

SELLING GTL

SOME OBSERVATIONS ON THE MARKETING OF GTL PRODUCTS

DUNCAN SEDDON & ASSOCIATES PTY. LTD.

116 KOORNALLA CRESCENT

MOUNT ELIZA

VICTORIA 3930

AUSTRALIA

(T) 61-3-9787-4793

(F) 61-3-9775-3385

E-mail: seddon@ozemail.com.au

www.duncanseddon.com



SELLING PREMIUM GTL PRODUCTS INTO HIGH VALUE MARKETS

- Retail forecourts for fuels
- Premium blend-stock markets
- Chemical markets

- Introduction
- Gasoline/petrol via methanol
- LPG via methanol
- Naphtha via FT process
- Diesel via FT process

REFINER/DISTRIBUTERS MOTTO

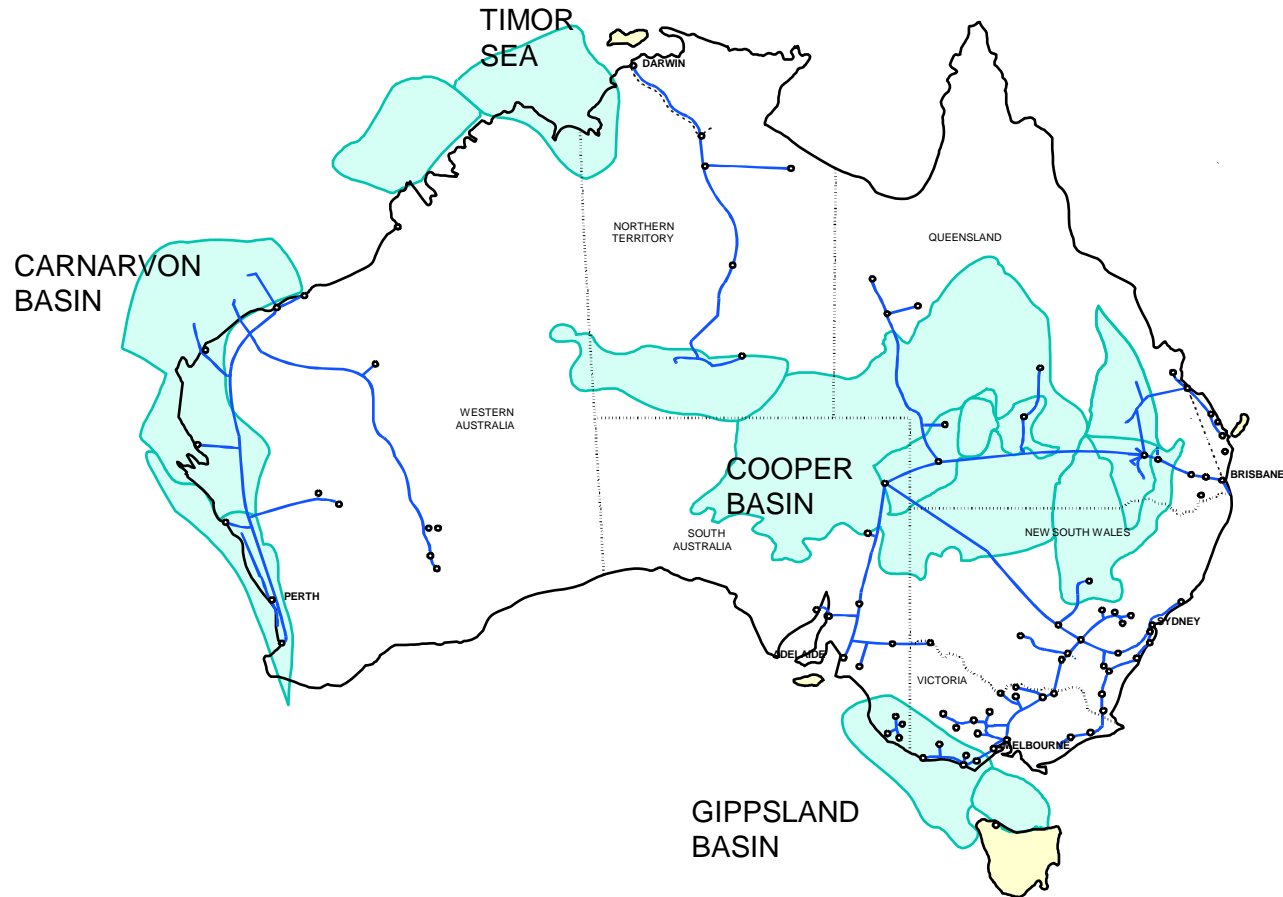
NEVER

SEE AN OPPORTUNITY IF WITH A LITTLE

EFFORT YOU CAN FIND PROBLEMS AND DIFFICULTIES

AUSTALIAN GAS DISTRIBUTION SYSTEM

Source: AGA



WORLD-WIDE FUEL CHARTER

REPRESENTED ORGANISATIONS

- **ACEA**: European Automobile Manufacturers Association: www.acea.be
- **ALLIANCE**: Alliance of Automobile Manufacturers: www.autoalliance.org
- **EMA**: Engine Manufacturers Association: www.engine-manufacturers.org
- **JAMA**: Japan Automobile Manufacturers Association: www.japanauto.com

WWFC first issued 1998:

WWFC Revision September 2006

WWFC (and Euro) UNLEADED GASOLINE key parameters

CATEGORY	1	2 (Euro-3)	3 (Euro-4)	4
91 RON	91.0 RON, 82.0 MON	91.0 RON, 82.5 MON	91.0 RON, 82.5 MON	91.0 RON, 82.5 MON
95 RON	95.0 RON, 85.0 MON	95.0 RON, 85.0 MON	95.0 RON, 85.0 MON	95.0 RON, 85.0 MON
98 RON	98.0 RON, 88.0 MON	98.0 RON, 88.0 MON	98.0 RON, 88.0 MON	98.0 RON, 88.0 MON
SULPHUR (ppm)	1,000	150 (150)	30 (50)	<10
OXYGEN (max, wt%)	2.7	2.7 (2.7)	2.7	2.7
OLEFINS (max, vol%)		20.0 (18.0)	10.0	10.0
AROMATICS (vol%)	50.0	40.0 (42.0)	35.0 (35.0)	35.0
BENZENE (vol%)	5.0	2.5 (2.7)	1.0	1.0
DENSITY (min, g/mL)	0.715	0.715	0.715	0.715
DENSITY (max, g/mL)	0.780	0.770	0.770	0.770
Metal (Fe, Mn, Pb other)		non detectable	non detectable	non detectable
P and Si		non detectable	non detectable	non detectable
Oxidation Stability (min)	360	480	480	480
Fuel Injector (#1, %loss)	10	5	5	5
Particulate size dist.			18/16/13	18/16/13
Intake Valve (ASTM D5500) (mg/valve)		100	50	50
Combustion deposits (ASTM D6201) (% fuel)		140	140	140

PROPERTIES OF MTG GASOLINE

RVP (bar)	0.58
RON	92
MON	83
s.g.	0.7306
Distillation (wt%, TBP)	
IBP (°C)	-12.2
10% (°C)	28.3
30% (°C)	62.2
50% (°C)	101.1
70% (°C)	140
90% (°C)	170.6
95% (°C)	188.3
FBP (°C)	206.7

Component	Vol%	Wt%
Sulphur	nil	Nil
Paraffins	53.2	47.8
Olefins	11.9	11.3
Naphthenes	8.1	8.6
Aromatics (total)	26.8	32.2
Benzene	0.3	0.4
Durene	1.7	2.0

GOOD STUFF

SO, WHATS WRONG WITH IT?

1. Where is the DIESEL !

Deliveries to retail forecourts are in multi-tanked vehicles
Require all liquid fuels to be delivered in ONE run

- Project requires a diesel source

2. We would want RON 95 !

Many areas (EU) have 95 RON as the lowest grade
Other areas see 95 as growing faster than 92 RON

- Issue for a 20 year project

3. There is no ETHANOL in it !

Many jurisdictions require bio-fuel blends

- Need to source ethanol
- Issues of blends meeting standards

GTL via Methanol – LPG fraction

LPG		ISO 8973	ALPG	
	Tb(K)	kPa (40)	MON	Vol%
Ethane	184.60	5611	95.40	0.00
Propylene	225.50	1661	83.90	1.80
Propane	231.10	1352	95.40	30.73
Isobutane	261.40	531	97.20	53.55
Butylene	266.20	467	75.80	4.50
n-Butane	272.70	377	89.00	8.41
Isopentane	301.00	151	89.00	1.00
Other C5s (as pentane)	309.20	115	89.00	0.00
				100.00

SO, WHATS WRONG WITH IT?

1. DOES NOT MEET AUTOGAS STANDARD !

Autogas is mainly propane and propane component dominant in cold climates.

- Project requires to fractionate LPG

2. EXCESS BUTANE DIFFICULT TO DISPOSE

(A) Sell to refiner for making alkylate

- SEE REFINERS MOTTO!

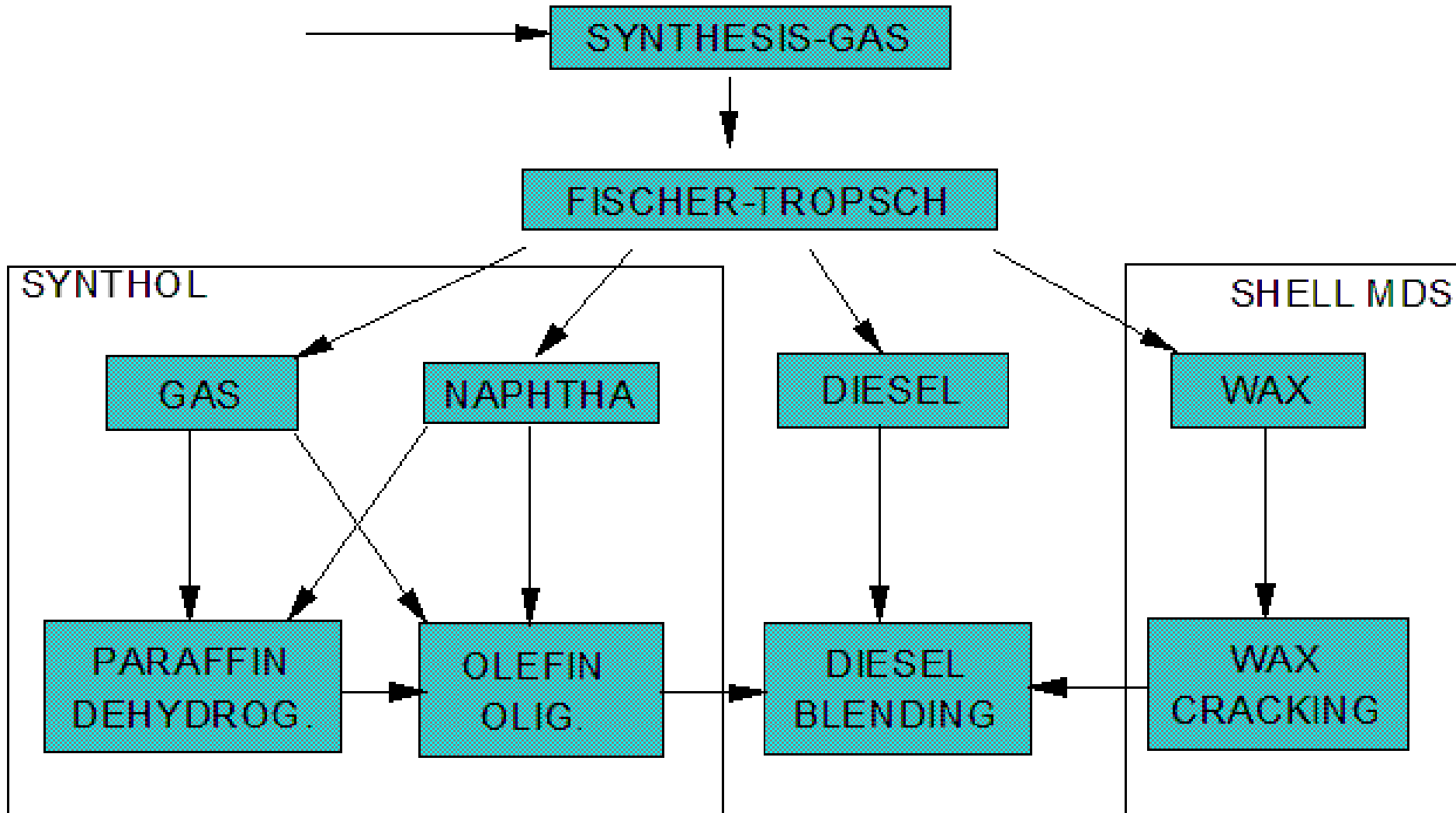
(B) Import additional propane to achieve auto-gas grade

(C) Sell to butane to importer with excess propane

(D) Market butane as heating fuel

LPG marketers are NOT refiners and see OPPORTUNITIES!

FISCHER –TROPSCH PROCESS TO NAPHTHA AND DIESEL



FT NAPHTHA – STRAIGHT RUN

Property	Method	Units	Value
Boiling Range		Deg. C	23.7 - 190.6
Gravity	ASTM D1298	Deg. API	70.1
Specific Gravity	ASTM D1298	60/60 F	0.7018
Sulphur		ppm	<1
RON	ASTM D2699	Clear	20.9

SO, WHATS WRONG WITH IT?

1. **LOUSY GASOLINE/PETROL!**

Requires extensive isomerisation and blending
- other markets than refining

2. **POTENTIAL PETROCHEM CRACKER FEED**

Distant and specialised market (relative to fuels)
- Gas owners difficulty in UNDERSTANDING MARKET
- Sale of large parcels (20,000t ~180,000bbl)

3. **SOLVENTS**

Requires distillation
- small specialised markets (high value)

PETCHEM marketers are NOT refiners and see OPPORTUNITIES!

WWFC (and Euro) DIESEL key parameters

CATEGORY	1	2 (Euro-3)	3 (Euro-4)	4
Cetane Number	48	51(51)	53	55
Cetane Index	45	48	51	52
Viscosity (mm ² /s)	2.0 - 4.5	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0
SULPHUR (ppm)	2,000	300 (350)	50 (50)	10
T90		340	320	320
T95	370	355	340	340
FBP (C)		365	350	350
AROMATICS (wt%)		25	15	15
PNA (wt%)		5 (11)	2.0	2.0
Carbon Residue (wt%)	0.30	0.30	0.20	0.20
DENSITY (min, g/mL)	0.820	0.820	0.820	0.820
DENSITY (max, g/mL)	0.860	0.850 (0.845)	0.840	0.840
METALS (Zn, Cu, Mn, Ca, Na, other)		non detectable	non detectable	non detectable
Flash Point (min C)	55	55	55	55
Ethanol/methanol	non detectable	non detectable	non detectable	non detectable
Water (mg/kg)	500	200	200	200
FAME (%vol)	5%	5%	5%	non detectable
Particulates (mg/kg)	10	10	10	10
Particulate size dist.		18/16/13	18/16/13	18/16/13

WWFC CATEGORY 3

PROPERTY	UNIT	MINIMUM	MAXIMUM	ASTM/EN
Cetane Number		53.0		D 613
Cetane Index (a)		53.0		D 4737
Density @ 15C	kg/cm	820	840	D 4052
Viscosity @ 40C	cSt	2.0	4.0	D 445
Sulphur content	mg/kg		50	D 5435/2622
Metals (Zn, Cu, Mn, Ca, Na, other)(b)	g/L	0		
Total aromatics content	% mass		20	D 5186
PAH content	% mass		3.0	D 2425
T (90)	C		320	D 86
T(95)	C		340	D 86
Final boiling point	C		350	D 86
Flash point	C	55		D 93
Carbon residue	% mass		0.20	D 4530
CFPP or LTFT or CP (c)				D 6371/4539/2500
Water content	mg/kg		200	D 6304
Oxidation stability Method 1	g/cm		25	D 2274
Foam volume	mL		100	
Foam vanishing time	sec		15	
Biological growth			Zero	
FAME content			5	EN 14078
Ethanol/methanol	%vol.		not detected	D 4515
Total acid number	mg KOH/g		0.08	D 664
Ferrous corrosion			light rusting	D 665
Copper corrosion	merit		Class 1	D 130
Ash content	% mass		0.01	D 482
Particulate contamination	mg/kg		10	D 5452
Particulate size distribution		18/16/13	per ISO 4406	
Appearance		Clear and bright	D 4176	
Injector cleanliness	% air flow loss	85		
Lubricity (HFRR wear scar @ 60C)	micron		400	D 6079
Notes				
(a) 51.0 if cetane improvers are used				
(b) not detectable or below the minimum level for quantitation. No intentional addition of metal based additives.				
(c) must be equal or below expected ambient. CFPP minus CP <10C				

ISOMERISED DIESEL

(FROM US 2004231237)

Analysis	Units	Method	GTL
Colour		D1500	<1
Appearance	Caltex	CMM76	1
Density (20)	kg/l	D4052	0.764
Density (15)	kg/l	D4052	0.768
IBP	C.	D86	150
5%	C.		173
10%	C.		178
20%	C.		192
30%	C.		208
40%	C.		226
50%	C.		244
60%	C.		263
70%	C.		281
80%	C.		297
90%	C.		315
95%	C.		326
FBP	C.		334
Recovery	vol%		98
Residue	vol%		1
Flash Pt	C.	D93	59
Viscosity	cSt@40C	D445	1.97
CFPP	C	IP 309	-20
Ash	mass%	D482	<0.01
Sediment	mass%	D473	<0.01
Water	vol%	D1744	0.003
Carbon Residue	mass%	D524	0.02
Sulphur	mass%	D5453	0.0001
Copper corrosion		D130	1b
Acid number	mgKOH/g	D664	0.001
Cetane		D613	71
Elec. Conductivity	pS/m		0
O2 stabiity	mg/100mL	D2274	0.21
Bromine number	gBr/100	IP 129	0.8
Nitrogen	mg/l	D5291	<1
HHV	MJ/kg		47.015
Hydrogen	wt%		14.98
LHV	MJ/kg		43.836
HFRR	micron.m	D6079	651
SLBOCLE	g	D6078	2800

GOOD STUFF EH?

SO, WHATS WRONG WITH IT?

1. DOES NOT MEET DIESEL STANDARDS ON DENSITY!

Requires extensive blending

- Sourcing suitable blend-stock an issue – high aromatic but low sulphur blend stock required.
- Exemptions from standard required (year by year basis)
- Opposition from truckers

2. JURISDICTIONS IN NO HURRY TO MAKE SPECIAL CASE.

- Strong opposition from truckers to change density spec.
- OEMs neutral at best

3. There is no BIO-DIESEL in it !

Many jurisdictions require bio-diesel blends

- Need to source biodiesel
- Issues of blends meeting standards
- Opposition of OEMs to FAME

THANK YOU