BIOFAT: large-scale optimisation through a step-by-step scale-up and low risk approach

Diana Raquel Bastos da Fonseca
Senior Project Engineer
Rua Rodrigo da Fonseca 77,
4°Esq, 1250-190,
Lisboa, Portugal

BIOFAT: LARGE-SCALE OPTIMIZATION THROUGH A STEP-BY-STEP SCALE-UP AND LOW RISK APPROACH

Diana Fonseca

D Fonseca[1,], L Costa[1], J Silva[1], V V Vieira[1], M Tredici[2], N Biondi[2], M Prussi[2], L Rodolfi[3], N Bassi[3], S Mangini[4], F Wrubl[4], S Leu[5], S Boussiba[5], M de Pooter[6], S Rios[7], O Lépine[7], S Anton[8], L Martinelli[9], K Tammy[10]*

1. A4F, A4F - Algae For Future, Campus do Lumiar, Estrada do Paço do Lumiar, Ed. E R/C, 1649- 038 Lisboa, Portugal
2. UNIFI, Department of Agriculture, Food and Environmental Sciences of the University of Florence
3. Fotosintetica & Microbiologica S.r.l.
4. A&A Fratelli Parodi S.p.a.
5. BGU, Microalgal Biotechnology Laboratory of Ben Gurion University
6. Evodos B.V.
7. AlgoSource Technologies SAS
8. Abengoa Bioenergia Nuevas Tecnologias S.A.
9. IN S.r.l.
10. Hart Energy

* corresponding author

Abstract: The main goal of the BIOFAT project is to integrate proven production technology designs by Europe's most experienced microalgal biotechnologists, to produce strains with proven performances at outdoor cultivation, and develop this within the concept of biorefinery, in order to bring to the biofuel production from algae the economic viability that is currently required. The BIOFAT consortium has been exploring this concept in the past 4 years, and the project was structured in two stages: 1. Process optimization in two pilot-scale facilities, each one-half hectare in size, located in Italy and Portugal; 2. Economic and scale-up modeling to a 10-hectare demo facility.
The pilot units scale was selected as the minimum area sufficient to provide consistent information about a) the LCA and b) the economic balance. The two units were design

Company/Institute name:
A4F-Algae For Future
Company/Institute address:
Rua Rodrigo da Fonseca 77, 4°Esq
Postal code + city:
1250-190, Lisboa
Website: www.all-gas.eu

as a module that will not be scaled-up, but instead multiplied, in order to achieve larger scale units (> 10 ha). The DEMO plant will be composed of 20 pilot unit modules, reducing largely the associated scale-up risks. BPPP, the Pilot Unit constructed at Portugal, was operated for more than 1 year with good results: the performance obtained indicates that with 17 $MJ/m^2/d$ average annual radiation, the pilot productivity was close to 15 $g/m^2/d$. This represents a satisfactory performance at such scale. BCPP, the pilot unit installed in Italy is being operated since early summer of 2015, and will soon have enough data to allow an LCA and economic analysis.

The BIOFAT has a unique consortium including 3 of the most relevant experts in microalgae production around the world: Professor Mario Tredici from Florence University, Vitor Verdelho Vieira from A4F, and currently President of the European Algae Biomass Association, and Professor Sammy Boussiba from Ben-Gurion University. The consortium includes also companies with relevant expertise in biomass harvesting (EVODOS), microalgae downstream processing (Algosource Technologies), LCA study (Abengoa), vegetable oil production (Fratelli Parodi) and Green-wall Panels technology development (Fotosintetica & Microbiologica).

Two Business Cases are currently being developed considering their installation in a high radiation profile zone, as 25 $MJ/m^2/d$ average annual radiation, and productivity close to 20 $g/m^2/d$ as result of a proxy developed based on the performance of the two Pilot Units, and an additional prototype unit installed operated in Israel. Each Business Case will represent an optimization of the technology developed in each one of the Pilot Units.

About the author: Diana Fonseca is a Chemical Engineer graduated at the Faculty of Engineering of the University of Porto. After joining the company A4F in 2008, her professional progress followed the quick growth of the company, becoming in 2011 a Senior Project Engineer. She specialized in microalgae production plants design and implementation, working as Team Leader for the design and installation of the BIOFAT Pilot Plant in Portugal. Besides this role, Diana Fonseca has been developing work as an R&D Engineer in several other FP7 & H2020 projects and A4F´s clients.

About the company: A4F-Algae For Future, is a bioengineering company with 20 years of accumulated experience in research, development, design, implementation, operation and transfer of industrial projects for microalgae production, as well as biomass and/or co-products selling.

What we do

We design, project, implement, operate, develop and transfer Industrial Microalgae Production Units, from demonstration size to large-scale commercial units. Our tailor-made projects start at the Client's site, followed by laboratory processes with single cell selection and improvement; scaling-up and adapting to intensive culture conditions; production management and optimization; downstream processing, product testing, application development and team training. We combine these capabilities with relevant experience on microalgae marketing and sales.

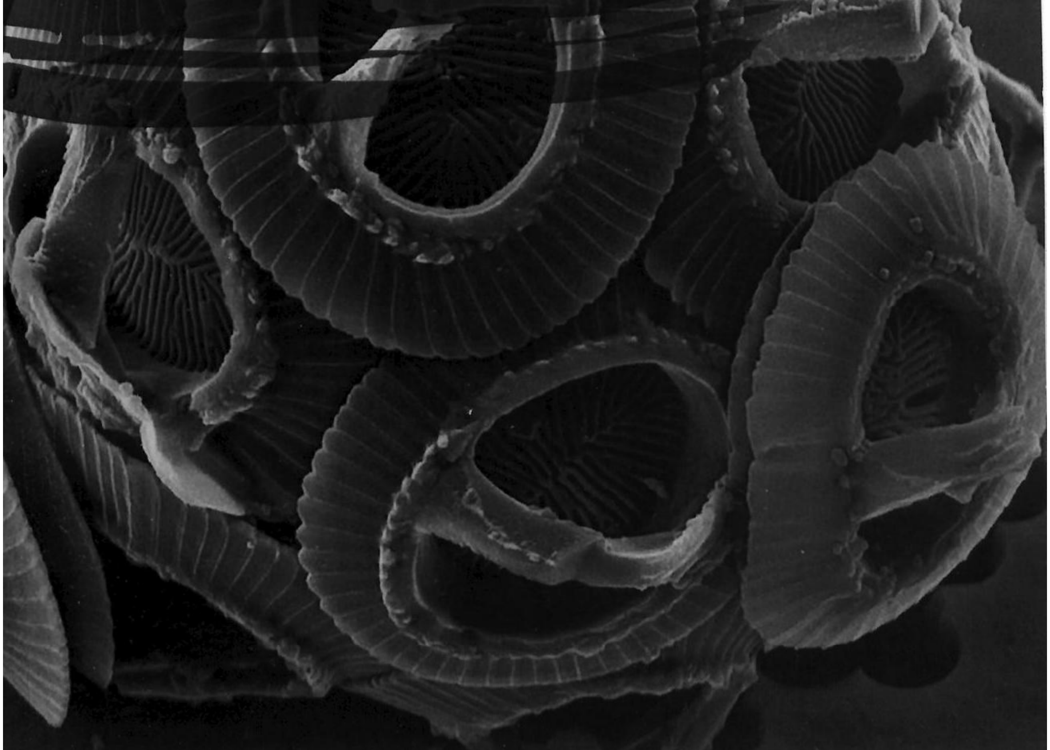
1 - 3 DECEMBER 2015
9th international
Algae
congress

ALGAEUROPE
CONFERENCE 2015

BOOK OF ABSTRACTS

2ND EABA AND EC ALGAE CONTRACTORS' CONFERENCE AND THE 9TH INTERNATIONAL ALGAE CONGRESS

LISBON, 1-3 DECEMBER 2015



algaecongress.com

EABA
EUROPEAN ALGAE BIOMASS ASSOCIATION

European Commission

BENELUX