Sustainability Challenges: Marine Fuel Supplier Perspective

World Fuel™

A World Kinect Company

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Navigating Sustainability Challenges in the Marine Sector

Transitioning to sustainable fuels presents significant complexities in the maritime industry. Most of the commentary we see is focused on end user and what issues they may have… **but there are also issues from the supply side.**

Our main concern is that we obtain the correct quality and sustainable fuel and therefore have confidence in selling this on.

Source:IMO

What happened at MEPC ES.2?

An important factor in the current **global** sustainable transition for shipping is the development of **IMO Net Zero Framework.**

What happened at the most recent extraordinary session?…

…There were two discussions to be had at MEPC ES.2 - what the Net Zero Framework procedure would look like going forward, and how exactly would we go about adopting the framework itself.

However! After prolonged decisions, there was **57 to 49 votes to postpone these votes for a year (21 abstained).**

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Navigating Sustainability Challenges in the Marine Sector

Where does this leave us?... We don't exactly know...
Will the Net Zero framework remain as it is and go for adoption again in 2026?

Will the framework be technically amended and then reconsidered?

Will nothing happen!?

Will ANOTHER framework be developed and presented at a future session of MEPC?

We don't know. However, we do know that the overall transition is currently uneven...

Regional Framework Development?
No clear global policy? What will happen regionally?

- Fuel EU maritime & Fuel EU ETS?
- USA?
- Asia?

And the question is... what will the development of these individual frameworks now look like?
The challenge for V/L owners/ operators will be compliance with the appropriate regime in the right place, at the right time.

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How do we tackle this transition?

Depending on whether you're considering the short, medium or long term (and what you can afford!) your plan will be different…

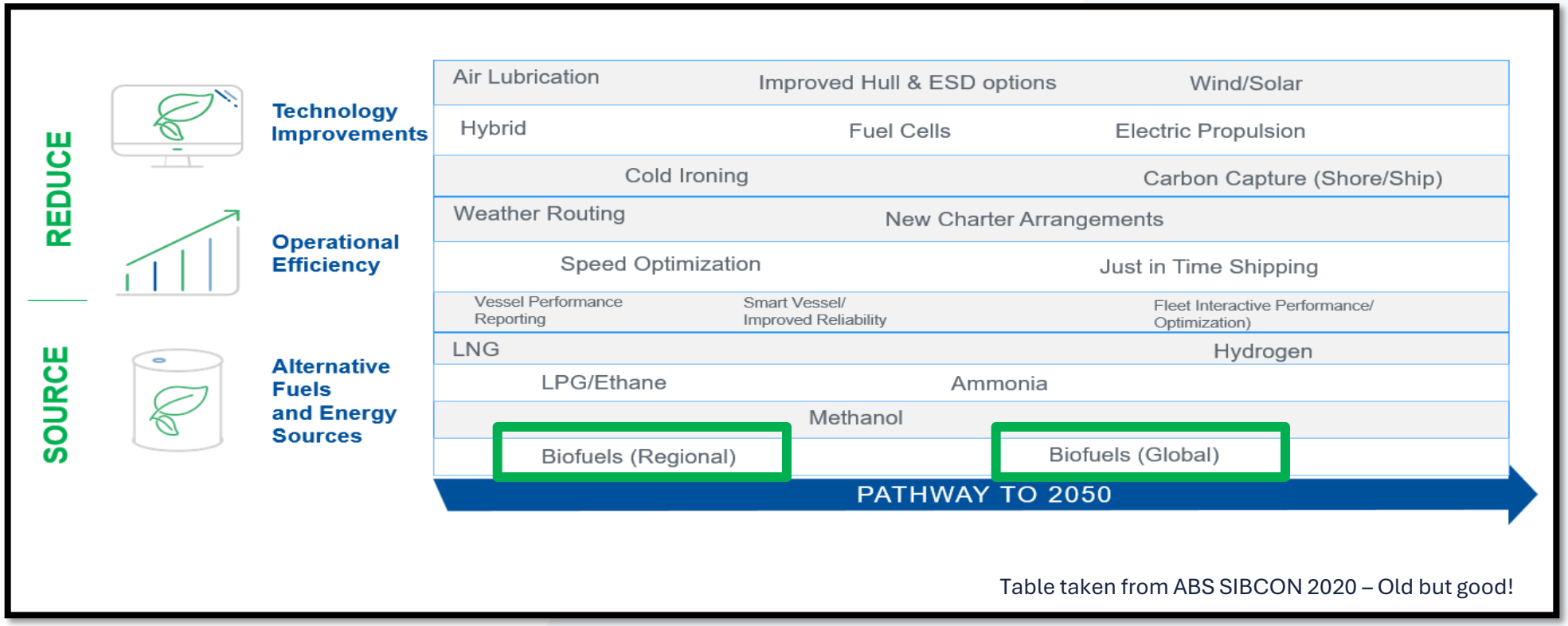

Table taken from ABS SIBCON 2020 – Old but good!

How will we successfully transition?… Biofuels are a good first step to address in the **SHORT TERM**. Decarbonizing for the long term will look different.

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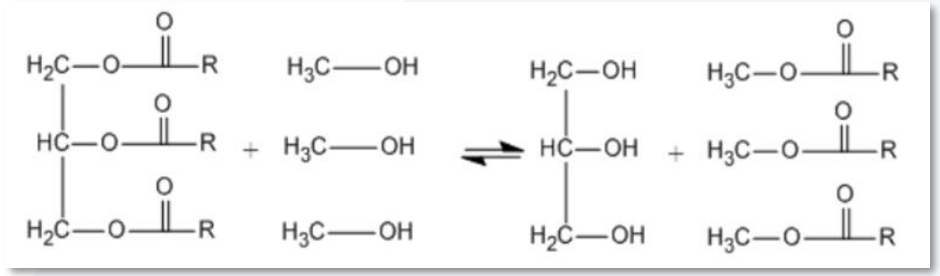
Biofuel Options: FAME vs. HVO

FAME (Fatty Acid Methyl Ester) Vs. HVO (Hydrotreated Vegetable Oil)

…What are the differences?



Taken from the 2024 CIMAC Guideline – Marine fuels containing FAME; A guideline for shipowners & operators

The overall FAME produced depends upon the **feedstock used!** Suppliers in the maritime sector already face sourcing and quality hurdles as we find ourselves at the back of the queue behind aviation and land.

Currently, FAME is not defined as a drop in fuel; however, it is being used as one. Considering this fact, there are practical challenges that need to be addressed. Just to name a few:

- At what temperature is it stored? This is important for cold flow properties.
- Do you have the space? FAME has lower energy density and therefore may need more product.
- How long are you storing your FAME for? FIFO method should be used.
- Control the water content! FAME absorbs water & corrosion of tanks or sludge may occur.
- FAME has lots of oxygen within it. Oxidation may occur if left for long periods of time.
- Oxidation could lead to a change in acid number.
- FAME can act as a solvent and can dislodge debris. This can increase filter clogging.
- Good onboard housekeeping practices should prevent possible microbial growth.

CIMAC Guideline: Marine Fuels containing FAME; A guideline for Ship Owners and Operators can be consulted for further info regarding FAME. **(Always consult OEM's).**

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Biofuel Options: FAME vs. HVO

On the other hand, we also have HVO, which doesn't pose the same challenges as those seen when using a FAME based product. For shipowners and operators, it is effectively the same as using a DMA / MGO which makes HVO, a "drop in fuel".

We see the terms "renewable diesel" and "biodiesel" interchanged; however, they are not the same! It is important to note that here are differences in the production process and specifications.

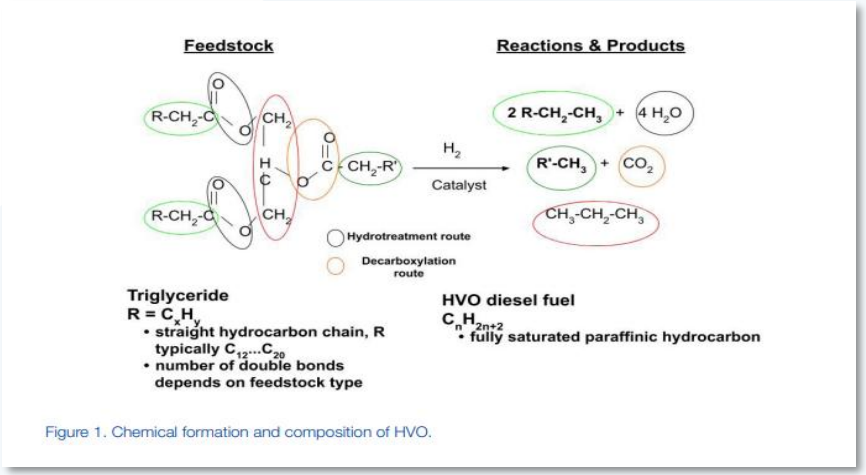
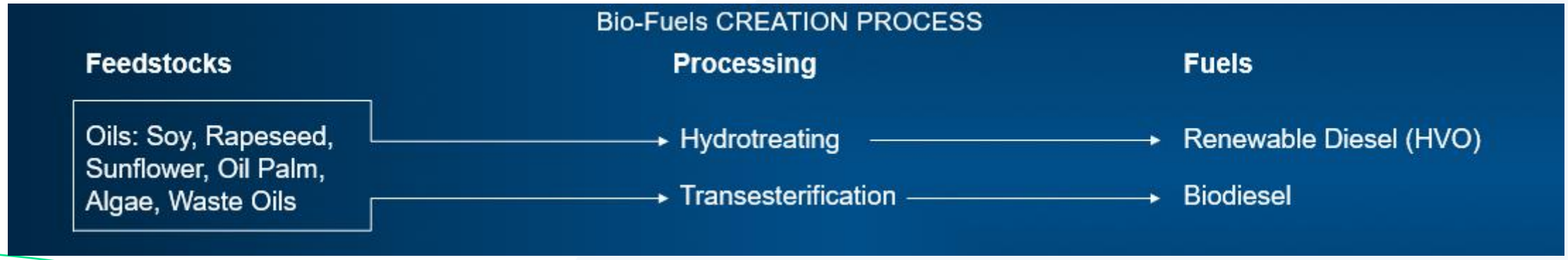


Figure 1. Chemical formation and composition of HVO.

Taken from the Neste Renewable Diesel handbook.



Same feedstock used, but different chemical processes...

(Hydrotreating will use Hydrogen to give you HVO. Transesterification will use a methanol catalyst and a base to give you a FAME biodiesel).

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The role of ISO 8217: 2024 in Biofuel Quality

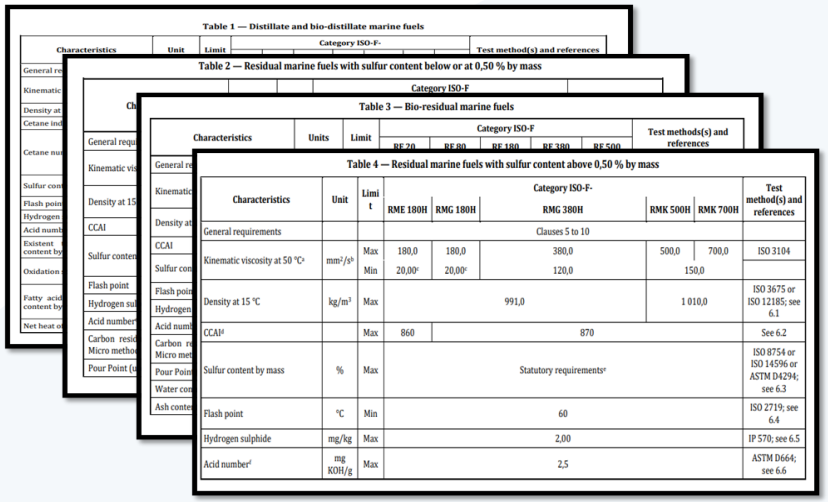
Table 1 — Distillate and bio-distillate marine fuels

Table 2 — Residual marine fuels with sulfur content below or at 0,50 % by mass

Table 3 — Bio-residual marine fuels

Table 4 — Residual marine fuels with sulfur content above 0,50 % by mass

Characteristics	Unit	Limit	Category ISO-F- RME 180H	RME 180H	RMG 380H	RMK 500H	RMK 700H	Test method(s) and references
General requirements			Clauses 5 to 10					
Kinematic viscosity at 50 °C[a]	mm²/s[b]	Max	180,0	180,0	380,0	500,0	700,0	ISO 3104
		Min	20,00[c]	20,00[c]	120,0	150,0		
Density at 15 °C	kg/m³	Max	991,0			1 010,0		ISO 3675 or ISO 12185; see 6.1
CCAI[d]		Max	860	870				See 6.2
Sulfur content by mass	%	Max	Statutory requirements[e]					ISO 8754 or ISO 14596 or ASTM D4294; see 6.3
Flash point	°C	Min	60					ISO 2719; see 6.4
Hydrogen sulphide	mg/kg	Max	2,00					IP 570; see 6.5
Acid number[f]	mg KOH/g	Max	2,5					ASTM D664; see 6.6

What changed between ISO 8217: 2017 and ISO 8217: 2024?

Short answer is… A lot!

- The title changed, the scope changed, and Clause 5 is different!
- The tables are also VERY different! There is now 4 instead of 2.
- Annex A (Bio Based Liquid Fuels including FAME) was rewritten.
- Annex B (Composition of Marine Fuels) addresses the composition of marine fuels & takes into account there is more oxygen in fuels than there was before.
- Annex K is a new addition that addresses the Characterization of Residual Marine Fuels. Are fuels more paraffinic or aromatic? (Aromatic fuels typically produce higher black carbon emissions).

The latest revision of ISO 8217 2024 reflects the growing adoption of biofuels. While earlier editions included "de minimis" provisions for FAME, the 2024 version has a more comprehensive overview for the wider use of fuels containing higher % levels of bio derived material.

ISO 8217 2024 is a commercial spec that is transactional between buyer and seller. **It is not mandated!** However, it is important to ensure bio quality that when selling bio blends, it is therefore recommended industry best practice to have **all COQ's (before and after the creation of the blend)!**

Additionally, if as a supplier we are guaranteeing and selling to ISO 8217 2024, then we are therefore guaranteeing **EN 14214/ ASTM D6751**.

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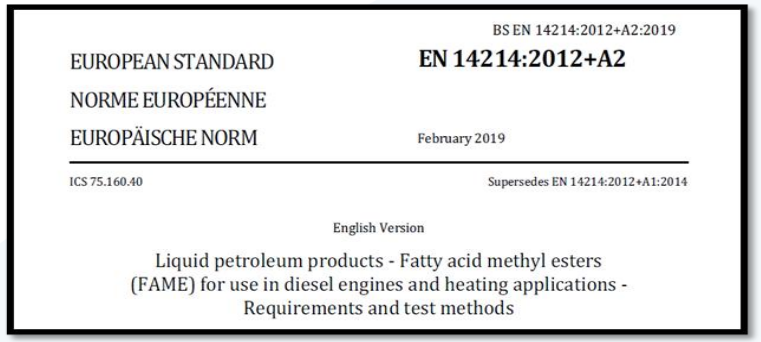
The role of ISO 8217: 2024 in Biofuel Quality



BS EN 14214:2012+A2:2019

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 14214:2012+A2

February 2019

ICS 75.160.40

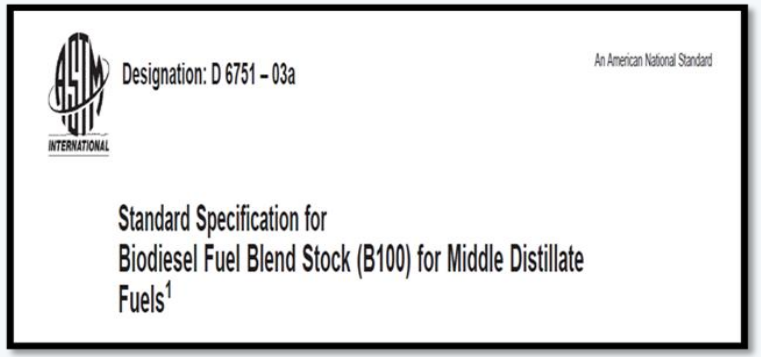
Supersedes EN 14214:2012+A1:2014

English Version

Liquid petroleum products - Fatty acid methyl esters (FAME) for use in diesel engines and heating applications - Requirements and test methods

<u>What is EN 14214 and ASTM D6751 and why are they important in understanding biofuel quality?</u>

When selling to ISO 8217 2024 spec, the specification specifically states "**regulated FAME" but ISO 8217 is a commercial spec, not mandatory.** So… you can buy what you want, however, if you do, you do so understanding the risks (and if you have consulted with your OEM).



Designation: D 6751 – 03a

An American National Standard

Standard Specification for
Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels[1]

So, what are these standards and why do they matter?

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15940

June 2016

ICS 75.160.20

Supersedes CEN/TS 15940:2012

English Version

Automotive fuels - Paraffinic diesel fuel from synthesis or hydrotreatment - Requirements and test methods

Carburants pour automobiles - Gazoles paraffiniques de synthèse ou obtenus par hydrotraitement - Exigences et méthodes d'essais

Kraftstoffe für Kraftfahrzeuge - Paraffinischer Dieselkraftstoff aus Synthese oder Hydrierungsverfahren - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 15 April 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EN 14214 is the European Standard for Liquid Petroleum Products -Fatty Acid Methyl Esters (FAME) for use in diesel engines and heating applications - Requirements and test methods

ASTM D6751 is the American Standard for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels.

Ensuring you are selling to ISO 8217 2024, means you are also ensuring the bio you are selling is in line with either of these standards. You are therefore ensuring the quality of your **regulated** FAME.

Similarly, if you're selling HVO? The standard you're wanting to comply with is **EN 15940** which is a standard originally produced for Automotive Fuels.

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Testing and Traceability

So, how do we test the % of FAME in a biofuel blend?

Within the 2017 spec there were provisions for % of FAME, however, given the wider inclusion of FAME in 2024 spec, additional test methods have been introduced.

Within the 2017 spec the test methods for distillate grades were ASTM D7963 or IP 579. For residual grades ASTM D7963 was used.

What test methods are used in the 2024 spec?

Distillate Grades:
ASTM D7963
IP 631
EN 14078
ASTM D7371 – DF only!

Residual Grades:
ASTM D7963
IP 631

The type of fuel will determine what test you use as not all tests will be suitable.
The expected concentration of the FAME in the blend will also define the test conditions to be used.

With that in mind, as a supplier, it is in your best interest to test and ensure what the quantity of FAME is in the product as you know this will be checked by the buyer further down the line!

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Feedstock Quality and Unregulated FAME

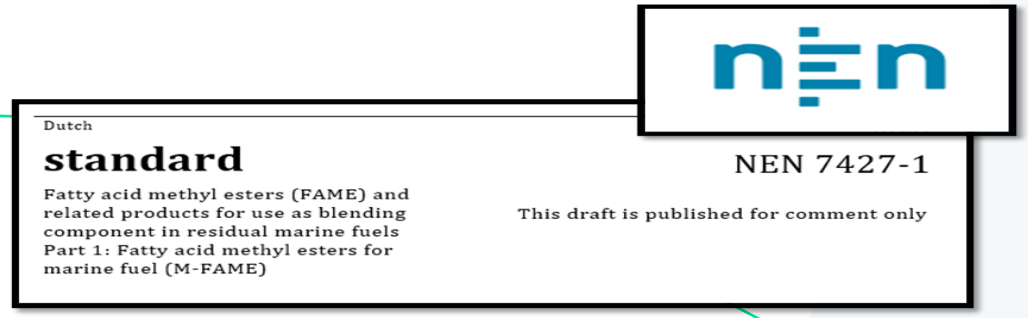
Can off spec FAME be used?... If you have the all clear with OEM and class (as long as you have checked that any off-spec parameters aren't critical to engine and system operation) then the answer is actually yes...

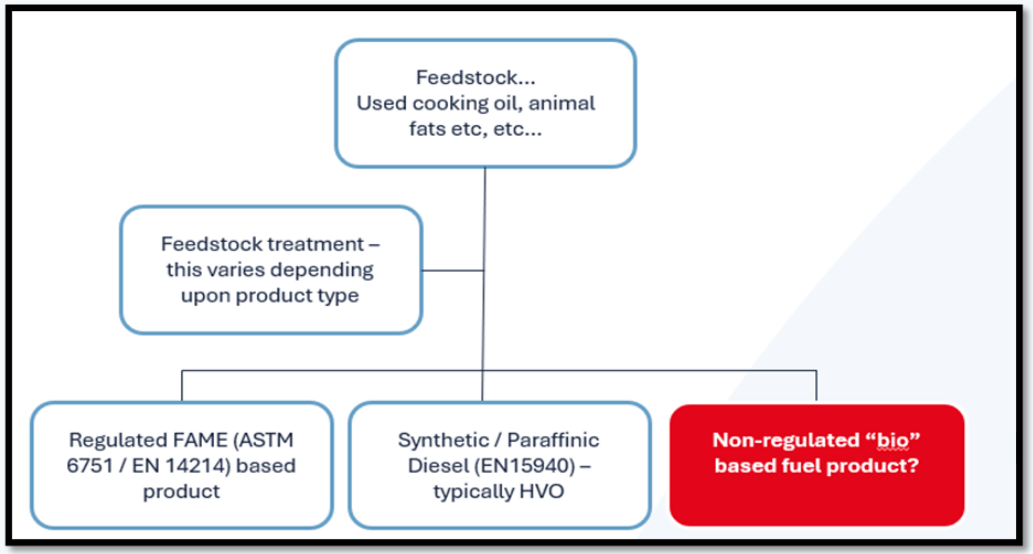
Your B element can meet regulatory requirements and be deemed as sustainable based on an appropriate accreditation scheme but **NOT** be regulated product from a quality perspective.

The two are very different boxes to tick!

With availability of regulated FAME being a tricky hurdle, there is a push from the industry to embrace alternatives. The NEN 7427-1 Standard is a prime example of an initiative to establish "alternative marine grades".

Sustainability **Quality**





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Feedstock Quality and Unregulated FAME

We also have FAME bottoms (also known as “Transesterification Residues” (TER), “Residue of FAME End Distillation” or “Bio-Heating Oil”.

FAME bottoms are the by-product of the FAME production process which typically consist of “heavy” byproducts. The compositions of said product can vary substantially depending on the management of the process, but they mostly consist of mono, di & tri glycerides, free fatty acids and unreacted catalyst.

Some OEM’s have referenced the presence of free fatty acids as being a key area of concern, and there is currently no overriding quality spec for FAME bottoms given how inconsistent they are.

So why would we use them???

Cost is a big factor. FAME bottoms are considerably cheaper than regulated FAME.

Availability is another big one. It is more readily available in certain major bunker ports and regions.

And… it has been cited as **eligible material for ISCC EU**.

ISCC
International Sustainability & Carbon Certification

Lists of material eligible for ISCC EU certification
(11 April 2023)

Transesterification residues (TER) *	Homogenous waste/residue from biodiesel production, after transesterification, mainly consisting of biodiesel, vegetable oil, fatty acids, methanol and water.	DK (Limited to the quantity normally produced by the manufacturer, defined as the average TER production in the 3 years preceding 22 June 2018. In the absence of documentation, at maximum 3% by weight of the amount of oil used for biodiesel production. Acceptance is limited until 01 July 2022. For further requirements, see Danish positive list.)

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Looking Ahead: Quality vs. Sustainability

The pressure will be placed on suppliers to provide **CONSISTENT**, **GOOD QUALITY**, **COMPLIANT** product. But quality and sustainability undoubtably linked but are still very different considerations!

It is likely that these similar conversations will also extend to Methanol and Ammonia in the future as using biofuel options will not always be enough to attain the necessary reduction in GHG emissions.

Sustainable?	Quality?
Is the feedstock accepted under the regulations? E.g., Food and/ or land waste?	What is your product? Is it FAME? HVO? Or something else?
Are you using an accepted accreditation body? E.g., ISCC EU or ISCC plus?	Is your FAME “regulated”? Is it in line with EN 14214 or ASTM D6751?
FAME will be used for both IMO and regional compliance. But different strategies will be needed to ensure you comply with both.	Is it “non- regulated” FAME? Do you know what the “B” element is? Has it been commercially agreed?

We also need to assess the quality of the base fuel!

The POS/ POC and COQ are both paramount; however, they don’t have the same use.

Just because the quality is good, this doesn’t guarantee the sustainability criteria.

And just because a product has been certified, this doesn’t guarantee its quality!

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Thank you! Any Questions?

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