

# UK Oil Heating & Biofuel Experience

Paul Rose – OFTEC Chief Executive

14<sup>th</sup> September 2016



The *energy* behind liquid fuels



# Agenda

- Who are OFTEC?
- UK Oil Heating Market
- Biofuel Experience
- Questions



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## Who are OFTEC?

- **Oil Firing Technical Association**
  - Trade Association
  - Operator of a Competent Person Registration Scheme



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- Biofuel Experience
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# UK Oil Heating Market

- **1.6 million domestic installations**
  - 1.1m in Great Britain
  - 0.5m in Republic of Ireland
- **0.5 million non-domestic installations**



# UK Oil Heating Market

- **Challenges**
  - Carbon reductions
  - Energy saving
  - Competing heat technologies
  - Government incentives  
(RHPP, Green Deal, RHI, etc.)



# UK Oil Heating Market

- **Positives**
  - Current fuel price
  - Reliability
  - UK housing stock
  - Hybrid system ready





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- **Biofuel Experience**
- Questions



## Biofuel Experience

- **Project Aims:**
  - To develop a reduced carbon liquid fuel
  - To develop a new fuel standard
  - To demonstrate reliability and ease of conversion on both new and existing oil installations



## Biofuel Experience

- **What is a Bio liquid Blend?**

A blend of:

% mineral fuel to BS 2869, and

% FAME (**F**atty **A**cid **M**ethyl **E**ster) to  
EN 14214



## Biofuel Experience

- **Phase 1 – Lab work**
  - Lab work commenced in 2007
  - Blends evaluated included:
    - 20 - 50% Bio / Kerosene
    - 20 - 50% Bio / Gas Oil



## Biofuel Experience

- **Phase 1 – Lab work**
  - Blends deemed appropriate for field trial included:
    - B30K (30% Bio / 70% Kerosene)
    - B50K (50% Bio / 50% Kerosene)
    - B30D (30% Bio / 70% Gas Oil)



# Biofuel Experience

## Phase 2 – Live Firing

- Domestic sites

No. Appliances	Fuel Blend
6	B30K
9	B50K

- Commercial sites

No. Appliances	Fuel Blend
3	B30K
2	B50K
5	B30D



## Biofuel Experience

- **Project Outcomes:**
  - OPS24 fuel standard was developed for B30K
  - No major burner operational issues
  - Appliance performance maintained
  - No storage issues were identified\*

\* Further work required



# Bio liquid Blends

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Other

CERTIFICATE OF QUALITY No. L31		
Vessel/Operation	Supplied Samples	Job No.
Product/Grade:	FAME KERO BLEND	Sample
Location:	Immingham	Date R
Sample Origin:	B30D	Date T

Test	Method	Unit
Appearance at 15 Deg C	* D 4178 (procedure 1)	%WT
Ash Content	IP4, ISO6245	kg/kg
Calorific Value - Net	D240	kJ/kg
Calorific Value - Gross	D240	kJ/kg
Calorific Value - Net	D240	kJ/kg
Calorific Value - Gross	D240	kJ/kg
Cold Filter Plugging Point	IP309, EN116	Deg C
Cloud Point	IP219, ISO3015	Deg C
Char Value	IP10	mg/kg
Corrosion Carbon Residue (10%bottoms)	IP13, ISO6615	%WT
Copper Corrosion	IP154, ISO2160	Class
Density @15°C	IP365, ISO12185	kg/Ltr
% Recovered @ 200 Deg C	IP 123, ISO 3405	%Vol
% Recovered @ 250 Deg C	IP 123, ISO 3405	%Vol
% Recovered @ 350 Deg C	IP 123, ISO 3405	%Vol
Final Boiling point	IP 123, ISO 3405	Deg C
Flash Point - Pensky Martens (Method A)	IP34 (A), ISO 2719	Deg C
Iodine Value	EN 14111	g I <sub>2</sub> /g
Kinematic Viscosity @40 Deg C	IP71, ISO3104	cSt
Nitrogen Content	* D4629	mg/kg
Particulate matter	IP415, ISO15167	mg/Ltr
Pour Point	IP 15, ISO3016	Deg C
Smoke Point	IP57, ISO3014	mm
Strong Acid Number	IP138, ISO6618	mg KOH/g
Sulphur content (EDXRF)	IP338, ISO 8754	%Wt
Total Acid Number	IP138, ISO6618	mg KOH/g
Water Content	* IP 438, EN ISO 12937	%Wt
Lubricity (Average Wear Scar)	IP450	um
Modified Rancimat	* EN 15751	Hours
FAME Content	* EN 14078 Mod	%Vol

Notes:  
1. List issue of test methods used unless stated otherwise.  
2. Please refer to ASTM D3244-07 and to IP method 367 Appendix E for utilization of test data for conformance with specifications.  
3. Inspectorate International Ltd accept no liability with respect to samples supplied  
4. denotes test is outside laboratories scope of UKAS accreditation

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Richard Byth  
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B30D

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www.inspectorate.com

Other

CERTIFICATE OF QUALITY No. L3		
Vessel/Operation	Supplied Samples	Job No.
Product/Grade:	FAME KERO BLEND	Sample
Location:	Immingham	Date R
Sample Origin:	B50K06050320	Date T

Test	Method	Unit
Appearance at 15 Deg C	* D 4178 (procedure 1)	%WT
Ash Content	IP4, ISO6245	kg/kg
Calorific Value - Net	D240	kJ/kg
Calorific Value - Gross	D240	kJ/kg
Calorific Value - Net	D240	kJ/kg
Calorific Value - Gross	D240	kJ/kg
Cold Filter Plugging Point	IP309, EN116	Deg C
Cloud Point	IP219, ISO3015	Deg C
Char Value	IP10	mg/kg
Corrosion Carbon Residue (10%bottoms)	IP13, ISO6615	%WT
Copper Corrosion	IP154, ISO2160	Class
Density @15°C	IP365, ISO12185	kg/Ltr
% Recovered @ 200 Deg C	IP 123, ISO 3405	%Vol
% Recovered @ 250 Deg C	IP 123, ISO 3405	%Vol
% Recovered @ 350 Deg C	IP 123, ISO 3405	%Vol
Final Boiling point	IP 123, ISO 3405	Deg C
Flash Point - Pensky Martens (Method A)	IP34 (A), ISO 2719	Deg C
Iodine Value	EN 14111	g I <sub>2</sub> /g
Kinematic Viscosity @40 Deg C	IP71, ISO3104	cSt
Nitrogen Content	* D4629	mg/kg
Particulate matter	IP415, ISO15167	mg/Ltr
Pour Point	IP 15, ISO3016	Deg C
Smoke Point	IP57, ISO3014	mm
Strong Acid Number	IP138, ISO6618	mg KOH/g
Sulphur content (EDXRF)	IP338, ISO 8754	%Wt
Total Acid Number	IP138, ISO6618	mg KOH/g
Water Content	* IP 438, EN ISO 12937	%Wt
Lubricity (Average Wear Scar)	IP450	um
Modified Rancimat	* EN 15751	Hours
FAME Content	* EN 14078 Mod	%Vol

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Other

CERTIFICATE OF QUALITY No. L31228			
Vessel/Operation	Supplied Samples	Job Number:	IM 28759
Product/Grade:	FAME KERO BLEND	Sample Number:	48197
Location:	Immingham	Date Received:	23/11/2009
Sample Origin:	B30K	Date Tested:	23-30/11/09

Test	Method	Unit	Result
Appearance at 15 Deg C	* D 4178 (procedure 1)	%WT	Clear & Bright
Ash Content	IP4, ISO6245	%WT	<0.001
Calorific Value - Net	D240	kJ/kg	9805
Calorific Value - Gross	D240	kJ/kg	10494
Calorific Value - Net	D240	kJ/kg	41.05
Calorific Value - Gross	D240	kJ/kg	43.94
Cold Filter Plugging Point	IP309, EN116	Deg C	-17
Cloud Point	IP219, ISO3015	Deg C	-6
Char Value	IP10	mg/kg	98
Corrosion Carbon Residue (10%bottoms)	IP13, ISO6615	%WT	0.02
Copper Corrosion	IP154, ISO2160	Class	1a
Density @15°C	IP365, ISO12185	kg/Ltr	0.8269
% Recovered @ 200 Deg C	IP 123, ISO 3405	%Vol	39.5
% Recovered @ 250 Deg C	IP 123, ISO 3405	%Vol	62.5
% Recovered @ 350 Deg C	IP 123, ISO 3405	%Vol	97.6
Final Boiling point	IP 123, ISO 3405	Deg C	344.2
Flash Point - Pensky Martens (Method A)	IP34 (A), ISO 2719	Deg C	45.5
Iodine Value	EN 14111	g I <sub>2</sub> /g	25
Kinematic Viscosity @40 Deg C	IP71, ISO3104	cSt	1.739
Nitrogen Content	* D4629	mg/kg	11.7
Particulate matter	IP415, ISO15167	mg/Ltr	2
Pour Point	IP 15, ISO3016	Deg C	-21
Smoke Point	IP57, ISO3014	mm	27.0
Strong Acid Number	IP138, ISO6618	mg KOH/g	16
Sulphur content (EDXRF)	IP338, ISO 8754	%Wt	0.014
Total Acid Number	IP138, ISO6618	mg KOH/g	0.13
Water Content	* IP 438, EN ISO 12937	%Wt	100
Lubricity (Average Wear Scar)	IP450	um	308
Modified Rancimat	* EN 15751	Hours	36.0
FAME Content	* EN 14078 Mod	%Vol	31.4

Notes:  
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B30K





# Bio liquid Blends

## OFTEC Standard OPS 24

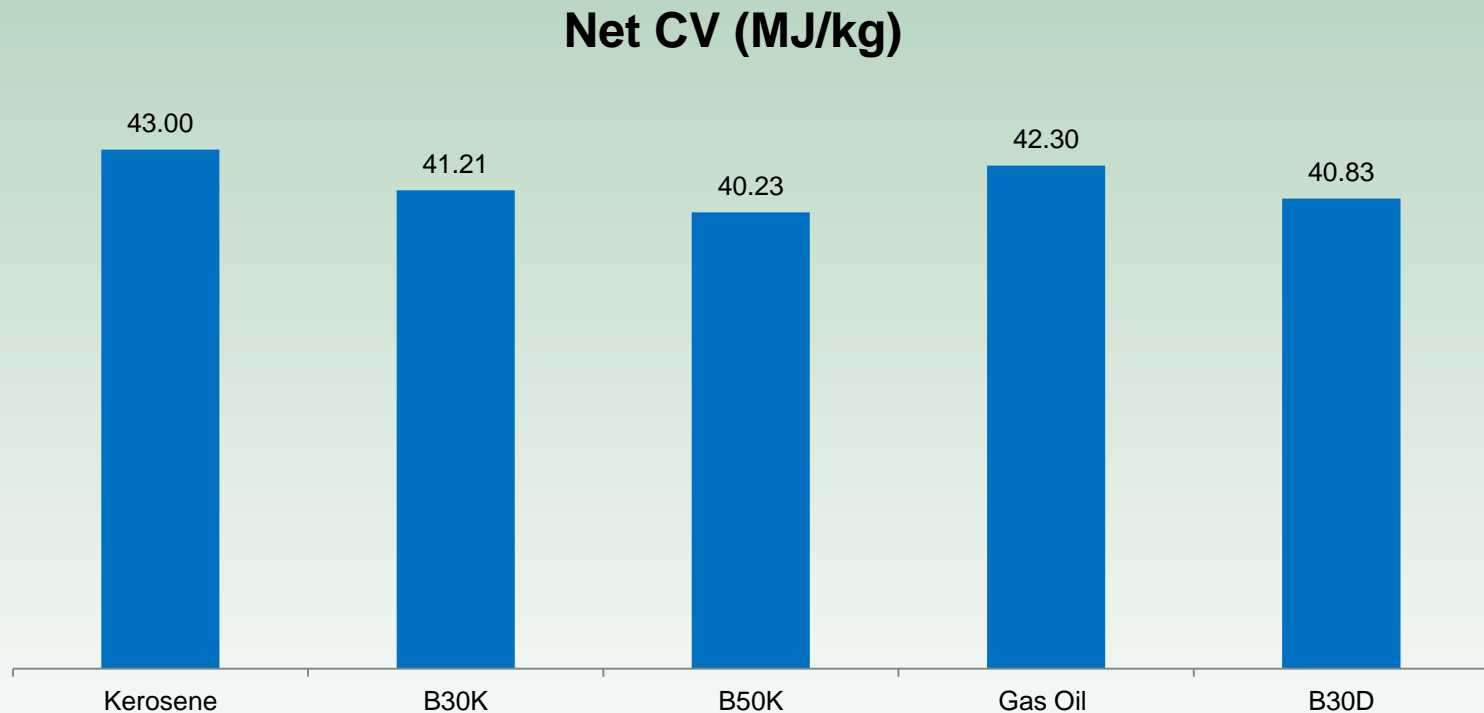
### Characteristics of B30 K

Test	Units	prOPS 24 Min	prOPS 24 Max	Standard
Appearance	None	Clear & Bright		D 1476
FAME Content	(%)	27	33	EN 14078 Mod
Ash Content	(% Wt)	<0.001		IP 4, ISO 6245
Net CV	(MJ/kg)	40		D240
Gross CV	(MJ/kg)		45	D240
CFPP	(Deg C)		-12	IP 309, EN116
Cloud Point	(Deg C)		-6	IP 219, ISO 3015
Copper Corrosion (3 hrs @ 50 deg C)	Class	1a		IP 54, ISO 2160
Char Value	mg/kg	70	120	IP 10
Conrad Carbon Residue (10% bottoms)	(% Wt)	0.01	0.06	IP 13, ISO 6615
Density @ 15C	(kg/m3)	0.81	0.84	IP 365, ISO 12185
% Recovered @ 200 deg C	% Vol	37	44	IP 123, ISO 3405
% Recovered @ 250 deg C	% Vol	60	68	IP 123, ISO 3405
% Recovered @ 300 deg C	% Vol	96	99	IP 123, ISO 3405
Final Boiling Point	(Deg C)	340	345	IP 123, ISO 3405
Flash Point	(Deg C)	47	50	Pensky Martens (Method A) IP 34(a), ISO 2719
Iodine Value	(g I2/g)	20	35	EN 14111
Kinematic Viscosity @ 40 C	cSt	1.65	1.75	IP 71, ISO 3104
Nitrogen Content	mg/kg	5	20	D 4629
Particulate Matter	mg/ltr	0	13	IP 415, ISO 3104
Pour Point	Deg C	-14	-22	IP 15, ISO 3016
Smoke Point	Mm	20	32	IP 57, ISO 3014
Strong Acid Number	mg KOH/g		Nil	IP139, ISO 6618
Sulphur Content	% Wt	0.01	0.03	(EDXRF) IP 336, ISO 8745
Total Acid Number	mg KOH/g	0.01	0.18	IP139, ISO 6618
Water Content	mg/kg	70	150	IP 438, EN ISO 12937
Lubricity (Average Wear Scar)	Um	170	340	IP 450
Oxidation Stability	Hrs	25		Modified Rancimat EN 15751



## Bio liquid Blends

# Fuel Characteristics Analysis

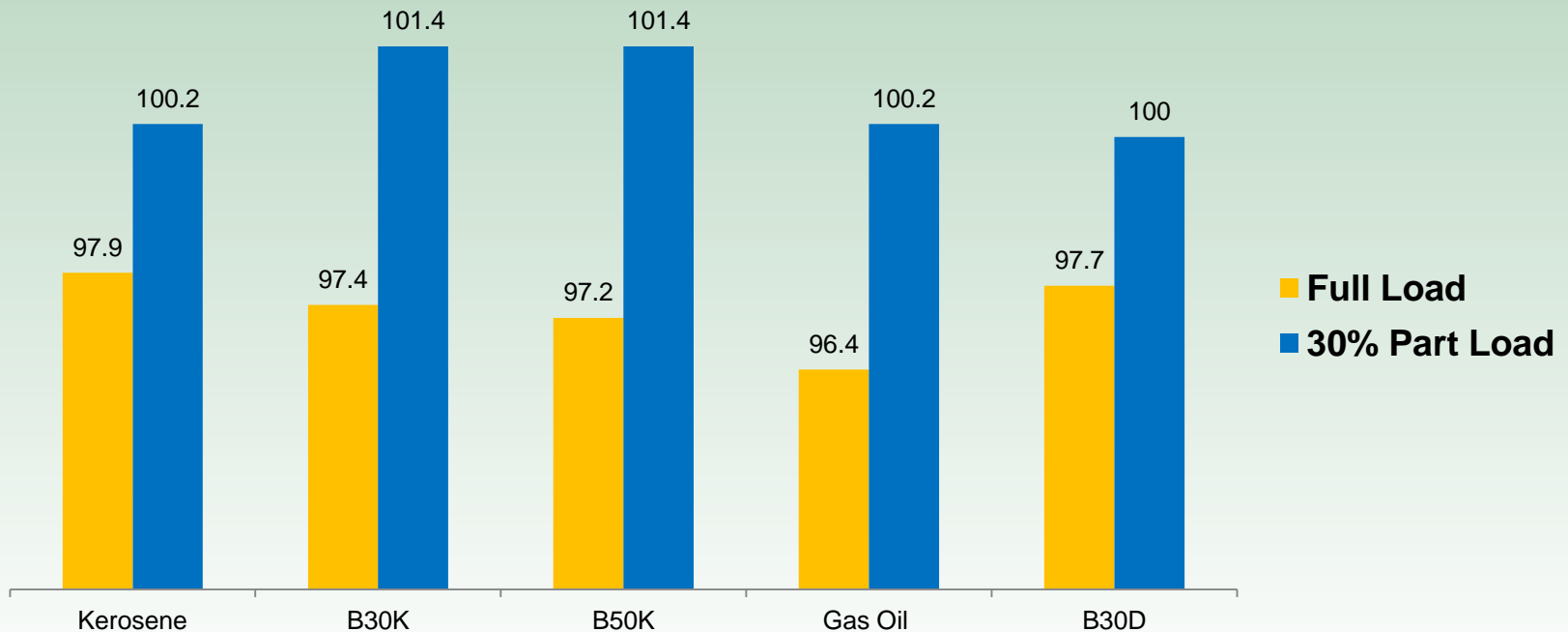




# Bio liquid Blends

## Boiler Efficiency Analysis

% - Boiler Efficiency Regulations 1993





## Equipment Conversion

- Consider the condition of the oil tank
- Replacement of oil ancillaries with natural rubber seals
  - Transfer pumps, isolation taps, fire valves, filters, flexible oil lines, etc.
- Burner conversion, or burner replacement



## Fuel Storage & Supply

- Management of oil storage is key
- Bio liquid blends are “Hygroscopic”
  - Attracts moisture
  - Promotes a detergent effect
- Increase fuel turnover
- Monitoring required following conversion



# Fuel Storage & Supply

- Additional considerations on fuel change
  - Kerosene blends have a flash point below 56°C
  - Classified as a “Flammable Liquid”
    - Metal storage tanks
    - Intrinsically safe electrical equipment
    - Additional financial investment!

# Combustion

- **Findings from the trials:**
  - 23 / 25 sites operated with no issues

Image 8. Gas Oil C/Head Condition



Source: Clean Energy Consultancy Ltd

Image 9. FAME B50/Gas Oil C/Head





# Combustion

- **Findings from the trials:**
  - 2 sites suffered sooting of the blast tube
- **Simple Remedy:**
  - Reduce the nozzle size
  - Increase the pump pressure





## Maintenance

- Trials suggest no more maintenance than with 100% mineral fuels. However, following conversion we recommend that:
  - combustion is check frequently
  - oil filters are checked/replaced frequently
  - records are kept for reference



# Agenda

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- Biofuel Experience
- **Questions**



# Questions

## Future Contact Information:



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