment. For carbon decontamination of food and beverage industries effluents, membrane bioreactors are being developed to decouple the solid retention time from the hydraulic retention time (HRT) and to produce solids free better quality effluents while the use of anaerobic biomass reduces the cost of excessive sludge disposal and produces methane as a source of renewable energy. Three litres submerged anaerobic membrane bioreactor (SAMBR) was used to study the effects of organic shock loads in the form of step change in feed strengths and alkalinity to different magnitudes (two and five times) at constant HRT to obtain an insight into microbial responses and chemical oxygen demand (COD) removal performance. The SAMBR was able to handle the high sludge loading rate (0.8 gCOD $gVSS^{-1}$ l^{-1}) and the organic loading rate (9.6 gCOD l^{-1} d^{-1}) with 90% COD removal at high gas sparging rate ($3m^{-3}$ m-2 h^{-1}) due to a uniform shear force. Settled and attached growth biomass inside SAMBR at low gas sparging rate (1.2 m^{-3} m^{-2} h^{-1}) survived an organic shock load of 20 gCOD l^{-1} (five times the steady state concentration) both in the presence and absence of moderate sodium toxicity (4.5 gNa^{+} l^{-1}). Acetate and propionate were the two most significant volatile fatty acids (VFAs) appeared at high substrate concentration, whereas butyrate appeared only at relatively low pH. Formate appeared for biomass acclimatised for above neutral pH and disappeared at low pH for similar flocs morphology. Substrate degradation depends upon active biomass and not on flow regime inside the bioreactor. However VFAs and soluble microbial products (SMPs) retention at low shear conditions (1.2 m-3 m-2 h^{-1}) confirm the concept of electrostatic "gel layer" formation. Based on the results of the specific methanogenic activity using batch assays a larger amount of methane production potential is observed in SAMBR at higher loading rate.

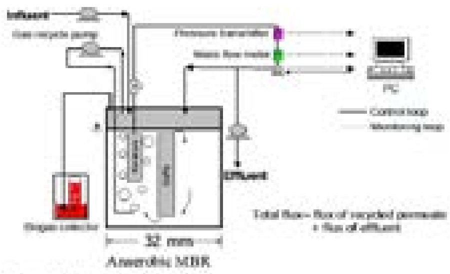

Figure 1 Schematic of SAMBR

Biography

Aurangzeb Akram is performing academic research in the Department of Chemical Engineering and Chemical Technology Imperial College London United Kingdom, Department of Chemical and Biochemical Engineering, Technical University of Denmark (DTU), Denmark, NFC Institute of Engineering and Technology Pakistan and the Institute of Chemical Engineering and Technology Faculty of Engineering and Technology University of the Punjab Pakistan and pursuing his career in academics, research and government advisory services. He is performing reviews and publishing of research work for peer-reviewed international scientific journals and is a member of different international scientific societies. His research interest is on the topics of energy and fuels, environmental sustainability and the relevant treatment processes and performing research on novel membrane based bioengineering design for carbon decontamination of industrial and municipal effluents for discharge into fresh water streams using anaerobic consortium producing biofuel..

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