



04/2024



BIO-BASED INDUSTRIES



DSEC, your Partner for Bio-based Projects

www.dsengineers.com

Biorefineries & Bio-based chemical plants

Implementing External Technologies and beyond

- * Capability to develop full projects **from feedstock handling to product conditioning**, including **offsites and construction works**
- * Full **understanding of Technology Providers' downstream requirement** through DSEC's large experience in the agro industry (filtration, evaporation, separation, drying, chromatography, ion exchanges...)
- * Experience in **assessing and validating all stages of process development** and products definition so as to reach a comprehensive concept before effective project start (Pilot ► Demo ► Industrial)
- * Experience in **2G cellulosic sugars, lignin and lignocellulose, bio solvents.**

Industrial Biotechnology: a large range of processes that DSEC can develop

- * **Catalytic reaction** (polyols)
- * **Fermentation and bioconversion**
- * **Membranes technologies**
- * **Separation technologies** (solid / liquid)
- * **Cross-sectional, interdisciplinary bio-refinery approach** through valorisation of food processing **side/waste streams** by the biochemical/biofuels industry for the **economical and environmental benefit** of both activities.



Reliability through experience

2G Fermentable sugars production plants

PARTICULAR FOCUS ON TECHNOLOGY PROVIDER'S DEVELOPMENT IN THE 2G FERMENTABLE SUGAR PRODUCTION

- * Biomass pre-treatment (wood, straw, bagasse, agroindustry wastes, energy crops...)
- * Enzymatic hydrolysis
- * Lignin processing
- * Catalytic reaction

Green field implementation or add-on to existing 1G facilities

Biomolecules & bio-plastics

EXPERIENCE IN THE DESIGN AND IMPLEMENTATION OF BIOMOLECULES PRODUCTION PLANTS

- * **Bio-based organic acids:** Butyric acid, Glycolic acid, Lactic acid
- * **Bio-solvents:** Ethyl acetate, Levoglucosenone (LGO), Propanediol (PDO)
- * **Bio-plastics:** PLA, PET bio-recycling, Compound/Filler

DSEC is your partner for...

PROJECT DEFINITION

- * PDP development based on technical process description from supplier & client
- * Technical & technological assessments
- * Selection of appropriate technology & unitary operation
- * Integration of an add-on into & existing facility
- * Utilities engineering & interfaces design
- * CAPEX & OPEX development

PROJECT IMPLEMENTATION

- * Overall Project Management including cost control, scheduling & HSSE
- * Detailed Design of all activities (CW, steel structure, piping, E&I...)
- * Procurement of equipment & materials
- * Workshop quality control & FAT
- * Expediting services
- * Integration of all related project activities
- * Plant automation standardization
- * Site activities management including implementation of site HSSE
- * Site activities management including implementation of site HSSE best practices
- * Plant commissioning & start-up assistance



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ENGINEERS & CONTRACTORS

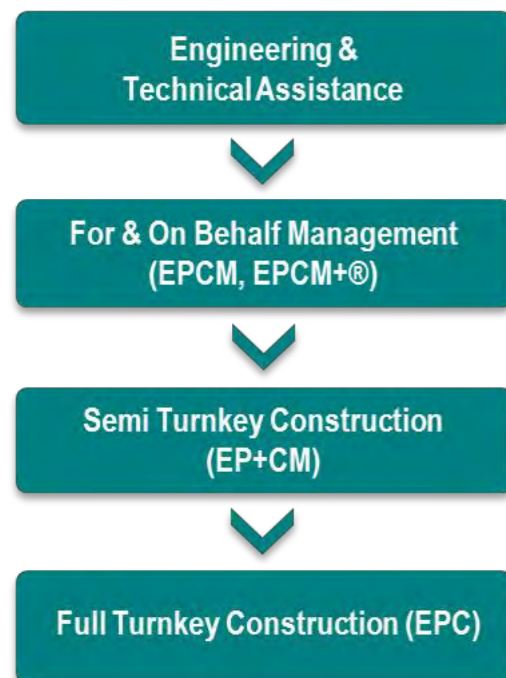
Reliability through experience

DSEC's Assets for the Bio-based Industry



- * Efficient Integration of new developments and flexibility in dealing with changing environments
- * Strong track record accumulated for more than 30 years, working in 65 countries and completing more than 50 Large Scale Projects (which major bio-based projects referenced are listed opposite)
- * Integrated, robust, validated process and final product definition, before transfer of technology (Pilot ► Demo ► Industrial)
- * Repeated experience with key industry players, Client IP protection
- * In-house specialists in Bio-based organic acids, Bio-solvents, Bio-plastics ...
- * Focus on efficiency and energy saving
- * Full independence from equipment suppliers allowing optimization of projects' Global Sourcing Strategy
- * Execution of all downstream process units applicable for the Bio-Industry such as: filtration, evaporation, separation, drying, chromatography, ion exchange, ...
- * Familiar with all types of raw material: seeds, grain, molasses, beet, chicory, bagasse, wood, straw, ...

MEETING OUR CUSTOMER'S NEEDS through flexible contractual set-up



Industrial References in Bio-based Industries

PRODUCT	CUSTOMER	COUNTRY	CONTRACT	YEAR
BIO-ETHYL ACETATE from bioethanol	Crop Energies	Germany	EPCM	2024 > 2025
BIORECYCLING of PET in PTA & MEG	Carbios	France	EPCM	2024 > 2025
BIO-SOLVENT (Cyrene) & LGO from sawdust	Circa	France	EPCM	2023 > 2025
TANNIN From chesnut wood biomass	Silvateam	Italy	Engineering services, FEED studies, Detailed engineering, Cost estimates	2023 > 2024
CELLULOSE, HEMICELLULOSE and LIGNIN From woody biomass	Bloom Biorenewables	Switzerland	FEL2	2023
LACTIC ACID from wood waste	TripleW	Belgium	FEL2 + FEL3	2023
2G SUGARS, LIGNIN from woody biomass	Fibenol	Estonia	FEED followed by EPCM Greenfield project	2018 > 2023
PROPANEDIOL, BUTYRIC ACID from (raw) glycerol	Metabolic Explorer (METEX)	France	FEED followed by EPCM Greenfield project	2017 > 2020
2G SUGARS, BIO-CHEMICALS from woody biomass, wheat straw, sugarcane bagasse	Several undisclosed customers	E.U. Brazil	Several Pre-FEED and FEED studies	2016 > 2023
AMINO ACID from sugars	Ajinomoto-Eurolysine	France	Several EPCM Brownfield units	2015 > 2018
2G BIOFUELS from woody biomass, wheat straw, sugarcane bagasse, cane straw	Several undisclosed customers	E.U. Brazil Australia	Audit, Pre-FEED, FEED studies, Cost estimates, Engineering services	2015 > 2023
2G BIOFUEL from miscanthus/wheat straw	INA	Croatia	Basic Engineering OSBL	2019 > 2020
LACTIC ACID from sugar	Galactic	Belgium	Engineering services	2013 > 2018