



2011 Crude Characteristics
No. 42

2011 CRUDE CHARACTERISTICS

The 2011 Crude Characteristics Booklet is a summary of selected chemical and physical properties of crude oils and condensates moved in the Enbridge Pipelines Inc. (Enbridge)/Enbridge Energy Partners, L.P. system. Samples were collected over a limited period of time and may or may not be representative of shipments over the entire year.

Density at 15C, Reid Vapour Pressure at 37.8C, Sulphur by Weight, Pour Point and Viscosity results at 10, 20, 30, 40 and 45C were tabulated.

The data was accumulated as follows:

- 1- Incoming streams were sampled as received and later tested at central laboratories in Edmonton and Superior.
- 2- RVP, Viscosity and Pour Point data was obtained from samples collected during the January, June, and September of 2011
 - Heavy crude viscosity data was reported from Samples obtained in January.
- 3- Density figures were obtained from volume weighted receipt tickets into Enbridge custody through-out 2011.
- 4- Sulphur data was obtained through-out the year, from samples taken at the first point of receipt or injection on the Enbridge system. Incentive Tolling sample data was used wherever possible. (Individual commodities that go into Enbridge blended streams were taken during the January, June, and September of the year)
- 5- All pour point results are taken from 2011 testing (pour point tests only conducted every second year)

VISCOSITY-TEMPERATURE RELATIONSHIP

The viscosity test of a commodity characterizes its resistance to flow in pipeline movement. The test itself may exaggerate the low temperature viscosity of paraffinic crude oils. Previous testing has shown that the viscosity behaviour of a crude oil in a pipeline follows a curve somewhere between the apparent viscosity (the extrapolated straight line portion of the viscosity-temperature plot) and the measured viscosity.

Measured values of viscosity should be used for interlab comparisons. Apparent values should be used for head loss calculations and surcharge grouping.

To increase pumping capacity, Enbridge/LPL has limited receipt viscosities to 350 cst. As seasonal temperatures vary, the blends of heavier crude oils with diluent will change to meet the viscosity limit.

2011 Crude Characteristics

Product Identifier	Crude Type (Long Name)	Total Sulphur (% by wt.)	Pour Point (C)	Reid Vapour Pressure (kPa)	Density (kg/m3)	Viscosity (cSt) at Specified Temperature (degree Celsius)				
						10.00	20.00	30.00	40.00	45.00
AHS	ALBIAN HEAVY SYNTHETIC	2.52	<-30	56.3	934.2	253	127	70.8	43.0	34.2
AMH	Albian Muskeg River Heavy	3.87	<-30	49.0	924.0	272	142	81.8	50.7	40.8
ARB	ALBIAN RESIDUAL BLEND	2.87	<-30	29.0	923.9	302	156	88.6	54.4	43.6
AWB	ACCESS WESTERN BLEND	3.92	<-30	52.0	923.0	293	152	87.2	53.9	43.3
BG	BONNIE GLEN	0.32	<-30	63.0	804.3	2.65	2.20	1.86	1.61	1.50
BHB	BOREALIS HEAVY BLEND	3.48	<-30*	41.0*	925.6	265*	140*	80.8*	50.3*	40.5*
BR	BOW RIVER	2.80	<-30	36.3	923.3	175	94.8	56.2	35.8	29.2
BSH	BP SYN HVY BLEND	3.10	n/a	n/a	931.0	n/a	n/a	n/a	n/a	n/a
BSO	BP CAVERN SWEET/SOUR	1.03	n/a	44.0	844.4	10.7	7.57	5.55	4.30	3.86
CAL	CENTRAL ALBERTA PIPELINE	1.08	-15	77.0	853.6	12.8	8.66	6.39	4.92	4.40
CAM	AMOCO CONDENSATE	0.03	<-30	69.8	708.7	0.770	0.660	0.610	0.560	0.580
CCA	CAROLINE CONDENSATE	0.38	<-30	40.3	742.0	0.660	0.590	0.540	0.490	0.470
CDB	CHRISTINA LAKE DIL-BIT BLEND	3.85	n/a	n/a	926.6	n/a	n/a	n/a	n/a	n/a
CFD	FEDERATED CONDENSATE	0.06	<-30	74.3	711.1	0.600	0.550	0.500	0.460	Boiled
CFT	FORT SASKATCHEWAN CONDENSATE	0.04	<-30	86.3	678.2	0.550	0.500	0.460	0.440	0.420
CGB	GIBSON CONDENSATE	0.23	<-30	78.3	741.1	0.710	0.660	0.610	0.560	0.520
CGY	GIBSON CONDENSATE HARDISTY	n/a	n/a	n/a	728.0	n/a	n/a	n/a	n/a	n/a
CL	COLD LAKE	3.58	<-30	53.0	925.7	288	151	86.7	54.4	44.8
CNS	CNRL light sweet synthetic blend	0.08	<-30	20.0	851.4	5.16	3.93	3.11	2.55	2.31
CPC	PETROCANADA CONDENSATE	0.00	<-30	56.3	700.1	0.650	0.540	0.500	0.460	0.450
CPM	PEMBINA CONDENSATE	0.14	<-30	69.0	760.1	1.60	1.36	1.17	1.04	1.09
CPN	PEMBINA NEXUS CONDENSATE	0.15	n/a	80.0	750.1	1.16	1.00	0.860	0.760	0.750
CPR	PEACE PIPE CONDENSATE	0.16	<-30	79.5	749.3	1.11	0.990	0.880	0.800	0.770
CRL	Rangeland Condensate	0.30	<-30	80.0	742.8	1.08	0.960	0.830	0.760	Boiled
CRW	CONDENSATE BLEND	0.10	<-30	76.7	709.5	0.610	0.550	0.490	0.470	0.430
F	FOSTERTON	3.20	<-30	29.0	928.7	245	131	75.3	45.8	36.7
FD	FEDERATED	0.38	<-30	76.7	825.7	5.58	4.31	3.38	2.76	2.50
HO	APACHE	0.70	0	47.5	821.8	6.77	4.52	3.44	2.78	2.50
HSB	HUSKY SYNTHETIC BLEND	0.11	<-30	41.0	859.4	11.9	8.32	6.14	4.69	4.18
ISH	ISH	0.68	<-30	37.0	833.8	7.83	5.79	4.47	3.55	3.21
LLB	LLOYDMINSTER BLEND	3.53	<-30	50.5	928.1	282	148	85.8	53.3	43.2
LLK	LLOYDMINSTER KERROBERT	3.23	<-30	53.0	928.0	296	155	88.3	54.9	44.1
LSB	LIGHT SOUR BLEND	0.99	<-30	74.5	838.8	5.66	4.39	3.47	2.79	2.52

* Results from 2010 Crude Characteristics.

** Results from 2009 Crude Characteristics.

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n/a = Test was not done.

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						10.00	20.00	30.00	40.00	45.00
M	MIDALE BLEND	2.22	-3	42.5	876.6	20.4	12.9	8.74	6.48	5.75
MCG	ICG LIGHT SOUR	0.68	-2	91.3	829.6	11.4	8.62	3.92	3.03	2.80
MGL	GIBSON LIGHT	0.44	-21	83.0	839.0	7.19	5.38	4.06	3.21	2.91
MGS	GIBSON SOUR	2.33	<-30	83.0	862.9	20.1	14.6	10.5	7.82	6.91
MJT	MOOSE JAW TOPS	1.66	<-30	44.3	826.8	5.56	3.54	2.84	2.35	2.14
MKH	MACKAY RIVER HEAVY	2.88	<-30	15.0	935.7	316*	157*	86.8*	52.4*	41.6*
MLN	JOARCAM	0.20	-6	71.0	830.7	10.5	6.98	5.10	3.92	3.53
MLS	TUNDRA LIGHT SOUR	0.55	<-30	85.7	830.3	6.08	4.34	3.34	2.70	2.46
MM	MANITOBA MEDIUM	2.11	<-30	40.7	896.3	32.6	21.2	14.3	10.1	8.82
MML	MANITOBA LIGHT	1.78	-15	74.7	859.0	11.6	8.34	6.13	4.73	4.25
MPR	PEACE PIPE LIGHT	0.43	-15	66.0	817.5	5.73	4.28	3.36	2.74	2.49
MSM	WESPUR MIDALE	2.11	-12	42.3	877.6	17.1	10.6	7.32	5.54	4.94
MST	MANITOBA SWEET - TUNDRA	0.43	-21	76.7	824.4	4.74	3.67	2.95	2.43	2.21
MSY	LIGHT SMILEY	0.33	-3	40.8	851.9	15.2	9.22	6.59	5.10	4.57
NSA	PREMIUM NEWGRADE SYNTHETIC	0.09	<-30	59.3	855.4	9.87	7.03	5.27	4.09	3.66
NW	NORMAN WELLS	0.31	<-30	88.7	823.0	4.86	3.93	3.19	2.61	2.11
OCC	SUNCOR-CRACKED C	3.25	<-30	4.5	924.5	22.3	14.3	9.77	7.03	6.12
OSA	SUNCOR - A	0.17	<-30	31.7	857.5	9.38	6.68	5.00	3.88	3.48
OSC	SUNCOR - C	0.06	<-30	4.0	870.5	4.31	3.34	2.67	2.21	2.01
OSH	SUNCOR-OSH	3.03	<-30	17.7	935.2	141	71.2	40.1	24.7	19.9
OSN	SUNCOR - N	0.01	<-30	64.4	723.8	0.750	0.670	0.610	0.560	0.530
P	PEMBINA	0.38	-15	69.3	825.9	6.27	4.77	3.60	2.85	2.57
PAS	PREMIUM ALBIAN SYNTHETIC	0.05	<-30	5.7	859.1	7.99	5.82	4.43	3.50	3.14
PBS	PINE BEND SPECIAL	3.48	<-30	19.5	925.3	98.4	53.1	32.8	21.7	18.0
PH	PEACE HEAVY	4.82	<-30	53.0	925.4	257	136	78.8	48.2	38.6
PHO	Pembina High Sour	2.63	<-30	73.0	864.1	17.3	11.8	8.56	6.46	5.74
PLS	PEMBINA LIGHT SOUR FOR SLE	0.76	<-30	70.0	825.8	5.53	4.28	3.35	2.72	2.49
PSB	Pembina Sweet Blend	0.42	<-30	64.0	828.1	7.21	5.33	4.07	3.25	2.93
PSC	LONG LAKE SWEET SYNTHETIC BLEND	0.07	<-30	23.3	839.1	6.60	4.85	3.73	2.97	2.68
PSH	LONG LAKE HEAVY DILSYNBIT BLEND	3.28	<-30	20.5	929.5	469	230	125	74.2	58.6
RA	RAINBOW LIGHT	0.38	-18	69.7	825.3	6.26	4.43	3.46	2.83	2.57
RSW	Rangeland Sweet	0.38	-18	81.3	824.4	6.19	4.68	3.61	2.85	2.49
SC	SMILEY COLEVILLE HEAVY	2.94	<-30	42.7	931.1	281	147	84.5	52.3	42.1

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SCB	Statoil Cheecham Blend	3.79	<-30	34.5	924.3	135	76.8	47.4	31.0	25.6
SES	SOUTH EAST SASK	0.84	-18	67.3	830.8	5.46	4.19	3.27	2.66	2.42
SH	BLACK ROCK SEAL HEAVY	4.72	<-30	49.3	932.4	246	132	77.4	48.8	39.7
SHB	SURMONT HEAVY BLEND	2.89	<-30	21.3	933.6	279	143	80.7	49.4	39.5
SHE	EDMONTON HIGH SOUR	2.43	<-30	62.8	860.4	22.5	15.5	11.0	8.16	7.21
SLD	SOUTHERN LIGHTS DILUENT	0.03	<-30	81.2	676.7	0.520	0.480	0.430	0.400	Boiled
SLE	EDMONTON LOW SOUR	0.96	<-30	80.0	839.5	7.67	5.54	4.27	3.41	3.05
SO	MIXED BLEND SOUR	1.89	<-30	67.0	858.3	26.9	17.5	12.3	8.91	7.83
SPR	PEACE PIPE SOUR	2.70	<-30	59.3	870.0	27.9	18.7	13.1	9.52	8.34
SPX	Shell Premium Synthetic	0.06	<-30	3.0	866.3	11.0	7.65	5.61	4.30	3.82
SSS	SARNIA SPECIAL	0.93	-15	55.0	899.6	176	94.0	53.9	34.4	27.7
SSX	SHELL SYNTHETIC LIGHT	0.13	<-30	21.7	862.8	15.1	10.3	7.41	5.54	4.90
SW	MIXED BLEND SWEET	0.41	-21	71.6	830.7	6.80	5.04	3.85	3.06	2.75
SYN	SYNCRUDE	0.18	<-30	32.0	862.6	7.40	5.44	4.17	3.32	2.98
UHC	U.S. HIGH SWEET - CLEARBROOK	0.19	-29	77.0	814.9	3.79	3.04	2.47	2.08	1.89
UHL	U.S. HIGH SWEET - LEWISTON	0.44	-8	59.1	802.3	5.81	3.23	2.45	2.01	1.34
UOC	U.S. SOUR - CLEARBROOK	2.20	13	36.5	882.5	49.6	21.4	13.3	9.16	7.83
WCB	WESTERN CANADIAN BLEND	3.01	<-30	27.0	929.1	287	149	84.9	52.5	42.3
WCS	WESTERN CANADIAN SELECT	3.35	<-30	51.7	928.0	302	157	89.6	55.3	44.4
WH	WABASCA HVY	4.30	<-30	44.0	931.9	256	134	77.5	47.5	37.5
ZA	ZAMA	0.31	<-30	88.0	821.8	4.71	3.64	2.93	2.43	2.20

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