

SECTION 8

PRODUCTS: PROJECTED MARKETABILITY AND CHARACTERISTICS

The adaptability of the higher boiling liquid Oil/Gas plant fuel products to current U.S. usage patterns remains to be demonstrated by functional product testing. They are valuable fuel products having some characteristics that differ from similar products made by crude oil refining. A likely future event is that coal conversion product characteristics will be reconciled with crude oil-based products, possibly by modification of liquid fuel-consuming equipment.

The projected characteristics of the products from the Oil/Gas complex were analyzed in detail and probable marketing outlets were defined for these products. Current judgments of product marketability are presented in subsection 8.1. In support of these judgments, projections of product characteristics were developed; they are given in subsection 8.2.

8.1 MARKETABILITY CONSIDERATIONS

The products, individually described in this section, are generally similar to petroleum products presently marketed in the United States. However, there are some property differences between coal and crude oil derived products.

Comments regarding marketability are presented for the following products:

- SNG
- Propane and butane LPG
- Naphtha
- Fuel oil
- Sulfur
- Ammonia

8.1.1 SNG

This product would be sold as pipeline gas for either industrial or residential use.

8.1.2 PROPANE AND BUTANE LPG

These products would be marketable through normal LPG market channels for industrial, agricultural, and residential uses. Other potential markets include:

- Ethylene feedstock.
- Butane, which could be marketed to refiners as a gasoline vapor pressure control additive for northern winter markets.

8.1.3 NAPHTHA

The primary value of this feedstock is as a reformer feed blending component.

The SRC-derived naphtha has a high naphthene content making it suitable for upgrading to lead-free precursor for gasoline through reforming. Heteroatom content is low. It should be marketable through conventional channels; see comments in subsection 5.7.

8.1.4 FUEL OIL

This heavy fuel oil should be marketable to utilities.

Its sulfur content is sufficiently low to allow sale in most areas of the United States. Also, its viscosity, pour point, flash point, and ash content meet No. 6 Residual Fuel Oil specifications.

A functional product testing program for a related product, solid SRC, is in progress using a 22 MW boiler installation. The results of this program should provide information regarding such factors as excess air requirements and preferred burner design. This information should be used to provide further insight into the marketability of the Oil/Gas fuel oil.

The compatibility of Oil/Gas fuel oil with petroleum-derived fuel oil is being studied, and the results of those studies will determine the ability to blend the two products in a consumer storage tanks/handling system.

Additional comments are presented in report subsection 5.5.1.

8.2 PRODUCT CHARACTERISTICS

Projected characteristics for the products follow.

8.2.1 SUBSTITUTE NATURAL GAS (SNG)

Projected SNG composition and characteristics are:

<u>Composition, dry basis</u>	<u>Vol %</u>
Methane	84.27
Ethane	8.61
Propane	1.69
Nitrogen	3.34
Hydrogen	1.54
Carbon monoxide	0.09
Carbon dioxide	<u>0.46</u>
Total	100.00

Higher heating value, Btu/SCF 1,050

American Gas Association Interchangeability Indices for the Oil/Gas SNG are given below where they are compared with several types of base-load gas.

Index	Base-Load Gas			Oil/Gas Plant SNG
	High Heating Value Natural Gas	High Methane Natural Gas	High Inert Natural Gas	
Lifting index				
Preferable	under 1.0	under 1.0	under 1.0	-
Objectionable	above 1.12	above 1.06	above 1.03	-
Oil/Gas SNG	-	-	-	1.01
Flash-back index				
Preferable	under 1.18	under 1.18	under 1.18	-
Objectionable	above 1.2	above 1.2	above 1.2	-
Oil/Gas SNG	-	-	-	1.05
Yellow-tip index				
Preferable	above 1.0	above 1.0	above 1.0	-
Objectionable	under 0.7	under 0.8	under 0.9	-
Oil/Gas SNG	-	-	-	0.95

Reference: AGA Research Bulletin, Number 36.

Explanation: If a substitute gas index falls within the preferred range, the substitute gas is interchangeable with the base-load gas. If a substitute gas index is beyond the preferred value but within the objectionable range, adjustments may be made to burners to allow its use. In all cases, Oil/Gas SNG indexes are below the objectionable value; therefore, the SNG may be used as a substitute gas with burner adjustment. Furthermore, slight adjustments of the methanation unit operation will produce a gas with indexes within the preferred range.

<u>Characteristic</u>	<u>Value</u>	<u>Test Reference</u>
Hydrocarbon dewpoint, °F	-36 @ 1,000 psig	ASTM D1142-58
Water dewpoint, °F	10 @ 1,000 psia	ASTM D1142-58
Wobbe number	1,350	(calculated)
Weaver flame speed	14.6	(calculated)

(Note: Heat content and dewpoints can be adjusted to meet consumer specification.)

8.2.2 PROPANE AND BUTANE LPG

<u>Composition, mol %</u>	<u>Propane LPG</u>	<u>Butane LPG</u>	<u>Test Reference</u>
Ethane	3.03	-	
Propane	96.08	23.93	
Butane	0.89	75.11	
Pentane and higher	-	0.96	
Sulfur	nil	nil	ASTM D1266
Specific gravity 60°F, liquid	0.503	0.568	ASTM D1657 or 2598
Vapor pressure @ 100°F, psig	210	70	ASTM D1267 or 2598
Butane and heavier %, max	<2.5	-	ASTM D2163
Pentanes and heavier %, max	-	<2.0	ASTM D2163
Moisture content	pass	pass	NGPSA standard tests
Corrosion, copper strip	No. 1	No. 1	ASTM D1838

8.2.3 NAPHTHA

The naphtha is a hydrotreated, stabilized light cut of coal derived liquid products. Its projected characteristics are:

<u>Characteristic</u>	<u>Value</u>	<u>Test Reference</u>
Gravity, °API	50	ASTM D287
Distillation		
<u>Vol %</u>	<u>°F</u>	
IBP	155	
10	210	
30	270	
50	300	
70	320	
90	345	
EP	380	
Viscosity, CS	1.7 @ 100°F	ASTM D445
Sulfur, ppm	1 (max)	ASTM D1266
Nitrogen, ppm	5 (max)	ASTM D3228
Higher heating value Btu/lb	19,900	ASTM D2382
UOP characterization factor	11.8	

Composition - General: Naphthenes-high
 Aromatic-high

} PONA analysis

8.2.4 FUEL OIL

Fuel Oil is composed of a blend of the remainder of the net liquefaction products; projected properties are:

<u>Characteristic</u>	<u>Value</u>	<u>Test Reference</u>
Gravity, °API	-8.2	ASTM D287
Distillation		ASTM D1160 (calculated)
<u>Vol %</u> <u>°F</u>		
10 460		
30 660		
50 875		
70 1,110		
90 1,450		
Viscosity, SSF	45 @ 122°F	ASTM D445
Sulfur, wt %	0.4	ASTM D129
Nitrogen, wt %	1.2	ASTM D3228
Ash, wt %, max	0.1	ASTM D482
Pour point, °F	50	ASTM D97
Higher heating value, Btu/lb	17,200	ASTM D2382
Flash point, °F	Above 150	ASTM D93
Conradson carbon	25 (estimated)	ASTM D189
UPO characterization factor	10.1	

8.2.5 AMMONIA

Ammonia is separated from process waste water by a proprietary process. Predicted characteristics are:

Ammonia content	99.99 wt%
Color	colorless
Water	100 ppm, max
Oils	2 ppm
Carbon dioxide	3 ppm
Hydrogen sulfide	nondetectable
Chlorine	2 ppm
Iron carbonyl	3 ppm
Noncondensables	0.1 cc/g

8.2.6 SULFUR

Sulfur is produced in several conventional-type units that typically give the following product analyses:

Sulfur	99.8 wt %, min
Ash	0.05 wt %, max
Color	Bright yellow (combined products)

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