THE MARINE INDUSTRY AS A SPRINGBOARD FOR DECARBONISING TRANSPORTATION

The value of gradually upscaling sustainable feedstocks

Future of Biofuels 2023

5th European Conference

Scandic Sluseholmen Copenhagen

Hidde Schijen
Business Innovation

FincoEnergies

FincoEnergies

Forward ’35 - 100% green in how we think, act and invest

FincoEnergies is an independent, leading provider of sustainable energy solutions.

Our mission is to propel our customers’ transition towards a better world.

At FincoEnergies we focus on providing low-carbon energy and decarbonisation solutions.

With these solutions, we empower our customers to calculate, reduce, inset and offset their emissions.

EXTENDING OUR FRONTRUNNER PORTFOLIO OF DIFFERENTIATING GLOBAL GOODBRANDS

Carbon offsetting	Sustainable (Bio)fuels	Carbon insetting	Electrified transport	Sustainable biomass

IMPACT TIMELINE GOODFUELS

2015
GoodFuels founded, focusing on Marine, Road & Rail

2017
GoodShipping enters the market

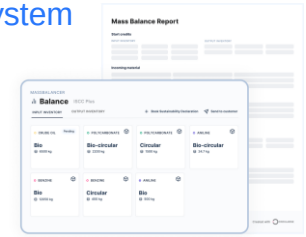
OCT/NOV 2017
Winner TEDx and Accenture Innovation Award

SEPTEMBER 2018
First blockchain bunkering with Samskip

OCTOBER 2022
Successful introduction of first physical fuel tracer

JULY 2022
First large passenger ship to sail on biofuel

OCTOBER 2023
GoodFuels and Circularise digitise ISCC EU biofuels system



2015 2017 2018 2022 2023

SEPTEMBER 2015
First marine biofuel bunkering with Boskalis and Wärtsilä

JUNE 2017
First inland waterway pilot with HEINEKEN

DECEMBER 2017
Partnership DHL Global Forwarding

DHL GLOBAL FORWARDING

NOVEMBER 2018
World's first **Bio Fuel Oil** bunkering

FEBRUARY 2022
GoodFuels Expansion Asia-Pacific Singapore

JULY 2023
GoodFuels first supplier of biomethanol in The Netherlands

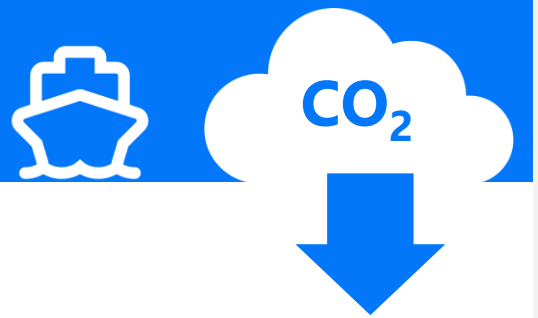
FincoEnergies

GOODFUELS PROPOSITION

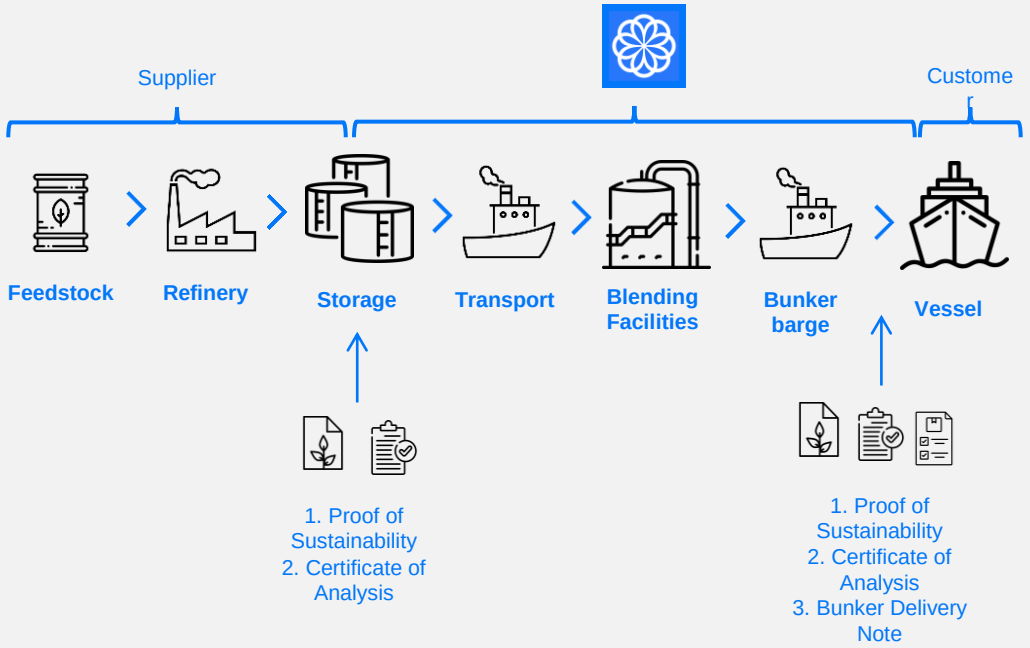
CHALLENGE

Growing demand for decarbonization in shipping.

- **Regulatory**
- **Voluntary**



CONNECTING SOLUTIONS



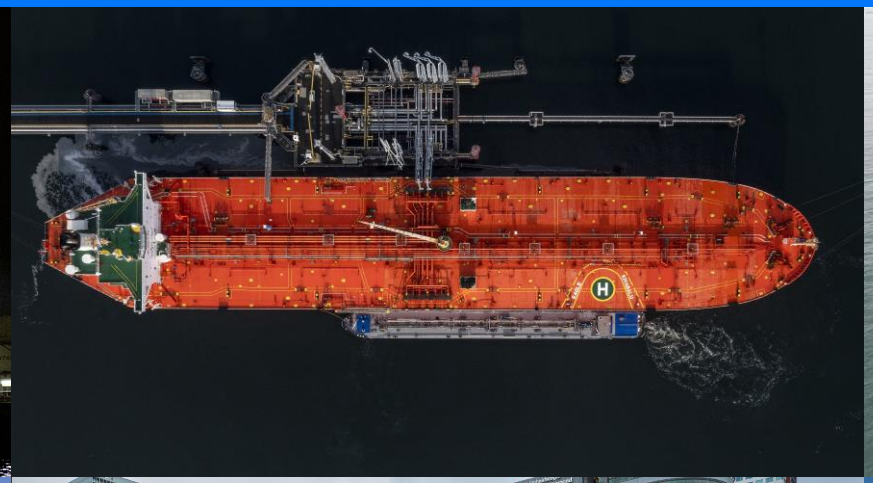
RESULT

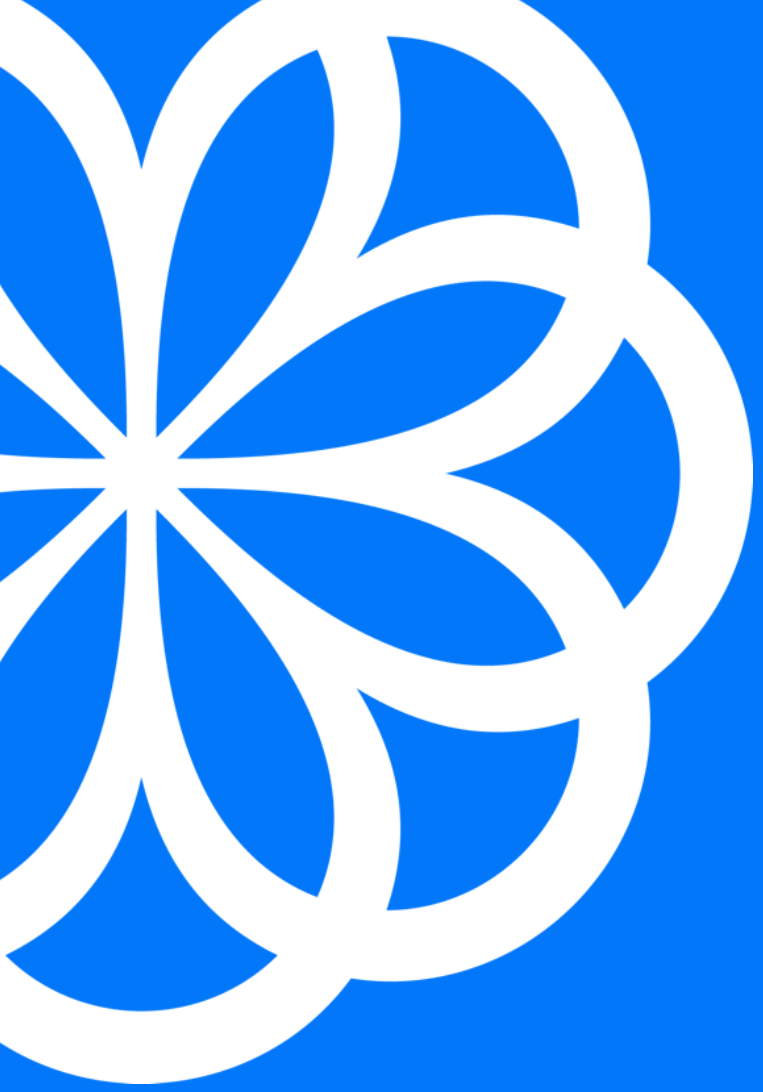
Our clients have a real impact in the industry

Our clients are sustainable frontrunners

Our clients enable sustainable marine fuel development

SUSTAINABLE, ‘DROP IN’ BIOFUELS

Container vessels	Tankers	Bulk Carriers and General Cargo
		
		
Car carriers	**Cruise ships**	**Dredging and Near-shore**



TAKING CLIMATE ACTION TOGETHER

DECARBONISE NOW

> “Our world needs climate action on all fronts – everything, everywhere, all at once.”

— António Guterres
Secretary General, United Nations

- Taken from the opening speech during the release of **the IPCC AR6 Synthesis Report** on 20 March 2023

SUSTAINABILITY

Our principles

Waste and residue based only

No competition with food

No direct or indirect land use change

No deforestation or biodiversity loss

No higher quality application possible

Minimum of 75% co_2 reduction

No negative social or legal impacts

Sustainability board

ANNE MARIT POST-MELBYE
Head of industry policy
Miljøstiftelsen ZERO

MARTIN JUNGINGER
Professor of
bio-based economy
Utrecht University

PATRICIA OSSEWEIJER
Professor of sustainability
TU Delft

Certification & partners

IBIA INTERNATIONAL BUNKER INDUSTRY ASSOCIATION

ZERO

ISCC International Sustainability & Carbon Certification

RSB MEMBER

ADAPTIVE INNOVATORS

MOST EXPERIENCED PLAYER IN MARINE BIOFUEL MANAGEMENT

ON-SHORE ENGINE TESTING

IN-HOUSE FUEL SYSTEM TESTING

LIVE LOCAL EMISSION TESTING

TECHNICAL SUPPORT DURING BIOFUEL TRIALS

CLOSE COOPERATION WITH MAJOR ENGINE MAKERS

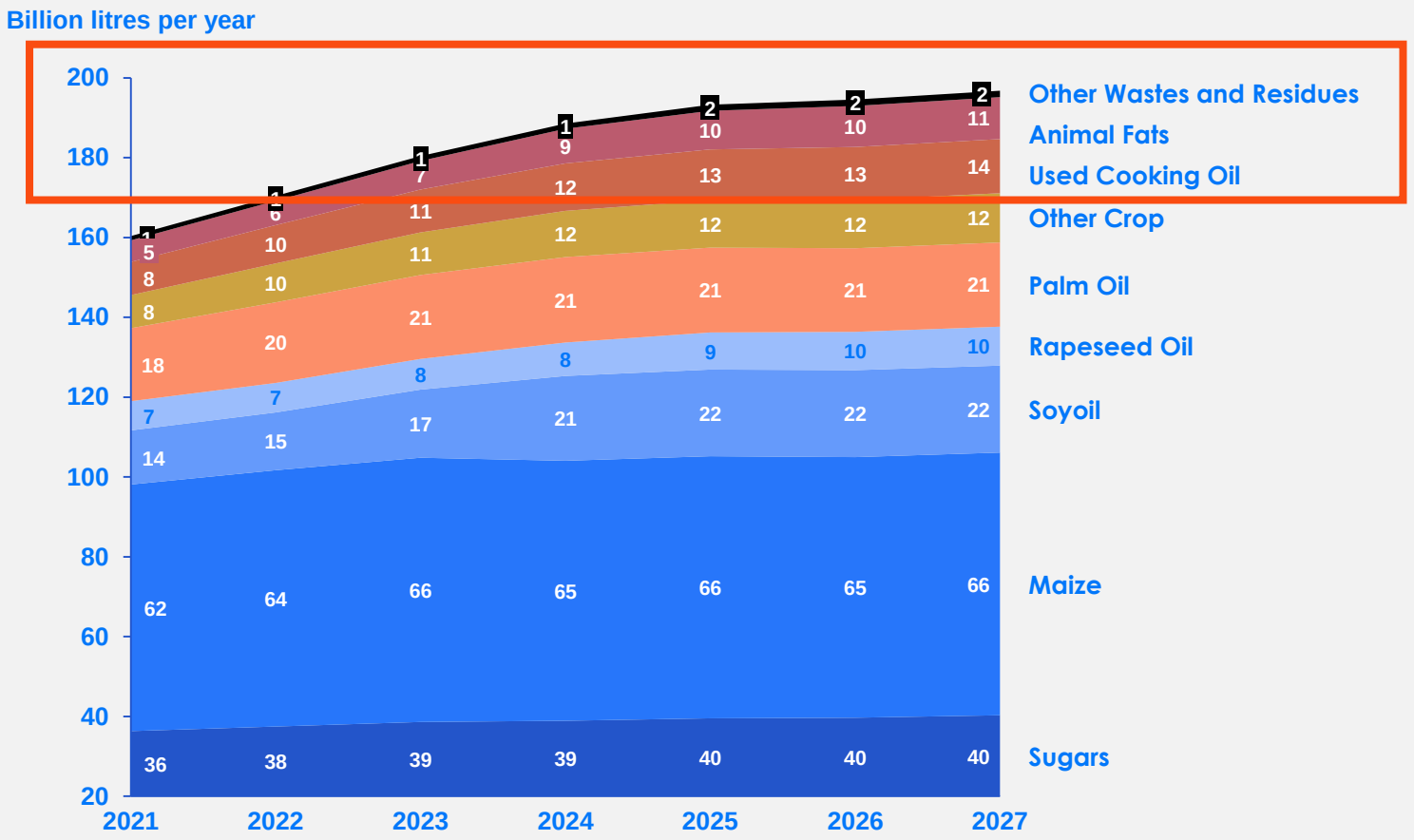
WÄRTSILÄ BOLL ALFA LAVAL MAN

WHAT ABOUT FEEDSTOCK AVAILABILITY?

FEEDSTOCK UTILISATION FOR BIOFUEL PRODUCTION EXPECTED TO STAGNATE TOWARDS 2027

- Total production stagnating. Why?
- Sugars and starches
- Vegetable oils
- UCO, animal fat and other residue.

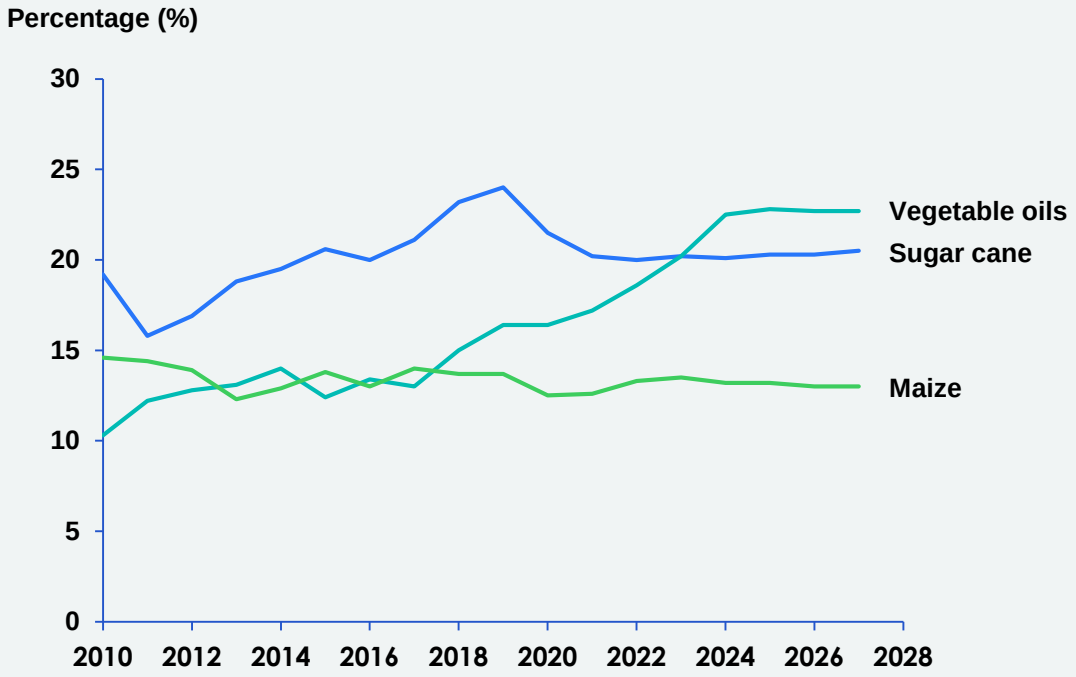
- Legislation drives feedstock demand per region:
  - Indonesia ⟶ CPO
  - Brazil ⟶ Soy oil
  - USA ⟶ Vegoils, UCO, animal fat
  - Europe ⟶ UCO, animal fats, wastes, residues



Source: IEA

EXPLORATION OF NEW FEEDSTOCKS IS NEEDED

Biofuel demand share of global crop production



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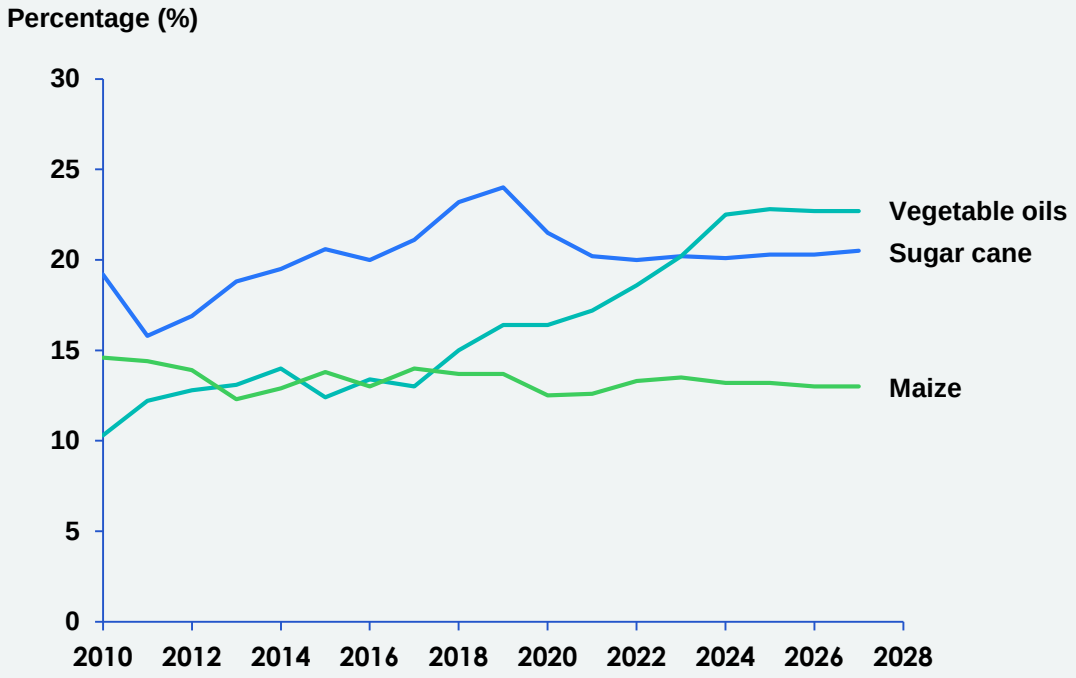
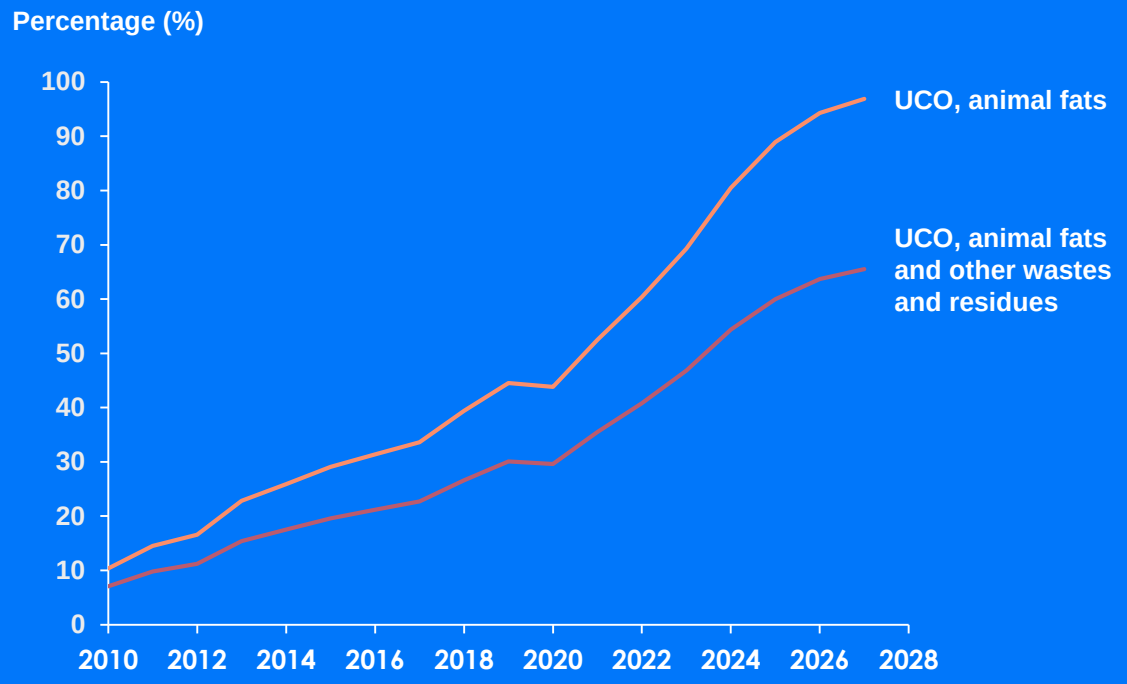


Source: IEA

Biofuel demand share of global wastes and residues



Source: IEA

WHAT FEEDSTOCKS TO USE? RED II(I) ANNEX IX A & B

What feedstocks can and should we use in Europe?

What technologies do we use for upcycling?

What feedstocks can be used by those technologies?

What is needed to use the rest of this list?

Part A. Feedstocks for the production of biogas for transport and advanced biofuels, the contribution of which towards the minimum shares referred to in the first and fourth subparagraphs of Article 25(1) may be considered to be twice their energy content:

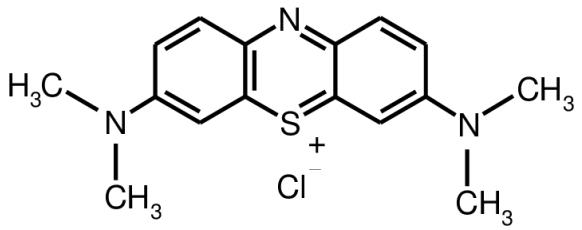
(a) Algae if cultivated on land in ponds or photobioreactors;
(b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under point (a) of Article 11(2) of Directive 2008/98/EC;
(c) Biowaste as defined in point (4) of Article 3 of Directive 2008/98/EC from private households subject to separate collection as defined in point (11) of Article 3 of that Directive;
(d) Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, and excluding feedstocks listed in part B of this Annex;
(e) Straw;
(f) Animal manure and sewage sludge;
(g) Palm oil mill effluent and empty palm fruit bunches;
(h) Tall oil pitch;
(i) Crude glycerine;
(j) Bagasse;
(k) Grape marcs and wine lees;
(l) Nut shells;
(m) Husks;
(n) Cobs cleaned of kernels of corn;
(o) Biomass fraction of wastes and residues from forestry and forest-based industries, namely, bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil;
(p) Other non-food cellulosic material;
(q) Other ligno-cellulosic material except saw logs and veneer logs.

Part B. Feedstocks for the production of biofuels and biogas for transport, the contribution of which towards the minimum share established in the first subparagraph of Article 25(1) shall be limited and may be considered to be twice their energy content:

(a) Used cooking oil;
(b) Animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009.

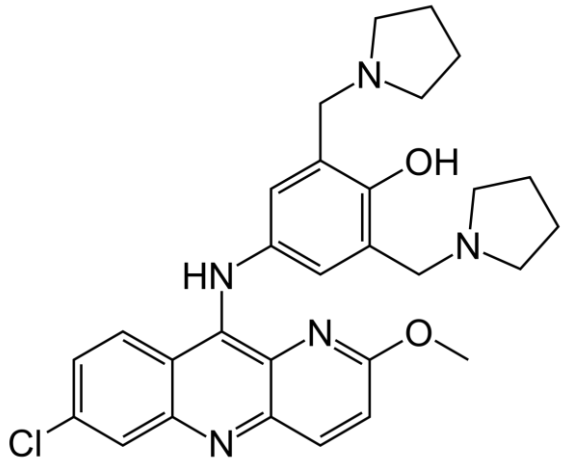
WHAT CAN WE LEARN FROM OTHER SECTORS?

Dyes → | **Chemical →** | **Pharma**



Methylene blue

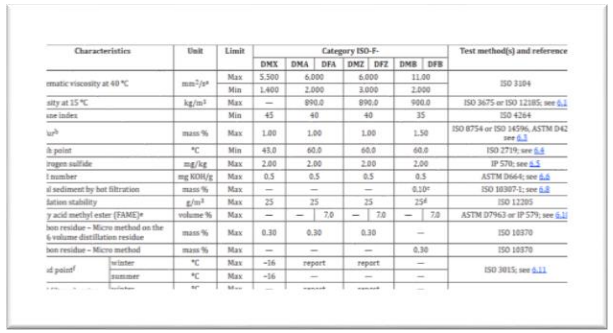
- Purity
- Reactivity
- Selectivity
- Functional groups



Pyronarydine

HOW SHIPPING COULD BE A SPRINGBOARD

ISO8217

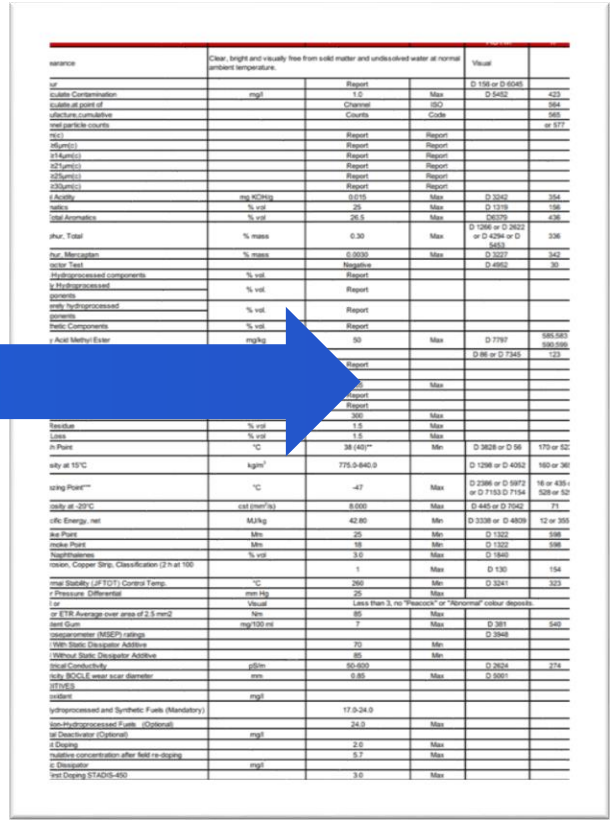


Characteristics		Unit	Limit	Category ISO-F-						Test method(s) and reference
				DMX	DMA	DFA	DMZ	DFZ	DMB	DFB	
rmatic viscosity at 40 °C		mm²/s[a]	Max	5.500	6.000		6.000		11.00		ISO 3104
			Min	1.400	2.000		3.000		2.000		
sity at 15 °C		kg/m³	Max	—	890.0		890.0		900.0		ISO 3675 or ISO 12185; see 6.1
ane index			Min	45	40		40		35		ISO 4264
ur[b]		mass %	Max	1.00	1.00		1.00		1.50		ISO 8754 or ISO 14596, ASTM D42 see 6.3
h point		°C	Min	43.0	60.0		60.0		60.0		ISO 2719; see 6.4
rogen sulfide		mg/kg	Max	2.00	2.00		2.00		2.00		IP 570; see 6.5
l number		mg KOH/g	Max	0.5	0.5		0.5		0.5		ASTM D664; see 6.6
l sediment by hot filtration		mass %	Max	—	—		—		0.10[c]		ISO 10307-1; see 6.8
lation stability		g/m³	Max	25	25		25		25[d]		ISO 12205
y acid methyl ester (FAME)[e]		volume %	Max	—	—	7.0	—	7.0	—	7.0	ASTM D7963 or IP 579; see 6.11
bon residue – Micro method on the 6 volume distillation residue		mass %	Max	0.30	0.30		0.30		—		ISO 10370
bon residue – Micro method		mass %	Max	—	—		—		0.30		ISO 10370
id point[f]	winter	°C	Max	–16	report		report		—		ISO 3015; see 6.11
	summer	°C	Max	–16	—		—		—		

EN590

Property	Test method	Test Unit	Guarantee	Limit
Density at 15 0C		kg/m3		820-845
Polycyclic aromatic hydrocarbons	EN 12916	wt%	B	Max
Flash Point	EN 2719	0 C	>55	
Cold Filter Plugging Point CFPP	EN 116	0 C		
Winter Grade			-15	max
Summer Grade			5	max
Distillation	EN ISO 3405			
Recovered at 250C		Vol%	65	max
Recovered at 350C		Vol%	85	min
95% (Vol/Vol) Recovered at		0 C	360	max
Sulphur	EN ISO 20846 EN ISO 20884	mg/kg	10	max
Copper Strip Corrosion (3h a5 50C)	EN ISO 2160	rating	No.1	max
Fatty acid methyl ester(FAME) content	EN 14078	Vol%	7.0	max
Cetane Number	EN ISO 5161 EN 15195		51	min
Cetane Index	EN ISO 4264	calculated	46	min
Water	EN ISO 12937	mg/kg	200	max
Particulate Matter	EN 12662	mg/kg	24	max
Oxidation Stability	EN ISO 12205 EN 15751	g/m3 h	25 20	max min
Lubricity (wsd1,4) at 60C	EN ISO 12156/1	um	450	max

ASTM D7566



earance	Clear, bright and visually free from solid matter and undissolved water at normal ambient temperature.			Visual	
ur		Report		D 156 or D 6045	
culate Contamination	mg/l	1.0	Max	D 5452	423
culate at point of		Channel	ISO		564
ufacture,cumulative		Counts	Code		565
nnel particle counts					or 577
≥(c)		Report	Report		
≥5µm(c)		Report	Report		
≥14µm(c)		Report	Report		
≥21µm(c)		Report	Report		
≥25µm(c)		Report	Report		
≥30µm(c)		Report	Report		
d Acidity	mg KOH/g	0.015	Max	D 3242	354
natics	% vol	25	Max	D 1319	156
otal Aromatics	% vol	26.5	Max	D6379	436
phur, Total	% mass	0.30	Max	D 1266 or D 2622 or D 4294 or D 5453	336
phur, Mercaptan	% mass	0.0030	Max	D 3227	342
ictor Test		Negative		D 4952	30
Hydroprocessed components	% vol.	Report			
y Hydroprocessed ponents	% vol.	Report			
ously hydroprocessed ponents	% vol.	Report			
hetic Components	% vol.	Report			
y Acid Methyl Ester	mg/kg	50	Max	D 7797	585,583 590,595
				D 86 or D 7345	123
		Report			
			Max		
		Report			
		Report			
		300	Max		
Residue	% vol	1.5	Max		
Loss	% vol	1.5	Max		
h Point	°C	38 (40)**	Min	D 3828 or D 56	170 or 52
sity at 15°C	kg/m³	775.0-840.0		D 1298 or D 4052	160 or 36
zing Point***	°C	-47	Max	D 2386 or D 5972 or D 7153 D 7154	16 or 435 528 or 52
osity at -20°C	cst (mm²/s)	8.000	Max	D 445 or D 7042	71
ific Energy, net	MJ/kg	42.80	Min	D 3338 or D 4809	12 or 355
ke Point	Mm	25	Min	D 1322	598
moke Point	Mm	18	Min	D 1322	598
Naphthalenes	% vol	3.0	Max	D 1840	
rosion, Copper Strip, Classification (3 h at 100		1	Max	D 130	154
mal Stability (JFTOT) Control Temp.	°C	260	Min	D 3241	323
r Pressure Differential	mm Hg	25	Max		
l or	Visual	Less than 3, no "Peacock" or "Abnormal" colour deposits.			
or ETR Average over area of 2.5 mm2	Nm	85	Max		
ilent Gum	mg/100 ml	7	Max	D 381	540
oseparometer (MSEP) ratings				D 3948	
With Static Dissipator Additive		70	Min		
Without Static Dissipator Additive		85	Min		
tricity Conductivity	pS/m	50-600		D 2624	274
city BOCLE wear scar diameter	mm	0.85	Max	D 5001	
ST/VES					
oxidant	mg/l				
ydroprocessed and Synthetic Fuels (Mandatory)		17.0-24.0			
ion-Hydroprocessed Fuels (Optional)		24.0	Max		
al Deactivator (Optional)	mg/l				
d Doping		2.0	Max		
ulative concentration after field re-doping		5.7	Max		
c Dissipator	mg/l				
irst Doping STADIS-450		3.0	Max		

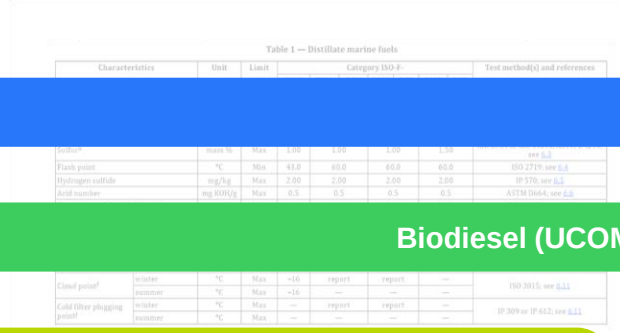
Gradual upcycling

MARINE COULD ENCOURAGE BUSINESS SCALE-UP

ISO8217

EN14214 / EN590

ASTM D7566



Property	Test method	Test Unit	Guarantee	Limit
Density at 15 0C		kg/m3		820-845
Winter Grade			-15	max
Summer Grade			5	max
Recovered at 350C		Vol%	85	min
95% (Vol/Vol) Recovered at		0 C	360	max
Sulphur	EN ISO 20846 EN ISO 20884	mg/kg	10	max
Carbon Residue (on 10%residue)	EN ISO 10370	wt%	0.30	max
Viscosity at 40C	EN ISO 3104	cst	2.0-4.5	
Copper Strip Corrosion (3h a5 50C)	EN ISO 2160	rating	No.1	max
Fatty acid methyl ester(FAME) content	EN 14078	Vol%	7.0	max
Cetane Number	EN ISO 5161 EN 15195		51	min
Cetane Index	EN ISO 4264	calculated	46	min
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Particulate Matter	EN 12662	mg/kg	24	max
Oxidation Stability	EN ISO 12205 EN 15751	g/m3 h	25 20	max min
Lubricity (wsd1,4) at 60C	EN ISO 12156/1	um	450	max

SAF

Biodiesel (UCOME)

Crude Waste Oils (UCO)

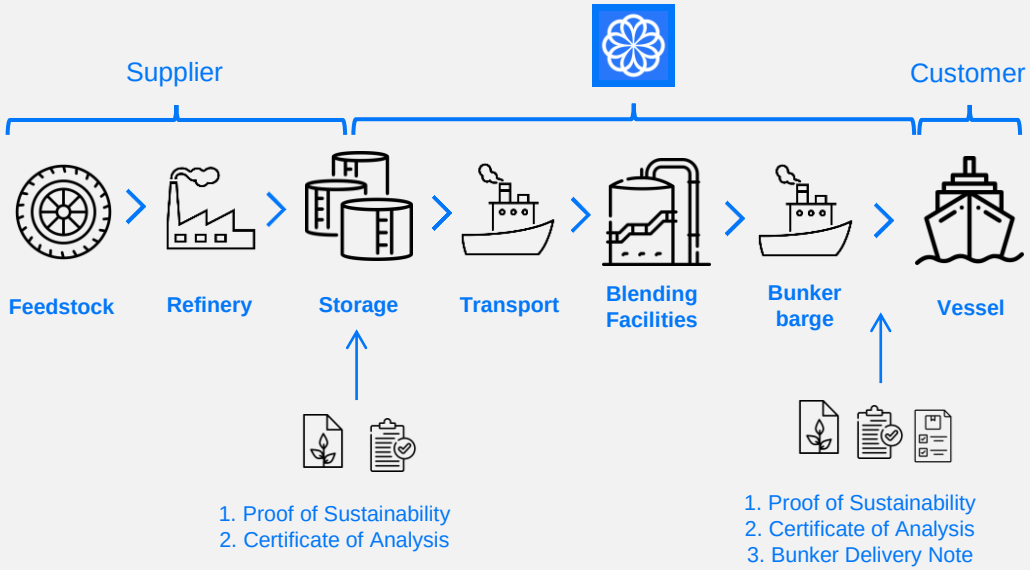
Lignocellulosic

Pyrolysis oils

and more

LET'S DO IT FOR REAL!

CONNECTING SOLUTIONS



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