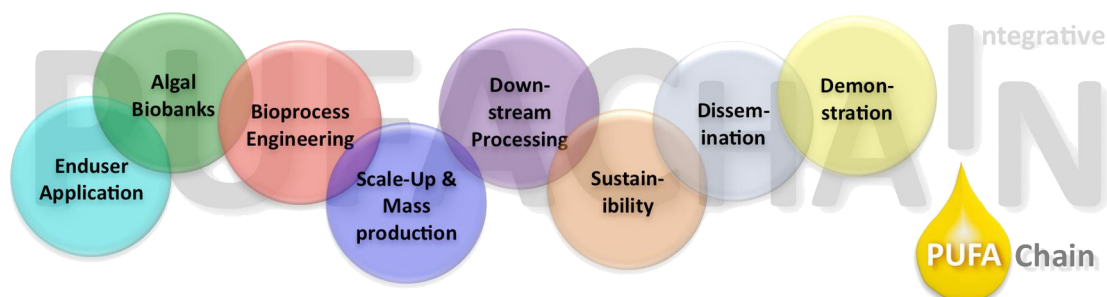


2<sup>nd</sup> Issue  
October  
2014

# NEWS



**PUFAChain:  
The Value Chain from  
Microalgae to PUFA**



# The Value Chain from Microalgae to PUFA

## Introduction

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The overall goal of the project PUFACHain is to develop a robust scientific and technological basis for substantiating strategic and technical decisions for the industrial development of high value products from algae. This shall contribute to develop this new and sustainable resource for market. The concept of the proposal is strictly oriented to the value chain of microalgae. Starting at the very end of the value chain the proposal picks up a distinct application of high market relevance. The main application targeted with this project is the use of high purified omega 3 fatty acids (DHA/EPA) as building blocks in modern oleo-chemistry to gain high value products for nutrition and pharmaceutical applications.

These applications will define specifications that propagate backwards along the various value-adding stages of the value chain. These stages include the downstream technologies of harvest, disruption, extraction and purification, the cultivation technology, and the biology at the beginning of the complete process. So, the aim of this project is to realise a specific exemplary value chain, develop the technical interfaces between

the different value adding stages and investigate the still open research aspects at every single stage while simultaneously addressing the needs of the value chain as a whole. Finally, an integrated process, combining all technical steps, will be implemented for demonstration. A comprehensive and holistic sustainability approach will complement the scientific and commercial advances on each value-adding stage. A consortium of 6 companies and 3 research institutes will integrate state of the art science and technologies in order to assemble a complete process from algae production and harvesting to oil extraction and purification. Innovative technologies will be combined taking advantage of a complementary partnership with the best available expertise in this sector in Europe. These processes will be evaluated for their sustainability and scaled-up from lab to demonstrative prototype level.



# The Value Chain from Microalgae to PUFA

## Consortium

### GEORG-AUGUST-UNIVERSITY GOETTINGEN



GEORG-AUGUST-UNIVERSITÄT  
GÖTTINGEN

The University of Goettingen is known for outstanding quality in several research areas and deeply anchored interdisciplinarity within natural and life sciences. The SAG, Culture Collection of Algae at the University, is among the three largest algal service culture collections in the world and a most comprehensive resource of micro algal cultures. It is supporting research in biotechnology and biodiversity through ex situ conservation of algae and expert knowledge on identifying and isolating. In addition to the characterization of and the provision of the partners with algae strains, the University of Goettingen also holds the role as overall project coordinator. These administrative tasks will be performed by the dedicated EU-Office of the University.

### A4F ALGAFUEL



The Portuguese company A4F-AlgaFuel, S.A. is a spin-out from Necton S.A., dedicated to the development and delivering of bioengineering projects for the industrial production of microalgae. A4F develops microalgae production units in high-emitting industries for CO<sub>2</sub> mitigation. The Prototype Unit, implemented on a cement plant (SECIL) was the first set of tubular photobioreactor systems, from cell to biomass, on a scale that established "proof of concept". It has evolved into Algafarm – a 1 ha microalgae production unit as a joint project between SECIL and A4F – which is already commercialising *Chlorella* for the food and feed industries. A4F proposes an innovative approach through a gradual scale-up, to maximize performance of each process. Within the project PUFACHain, A4F is coordinating two work packages and will be mainly responsible for the bioprocess engineering and the industrial scale.

### MAHLE INNOWA



MAHLE InnoWa GmbH is a specialist in the development and application of membrane technologies in various application fields. Through the production of capillary membranes for micro and ultrafiltration that are built into module housing with filter areas ranging from 0.1 m<sup>2</sup> to 60 m<sup>2</sup>, a variety of applications can be covered. This comprises e.g. a large selection of hollow fibre membranes with different dimensions and cut-offs, point-of-use and point-of-entry systems for water filtration, systems and modules for the crossflow-filtration of wine and fruit juice, as well as the possibility of customer specific filter system design. In PUFACHain MAHLE is responsible for a new integrated membrane based filtration and the reuse of process water.



# The Value Chain from Microalgae to PUFA

## Consortium

### NATEX PROZESSTECHNOLOGIE



NATEX has gathered experience in supercritical fluid extraction technology for more than 25 years, predominantly in process development, plant design and the operation of CO<sub>2</sub>-extraction plants. Nowadays the company is well established as a specialist in supercritical fluid extraction technology and can offer its clients a "one stop shop" covering process development for new applications of CO<sub>2</sub> processes, scale-up and design of industrial plants as well as manufacturing of main components, erection and start-up. NATEX will lead the work package involving the downstream processing and will investigate algae biomass in its liquid extraction and supercritical fluid technology.

### CREMER OLEO



CREMER OLEO as the oleochemical division of the globally active company CREMER produces raw materials based on vegetable origin like fatty acids, glycerol, and esters up to structured lipids. With a strong commitment to R&D the company provides its customers with state-of-the-art tailor-made oleochemical solutions. The broad product range contains individual solutions for pharmaceutical excipients as well as oleochemical based active pharmaceutical ingredients for enteral and parenteral formulations. Apart from their role as scientific project coordinator, CREMER OLEO is the lead of the working packages responsible for purification of crude algae oil as well as final product preparation.

### FRAUNHOFER INSTITUTE FOR CELL THERAPY AND IMMUNOLOGY



The Fraunhofer Institute for Cell Therapy and Immunology with its Branch Bioanalytics and Bioprocesses (IZI-BB) offers solutions in the areas of biomedical engineering, biotechnology, environmental control systems and material testing, as well as industrial process automation for food, chemical and pharmaceutical industry. Its Extremophile Research & Biobank CCCryo group studies cold-adapted snow and permafrost algae. Aims of the group's applied research are the use of algal strains for production of high quality substances and development of product-optimised photobioreactors for high purity algal mass production and the extraction of high-value metabolites for health and cosmetics. Within the project, the Fraunhofer IZI-BB acts as provider of well characterised algal strains.



# The Value Chain from Microalgae to PUFA

## Consortium

### INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH



Founded in 1978, the ifeu – Institut für Energie- und Umweltforschung Heidelberg – GmbH is a private independent non-profit organisation for environmental research and consulting. IFEU has an extensive track record in areas such as waste management and packaging materials, transport & mobility, renewable energies and energy efficiency as well as food and bio-based systems. IFEU is especially renowned for its expertise (>20 years) in the field of life cycle assessment (LCA), environmental impact assessment (EIA), and integrated life cycle sustainability assessment (ILCSA). At European level, IFEU is involved in a number of projects on bio-based products. In the project PUFAChain, IFEU will lead and perform in the work package focusing on the integrated assessment of sustainability.

### STICHTING DIENST LANDBOUWKUNDIG ONDERZOEK



Wageningen University and Research Centre (Wageningen UR) is a collaboration between Wageningen University and the specialised former research institutes (Stichting Dienst Landbouwkundig Onderzoek - DLO) from the Dutch Ministry of Agriculture. This combination of knowledge and experience enables Wageningen UR to contribute actively to solving scientific, social and commercial problems in the field of life sciences and natural resources. DLO embodies strategic and fundamental research as well as applied research in which researchers are operating in close co-operation with farmers, companies and governments. The main tasks for DLO in the project concerns the assessment of the economics and social sustainability.

### EURA CONSULT



EurA Consult has been established in 1999. As an innovation service provider the company advises more than 800 medium-sized companies in Germany, covering all industrial sectors. EurA Consult mainly focuses on consulting and assisting companies in national and European R&D projects. This comprises the entire innovation process, including the generation of promising ideas, the search for suitable partners, the establishment of the project consortium, the technical and administrative coordination of the project as well as the project controlling. Within the project PUFAChain, the company will act as assistance of the project coordinator and will furthermore be responsible for the dissemination activities.





# The Value Chain from Microalgae to PUFA

## General Assembly Meeting

**Date:** 6<sup>th</sup> – 8<sup>th</sup> October 2014

**Location:** Lisbon, Portugal



From the 6<sup>th</sup> to the 8<sup>th</sup> October 2014, the first annual meeting of the project "PUFACHain: The Value Chain from Microalgae to PUFA" took place at the Campus do Lumiar in Lisbon, Portugal where A4F Algafuel is located.

The meeting started with a tour through the experimental unit of A4F. This occasion provided the project partners with a deep and very detailed insight of the research and development activities by A4F in the fields of photobioreactors and algae upscaling. Afterwards the host of the meeting, Vítor Verdelho, officially welcomed all guests and wished for an interesting and fruitful meeting.

On the second day, the scientific work packages were presented by the respective work package leaders. These presentations gave the consortium the opportunity to learn in detail about the progress within each work package, the results already achieved, the issues encountered and the work planned for the future. In an extensive discussion session after the scientific presentations, the partners were given the possibility to ask questions, provide ideas and clarify more details.

These discussions were very helpful as it was afterwards easily possible to agree on the tasks to be done in the next 12 project months.

In order to process the vast amount of information exchanged in the morning, a field trip to Algafarm was organised by A4F for the afternoon (see also Newsflash). At this facility, which is owned by SECIL and A4F, the partners had the opportunity to see a large-scale microalgae production farm in action and get a glance at what might be possible at the end of PUFACHain.

The focus of the last meeting day lay on the sustainability assessment, dissemination activities and project management work done so far and planned for the next period. Once more thanks to the active cooperation of all partners, further exciting and very interesting discussions were possible. So, after all details were presented and the last questions answered, Vítor Verdelho appropriately summarised both, the meeting as well as the first project year, by underlining the good standard of work performed in the project. By keeping this up, the project is on a very good path to reach its goals.



# The Value Chain from Microalgae to PUFA

## Project Progress

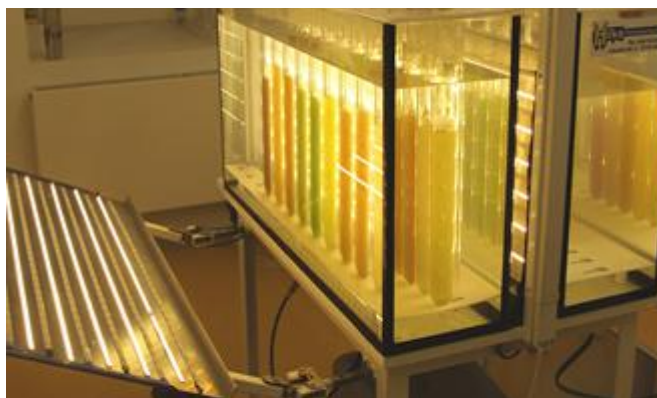
After the first project year quite a lot of work has already been performed and first successes have become apparent:

### Project Management:

So far, the project management has not encountered any severe problems. All minor issues have been solved in a timely manner and without interferences. The preparation of the first periodic report and the respective Form Cs is on time, as well.

### Research and Development:

Analytical methods for the fatty acid analysis and determination of the total lipid content have been evaluated and shall be further developed. Based on these methods, first batches of microalgae samples have been analysed. So far, all strains contained the targeted fatty acids. In the next step, further strains shall be analysed and more detailed testing shall be done for the most promising strains. Furthermore, pilot scale testing and filtration trials have been performed with certain strains. The results of these tests were also quite positive and shall now be transferred to other microalgae strains. Finally, the extraction plant for processing the biomass has been fully modified and will be tested in the beginning of 2015.



*Photobioreactor at A4F Pilot Unit located in Lisbon.*

Regarding the sustainability assessment, basic definitions and scenarios for the future assessment have been drawn up. These shall be further discussed and finalised in a project workshop early 2015.

### Dissemination Activities:

The first project newsletter has been sent to major interest groups in June 2014. Posters have been presented on the *7<sup>th</sup> Bundesalgenstammtisch* in Koethen, Germany and the *Algae Biomass Summit 2014* in San Diego, USA. Presentations have been held on the *4<sup>th</sup> International Conference on Algal Biomass*, Biofuels & Bioproducts in Santa Fe, USA, the *22<sup>nd</sup> EU BC&E Algae event* in Hamburg, Germany and the *1<sup>st</sup> Bioökonomie-Kongress* in Stuttgart, Germany. In addition, two articles have been published and another one has been submitted. In the beginning of December 2014, another presentation will be held on the *1<sup>st</sup> EC Algae Contractors' Conference* in Florence, Italy.



# The Value Chain from Microalgae to PUFA

## Newsflash

### ***Chlorella vulgaris* production in Algafarm, Portugal**

The Algafarm, a joint venture between PUFAChain project partner A4F and the Portuguese cement company SECIL, is one of the largest facilities in the world using closed photobioreactors production systems which account for a total volume of 1,300 m<sup>3</sup>. Located on the Portuguese Atlantic coast, the facility allows performing the entire process from the initial upscaling to the final packaging of the harvested and dried microalgae. Tens of tons of food grade *Chlorella vulgaris* have already been produced at this facility.



### **IFEU receives funding for two algae projects**

The German Institute for Energy and Environmental Research (IFEU) successfully acquired 900,000 euros funding for two European algae projects. Within these projects, IFEU will be responsible for the sustainability assessments for the entire value chains from algae to either biofuels or dietary supplement. The goal of these assessments is to determine, whether the use of algae is more ecological and sustainable compared to the ordinary production of the respective goods.

Source: Rhein-Neckar-Zeitung, 22<sup>nd</sup> October 2014





# The Value Chain from Microalgae to PUFA

## Event Watch

### 5<sup>th</sup> European Algae Biomass

Date: 22<sup>nd</sup> – 23<sup>rd</sup> April 2015

Location: Amsterdam, Netherlands



The 5<sup>th</sup> European Algae Biomass Conference will take place in Amsterdam. The main purpose of this annual event is to bring together senior executives from industry and academia to discuss the latest commercial and technical developments, challenges and research breakthroughs throughout the entire algae value chain.

This years' main focus will be on the latest technologies in operation in the global algae industry, the technical challenges faced when optimising the cultivation of algae, the current and future commercial markets for algae products and the challenges faced during the commercialisation process including the views from three different end markets.

In addition, the conference will offer the opportunity to visit two algae production facilities.

For further information please visit: <http://www.wplgroup.com/aci/conferences/eu-eal5.asp>

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