Advanced Sustainable BIOfuels for Aviation

Deliverable D1.3:

ASTM certified aviation biofuel production of at least 1000 tons

Consortium:

Acronym	Legal entity	Role
RE-CORD	CONSORZIO PER LA RICERCA E LA DIMOSTRAZIONE SULLE ENERGIE RINNOVABILI	CO
ENI	ENI S.p.A.	BEN
SKYNRG	SKYENERGY BV	BEN
CENER	FUNDACION CENER-CIEMAT	BEN
ETA	ETA – Energia, Trasporti, Agricoltura Srl	BEN
CCE	CAMELINA COMPANY ESPANA S.L.	BEN
JRC	JOINT RESEARCH CENTRE – EUROPEAN COMMISSION	BEN

CO…Coordinator, BEN…Beneficiary

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General Information

Call identifier: H2020-LCE-2017-RES-IA
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Topic: LCE-20-2016-2017
Start date of project: 01/05/2018
Duration: 5 years (30/06/2023)
Work Package: WP1
Type: Deliverable
Number: D1.3
Title: ASTM certified aviation biofuel production of at least 1000 tons
Due Date: 31/10/2022
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Reference Period: 01/01/2022 – 24/02/2023

Prepared by: ENI (Lead)
Responsible Person: Luca Sassi
Dissemination Level: Public

INTERNAL MONITORING & REVISION TABLE					
REV.	**DATE**	**DESCRIPTION**	**PAGES**	**CHECKED**	**APPROVED**
1	**24/02/2023**	**Original**	**6**	**LS**	**LS**

Document Type		
PRO	Technical/economic progress report (internal work package reports indicating work status)	
DEL	Technical reports identified as deliverables in the Description of Work	**x**
MoM	Minutes of Meeting	
MAN	Procedures and user manuals	
WOR	Working document, issued as preparatory documents to a Technical report	
INF	Information and Notes	

Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	**x**
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	
CON	Confidential, only for members of the Consortium	

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1 Production

Eni reached the target production of 1000 t of HEFA, available for BIO4A project, during November 2022, more than 1 month in advance vs. the new deadline agreed of 31 December 2022.

HEFA production was realized through a process configuration that involves Eni's Gela biorefinery to produce HVO and Eni's Livorno refinery for the distillation of HEFA from HVO.

More in details, the process developed had seen the production of HVO-naphtha long cut[1] from Gela biorefinery instead of HVO-Diesel and distillation in Livorno (traditional Eni refinery) through a dedicated and refurbished distillation column.

Gela started the production of HEFA through the distillation of HVO-naphtha long cut starting from the beginning of September 2022. The yields of:

HVO-naphtha long cut compared to HVO-Diesel -18,

HEFA from HVO-naphtha long cut compared to HEFA from HVO-Diesel -18 are significantly lower, leading to a significantly lower HEFA production rate. The possibility of producing HEFA from Livorno had been made possible thanks to the realization of minor investments on the site and allowed Eni to produce 1000 t of HEFA without using third party's facilities and with product quality under the full guarantee and complete control of Eni within the end of December 2022. HVO-naphtha long cut on Gela had been produced from Tallow cat. 1 and /or 2 and UCO (Annex IX, part b RED II), eligible feedstocks for the project aims.

The proposed configuration, integrating Gela bio-refinery and Livorno traditional refinery through the refurbishment of an idle naphtha fractionation column, has been an innovation by itself in Eni's operations and it facilitates the potential industrial scalability of the solution. The proposed pathway is still relevant in its novelty for the research purposes of the project.

The quality of the resulting HEFA product complies with the required ASTM aviation fuel standards (see Annex I) and Eni confirms that had the logistical capability to deliver the final product to the off-taker in the Netherlands.

This brand-new configuration introduced a positive innovation creating synergy and integration between Gela biorefinery site and the traditional Livorno site, thus proving an industrial choice in line with Eni's decarbonization strategy which transforms traditional sites into sites to produce new low-carbon footprint energy vectors/fuels such as HEFA/Biojet.

[1] HVO naphtha with a wider range of boiling point that includes a certain HEFA percentage.

Annex 1

Livorno refinery
Chemical Laboratory
Via Aurelia, 7 57017 Stagno (LI)
Tel. +39 0586948111 - Fax +39 0586948600
Email Address: federica.baldi@eni.com

Date: 14-02-2023
Certificate of Quality (CoQ)
Boll_08_2023_000268
Sampling date: 02-12-2022
Tank: 111
Sample: 201491848

Product

ENI BIOJET

Product code: 281

Rdp correction N° Boll_08_2023_000265 of 09-02-2023

Specification according to Standard ASTM D 7566-22A - Annex A.2

Analysis	*Notes*	*U. of M.*	*Limits*	*IP Method*	*ASTM Method*	*Result*
Appearance						
Appearance	(1)	—	Pass		ASTM D4176	Pass
Colour Saybolt		—	Report		ASTM D6045	>30
Particolate, at point of manifacture, cumulative channel particle counts						
Channel counts >= 4 µm		Channel counts	Report	577		479.3
Iso Code >= 4 µm		ISO Code	Max. 19	577		16
Channel counts >= 6 µm		Channel counts	Report	577		93
Iso Code >= 6 µm		ISO Code	Max. 17	577		14
Channel counts >= 14 µm		Channel counts	Report	577		12.6
Iso Code >= 14 µm		ISO Code	Max. 14	577		11
Channel counts >= 21 µm		Channel counts	Report	577		5.8
Iso Code >= 21 µm		ISO Code	Report	577		10
Channel counts >= 25 µm		Channel counts	Report	577		3.0
Iso Code >= 25 µm		ISO Code	Report	577		9
Channel counts >= 30 µm		Channel counts	Report	577		1.3
Iso Code >= 30 µm		ISO Code	Max. 13	577		7
Composition						
Total acidity	#	mgKOH/g	Max. 0.015		ASTM D3242	0.004
Hydrocarbon composition						
Cycloparaffins	(5)#	% massa	Max.15		ASTM D2425	7.4
Aromatics	(5)#	% massa	Max. 0.5		ASTM D2425	0.2
Paraffins	(5)#	% massa	Report		ASTM D2425	92.6
Carbon and Hydrogen	(5)#	% massa	Min. 99.5		ASTM D5291	100.0
Non Hydrocarbon composition						
Nitrogen	#	mg/kg	Max. 2		ASTM D4629	0.34
Water	#	mg/kg	Max. 75		ASTM D6304	38
Total Sulphur	#	mg/kg	Max. 15		ASTM D5453	2.00
Al, Ca, Co, Cr, Cu, Fe, K, Mg, Mo	(4)#	mg/kg	<0.1 per singolo metallo		ASTM D7111	<0.1 per singolo metallo
Na, Ni, P, Pd, Pb, Pt, Sn, Sr, Ti, V, Zn	(4)#	mg/kg	<0.1 per singolo metallo		ASTM D7111	<0.1 per singolo metallo
Halogens	(4)#	mg/kg	Max. 1		ASTM D7359	<1
Incidental material						
Fatty Acid Methyl Ester (FAME)	(3)#	mg/kg	Max. 5	IP 585		<4.5
Volatility						
Initial boiling point		°C	Report		ASTM D 86	156.1
fuel recovered 10%	#	°C	Max. 205		ASTM D 86	166.8
fuel recovered 50%		°C	Report		ASTM D 86	189.1

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Date: 14-02-2023
Certificate of Quality (CoQ)
Boll_08_2023_000268
Sampling date: 02-12-2022
Tank: 111
Sample: 201491848

Analysis	Notes	U. of M.	Limits	IP Method	ASTM Method	Result
fuel recovered 90%	#	°C	Min.210		ASTM D 86	251.4
T90%-T10%		°C	Min. 22		ASTM D 86	84.6
evaporated at 250°C		%V	Min. 65		ASTM D 86	>65
end point	#	°C	Max. 300		ASTM D 86	267.6
residue	#	%V	Max. 1.5		ASTM D 86	1.0
loss	#	%V	Max. 1.5		ASTM D 86	0.1
IBP Simdist	#	°C	Report		ASTM D 2887	131.8
recovered 10% Simdist	#	°C	Report		ASTM D 2887	144.0
recovered 20% Simdist	#	°C	Report		ASTM D 2887	156.9
recovered 50% Simdist	#	°C	Report		ASTM D 2887	187.2
recovered 80% Simdist	#	°C	Report		ASTM D 2887	251.7
recovered 90% Simdist	#	°C	Report		ASTM D 2887	269.6
FBP Simdist	#	°C	Report		ASTM D 2887	327.3
Flash point	#	°C	Min. 38	IP 170		46
Density at 15°C	#	kg/m3	730.0 - 772.0	IP 160	ASTM D4052	754.7
Fluidity						
freezing point	#	°C	Max. -40.0	IP 529		-47
Viscosity at -20°C		mm2/s	Max. 8.000		ASTM D445	3.900
Corrosion						
Copper, classification (2h at 100°C)		—	Max. 1		ASTM D130	1B
Thermal stability JFTOT contr. temp. 325°C						
control temperature	#	°C	Min. 325	IP 323	ASTM D3241	325
filter pressure differential	#	mmHg	Max. 25.0	IP 323	ASTM D3241	0
tube deposit rating (visual)	#	—	Max. <3	IP 323	ASTM D3241	1
existing tires (not washed)	#	mg/100ml	Max. 7	IP 540	ASTM D381	2.2
Antioxidant:						
Antioxidant in Synthetic Fuels	(2)#	mg/l	17.0 - 24.0		FROM BLENDING	20.6
Seal n°		—	Report			086997
Quantity of fuel in the batch		m3	Report			2573.6

The product is 100% paraffinic kerosene synthesized from esters and hydroprocessed fatty acids (HEFA-SPK)
We certify that the samples have been analyzed using established test methods, and that the analyzed samples are representative of the batch that complies with ASTM D 7566-22A Annex A.2
(1) Clear, bright and visually free from solid matter and undissolved water at ambient fuel temperature.
(2) Antioxidant additive approved by both from ASTM D7566-22A Annex A.2 and DEF STAN 91-091/14 (Qualification reference RDE/A/609)
(3) Analysis performed by SGS Italia (doc. n° LIV22-00666.001 of 08.12.2022)
(4) Analysis performed by SGS Italia (doc. n° LIV22-00667.001 of 08.12.22)
(5) Analysis performed by Laboratorio di Ricerca ENI di San Donato Milanese (doc. n° 2705LB del 12.12.22)

(#) Characteristics foreseen by Annex A2 of ASTM D7566-22A

Reason for modification: Error in "Quantity of fuel inthe batch"

Laboratory Manager
Ing. Federica BALDI