Brent blend, U.K. North Sea marker crude, assayed

Anne K. Rhodes *Refining/Petrochemical Editor*

World marker crude Brent blend was assayed in August 1994. The price of this 38° API, 0.04 wt % crude from the U.K. North Sea is used to determine the prices of many other world crudes.

The assay was supplied by Enterprise Oil plc, London. Brent's distillation curve is shown in Fig. 1.

Brent's qualities have changed since an assay of the crude was last published in the Journal, at which time the stream recently had been commingled with Ninian blend (July 8, 1991, p. 46). API gravity has increased by only 0.5° and sulfur content, by 0.05 wt %, but the crude's pour point has decreased from −12° C. to −42° C.

Brent blend comprises Brent, North and South Cormorant, Tern, Eider, Dunlin, Osprey, Murchison, Thistle, Deveron, Don, Hutton, N.W. Hutton, Ninian, Heather, Magnus, North Alwyn, Lyell, Staffa, and Strathspey fields. Lyell, Staffa, and Strathspey use some of Ninian's spare processing capacity. These fields have been added to the blend since an assay was last published.

Oil from Shell-Esso's Pelican field is scheduled to be added to the stream at the Cormorant Alpha platform beginning in late 1995. And as of last November, Total expected to bring its Dunbar field on line via the Alwyn North platform by the end of the year (OGJ, Nov. 14, 1994, p. 31).

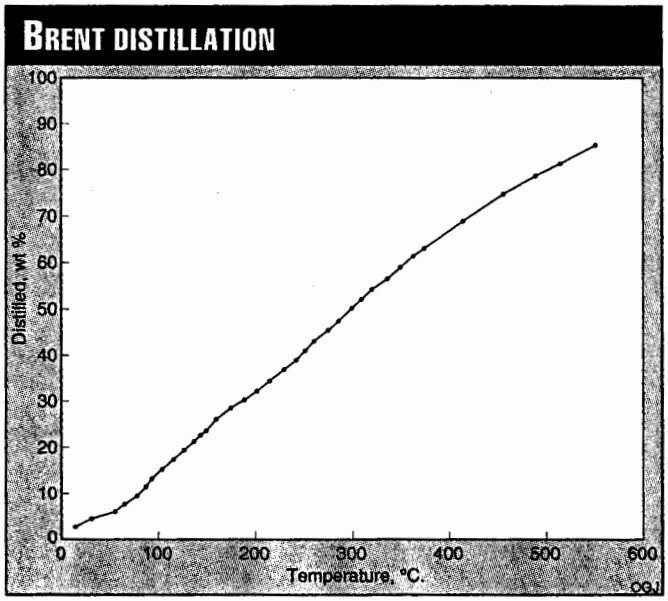
Some say Brent's future as a world marker crude is in jeopardy, as Brent fields are in decline and BP's lease at the Sullom Voe terminal, in the Shetland Islands north of Scotland, expires in the year 2000. In fact, Shell Exploration & Production has begun a program to redevelop Brent for gas production, although this will recover additional crude as well.

According to Oil & Gas Journal records, Brent production in 1994 averaged about 815,000 b/d. That rate has been projected to decline to anywhere from 450,000 b/d to as low as 300,000 b/d over the next 4-5 years, as the fields that feed the Ninian and Brent systems decline.

BP's Foinaven field is set to be the first producer West of the Shetland Islands. In a recent test, a Foinaven well flowed 17,800 b/d of waxy, 26° API oil for some 6 weeks (OGJ, Oct. 31, 1994, p. 26). Foinaven will be produced using a floating storage, production, and offloading unit beginning in late 1995 or early 1996.

If the volume from such "West of Shetlands" developments becomes sufficient, the streams may be transported to Sullom Voe via pipeline in the longer term. This may breathe new life into the aging Brent system.

Fig. 1



Brent blend

U.K. North Sea

Whole crude
Density @ 15° C., kg/l.: 0.8334
Gravity, °API: 38.3
Sulfur, wt %: 0.40
Visc. @ 20° C., cSt: 6.07
Visc. @ 30° C., cSt: 14.673
Pour point, °C.: −42
Acidity, mg KOH/g: 0.10
Micro carbon residue, wt %: 2.13
Asphaltenes, wt %: 0.45
V/Ni, ppm: 6/1
H_2S, wt %: <0.0001
Salt content (as NaCl), wt %: 0.015
Water content, wt %: 0.38

Light ends (C_1-C_5)
Yield, wt %: 5.87

Range, °C.: IBP-95
Yield, vol %: 12.3
Yield, wt %: 10.3
Density @ 15° C., kg/l.: 0.6924
Sulfur, wt %: 0.0006
Mercaptan S, ppm: 51
Paraffins, wt %: 82.8
Naphthenes, wt %: 11.9
Aromatics, wt %: 5.3
n-Paraffins, wt %: 30.9

Range, °C.: 95-175
Yield, vol %: 16.7
Yield, wt %: 15.4
Density @ 15° C., kg/l.: 0.7693
Sulfur, wt %: 0.0012
Mercaptan S, ppm: 14
Paraffins, wt %: 44.9
Naphthenes, wt %: 36.7
Aromatics, wt %: 18.4
n-Paraffins, wt %: 20.1

Range, °C.: IBP-150
Yield, vol %: 23.8
Yield, wt %: 20.8
Density @ 15° C., kg/l.: 0.7279
Sulfur, wt %: 0.0007
Mercaptan S, ppm: 21
Paraffins, wt %: 65.3
Naphthenes, wt %: 23.8
Aromatics, wt %: 10.9
n-Paraffins, wt %: 25.9

Range, °C.: 150-230
Yield, vol %: 13.9
Yield, wt %: 13.3
Density @ 15° C., kg/l.: 0.8001
Sulfur, wt %: 0.0048
Mercaptan S, ppm: 42
Visc. @ 40° C., cSt: 1.135
Visc. @ 60° C., cSt: 0.9408
Acidity, mg KOH/g: 0.036
Smoke pt., mm: 22
Freeze pt., °C.: −61.5
Aniline pt., °C.: 55.0
Cetane index: 36.6
Hydrogen content, wt %: 13.45
Color stability: Stable
Naphthalenes, vol %: 2.30

Range, °C.: 230-350
Yield, vol %: 22.2
Yield, wt %: 22.5
Density @ 15° C., kg/l.: 0.8461
Sulfur, wt %: 0.24
Visc. @ 50° C., cSt: 2.831
Visc. @ 100° C., cSt: 1.339
Cloud pt., °C.: −9
Pour pt., °C.: −9
Wax content, wt %: 6.2
Total nitrogen, mg/kg: 107
Acidity, mg KOH/g: 0.028
Aniline pt., °C.: 70.6
Cetane index: 51
Color stability: Stable

Range, °C.: 350-375
Yield, vol %: 3.8
Yield, wt %: 4.0
Density @ 15° C., kg/l.: 0.8795
Sulfur, wt %: 0.49
Visc. @ 50° C., cSt: 7.807
Visc. @ 100° C., cSt: 2.714
Cloud pt., °C.: 19
Pour pt., °C.: 15
Wax content, wt %: 17.3
Total nitrogen, mg/kg: 532
Aniline pt., °C.: 80.5
Cetane index: 49.5

Range, °C.: 375-550
Yield, vol %: 20.7
Yield, wt %: 22.5
Density @ 15° C., kg/l.: 0.9059
Sulfur, wt %: 0.61
Visc. @ 60° C., cSt: 26.23
Visc. @ 80° C., cSt: 12.69
Visc. @ 100° C., cSt: 7.711
Wax content, wt %: 20.7
Total nitrogen, mg/kg: 1,447
Basic nitrogen, mg/kg: 354
Acidity, mg KOH/g: 0.052
Aniline pt., °C.: 90.5
Refractive index @ 60° C.: 1.4884

Range, °C.: 350+
Yield, vol %: 36.7
Yield, wt %: 40.9
Density @ 15° C., kg/l.: 0.9285
Sulfur, wt %: 0.86
Visc. @ 50° C., cSt: 126.8
Visc. @ 60° C., cSt: 77.38
Visc. @ 80° C., cSt: 31.87
Visc. @ 100° C., cSt: 16.80
Visc. @ 120° C., cSt: 9.5*
Visc. @ 150° C., cSt: 5.5*
Pour pt., °C.: 36
Wax content, wt %: 14.6
Total nitrogen, mg/kg: 2,667
Acidity, mg KOH/g: 0.18
Micro carbon residue, wt %: 5.0
Asphaltenes, wt %: 0.95
V/Ni, ppm: 12/1
Xylene equivalent, vol %: 5-10†

Range, °C.: 550+
Yield, vol %: 12.2
Yield, wt %: 14.4
Density @ 15° C., kg/l.: 0.9876
Sulfur, wt %: 1.21
Visc. @ 80° C., cSt: 975.4
Visc. @ 100° C., cSt: 303.1
Visc. @ 120° C., cSt: 120*
Visc. @ 150° C., cSt: 40*
Penetration @ 25° C.: >400
Softening pt., °C.: 31.8
Total nitrogen, mg/kg: 5,242
Micro carbon residue, wt 15.0
Asphaltenes, wt %: 2.05
V/Ni, ppm: 35/3
Xylene equivalent, vol %: 5-

Dewaxed oil
Density @ 15° C.: 0.9244
Visc. @ 40° C., cSt: 104.2
Visc. @ 60° C., cSt: 37.17
Visc. @ 100° C., cSt: 9.539
Viscosity index: 54
Pour pt., °C.: −18

*Extrapolated
†Sample contained sediment

NELSON-FARRAR COST INDEXES

Refinery construction (1946 Basis)

(Explained on p. 145 of the Issue of Dec. 30, 1985)

	1962	1976	1991	1992	1993	Sept. 1993	Aug. 1994	Sept. 1994
Pumps, compressors, etc.	222.5	538.6	1,177.8	1,216.4	1,254.6	1,254.9	1,286.1	1,280.5
Electrical machinery	189.5	287.2	548.1	550.4	555.5	556.3	561.3	559.5
Internal-comb. engines	183.4	348.3	794.4	809.2	820.6	822.6	842.2	841.5
Instruments	214.8	466.4	844.7	865.5	879.3	881.7	882.1	885.4
Heat exchangers	183.6	478.5	772.6	746.6	704.1	695.4	681.8	689.8
Misc. equip. average	198.8	423.8	827.5	837.6	842.8	842.2	850.7	851.3
Materials component	205.9	445.2	832.3	824.6	846.7	852.7	879.5	882.1
Labor component	258.8	729.4	1,533.3	1,579.2	1,620.2	1,637.7	1,673.6	1,682.5
Refinery (Inflation) Index	237.6	615.7	1,252.9	1,277.3	1,310.8	1,323.7	1,356.0	1,362.3

Refinery operating (1956 Basis)

(Explained on p. 145 of the Issue of Dec. 30, 1985)

	1962	1976	1991	1992	1993	Sept. 1993	Aug. 1994	Sept. 1994
Fuel cost	100.9	384.5	443.8	425.9	421.5	398.2	508.6	481.9
Labor cost	93.9	145.5	280.8	281.1	286.2	282.8	256.3	297.6
Wages	123.9	314.3	787.4	824.9	868.0	870.0	854.9	970.5
Productivity	131.8	216.1	280.6	293.8	303.4	307.7	333.5	326.1
Invest., maint., etc.	121.7	252.6	511.4	519.2	524.3	529.5	542.4	544.9
Chemical costs	96.7	195.2	228.5	218.8	210.0	208.0	216.4	223.3
Operating indexes Refinery	103.7	209.3	392.2	393.3	396.3	395.0	401.3	416.3
Process units*	103.6	267.1	418.6	415.1	416.9	409.5	444.7	448.7

*Add separate index(es) for chemicals, if any are used. See current Quarterly Costimating, first issue, months of January, April, July, and October.

These indexes are published in the first issue of each month. They are compiled by Gerald L. Farrar, Journal Contributing Editor.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.