



Optimizing the production of bio based high value products and biofuels – Partner search!

Dr. Sune Dowler Nygaard

About you and your organisation



- **Dr. Sune Dowler Nygaard**
- **Danish Technological Institute – a not-for-profit research institute**
 - *Based in Denmark – Aarhus, Taastrup, Odense, Kolding*
 - *Approximately 1000 employees*
 - *Most industrial sectors are served with a special focus on Danish SME's*
- **DTI Centers represented for the KBBE call:**
 - *Chemistry and Water Technology*
 - *Food Technology*
 - *Renewable Energy and Transportation*
- **DTI's specialties represented here:**
 - *Logistics and harvest evaluation*
 - *Chemical analyses of feedstock's, intermediates, and final products*
 - *Development of new analyses methods*
 - *Screening for new bioactive components and/or functional food products*
 - *Evaluation of bioactive components*
 - *Testing (lab scale and dynamometer scale) and evaluation of liquid biofuels*
- **Contact information:**
 - *[E-mail: Sune.nygaard@teknologisk.dk](mailto:Sune.nygaard@teknologisk.dk)*
 - *[Homepage: http://www.dti.dk/specialists/26409?cms.query=biofuel](http://www.dti.dk/specialists/26409?cms.query=biofuel)*
 - *Phone: 004572201809*

DTI Experience



- DTI strengths:
 - 1000 employees
 - Strong and diverse scientific background with a lot of test facilities
 - **Not a university!** Private non-profit organization
- DTI is mainly interested in the following topics under the KBBE call:
 - KBBE.2010.3.2-01: Sustainable culture of marine microorganisms, algae and/or invertebrates for high value added products
 - KBBE.2010.3.2-03: Modification of marine or freshwater algae to better suit industrial applications
- DTI has been involved in the following projects:
 - Project manager in a number of Danish projects in biofuel and renewable energy:
 - Waste2Value: Biodiesel in the Danish fuel network:
 - Biodiesel Denmark: Implementation of biodiesel blends in Denmark
 - Sea lettuce project: farming and harvest followed by feasibility study of the use of macro algae in the bioenergy sector
 - Partner and work package in the FP7 project on biorefinery – EuroBioRef
 - Partner in the FP7 project on biogas from marine algae - BioWalk4BioFuel
 - DTI has several years of experience in co-ordinating and leading EU research projects including a number of large scale integrating projects under FP7.
 - DTI has a dedicated FP7 office for providing administrative, financial and legal backup for proposal preparation and grant negotiation.

DTI contribution – Food Technology



- LC-MS screening followed by appropriate HPLC methods:
 - sugars, starch, and other minor components
- Fatty acid composition - by GC and HPLC with a specific focus on PUFA
- Screening of biomass for pigments, dyes, antioxidants, vitamins and secondary metabolites by HPLC and spectrophotometry.
 - carotenoids, astaxanthin, fucoxanthin and/or sulfur containing polysaccharides and phloretanin.
- The following points can be carried out related to proteins by a combination of capillary LC-MS/MS, gel electrophoresis, etc.
 - amino acid composition, protein concentration, protein identification, protein oxidation and
- Screening of functionality of isolated fractions:
 - Viscosity
 - gelation,
 - capability of binding water
 - emulsifying capability
- Characterization of bioactive compounds in the biomass can be carried out by the following techniques:
 - Anti-oxidative effect
 - DPPH radical scavenging activity
 - TEAC (trolox equivalent antioxidant capacity)
 - FRAP (ferric reducing antioxidant power)
 - ORAC (oxygen radical absorbance capacity)

DTI Contribution - Chemistry



- **Biomass/feedstock and product characterization**
 - New methods can be developed according to the specific needs of the project partners
 - All types of standard analyses can be tailor made to suit the needs of our partners:
 - Total acid number (TAN) determination
 - water determination
 - Determination of inorganic contaminants by X-ray and ICP-MS technologies.
 - 1D and 2D GC, HPLC, LC-MS, and Raman spectroscopy
 - LC-MS, HPLC, and/or 1D and 2D GC-MS.
 - New methods can be developed according to the specific needs of the project partners
- **Fuel characterization and evaluation**
 - Cold climate evaluations:
 - Cold climate evaluation by cold filter plugging point (CFPP), cloud point (CP), and detailed filterability studies (IP387).
 - Special attention to blends of the produced biofuels and standard petrochemical products to ensure that a seamless integration of the algae derived biofuels
 - Long term storage experiments, accelerated weathering cycles, and studies of major and minor chemical components of the fuel blends that might be expected or observed to cause difficulties. The chemical analyses will be carried out by GC-MS, 2D GC, ICP-MS, and LC-MS.
- **New separation technologies**
 - Access to state of the art separation technologies through external partners
 - Biomimetic membranes
 - Open bed chromatographic methods
- **Advanced microbiological evaluations based on Modern Molecular Methods**
 - Evaluation of inhibitory substances in (pretreated) biomass for microbial conversion
 - Characterization of microbial growth in biofuels by DAPI, FISH, qPCR and clone libraries

DTI contribution Renewable Energy



- **Harvesting, conditioning and logistic**
 - Development of harvest equipment integrated with pre-treatment procedures
 - All types of physical/mechanical pretreatment and conditioning in bench, pilot and industrial scale equipment e.g.:
 - Drying with various techniques
 - Particle size reduction and characterization
 - Pelletizing for feed and bioenergy
 - Extrusion for food and feed
 - Extraction of proteins in wet or dry conditionings
 - Logistic from farm to fork
 - All parts of the logistic from production site to the final product including various treatment steps in a biorefinery concept where various parts are utilized stepwise to secure a optimum realization of the valuable ingredients in the feedstock
- **Biomass feedstock and product characterization**
 - Complete biomass laboratory for all available CEN standards for physical/mechanical analyses
- **Energy production from raw biomass and residual products**
 - Utilization of the raw biomass in combined heat and power plants as solid biofuel or as additives for in co-combustion with terrestrial biomasses

Possible Partners



- DTI is mainly looking to join a relevant consortium where our core competences can be utilized in the best possible manner.
- Hence, All types of project partners are looked for:
 - Universities
 - Research Institutions
 - SME companies
 - Non-SME companies
 - Partners with strong links to EU overseas territories