

BLEND S OF BABASSU, PALM KERNEL AND COCONUT FAME WITH FOSSIL KEROSENE. Low carbon number methyl esters as a possible source for renewable jet fuel.

Table 1. Ester profiles, boiling point and distillation conditions

FAME's, % wt.	Boiling point, °C,	Babassu	Coconut	Palm kernel
		Biokerosene BBK100	Biokerosene CBK100	Biokerosene PBK100
Methyl caprylate, C8:0	193	13.27	17.3	3.6
Methyl caprate, C10:0	224	11.27	7	3.5
Methyl laurate, C12:0	273	69.26	66.7	90.8
Methyl myristate, C14:0	296	5.58	8.9	2.1
Methyl palmitate, C16:0	338	0.61	0.1	
Distillation Conditions				
Start point (°C) *		47	47	35
AET (°C)		273	273	259
End point (°C) *		124	114	113
AET (°C)		359	349	348

* 2.67 hPa, AET: Atmospheric Equivalent Temperature

Table 2. Properties of the blends of palm kernel biokerosene (PBK) and Jet A1 (K2).

Properties	PBK_0/K2_100	PBK_5/K2_95	PBK_10/K2_90	PBK_20/K2_80	Method	Equipment	Experimental error
Colour and aspect	Clear ^a	Clear ^a	Clear ^a	Clear ^a	ASTM D1500		±0.5 u.c.
Elemental composition							
C (%)	84.12	84.47	84.17	82.57		LECO CHN-600	±0.71
H (%)	14.67	14.24	13.97	14.11	ASTM D5291		±0.18
O (%)	1.22	1.29	1.86	3.32			
Density at 15 °C (kg/m ³)	791	802.3	805.5	811.8	ASTM D1298	Hydrometer	±0.3
Higher heating value (MJ/kg)	46.04	45.68	45.17	44.21	ASTM D240	LECO AC-300	±0.25
Lower heating value (MJ/kg)	42.9	42.64	42.18	41.19	ASTM D240 ^b	-	
Lower heating value (MJ/kg)	44.44	42.51	42.13	41.2	ASTM D4809		
Flash point (°C)	43	43.5	45	45.5	EN ISO 3679	Herzog 1088	±1.2
Freezing point (°C)	-66.53	-54.41	-44.56	-34.72		DSC	
Freezing point (°C)	-62	-60	-48.3	-41.5	ASTM D2386	M.Belenguer 528.01	±3.0
Smoke point (mm)	27.1	26.8	27.6	29.1	ASTM D1322	Analisis 47551	±0.5
Copper strip corrosion, class	1a	1a	1a	1a	ASTM D130	M. Belenguer 534.01	

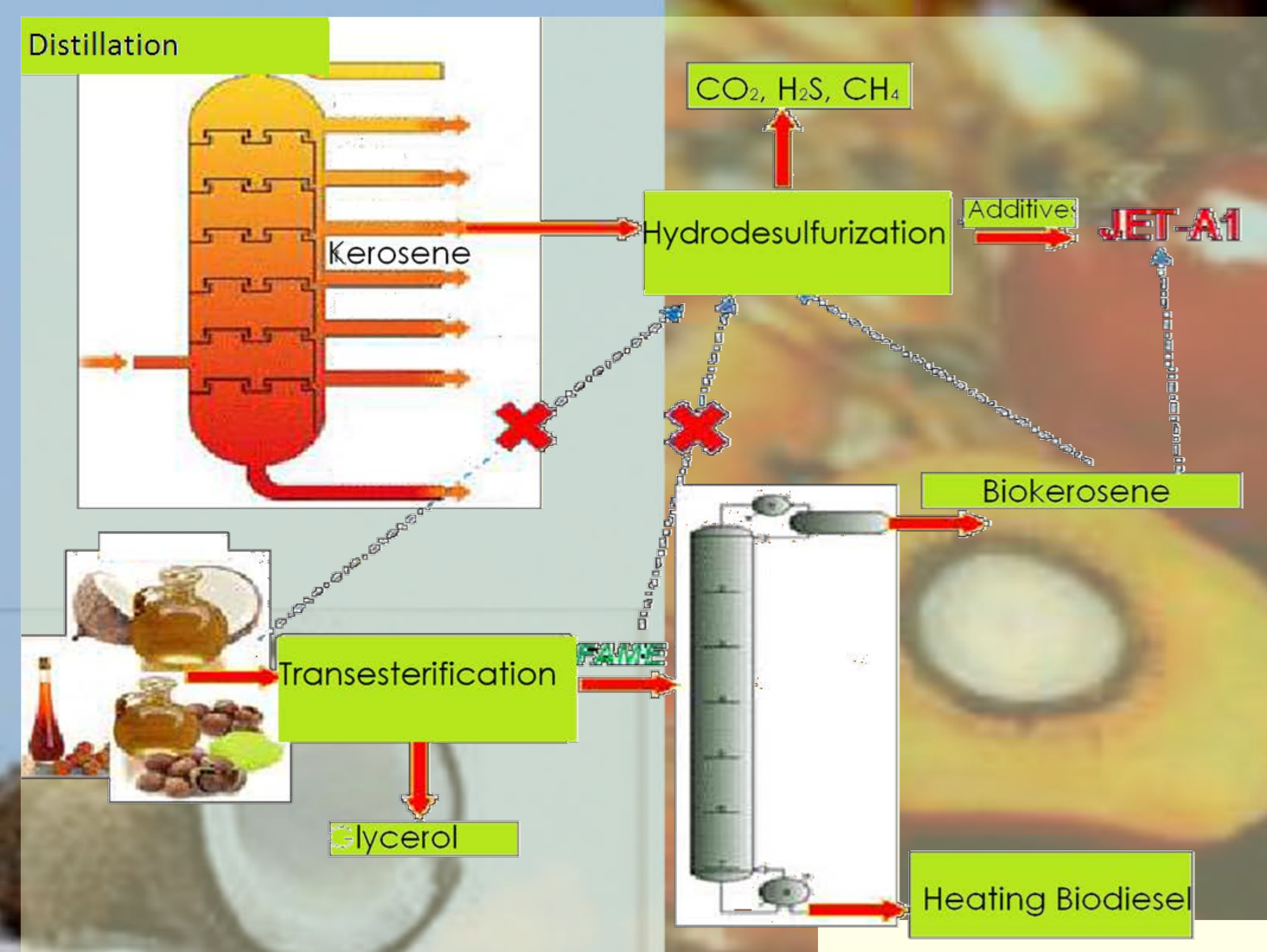
^a Clear and colourless. fuels.

^bASTM D240 modified for oxygenated fuels

$$Q_n \text{ (net, 25 °C)} = Q_g \text{ (gross, 25 °C)} - 213.65 H - 0.77 O - 0.88 N$$

	Babassu	Coconut	Palm kernel
Number of stages	8	8	9
Feed stage	6	7	8
Column diameter	610	610	610
Tray spacing	610	609	610

A simulation was ran in Pro 2, which suggest that eight to nine stages are needed for the vacuum distillation of the FAME.

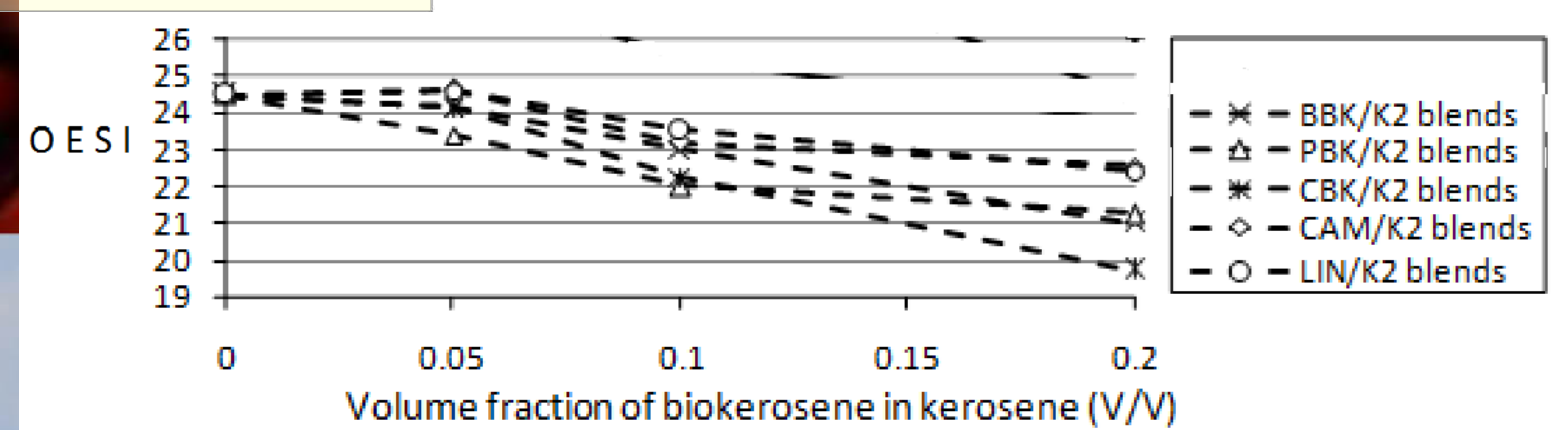


Tests were run under stress conditions with 5 different elastomer materials and the one used in the aircraft's seals.



Three different oils: babassu, coconut and palm kernel have been transesterified with methanol. The fatty acid methyl esters (FAME) have been subjected to vacuum fractional distillation, and the low boiling point fractions have been blended with fossil kerosene at three different proportions: 5, 10 and 20% vol.

Oxygenated fuels are proved to decrease the emissions regarding global warming such as: soot, which is discussed in this work, and CO2.



OESI: Oxygen Extended Sooting Index

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