Quality Pooling Specification Package

May 1, 2024

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Premium Synthetic (PSY) Pool Quality Specifications

Quality Specifications for Component Streams to the Premium Synthetic (PSY) Pool								
Quality	Units	Min	Max	Typical*	Pool Typical Ex-Superior**	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality
Existing Specifications								
Density (15C)	kg/m^3	>799	<876	830-876***	864	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<20			ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1			H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		85/95[8]			ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5			ASTM D4007	Frequency: AR2	Immediate shut-in[5]
Organic Chlorides in naphtha fraction[1]	wppm		<1			ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals								
Sulphur, total	wt%			<0.2	0.20	ASTM D4294	Frequency: AR[2]	Notification Process[6]
Naphtha (IBP-350F)	mass% recovered			8-24	14	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Distillate (350-650F)	mass% recovered			52-70	46	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Gas Oil (650-980F)	mass% recovered			20-30	38	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Resid (+980F)	mass% recovered			<1		ASTM D7169	Frequency: MR[3]	Notification Process[6]
Deemed Butane	vol%			≤3	1.3	ASTM D7169		
Other Requirements								
• Stream must be produced by an Upgrader • Cetane index in distillate: min 40								

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

**The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

***This specification was revised March 5th, 2014.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of PSY component streams tested using weekly composite.
3. MR: Monthly Random testing of PSY component streams.
4. QR: Quarterly Random testing of PSY component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th

Synthetic Sweet Blend (SYN) Pool Quality Specifications

Quality Specifications for Component Streams to the Synthetic Sweet Blend (SYN) Pool***								
Quality	Units	Min	Max	Typical*	Pool Typical Ex- Superior**	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications								
Density (15C)	kg/m^3	>799	<876	850-875	862	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<20			ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1			H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		85/95[8]			ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5			ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1			ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals								
Sulphur, total	wt%			0.12-0.21	0.21	ASTM D4294	Frequency: AR[2]	Notification Process[6]
Naphtha (IBP-350F)	mass% recovered			11-18	15	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Distillate (350-650F)	mass% recovered			37-48	44	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Gas Oil (650-980F)	mass% recovered			37-49	38	ASTM D7169	Frequency: MR[3]	Notification Process[6]
C4-	vol%			1.5-3.5		ASTM D2887		
Other Requirements								
• Stream must be produced by an Upgrader								

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

**The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

***SYN (Synthetic Sweet Blend) is the pool name (transport commodity) effective May 1st. SSP (Syncrude Sweet Premium) is a receipt commodity name that will replace the former SYN (Syncrude) as the receipt commodity.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of SYN component streams tested using weekly composite.
3. MR: Monthly Random testing of SYN component streams.
4. QR: Quarterly Random testing of SYN component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th

Hardisty Synthetic Crude (HSC) Pool Quality Specifications

Quality Specifications for Component Streams to the Hardisty Synthetic Crude (HSC) Pool								
Quality	Units	Min	Max	Typical*	Pool Typical Ex-Superior**	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications								
Density (15C)	kg/m^3	>799	<876	813-876	864	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<20			ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1			H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		85/95[8]			ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5			ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1			ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals								
Sulphur, total	wt%			<0.2	0.22	ASTM D4294	Frequency: AR[2]	Notification Process[6]
Naphtha (IBP-350F)	mass% recovered			8-30	13	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Distillate (350-650F)	mass% recovered			42-52	44	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Gas Oil (650-980F)	mass% recovered			19-50	42	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Resid (+980F)	mass% recovered			<1		ASTM D7169	Frequency: MR[3]	Notification Process[6]
Other Requirements								
• Stream must be produced by an Upgrader								

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

**The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of HSC component streams tested using weekly composite.
3. MR: Monthly Random testing of HSC component streams.
4. QR: Quarterly Random testing of HSC component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th

Condensate Blend (CRW) Pool Quality Specifications

Quality Specifications for Component Streams to the Condensate Blend (CRW) Pool						
Quality	Units	Min	Max	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications						
Density (15C)	kg/m^3	600	775	ASTM D4052	Frequency: AR[2]	Delayed shut-in[5]
Viscosity (@ 7.5C)	cSt		2	ASTM D7042	Frequency: R[6]	Delayed shut-in[5]
Olefins, total[1]	mass%		<1	H NMR	Frequency: R[6]	Immediate shut-in[4]
Vapour Pressure (DVPE)	kPa		103	ASTM D5191	Frequency: MR[3]	Immediate shut-in[4]
S&W	vol%		0.5	ASTM D4007	Frequency: AR[2]	Immediate shut-in[4]
Organic Chlorides[1]	wppm		<1	ASTM D4929	Frequency: R[6]	Immediate shut-in[4]
Sulphur, total	wt%		0.5	ASTM D4294	Frequency: AR[2]	Reclassification Process[5]
Micro Carbon Residue (MCR)	wt%		0.5	ASTM D4530	Frequency: MR[3]	Delayed shut-in[5]
Aromatics, total (BTEX)	vol%	2		PONAOX(U) ASTM D6729	Frequency: R[6]	Delayed shut-in[5,9]
Mercaptans, volatile (cumulative C1, C2, C3)	ppmw S		175	ASTM D5623	Frequency: R[6]	Delayed shut-in[5]
H_2S (in liquid phase)	wppm		20	ASTM D5623	Frequency: R[6]	Delayed shut-in[5]
Benzene[7]	vol%		1.6	PONAOX(U) ASTM D6729	Frequency: R[6]	Delayed shut-in[5]
Mercury[1]	wppb		10	ASTM D7623	Frequency: R[6]	Monitoring Process[8]
Oxygenates	wppm		100	PONAOX(U) ASTM D6729	Frequency: R[6]	Delayed shut-in[5]
Filterable Solids	wppm		200	ASTM D4807 with "Procedure C"	Frequency: R[6]	Delayed shut-in[5]
Phosphorus, volatile	ppm	Per CAPP Guidelines		ICP AES D86 (250 cut)	Frequency: R[6]	CAPP Guidance. Refer to AEB Directive 058. Violating test results communicated to the AEB

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of CRW component streams tested using weekly composite.
3. MR: Monthly Random testing of CRW component streams.
4. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
5. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
6. R: Annual Random composite testing per CRW component stream.
7. Benzene level of the CRW pool to be monitored. Results ≥ 1.25 vol% require Enbridge CRW Committee to reconvene appropriateness of benzene spec on CRW component streams
8. Monitoring and reporting only.
9. For BTEX values < 2.0 vol%, a component stream condensate can still be accepted through completion of a Wiehe compatibility analysis.

Mixed Sweet Blend (MSW) Pool Quality Specifications

Quality Specifications for Component Streams to the Mixed Sweet Blend (MSW) Pool						
Quality	Units	Min	Max	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications						
Density (15C)	kg/m^3	>799	<876	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<20	ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1	H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		85/95[8]	ASTM D6377	Frequency: MR[3]	Immediate shut-in[5]
S&W	vol%		0.5	ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1	ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Sulphur, total	wt%		0.5	ASTM D4294	Frequency: AR[2]	Reclassification Process[6]
Phosphorus, volatile	ppm		< 1	ICP AES (D86 for IBP - 250 cut)	Frequency: R[7]	CAPP Guidance. Refer to AEB Directive 058. Violating test results communicated to the AEB

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of MSW component streams tested using weekly composite.
3. MR: Monthly Random testing of MSW component streams.
4. QR: Quarterly Random testing of MSW component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th

Light Sour Blend (LSB) Pool Quality Specifications

Quality Specifications for Component Streams to the Light Sour Blend (LSB) Pool							
Quality	Units	Min	Max	Pool Typical Ex- Superior*	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications							
Density (15C)	kg/m^3	>799	<876	847	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<20		ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1		H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure (VPCR$_{4:1}$ @ 37.8 C)	kPa		85/95[8]		ASTM D6377	Frequency: MR[3]	Immediate shut-in[5]
S&W	vol%		0.5		ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1		ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals							
MCR	wt%		4	3.9	ASTM D4530	Frequency: MR[3]	Reclassification Process[6]
TAN[9]	mgKOH/g		0.25	0.20	ASTM D664	Frequency: MR[3]	Reclassification Process[6]
Nickel	mg/L		11	11	ASTM D5708-05	Frequency: MR[3]	Reclassification Process[6]
Vanadium	mg/L		20	22	ASTM D5708-05	Frequency: MR[3]	Reclassification Process[6]
Naphtha (IBP-350F)	mass% recovered			25	ASTM D7169		
Distillate (350-650F)	mass% recovered			28	ASTM D7169		
Gas Oil (650-980F)	mass% recovered			26	ASTM D7169		
Resid (+980F)	mass% recovered			21	ASTM D7169		

*The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of LSB component streams tested using weekly composite.
3. MR: Monthly Random testing of LSB component streams.
4. QR: Quarterly Random testing of LSB component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th
9. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
   Heavy Crude: TAN ≤ 1.1. mgKOH/g

Medium Sour Blend (MSB) Pool Quality Specifications

Quality Specifications for Component Streams to the Medium Sour Blend (MSB) Pool							
Quality	Units	Min	Max	Pool Typical Ex- Superior*	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications							
Density (15C)	kg/m^3	>799	<876	859	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<20		ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1		H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure (VPCR$_{4:1}$ @ 37.8 C)	kPa		85/95[8]		ASTM D6377	Frequency: MR[3]	Immediate shut-in[5]
S&W	vol%		0.5		ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1		ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals							
MCR	wt%		6	4.9	ASTM D4530	Frequency: MR[3]	Reclassification Process[6]
TAN[9]	mgKOH/g		0.5	0.2	ASTM D664	Frequency: MR[3]	Reclassification Process[6]
Nickel	mg/L		33	17	ASTM D5708-05	Frequency: MR[3]	Reclassification Process[6]
Vanadium	mg/L		75	36	ASTM D5708-05	Frequency: MR[3]	Reclassification Process[6]
Naphtha (IBP-350F)	mass% recovered			23	ASTM D7169		
Distillate (350-650F)	mass% recovered			27	ASTM D7169		
Gas Oil (650-980F)	mass% recovered			26	ASTM D7169		
Resid (+980F)	mass% recovered			24	ASTM D7169		

*The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of MSB component streams tested using weekly composite.
3. MR: Monthly Random testing of MSB component streams.
4. QR: Quarterly Random testing of MSB component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th
9. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
   Heavy Crude: TAN ≤ 1.1. mgKOH/g

Midale (M) Pool Quality Specifications

Quality Specifications for Component Streams to the Midale (M) Pool							
Quality	Units	Min	Max	Pool Typical Ex- Cromer*	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications							
Density (15C)[9]	kg/m^3	860	890	863	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	2	<100		ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1		H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure (VPCR$_{4:1}$ @ 37.8 C)	kPa		85/95[8]		ASTM D6377	Frequency: MR[3]	Immediate shut-in[5]
S&W	vol%		0.5		ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1		ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals							
MCR	wt%			4.8	ASTM D4530	Frequency: MR[3]	Reclassification Process[6]
TAN[10]	mgKOH/g			0.12	ASTM D664	Frequency: MR[3]	Reclassification Process[6]
Nickel	mg/L			12	ASTM D5708-05	Frequency: MR[3]	Reclassification Process[6]
Vanadium	mg/L			22	ASTM D5708-05	Frequency: MR[3]	Reclassification Process[6]
Naphtha (IBP-350F)	mass% recovered			22	ASTM D7169		
Distillate (350-650F)	mass% recovered			28	ASTM D7169		
Gas Oil (650-980F)	mass% recovered			27	ASTM D7169		
Resid (+980F)	mass% recovered			23	ASTM D7169		

*The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Cromer, timeframe June 2022 – May 2023.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of M component streams tested using weekly composite.
3. MR: Monthly Random testing of M component streams.
4. QR: Quarterly Random testing of M component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 85kPa from May 1st through October 31st
   Max 95kPa from November 1st through April 30th
9. Density range effective October 1, 2017.
10. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
    Heavy Crude: TAN ≤ 1.1. mgKOH/g

Premium Conventional Heavy (PCH) Pool Quality Specifications

Quality Specifications for Component Streams to the Premium Conventional Heavy (PCH) Pool								
Quality	Units	Min	Max	Typical*	Pool Typical Ex-Superior**	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications								
Density (15C)	kg/m^3	≥904	≤940		923	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	≥100	≤350			ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1			H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure (VPCR4:1 @ 37.8 C)	kPa		70/76[8]			ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5			ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1			ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals								
Resid (+980F)	mass% recovered			≤39	41	ASTM D7169	Frequency: MR[3]	Notification Process[6]
TAN[9]	mgKOH/g		≤1.1	<0.9	0.9	ASTM D664	Frequency: MR[3]	Reclassification Process[6]
Nickel	mg/L			<60	54	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Vanadium	mg/L			<130	131	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Deemed Butane	vol%			<3	2.0	ASTM D7169	Frequency: MR[3]	Notification Process[6]

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

**The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of PCH component streams tested using weekly composite.
3. MR: Monthly Random testing of PCH component streams.
4. QR: Quarterly Random testing of PCH component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 70kPa May 1st through November 30th
   Max 76kPa December 1st through April 30th
9. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
   Heavy Crude: TAN ≤ 1.1. mgKOH/g

Conventional Heavy (CHV) Pool Quality Specifications

Quality Specifications for Component Streams to the Conventional Heavy (CHV) Pool								
Quality	Units	Min	Max	Typical*	Pool Typical Ex-Superior**	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications								
Density (15C)	kg/m^3	≥904	≤940		926	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	≥100	≤350			ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1			H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		70/76[8]			ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5			ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides[1]	wppm		<1			ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals								
Resid (+980F)	mass% recovered			>39	42	ASTM D7169	Frequency: MR[3]	Notification Process[6]
TAN[9]	mgKOH/g		≤1.1	<1.1	1.0	ASTM D664	Frequency: MR[3]	Reclassification Process[6]
Nickel	mg/L			<70	52	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Vanadium	mg/L			<160	126	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Deemed Butane	vol%			<3	2.0	ASTM D7169	Frequency: MR[3]	Notification Process[6]

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

**The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of CHV component streams tested using weekly composite.
3. MR: Monthly Random testing of CHV component streams.
4. QR: Quarterly Random testing of CHV component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 70kPa May 1st through November 30th
   Max 76kPa December 1st through April 30th
9. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
   Heavy Crude: TAN ≤ 1.1 mgKOH/g

Kearl Heavy Dilbit (KDB) Pool Quality Specifications

Quality Specifications for Component Streams to the Kearl Heavy Dilbit (KDB) Pool							
Quality	Units	Min	Max	Typical*	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications							
Density (15C)	kg/m^3	≥904	≤940	925	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	≥100	≤350		ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1		H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		70/76[8]		ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5		ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides in naphtha fraction[1]	wppm		<1		ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals							
MCR	wt%			9.14	ASTM D4530	Frequency: MR[3]	Notification Process[6]
TAN[9]	mgKOH/g			1.88	ASTM D664	Frequency: MR[3]	Notification Process[6]
Nickel	mg/L			52	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Vanadium	mg/L			136	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Other Requirements							
● Production method: Mined							

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of KDB component streams tested using weekly composite.
3. MR: Monthly Random testing of KDB component streams.
4. QR: Quarterly Random testing of KDB component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 70kPa May 1st through November 30th
   Max 76kPa December 1st through April 30th
9. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
   Heavy Crude: TAN ≤ 1.1 mgKOH/g

Synbit Blend (SYB) Pool Quality Specifications

Quality Specifications for Component Streams to the Synbit Blend (SYB) Pool								
Quality	Units	Min	Max	Typical*	Pool Typical Ex- Superior**	Referee Test Method	Test Frequency	Enbridge Response to Crude Not Meeting Quality Specs
Existing Specifications								
Density (15C)	kg/m^3	≥904	≤940		928	ASTM D4052	Frequency: AR[2]	Delayed shut-in[6]
Viscosity, at reference temp	cSt	≥100	≤350			ASTM D7042	Frequency: QR[4]	Delayed shut-in[6]
Olefins, total[1]	mass%		<1			H NMR	Frequency: R[7]	Immediate shut-in[5]
Vapour Pressure ($VPCR_{4:1}$ @ 37.8 C)	kPa		70/76[8]			ASTM D6377	Frequency: QR[4]	Immediate shut-in[5]
S&W	vol%		0.5			ASTM D4007	Frequency: AR[2]	Immediate shut-in[5]
Organic Chlorides in naphtha fraction [1]	wppm		<1			ASTM D4929	Frequency: R[7]	Immediate shut-in[5]
Component Typicals								
MCR	wt%			<9	7.5	ASTM D4530	Frequency: MR[3]	Notification Process[6]
Naphtha (IBP-350F)	mass% recovered			7-14	10	ASTM D7169	Frequency: MR[3]	Notification Process[6]
Resid (+980F)	mass% recovered			29-38	34	ASTM D7169	Frequency: MR[3]	Notification Process[6]
TAN[9]	mgKOH/g			>1.1	1.6	ASTM D664	Frequency: MR[3]	Notification Process[6]
Nickel	mg/L			<65	45	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Vanadium	mg/L			<172	119	ASTM D5708-05	Frequency: MR[3]	Notification Process[6]
Other Requirements								
– Only the following approved Light Synthetics to be utilized as diluent for SYB feeder components. These include OSA, SSP, PAS, CNS, PSC, HSB, SYN, PSY, HSC, and any combination thereof. – Within New Commodity Approval process, a raw bitumen assay is to be submitted.								

*The expected or anticipated crude quality of individual components, understanding the fact that there may be, on occasion, variability outside of the range of the typical.

**The estimated crude quality of a pool is based on a limited number of random composite samples of batches ex-Superior, timeframe June 2022 – May 2023

Notes

1. For these properties, blending should not occur.
2. AR: All Receipts of SYB component streams tested using weekly composite.
3. MR: Monthly Random testing of SYB component streams.
4. QR: Quarterly Random testing of SYB component streams. Upon violation perform probational testing at Enbridge discretion.
5. Immediate shut-in upon identifying violation. Request third party Certificate of Analysis prior to subsequent receipt.
6. Upon violation, notification to applicable party, increase monitoring. Consequence based on outcome of increased monitoring.
7. R: Annual Random testing.
8. Max 70kPa May 1st through November 30th
   Max 76kPa December 1st through April 30th
9. Heavy High TAN Crude: TAN > 1.1 mgKOH/g
   Heavy Crude: TAN ≤ 1.1 mgKOH/g