MEG ENERGY

December 12, 2013

Shunlan Liu, Program Director
Alberta Innovates – Energy and Environment Solutions
Suite 2540 AMEC Place
801- 6th Avenue SW
Calgary, AB T2P 3W2

Dear Shunlan,

Please accept our progress report "Phase 1A: MDRU + SDA Program" signifying the completion of Phase 1A for AIEES Contract #1786.

The attached report provides results from the 5 BPD Laramie, WY pilot facility and supporting data from studies for and analyses on the HI-Q® product to successfully fulfill the requirements of all the deliverables in Phase 1A.

Phase 1A has elucidated that the HI-Q® process concept (MCRU + SDA) is technically viable and that the pilot plant can process 5 BPD of dilbit and produce the desired products consistently and reliably at this scale. The product produced has a market and should command a favourable market price validating the economics that allow the project to proceed to the next phase of development.

Valuable information has been obtained from the integrated pilot operation to solidify/validate/prove our IP position resulting in a Canadian Patent (#2,764,676) being issued in November 2013. The process results from the integrated pilot operation in Phase 1A are crucial in setting necessary design parameters for the successful design of the 1,500 BPD demonstration facility.

We look forward to continuing our partnership for a successful completion of Phase 1B.

Sincerely,

Tom Corscadden
Director Marketing Operations and Development

MEG Energy

MEG

Phase 1A:

MDRU + SDA Program

Report

In

Support of

AIEES Phase 1A

Under Contract

AIEES-1786A

Table of Contents

MEG ENERGY

Executive Summary

MEG Energy has successfully completed Phase 1A (P1A) under AIEES contract AIEES-1786A. This process performance report along with the PFCR report (project ledgers included in the PFCR), and the presentation material presented at the quarterly steering committee meetings (serve as project status reports) constitute the reports necessary to bring P1A to closure.

20 test runs were conducted on the integrated MDRU plus SDA arrangement between May 2011 and September 2013. Stable and steady operation was repeatedly demonstrated with over 350 barrels of bitumen processed. The successful performance of the 5 BPD HI-Q® pilot facility in Laramie, Wyoming provided the necessary data so the target range of the performance metrics (compared to Delayed Coking) in P1A could all be satisfied as originally conceptualized:

1. Liquid yield > 85 vl% from a barrel of bitumen. **MEG result = 87.9-91 vl%**
2. Product quality > 20 API, and stable. **MEG result = 20.1 API and stable as per P- test of 2.58 (>1)**
3. Product valuation > improvement approaching 50% of the light/heavy oil price differential. **MEG result = HI-Q® product captures ~56% of the 2016 to 2025 light/heavy oil price differential based on WTI to Athabasca dilbit (ex. AWB) price differential**
4. Energy intensity is 20% less energy input (per barrel of bitumen charge vs DC). **MEG result = ~43% of Delayed Coking (DC) energy intensity**

Table 10 in the report provides a quantity comparison of the key success criteria for the MEG HI-Q® process in P1A. For every measure in table 10, the MEG HI-Q® process at 5 BPD pilot scale was able to meet and exceed the target. A product meeting pipeline specification can be produced with an increased market disposition for HI-Q®. Increasing yield by 6-12% depending on measure and reducing off gas by over 60% and solids by 18% in a lower capital cost configuration when compared to delayed coking reinforces the positive economics that have been calculated and used to obtain approval for the next stage of commercial development, a 1500 BPD field demonstration pilot.

Measure	Delayed Coking Base	MEG Field Upgrading (HI-Q® Process) Target	MEG Field Upgrading (HI-Q® Process) MS#2 outcome	Comment
Gas Yield (%wt)	7	lower	2.5	64% reduction in Gas produced
Coke/Asphalt Yield (%wt)	20.1	lower	16.5	18% reduction in solids produced
Liquid Yield (%wt)	72.7	higher	81.3	12% increase in mass yield (with diluent slip)
			81.2	11.8% increase in mass yield (diluent/solvent free)
Liquid Yield (%vol)	82.7	higher	91.0	10% increase in vol yield (with diluent slip)
			87.9	6.3% increase in vol yield (diluent/solvent free)
Liquid Product API	27.3	Pipeline ready	20.1	~130 cSt @ 7.5oC << 300 cSt pipeline spec
Liquid Product %S (wt)	2.81	market	3.48	<4.1wt% for dilbit; positive from market feedback

Table 10 – Success Criteria for MEG Field Upgrading (source: Attachment 1 to Schedule B in AIEES contract)

MEG is proceeding with a modified version of Phase 1B (SDA + MDRU program) with the objective "Establish the process performance of the Alternate integrated upgrader configuration (SDA DAO feeding into MDRU)".

1.0 Introduction

MEG has engaged in a commercialization program for a novel partial upgrading technology termed the HI-Q® process, shown in Figure 1. The intent of the technology is to provide an improved refinery feedstock that is pipeline ready without the need for transport diluent.

As illustrated in Figure 1, blended bitumen is delivered to the HI-Q® production facility via pipeline. Diluent is separated from the blend and returned to the pipeline to be moved back to the bitumen production facilities. The bottom (bitumen) from the diluent separation becomes the feed to the HI-Q® Process. The HI-Q® Process is a low-intensity, low-complexity process integrating mild thermal cracking (MEG Distillate Recovery Unit or MDRU) with simplified solvent deasphalting (SDA). Several innovations exist in the HI-Q® Process:

- The design of the MDRU minimizes gas production, eliminates coke production and maximizes liquid yield from heavy residue conversion. This requires a high level of process reactor measurement and control with its own unique set of challenges.
- The selectivity of the SDA process and the asphaltene separation are unique and outside of the realm of the typical application of solvent deasphalting in a refinery/upgrading complex.

The HI-Q® Process

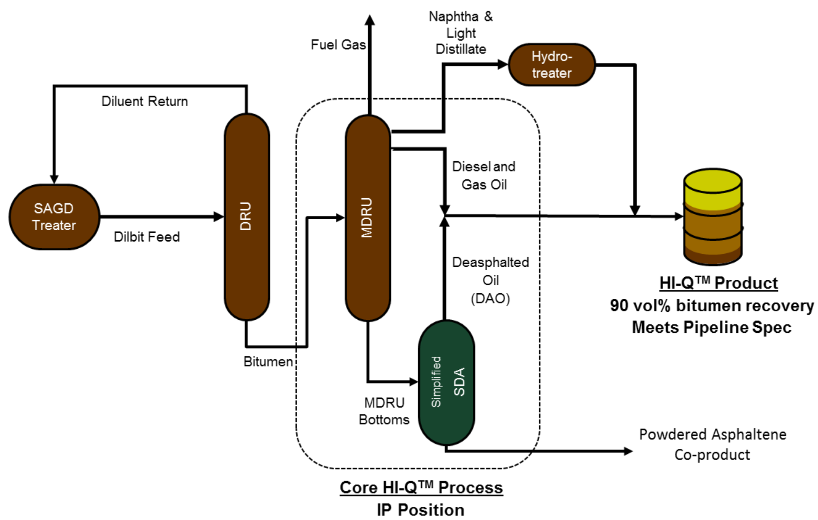

Figure 1 – Block Flow Diagram for MEG's patented HI-Q® Process

Along the commercialization path, a crucial step is to prove out the concept in a pilot plant. A 5 bpd pilot plant was located at the Western Research Institute (WRI) in Laramie, Wyoming. WRI was chosen as the location for the pilot due to the following contributing factors,

1. The intellectual property (IP) for the reactor (MDRU) technology was developed by WRI
2. WRI had experienced staff and facilities to handle the pilot program
3. WRI had proven success in running hydrocarbon based pilot program

In support of the pilot plant program in Laramie, Wyoming, AIEES has agreed to contribute funds up to $1,400,000 CAD under contract agreement AIEES-1786A. The payments are tied to 3 specific milestones:

1. $400,000 for signing agreement
2. $500,000 for completion of Phase 1A - MDRU and MDRU + Solvent Deasphalting (SDA) Program
3. $500,000 for completion and submission of final report.

Milestone #1 was completed with the process performance capabilities of the 5 BPD MDRU reactor successfully established.

This report covers the findings and results from Phase 1A where an SDA was added to the pilot plant to process the bottoms product of the successfully operating MDRU reactor as described in Figure 1. The AIEES funds for milestones #1 were used to support the construction of the pilot SDA unit and to support the operation of the integrated pilot in this phase. This integrated arrangement of MDRU followed by SDA forms the process concept of the patented HI-Q® process. The HI-Q® process is currently patented in Canada under #2,764,676.

Phase 1A represents a crucial phase in the overall development of commercializing the HI-Q® technology. The outcomes from the Phase 1A will inform the decisions for the design of the proposed 1,500 bpd demonstration facility in Bruderheim, AB and to provide technical input into the overall economic evaluation for decision making purposes on project continuation.

2.0 Objective/Deliverables

The primary objective of Phase 1A is to "establish the process performance of the base integrated field upgrader configuration (MDRU feeding bottoms into SDA) compared to minimum Delayed Coking". Table 1 highlights the 9 deliverables associated with Phase 1A.

Item	Phase 1A Deliverables	Status
A	Commission and stable operation of integrated pilot (MDRU first then SDA)	Done
B	Complete Test Run program - MDRU + SDA	Done
C	Produce Upgrader products for 3rd party quality testing	Preliminary done
D	Third party analytical testing for products produced	Preliminary done by Maxxam
E	Product hydrotreating Study with potential pilot	Preliminary done
F	Byproduct (asphaltene) utilization study	Preliminary done by W. Asphalt
G	Stability and compatibility testing for products produced	Prelim done by I Wiehe
H	Product refining Study for MS-2 product	Done by Muse Stancil
I	Product valuation study for MS-2 product	Done by Muse Stancil

Table 1 – List of Deliverables for Phase 1A

The deliverables A,B,H and I have been fully completed while preliminary results for items C through G have been obtained. Commentary on what has been completed based on the metrics for each objective has been provided in the following sections.

3.0 Laramie Pilot Plant Operations for Phase 1A (Deliverable items A and B)

3.1 Item A - Commission and stable operation of integrated pilot (MDRU directly coupled to SDA unit)

The following metric was developed to meet the deliverable of item A:

"Process 5 BPD of bitumen feed to the MDRU and run the SDA unit in an integrated manner. Produce DRU overheads, Deasphalted Oil (DAO) and asphaltenes as products. Confirm stable and controlled operation of the Base integrated upgrader configuration (MDRU + SDA)."

3.1.1 Commissioning of Integrated Pilot

The SDA pilot skid was fabricated by BWS in Red Deer, Alberta. The skid was completed and delivered to Laramie, Wyoming in Q1 2011. Figure 2 shows a picture of the SDA skid installed at the WRI facility. On May 16 2011, successful start-up of the integrated MDRU and SDA pilot operation occurred. The initial start-up coincided with the first test run, named SDA-1. The test run lasted 9 days with 5 BPD of feedstock used for the integrated MDRU and SDA pilot operation.

Figure 2 – Installation of SDA skid at WRI facility in Laramie, Wyoming

3.1.2 Stable Operation of Integrated Pilot

There were 20 test runs associated with Phase 1A occurring between May 2011 and September 2013; a 29 month period. Test runs 1-7 were used to prove out the operation of the SDA and to determine the conditions for a stable operation. During test run 8, AIEES representatives Shunlan Liu and Les Little were present to witness successful production of asphaltenes and deasphalted Oil (DAO) and MDRU Overheads. Figure 3 shows a collage of photos taken of the products produced from the pilot. On the left, the flowing black hydrocarbon liquid is a blend of the produced DAO from the SDA skid and the produced MDRU overheads. The blend is a preliminary representation of the HI-Q® product. On the right, the produced dry asphaltenes, a co-product of the integrated process is shown.

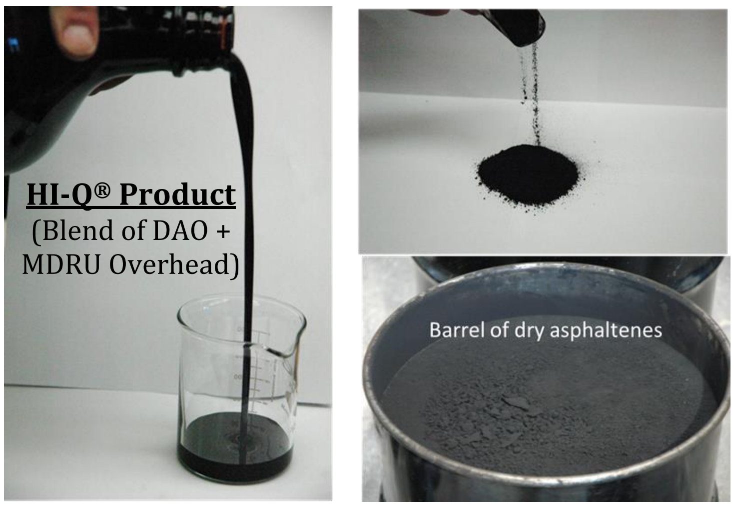

Figure 3 – Photos showing the products from the integrated MDRU + SDA pilot operation

During test run SDA-19, AIEES representatives, Shunlan Liu and Duke DuPlessis visited the pilot facility on April 20, 2013 to witness the optimized, steady and stable operation of the integrated unit. Real time asphaltene production, and DAO and MDRU overhead product stream production from the pilot were shown to the AIEES representatives to validate the successful steady and stable operation of the integrated operation. The asphaltene production was witnessed from the collection hopper after a transfer of asphaltene extractor bottoms to the inertial separation unit. The DAO and MDRU overhead streams were shown to the AIEES representatives by opening the sample port valve when collecting the streams for lab analysis.

For operational context into the stable operation obtained in the pilot plant, figures 4 and 5, show photos of the control panels used to operate the SDA pilot unit. Figure 4 shows the asphaltene extractor and the MDRU bottoms and solvent streams feeding the extractor (V-110). In Figure 4, the solvent and DAO separation using 2 strippers is shown (V-114 and V115).

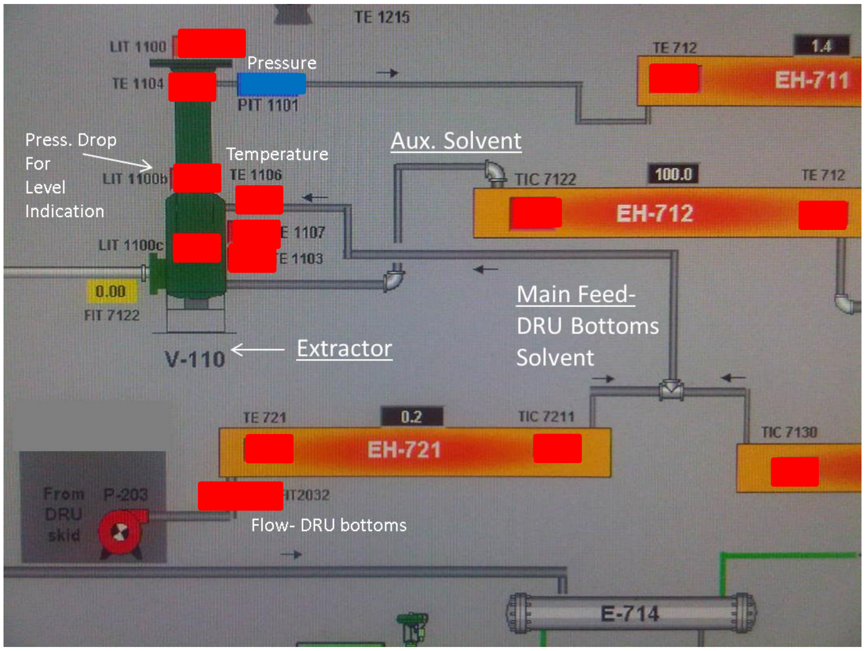

Figure 4 – "Screen shot" of Control Panel for front end of SDA skid – Primary asphalt Extractor

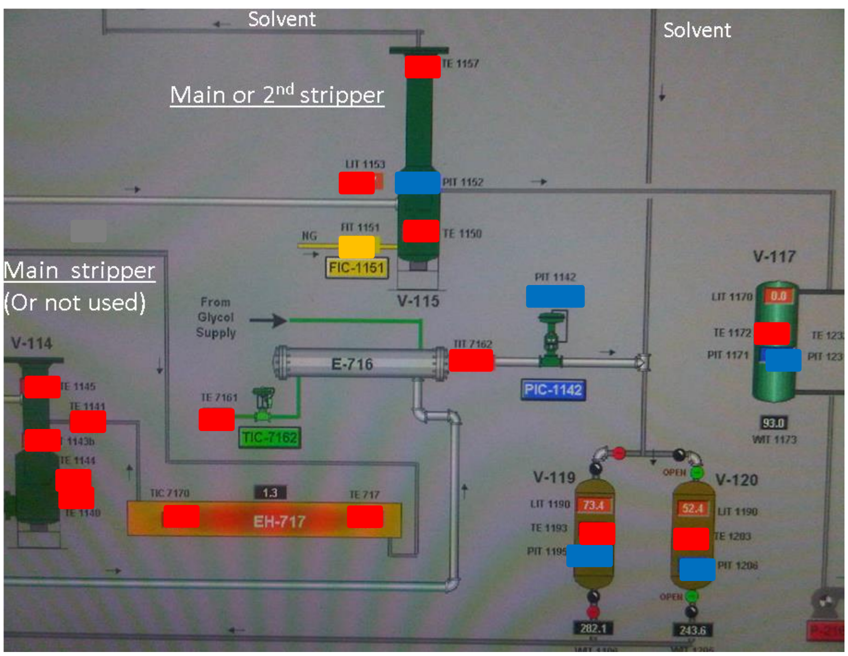

Figure 5 – "Screen shot" of Solvent Recovery and DAO production (2 stage stripping capability)

3.2 Item B - Complete Test Run program - MDRU + SDA

Once the integrated pilot operation demonstrated a stable operation after SDA-7, test runs 8-20 were performed to:

a) Determine the best arrangement and design of equipment
b) Determine appropriate solvent to meet design objectives
c) Obtain mass balance closure
d) Complete a design of experiments to determine the overall operating range and the optimal operating point to best meet the overall economic requirements for this project and also to meet the performance metrics of Phase 1A.
e) Inform the design for the 1,500 BPD demonstration facility.

The metric for this deliverable is "Complete test runs 29 through 34 (actually 1-20), processing 350 barrels of diluted bitumen, manipulating the specific process operating variables outlined in the testing plan. Produce the data required to develop and compare the process performance of the MEG Field Upgrading process to the industry stand of Delayed Coking in terms of product yields, product qualities, energy intensity and environmental performance."

3.2.1 Test Runs Performed

Table 2 provides a summary of each test run explaining the primary test objective, the date for the test, the duration of the test and some commentary on the outcomes from the SDA operation. Tests 29-34 referenced in the deliverable were renamed SDA-1 to SDA-20, with 15 more tests performed than the planned 5. There were 168 operating days for the integrated pilot during the 20 test runs. Assuming a consistent flow of 5 BPD of feedstock over the 168 days of testing, then 840 barrels could ideally be processed. Using a realistic on-stream factor of 45% for the integrated pilot operation, approximately 375 barrels of diluted bitumen were processed meeting the requirement of 350 barrels processed (350 barrels equates to a 43% on-stream factor).

Test run	Objective	Start	Stop	Days	Comments
SDA-1	Shake out unit	May 16 2011	May 24 2011	9	Learned multiple plugging locations and conditions not to repeat Prove need asphalt extractor bottoms out bottom of vessel
SDA-2	Shake out unit	Jul 3 2011	Jul 8 2011	6	Demonstrated transfer of asphaltenes from extractor to flash drier Learned how to get solvent clean for reuse Learned not to circulate SDA with dilbit
SDA-3	Test modified inertial separation unit (ISU)	Aug 1 2011	Aug 3 2011	3	Inconsistent flow from cracker to SDA (slugs) compromised operation. Plugged thoroughly!
SDA-4	Test automated valve sequencing Test cyclone	Sep 12 2011	Sept 21 2011	10	Produced dry asphaltenes occasionally DP meters successfully used to measure asphalt level

	Test resin extractor/stripper				Automated valve sequencing implemented and worked well
SDA-5	Run continuously Produce HiQ	Oct 10 2011	Oct 19 2011	10	Ran for 5 days continuously; semi-batch Last day ran at full cracker bottoms rates Produced 2 barrels of HI-Q for analysis
SDA-6	Recreate SDA-5 operation -run continuously C6 used	Dec 9 2011	Dec 11 2011	2	Shear mixer operated Successfully activated 2 stage stripping Ran at full cracker bottom rates – tough to attain continuous operation; semi-batch
SDA-7	Recreate SDA-5 operation -run continuously C6 used	Dec 9 2011	Dec 11 2011	2	Validation of recent progress, collect additional data to support dry asphaltenes operating parameters
SDA-8	Board of Directors visit Run shear mixer Run 10 days straight	Feb 19 2012	Feb 28 2012	10	Ran 10 days semi-batch mode successfully. Best run to date Shear mixer operation reduced DAO losses in asphaltene
SDA-9a	Run with high pressure shear mixer Goal-continuous	Mar 26 2012	Mar 30 2012	5	Ran continuous 3 times @ 8 hours each before fully plugged high pressure mixer
SDA-9b	Run with low pressure shear mixer Goal- Continuous	Apr 9 2012	Apr 18 2012	10	Ran continuous each day for minimum of 6 hours and maximum of 16 hours. Huge success to get to steady state.
SDA-10	Run with low pressure shear mixer Repeat SDA-9b success Test new 3-way valve configuration for solids transfer Start Design of Experiments	May 7 2012	May 16 2012	9	Ran on/off for 9 days. Obtained multiple mass balance data points. Mechanical issues with shear mixer and 3-way valve.
SDA-11	Test heavier and more aromatic solvent. Ran reactor with more severe conditions New asphaltene transfer line installed	Jun 12 2012	Jun 20 2012	9	Developed basis for aromatic content limit for commercial solvents Higher reactor yield did not negatively impact SDA operation
SDA-12	Close couple mixer and extractor and feed to top of extractor. Run reactor at higher severity (up to 47% overhead) Type of solvent= hexane Work on 2-stage stripping	Jul 9 2012	Jul 14 2012	6	Asphalt extractor plugged with new top feed configuration Low pressure shear mixer failed halting remainder of test run
SDA-13	Test “pure” heptane solvent. Re-use high pressure shear mixer	Aug 6 2012	Aug 14 2012	9	High concentration of C7’s in solvent tend to “gum” up the extractor limiting continuous performance Switched back to hexanes to develop continuous performance. Tested mixtures

					of C6/C7 for limit of C7's allowed in process
SDA-14	Test different aux. solvent injections on extractor performance Test different top inlet feed configuration	Sept 4 2012	Sept 13 2012	10	Longest run with top inlet feed accomplished – shutdown without plugging Tested a new inlet feed configuration. Slight improvement in extractor performance Switched between high pressure and low pressure shear mixer operation Lower aux. solvent injection point provided better washing of asphaltenes.
SDA-15	Separator feed through the bottom, DAO outlet via the side - distance between bottoms inlet and DAO outlet shortened - Increased Separator temperatures	Oct 2 1012	Oct 10 2012	9	Experienced Asphaltene carryover LP shear mixer mechanical problem Configured solvent/feed "mixing T" for feed/solvent
SDA-16	Separator feed through the side, DAO outlet through the top - Maintained higher Separator temperatures - Lowered ISU and hopper temperatures - Thermal cracker reactor operation 42 - 47 wt% overhead	Nov 11 2012	Nov 20 2012	10	Improved operability -NO PLUGGING!! -Minimal asphaltene carry over -Feed "mixing T" working well -Resin handling issues observed Obtained multiple sets of mass balance closure data points!!!
SDA-17	Same feed/outlet configuration as SDA-16 - Separator outlet tuning - Solvent variations planned	Dec 10 2012	Dec 21 2012	12	Revamped resin handling equipment and procedures -Progress update: run is smooth -New instrumentation for reactor bottoms viscosity estimate Obtained multiple sets of mass balance closure data points !!!!
SDA-18	Separator feed through the side, DAO outlet through the top -Maintained higher asphalt separator temperatures -Lowered ISU and hopper temperatures -Thermal cracker	Jan 20 2013	Feb 1 2013	12	Improved operability -NO PLUGGING!! -Minimal asphaltene carry over -Feed "mixing T" working well -Resin handling issues observed

	reactor operation 42 - 47 wt% overhead				
SDA-19	Same feed/outlet configuration as SDA-16 -Separator outlet tuning -Solvent variations planned	Feb 24 2013	Mar 1 2013	6	Production of solvent. Target C6/C7 fraction.
SDA-20	Test new Asphaltene separator	Apr 1 2013	Apr 9 2013	9	New Asphalt separator design installed Excellent separation of DAO from asphaltenes

Table 2 – Summary of test runs performed during Phase 1A

Table 3, extracted from MEG's Canadian patent #2,764,676, shows the range of operating conditions for both the MDRU and SDA to create stable operations. The learnings from test runs SDA-1 to 20 were used to develop and validate the operating envelope. The optimal operating point can be found within the range of operating conditions noted for the MEG HI-Q® process in column 1 of Table 3. For reference, other thermal cracking and SDA processes have been included as a comparison to highlight the novel operating conditions that are achieved with the HI-Q® process thereby allowing higher overall product yield with lower energy intensity. Table 3 confirms that specific process variables were manipulated during the 20 test runs to develop a stable operating envelope.

		Zhao	Zhao	Zheng et al	Lutz	KBR	KBR-Rose	Kerr-McGee
Conditions	**MEG HI-Q**	7597794	7597794	2007/0125686	4454023	8048291	7749378	5009772
		Example 6						
Arrangement	Cracker to SDA	SDA only	SDA only	Cracker to SDA	Cracker to SDA	SDA to cracker	SDA only	SDA only
Thermal Cracker								
Style	controlled	-	-	Visbreaker	Visbreaker	Visbreaker	-	-
Feed to Thermal Cracker (API)	0-9	-	-	?	?	-	-	-
Temperature of reactor (oF)	675-775	-	-	662-932	850-920	-	-	-
Pressure of reactor (psig)	0-40	-	-	43-2175	250	-	-	-
Residence Time (min)	40-180	-	-	60-360	16-26	-	-	-
Sweep Gas (scf/bbl)	20-80	-	-	-	-	-	-	-
Heat Flux in Reactor (BTU/hr sqft)	7000-12000	-	-	-	-	-	-	-
					Gearhart			
SDA					4239616			
Feed to SDA (API)	-5 to 0	2.00	2+	?	? (>>0, VB coke)	5-30	2-15	?
Asphalt ext temp (oF)	320-400; Tc-(40-130)	374.00	176-482	50-392	200-550	TC+(60-270)#	<450oF	Tc-(41-68)
asphalt ext press (psig)	200-400; Pc-(40-240)	580.00	435-1450	29-1450	125-900	Pc+(0-100)*	275-1000	Pv to >Pc
Solvent choice	C6-C7	C6	C4-C6	C3-C5	C3-C9	C3-C7	C3-C8	C3-C6
solvent to oil ratio	2-4:1 M	4.65:1 M	1.72-7.02:1 M	3-12:1 V	2-20:1 M	2-100:1	1-10:1 M	4-20:1 V
Extraction steps in SDA	min. 1	2/3	2/3	?	?	2/3	2/3	min 3
DAO Yield (vol%)	85-90	62/83.5	62/83.5	?	?	?	?	?
Solvent Recovery (%)	over 98%	over 80%	over 80%	?	?	?	?	?

Table 3 – Integrated MDRU+SDA (MEG HI-Q®)operating condition ranges compared to other conceptual processes

Test runs SDA-21 and SDA-22 were additionally performed to test the pilot plant for data reproducibility and to improve mass balance closure for the operation. In addition, conditions were tested in preparation for Phase 1B where the SDA treats the bitumen first removing asphaltenes before being processed in the MDRU reactor. Table 4 provides the objectives of SDA-21 and SDA-22 which includes mass balance closure attempts in support of Phase 1A.

Test	Date	Duration	Objectives
Transition runs			
SDA-21	Sept 2013	14	✓ Preliminary testing of reconfigured MDRU and SDA feeds ✓ Define SDA operation at a minimum of two bitumen densities ✓ Define MDRU operating temperatures for SDA resin feedstock ✓ **Perform multiple mass balance closures**
SDA-22	Oct 2013	12	✓ Define SDA operating temperature and solvent flow rates for bitumen feed ✓ Complete evaluation of different bitumen densities ✓ **Perform multiple mass balance closures**

Table 4 – Transitional test runs between Phase 1A and #3

3.2.2 Mass Balance Closure and Performance Yields

To obtain useable data to compare Delayed Coking to the MEG HI-Q® process, mass balance closure needed to be accomplished. Both overall and component mass balances were evaluated to crosscheck the results. A combination of flowmeters, compositional lab analysis, and weight measures on equipment were used to build the mass balance. Four test runs provided suitable data to perform mass balance closures. From table 5, the average mass balance closure range from the four test runs was 100.3% to 102.1% with a single standard deviation range between 1.3 and 3.3. For an experimental facility dealing with material in 3 phases (solid, liquid, gas) having the mass balance close between 97.8 and 104.4% within one standard deviation should provide confidence in the performance results.

Using the data from the 4 test run with mass balance closure, the average mass yield for the HI-Q® product over the 4 test runs is 81.8% which is well above the Delayed coking mass yield of 72.7% and is within the economic parameters needed to develop a successful commercial project. Similarly, the average volume yield for the HI-Q® product was calculated as 87.8%. Comparable Delayed Coking volume yields are around 82.7%, representing a 6% increase in volume yield for the HI-Q® process over minimum Delayed Coking.

Test run	Overall Mass Balance Closure %	1 Std Dev	HI-Q® Mass Yield%	1 Std Dev	HI-Q® Vol Yield%	1 Std Dev
16	100.5	1.4	83.7	1.7	89.7	1.7
17	102.1	2	81.1	1.9	85.9	2.6
21	101.1	3.3	81.2	3.7	87.5	3.6
22	100.3	1.3	81.2	1.3	87.9	1.5
Average	101.0	2.0	81.8	2.2	87.8	2.4

Table 5 – Mass Closure Results and associated HI-Q® Yield%

Using test run 22 as a representative mass balance closure for the integrated MDRU plus SDA configuration, a simple block flow diagram with the key input and output streams was developed as Figure 2. Stream 3, with 78.7 lbs/hr of bitumen, is fed to the integrated MDRU and SDA process. The resulting HI-Q® product is 64 lbs/hr with 13.0 lbs/hr of dry solid asphaltene co-product (stream 5). There is 2.0 lbs/hr in stream 4, offgas. The mass balance closure for this test run was 100.3%.

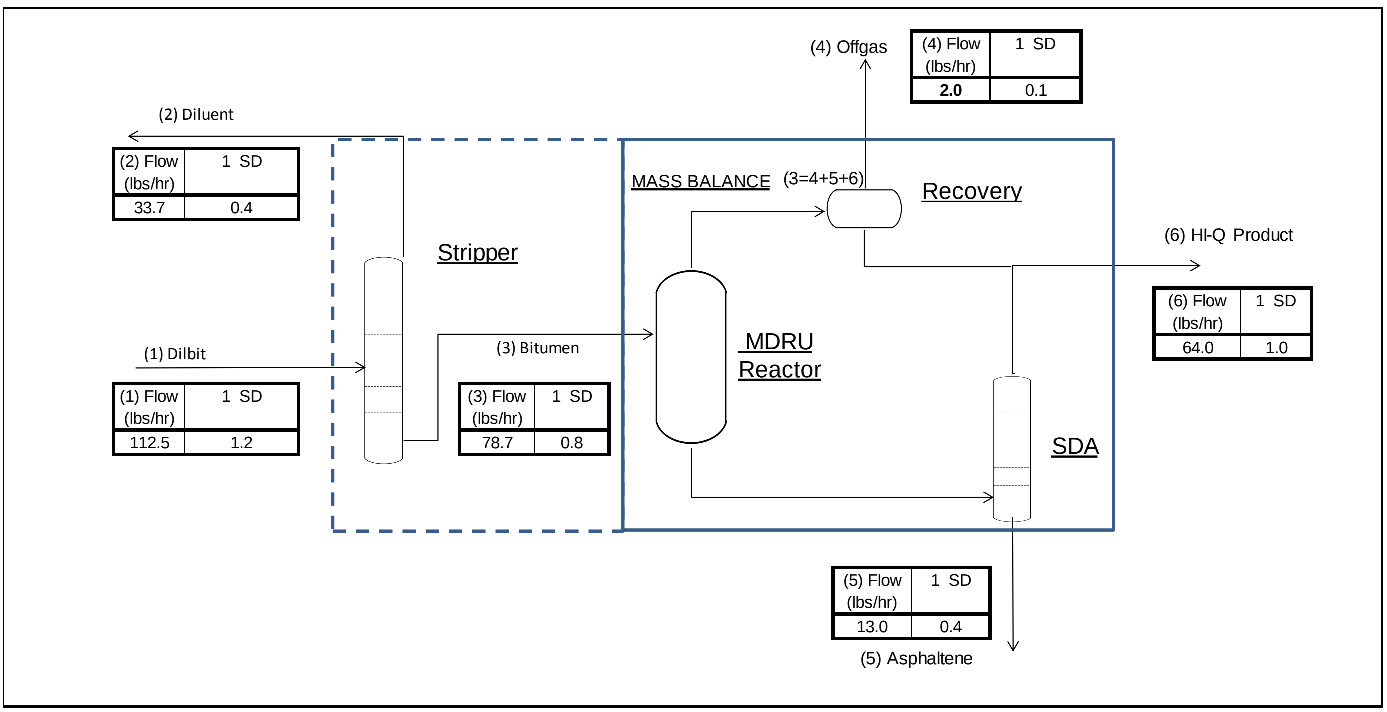

Figure 6 – Overall Mass Balance for Integrated MDRU Reactor + SDA (Average values from SDA-22)

Table 6 and table 7 share the compositions of the input and output streams in the mass balance of Figure 6. As expected, all the off gas generated is in the 350°F and lighter range. The dry asphaltenes are nearly all 975+ °F material with 1.5wt% DAO "stuck" with the asphaltene co-product stream. Further evaluation and testing is being done to determine the value in reducing the DAO content in the solid asphaltenes which would increase the HI-Q® product yield further. HI-Q® has increased gas oil and distillate content due to the mild thermal cracking in the MDRU along with the removal of asphaltenes in stream 4.

Mass Basis - Yields					
Stream #		3	4	5	6
	oF	Bitumen	Off gas	Asphaltene	HI-Q
Naphtha	350-	1.8	100	0	4.4
Distillate	350-650	8.2	0	0	26.8
Gas oils	650-975	30.7	0	1.5	43.8
Residue	975+	59.3	0	98.5	25

Table 6 – Mass Composition Analysis for Feed and Product Streams

Volume Basis- Yields					
Stream #		3	4	5	6
	oF	Bitumen	Off gas	Asphaltene	HI-Q
Naphtha	350-	2.0	100	0	5.5
Distillate	350-650	9	0	0	28.5
Gas oils	650-975	32	0	1.5	42.8
Residue	975+	57	0	98.5	23.2

Table 7 – Volume Compositional Analysis for Feed and Product Streams

Figure 7 provides a graphical analysis of the mass yields for the key streams in the mass balance. This representation highlights the shift in residue (975+ °F boiling material) in the bitumen feed to

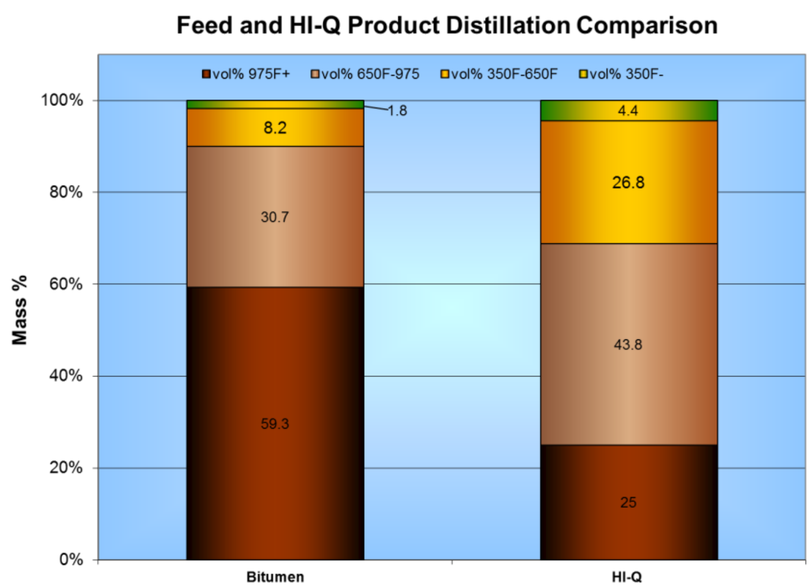

Figure 7 – Graphical Representation of Feed and HI-Q® product yield from Pilot

to gasoils and distillate in line with the desired outcome for a pipelineable and saleable crude.

3.2.3 Environmental Performance

The University of Calgary performed an independent evaluation that involved comparing the environmental impact of Delayed Coking to the H-IQ® process. The report is titled "*Investigation of life cycle greenhouse gas emissions performance of the HI-Q process using tools developed through the LCAOST project* " and was authored by Joule Bergeson, Ph.D. of the Institute for Sustainable Energy, Environment and Economy at the University of Calgary in July 2012. The data for the HI-Q® process used in the analysis was provided by MEG based on the performance of the Laramie pilot facility up to test run SDA-10 in May 2012. The results from this report are shared in Figure 9 and do exceed the metric of the HI-Q® process demonstrating a Carbon footprint that is 6-8% less than delayed coking (kg CO2/bbl (or m3) of feed) on a Well-to-Tank (WTT) basis. Of note, if we use the latest results from the Laramie pilot, the carbon footprint values are further improved with reduced energy required and more product yield generated for the same barrel. A new round of life cycle greenhouse gas emission analysis will be performed taking the latest learnings from the Laramie pilot operation to quantify the improvement in HI-Q® carbon footprint from the July 2012 study.

Figure 8 provides an appreciation for the process considered and the boundaries set for the emissions analysis. For P1A, a WTT metric was required.

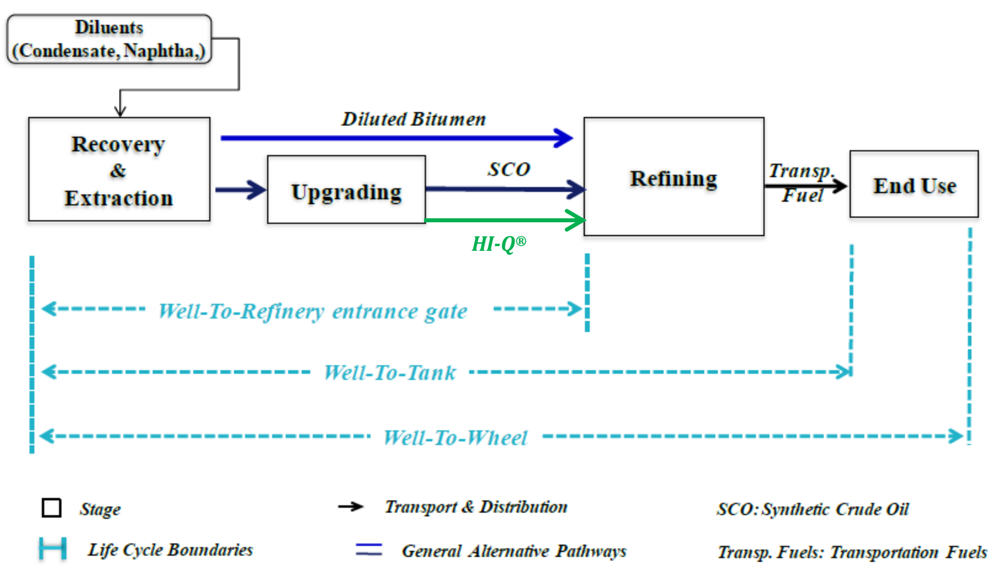

Figure 8 – General flow chart of the life cycle processes and system boundary considered (Source: Bergeson, ISEEE, UofC)

On a /m3 of bitumen basis given a specific set of project conditions (i.e., comparable extent of upgrading with Delayed coking only producing a sour SCO with reduced emissions levels and similar level of heat integration for both processes), the Bergeson report calculates emissions estimates for Delayed Coking WTT at 10.7% higher than HI-Q® Process estimates (WTT emissions are estimated to be 1,190 and 1,080 kg CO2e/m3 bitumen respectively; emissions estimates include emissions associated with surplus electricity generation). Figure 9 provides a breakdown of the contributors considered in the emissions evaluation. The difference results primarily from differences in emissions at the refinery stage for processing the different SCO qualities (65.4 kg CO2e/m3 bitumen higher for processing DC Sour SCO) and differences in emissions estimates at the upgrading stage (46.8 kg CO2e/m3 bitumen higher for the Delayed Coking Case).

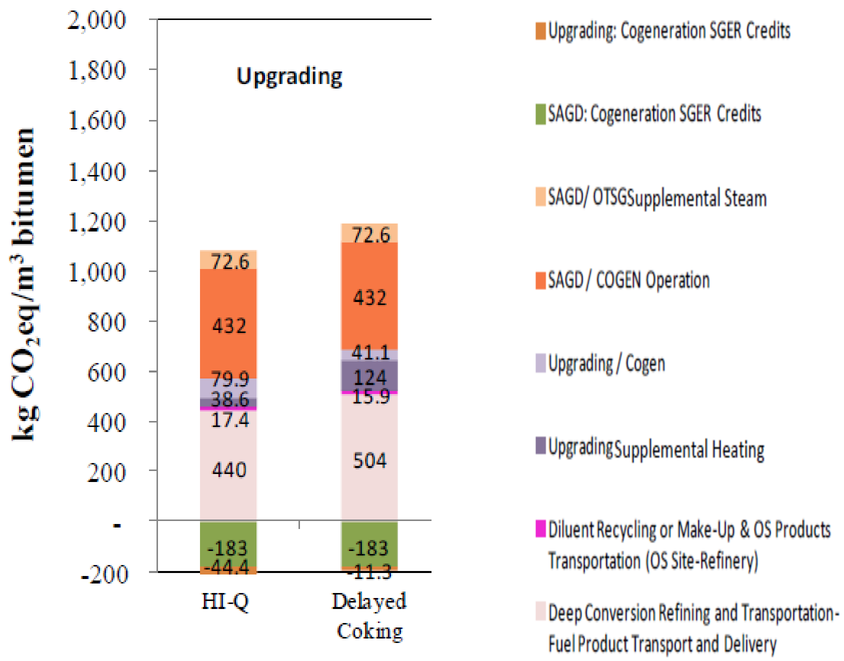

Figure 9 – Well-to-Tank (WTT) greenhouse gas emissions estimates on a m3 Bitumen feed basis (Source: Bergeson, ISEEE, UofC)

MEG also performed an internal emissions evaluation comparing the HI-Q® product with potential competing crudes. Figure 10 shows that HI-Q® compares favourably against global sources of heavy oil imported into the US market (ex. Maya and Arab Medium) when looking at CO_2 mass emissions per energy unit of gasoline consumed; on both a Wells-to-Wheels (WTW) basis and a WTT basis. MEG uses a WTW approach to assess the benefit of strategic greenhouse gas (GHC) levers. This all-encompassing measure shows that MEG can provide the market with a premium green product, marketable in jurisdictions that may otherwise be restricted through GHG policy. Also, this approach allows MEG to respond to negative public opinion by demonstrating that the oil sands is a secure, job creating form of energy produced in a responsible manner.

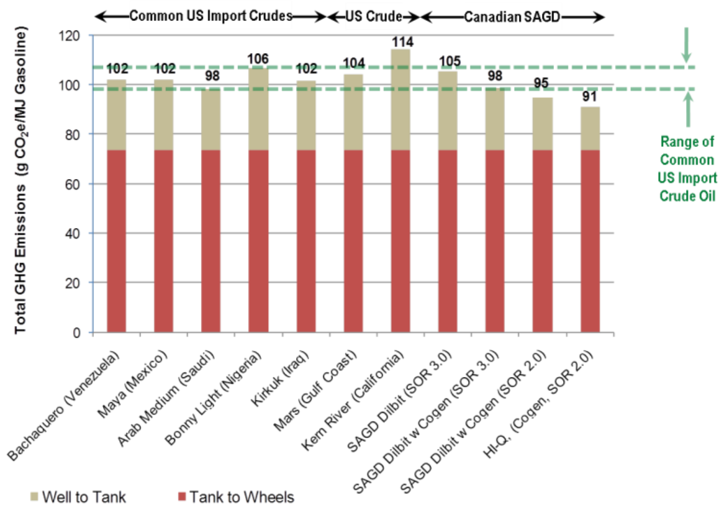

Figure 10 – Comparison of GHG emissions between HI-Q® and global sources of heavy oil

3.2.4 Energy Intensity

The Nelson complexity index (NCI), a measure of conversion capacity of a petroleum refinery relative to the primary distillation capacity, was chosen as a transparent method to compare energy intensity among upgrading technologies.

The NCI assigns a complexity factor to each major piece of refinery equipment based on its complexity and cost in comparison to crude distillation, which is assigned a complexity factor of 1.0. The complexity of each piece of refinery equipment is then calculated by multiplying its complexity factor by its throughput ratio as a percentage of crude distillation capacity. Adding up the complexity values assigned to each piece of equipment, including crude distillation, determines a refinery's complexity on the NCI. The NCI can be directly correlated to the energy intensity of the refinery.

Figure 11 shows typical complexity indices used for upgrading and refining units. Of note, delayed coking is rated as a 6.0 complexity and traditional visbreaking is rated as a 2.75. Our HI-Q® MDRU reactor runs at lower temperatures and thus consumes less energy, so it can be given a lower rating. For this level of analysis, we assigned our MDRU a complexity index of 1.93, a straight linear reduction based on the energy consumed in both processes. The MEG HI-Q® reactor will consumed 70% less than a standard visbreaker based on pilot data from Laramie and commercial data for Visbreakers.

GENERALIZED COMPLEXITY INDICES

Refining process	Generalized complexity index
Atmospheric distillation	1
Vacuum distillation	2
Thermal processes	5*
Thermal cracking, visbreaking = 2.75	
Fluid & delayed coking, other = 6.0	
Catalytic cracking	6
Catalytic reforming	5
Catalytic hydrocracking	6
Catalytic hydrorefining	3
Catalytic hydrotreating	2
Alkylation/polymerization	10
Aromatics/isomerization	15
Lubes	10
Asphalt	1.5
Hydrogen (Mcfd)	1
Oxygenates (MTBE/TAME)	10.0

*Weighted average

Figure 11 – Generalized Nelson Complexity Indices

Using the Nelson complexity indices in Figure 11, and public data for 2 commercial delayed coking upgraders, the overall complexity for MEG HI-Q and delayed coking were derived. As shown in Figure 12, the Nelson

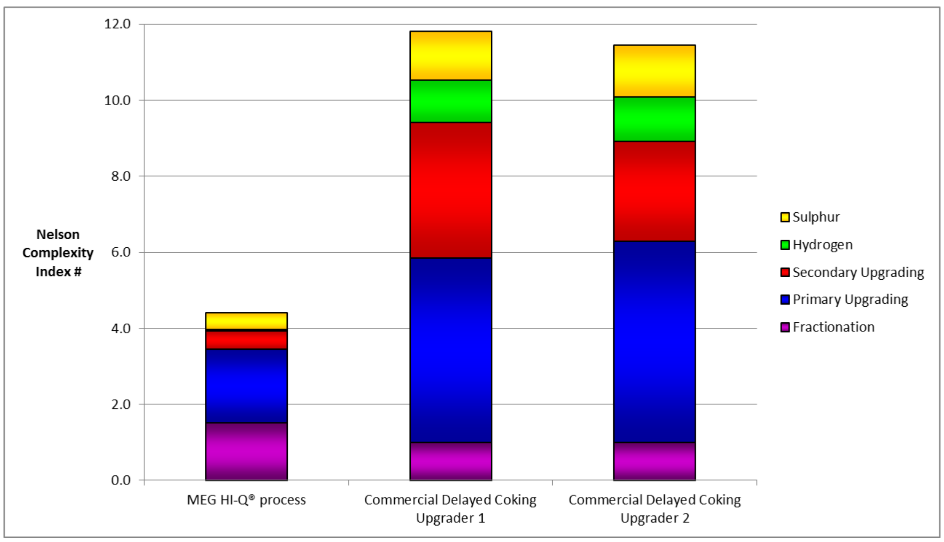

Figure 12 – Nelson Complexity Index Comparison for HI-Q® process and Delayed Coking

Complexity Index for the MEG HI-Q® process is 4.4, while the two commercial delayed coking upgraders were calculated as 11.2 and 11.8. The HI-Q® NCI is 37-40% of the delayed coking NCI. When removing the credit of the MDRU reactor instead of a visbreaker, the HI-Q® NCI is 5.2. This still leaves the HI-Q® less than half the complexity of a delayed coker. By extension of the NCI comparison, the energy intensity of the HI-Q® is less than half of delayed coking.

In a validation exercise, based on MEG's Bitumen Processing Evaluation Report for MS#1, actual energy usage calculations were performed for the MEG HI-Q® process based on the most recent data from the Laramie pilot facility and from readily available data on current operational delayed coking upgraders. For a 60,000 BPD feed, using the same heat integration principles, as noted in table 8, 1,115 GJ/d of net energy is required for the HI-Q® process while the delayed coking upgraders required 6,545-7,867 GJ/d of net energy. The HI-Q® process requires less than half the energy needed of a comparable delayed coking upgrader.

Basis: 60,000 kBPD feed		MEG HI-Q Process	Commercial Delayed Coking Upgrader 1	Commercial Delayed Coking Upgrader 2
Net Total Fuel Energy Required (incl. Steam and cogen)	GJ/d	1115	7867	6545

Table 8 – Energy Usage for HI-Q® process and Delayed Coking Upgraders

4.0 HI-Q® Product output and analysis (Deliverable items C and D)

4.1 Production of partially upgraded products for Third Party Quality Testing (Item C)

Metric for item C deliverable is "Produce sufficient volumes of liquid product (MDRU overheads and deasphalted oil (DAO)) and asphaltenes from each test run for stream and blend analysis".

During every test run useable samples of MDRU overheads, DAO and asphaltenes were produced for both stream and blend analysis. Samples are stored at WRI in Laramie, WY. Due to storage limitations, any asphaltenes not used in analysis end up being sent to a local cement plant where the asphaltenes are used as fuel for the cement kiln. Any liquid samples not used for property testing or supplemental pilot testing (ex. Hydrotreating testing) are stored under refrigerated conditions.

With approximately 375 Barrels of feed processed during Phase 1A, 184 bbls of DAO, 191 bbls of MDRU overheads and 10.6 metric tons of asphaltenes were produced for potential analytical testing.

4.2 Third Party Analytical testing complete for the products produced (Item D)

Metric for item D deliverable was "Third party testing completion and correlation of process performance results for the production of MS-2 products'.

External, third party laboratory analysis by Maxxam was performed on a manufactured HI-Q® product blend prior to SDA-1 to provide a baseline for the analytical results performed by WRI. An excerpt of the Maxxam distillation analysis is provided as proof of external third party analysis.

	oF	WRI (SDA-22)	Maxxam (Pre SDA-1)
Naphtha	350-	4.4	7.8
Distillate	350-650	26.8	27.8
Gas oils	650-975	43.8	45.8
Residue	975+	25	19.0

Table 9 – Distillation results for HI-Q® product from Maxxam and WRI

Maxxam

Success Through Science®

CRUDE ASSAY TEST SUMMARY

Client : MEG Energy Corporation
Contact : Gerald Bruce
Sample Description : Deasphalted Crude
Sample Date : 2010/10/11

Project Number : B099715
Date Reported : 2010/12/01

Distillation Fraction

Sample Number	X71970	X71971	X71972	X71973	X71974	X71975
Description	Whole Sample	Naphtha	Distillate	AGO	VGO	Residue
Distillation Range, °C	- - -	IBP - 180	180 - 343	343 - 399	399 - 525	525+
Distillation Range, °F	- - -	IBP - 356	356 - 649	649 - 750	750 - 977	977+
Yield, mass %		7.75	27.78	4.47	41.01	18.99
Yield, volume%		9.71	29.13	4.39	39.38	17.39
Position in Crude, mass %		IBP - 7.75	7.75 - 35.53	35.53 - 40.00	40.00 - 81.01	81.01 - 100.00
Position in Crude, volume%		IBP - 9.71	9.71 - 38.84	38.84 - 43.23	43.23 - 82.61	82.61 - 100.00
Mid mass %		3.88	21.64	37.77	60.51	90.51
Mid volume%		4.86	24.28	41.04	62.92	91.31

Figure 13 – Excerpt from Maxxam for HI-Q® Assay Analysis Summary and Report – B099715

Maxxam analysis was done before the start-up of the integrated pilot. MEG solicited PARC (Pittsburgh Applied Research Centre) to provide DAO equivalent material from our MDRU bottoms. A preliminary HI-Q® blend was created for economic evaluations and for a baseline for WRI to target during P1A . Both WRI's testing capabilities and the operation of the pilot have improved so the product yield noted in Table 9 from WRI should be considered representative. The distillate and gasoil boiling ranges have remained consistent throughout Phase 1A with operational learnings from the integrated MDRU + SDA configuration allowing the reduction in MDRU severity since less overall conversion is needed to meet pipeline specification. More residue is retained while less naphtha is generated which translates to reduced overall energy intensity. The SDA-22 HI-Q® composition fits well with the findings of the third party product and market valuation for deliverables H and I described in section 8.0 below.

An updated analytical test of a HI-Q® blend by Maxxam will be done once a sample is prepared. Sample DAO and MDRU overheads were gathered during SDA-22. A portion of the MDRU overheads was sent to DuPont to hydrotreat the naphtha and distillate range to remove olefins to meet pipeline specification. This added step of hydrotreating is needed to emulate what the demonstration and commercial HI-Q® products will be. The hydrotreating is necessary to meet the olefin specification for pipeline crude. DuPont testing is planned to be completed in Q2 2014. Maxxam will be testing this blend of HI-Q® and the results will be shared with the funding partners.

Asphaltene testing has also been performed on the co-product from the integrated MDRU+SDA configuration. Jenike & Johanson (J&J) were solicited to determine the physical characteristics of the asphaltenes so transport and storage requirements could be ascertained. Figure 14 shows an excerpt of the analysis performed in their report (11348-1) with a graph showing the angle of inclination needed to prevent bridging and a summary of the particle size distribution. This information has been used to redesign the asphaltene hopper in Laramie to mitigate solids bridging in the hopper. This info is also being used in the design of the demonstration facility.

JENIKE & JOHANSON
INCORPORATED

Flow Properties Testing of Asphaltene

MEG Energy Corp.
Calgary, AB, Canada

11348-1
June 12, 2013
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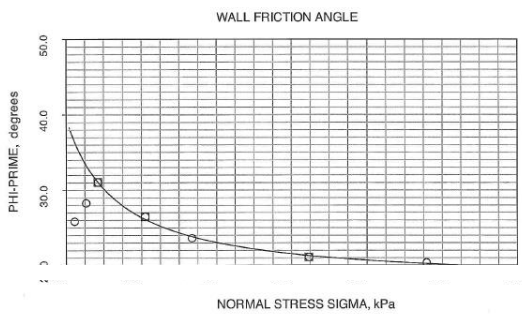
Report author
John Cushion, Assistant Engineer, Tyngsboro, Massachusetts; jcushion@jenike.com

Report reviewer
Andrés D. Orlando, Ph.D., Project Engineer, Tyngsboro, Massachusetts; aorlando@jenike.com

We value your feedback. **Please send your comments to** ceo@jenike.com



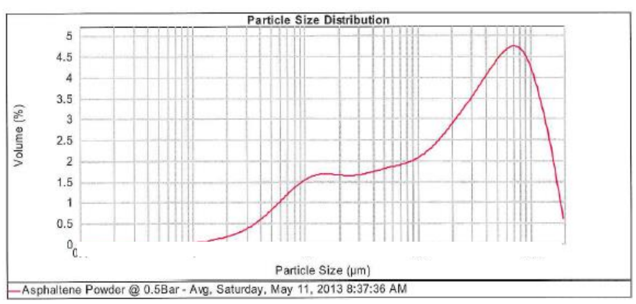


Figure 14 – Analysis of the Asphaltenes – Excerpts from J&J report

Also, chemical analysis on the asphaltenes was performed by Standard Laboratories Inc (Job # 201200666001) so potential uses for the asphaltenes could be categorized. Figure 15 provides an excerpt from the analysis showing the chemical composition of the asphaltenes. Of note, the asphaltenes have good burning potential based on the volatility analysis (blanked out for confidentiality reasons).

STANDARD LABORATORIES, INC.
03/08/12

CUSTOMER: WESTERN RESEARCH INSTITUTE

1366-18-BB-1

JOB NO.: 201200666001
LOCATION: CASPER, WY
APPROVAL:

PROXIMATE ANALYSIS (%)

	AS RECD	DRY	EQM
MOISTURE			
ASH			
VOLATILE			
FIXED C			
SULFUR			
BTU/#			

ULTIMATE ANALYSIS (%)

	AS RECD	DRY	EQM
MOISTURE	0.53		
ASH	0.28	0.28	
SULFUR	7.70	7.74	
NITROGEN	1.62	1.63	
CARBON	83.08	83.52	
HYDROGEN	6.46	6.49	
OXYGEN	0.34	0.34	

MINERAL ANALYSIS OF ASH (%)

Figure 15 – Chemical Analysis of Asphaltenes
(Source: Standard Laboratories Inc. Job # 201200666001)

In addition, MEG obtained explosivity testing on the asphaltenes from Chilworth Global summarized in report – ME13764RP. Figure 16 summarizes the results of dust explosion risk posed by the dry solid asphaltenes generated. This information has been used in the design of the demonstration scale facility.

Overall, a good appreciation of the HI-Q® product and co-products has been obtained during P1A. through third party testing. Further third party testing will continue to be obtained and shared with the funding partners in subsequent phases.

The Global Experts in Explosion & Process Safety
Chilworth Global

DEKRA

MEG Energy
CTI Ref: ME13764RP
Page 2 of 25

TABLE 1

SUMMARY OF TEST RESULTS

For Test Sample: **1419-13-T**

Parameter			Test Results
Fire Risk			
1.	Flammability of Solids - Burning Rate		*
2.	Flammability of Solids @ Elevated Temp.		*
Dust Explosion Risk			
1.	Explosibility Classification		*
2.	Explosion Severity - 20L Sphere		
	Maximum Explosion Pressure (bar)		7.9
	Maximum Rate of Pressure Rise (bar/s)		757
	Kst Value (bar.m/s)		206
3.	a. Minimum Ignition Energy – Dust Cloud (mJ)		10-25
	b. Minimum Ignition Temperature - Dust Cloud (°C)		550-560
	c. Minimum Ignition Temperature – Dust Layer (°C)		210-220
4.	a. Limiting Oxygen Concentration (% by volume)		*
	b. Minimum Explosible Concentration (g/m^3)		*
Thermal Stability			
1.	Bulk Powder Test - Onset Temp. (°C)		*
2.	Aerated Powder Test - Onset Temp. (°C)		*
3.	Air Over Layer Test - Onset Temp. (°C)		*
Electrostatic Risk			
1.	Volume Resistivity (ohm.m)	ambient R.H.	*
		low R.H.	*
2.	Charge Decay Time (min:sec)	ambient R.H.	*
		low R.H.	*

Note: The results given in this report apply to the sample tested. Changes in composition, particle size, and moisture content may affect the results.
* Indicates test was not performed on your sample.

Figure 16 – Dust Explosion Risk analysis on asphaltene solids produced;
(Source: Chilworth Global Report – ME1376RP)

5.0 Product Hydrotreating Study (Deliverable item E)

Metric for deliverable item E was "Supply liquid products to third party for hydroprocessing assessment. Determine the hydrotreating requirements of Base upgrade products for stability, contaminant removal, diesel cetane improvement and gas oil hydrogen content".

DuPont was engaged to perform hydroprocessing test runs at their pilot facility in Q4 2012 as per the follow objective:

> Define process conditions, quantify hydrogen consumption and identify a catalyst suitable to reduce bulk olefins in HI-Q crude to 0.5 wt% or lower using Isotherming (DuPont's liquid phase hydrotreating technology).

DuPont completed the test program in April 2013 and delivered a final report with process and catalyst recommendations in June 2013. The recommendations have formed the basis of the Preliminary Process Design Package. Figure 17 shows a sanitized conclusions slide of the report presentation by DuPont.

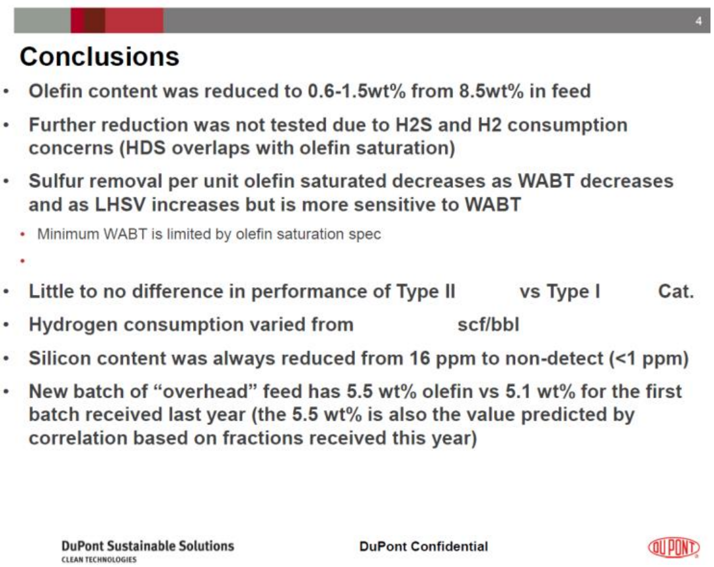


Figure 17 – Hydroprocessing Test Results

There is a further hydroprocessing study planned in which DuPont will saturate 25 litres of overhead material to support the blending of approximately 50 litres of HI-Q® blend. This blend would be used to generate an updated HI-Q® assay for market analysis. This hydroprocessing study is in the queue with DuPont with their expected completion of the study to be in Q2/Q3 2014.

6.0 Byproduct Utilization Study (Deliverable item F)

Metric for deliverable item F was "Supply asphaltene by-products for clean energy technology testing (oxycombustion and catalytic gasification). Target production >3000kg asphaltenes".

MEG Energy has evaluated possible uses for the asphaltene by-product including gasification, incineration, landfill and asphalt blending. Of the technologies evaluated in the scoping exercise, the asphalt product pathway seems the most promising with the highest potential value generated and the lowest potential environmental footprint and thus was pursued further at this stage. Asphaltene samples (1 gallon (3.8 L)) were provided to Western Asphalt (www.westernasphalt.ca) of Bruderheim, AB in Q2 2013. Favourable results from their initial in-house laboratory analysis were:

1. Co-product dosage positively affects ductility of parent asphalt (ASTM D113)
2. Asphaltenes impact the kinematic viscosity (ASTM D2170) –quantifiable and controllable
3. Penetration minimally affected by Asphaltene (ASTM D-5)
4. Solubility not effected by Asphaltene (ASTM D-2042)

Based on the successful preliminary results, Western Asphalt has asked for a 1 55 gallon drum (210 litres) to continue with more detailed testing. The asphaltene material will be shipped to Western

Asphalt in January 2014. They believe there is a large enough asphalt market that would consume all the asphaltenes produced from a commercial HI-Q® facility.

However, MEG continues to investigate all asphaltene disposition technologies to ensure all options are available.

7.0 Stability and compatibility of HI-Q Product study (Deliverable item G)

Metric for deliverable item G was "Stability and compatibility testing for blended products produced in MS-2. Determination of the stability/instability index (P-value) of the product blends from each test run. P-value is a measure of asphaltened precipitation propensity. P-value >1 is stable."

Irv Wiehe of Soluble Solutions (www.solublesolutions.com), a world renowned expert on crude compatibility, was solicited to determine the stability of our product. Below is his email response sharing the results from his analysis. A P-value of 2.58 was obtained.

Irv Wiehe Email:

"On Jan. 8, 2013 I compatibility tested Sales Oil for MEG Energy. First, I mixed 5 ml of Sales Oil with 25 ml of n-heptane and asphaltenes precipitated, showing that the heptane dilution and toluene equivalence tests were the proper tests to run. In the heptane dilution test I determined the maximum volume in ml of n-heptane that can be blended with Dilbit without precipitating asphaltenes. The value I obtained of 8.25 ml shows that Sales Oil not only is compatible with itself but it has considerable reserve solvency. This is sometimes measured by the P-value, which is 2.65 for MEG Sales Oil. In the toluene equivalence test the concentration is kept at 2 grams of oil and 10 ml of a mixture of n-heptane and toluene. The toluene equivalence is the minimum percent toluene in the heptane-toluene mixture required to keep the asphaltenes in solution. For MEG Sales Oil a toluene equivalence of 26.5 was measured. The compatibility numbers were calculated from the heptane dilution, the toluene equivalence, and the measured density (0.9362 g/ml). I calculated an insolubility number of 41 and a solubility blending number of 108.

The criterion of compatibility for a mixture of oils is that the volume average solubility blending number of the mixture must be higher than the insolubility number of all the oils in the mixture. All crude oils have insolubility numbers that are much less than the solubility blending number of MEG Sales Oil. As a result, MEG Sales Oil is compatible in all proportions with all crude oils with solubility blending numbers greater than 41. About 17% of crude oils have solubility blending numbers less than 41. Since MEG Sales Oil is compatible with n-heptane if the volume percent of Sales Oil is above 38% and since n-heptane has a solubility blending number of zero, lower than any crude oil, MEG Sales Oil is only prone to precipitate asphaltenes at volume percents below 38."

Irv will be asked again to provide his stability analysis on the updated HI-Q® product with hydrotreated components from DuPont. It is expected that the stability of the updated HI-Q® product should be in the same range with a P-Value above 2.5 which is well above the target value of 1.

8.0 HI-Q® Product marketing and valuation study (Deliverable items H and I)

Metric for deliverable item H was " Product refining study to determine the technical requirements for motor fuels production from MS-2 product blends. Requires detailed feedstock characterization from analytical work for screening analysis leading to subsequent pilot plant work with technology providers".

Metric for deliverable item I was "Determine the ability to process, and associated value of the upgrade products from the Base integrated upgrader configuration (MS-2 product) in the North American refinery complex"

Muse Stancil was solicited in Q2 2012 to perform a comprehensive product and market valuation analysis on the HI-Q® product. This analysis is crucial in determining what economic benefit the HI-Q® product will deliver and if HI-Q® will meet the economic hurdles required in order to proceed with the commercialization program. As a side benefit, the report satisfies deliverable items H and I.

The key outcomes from the Muse Stancil study was that HI-Q® :

1. is a suitable feedstock for high conversion refiners with no specific modifications required to process HI-Q®.
2. provides a potential yield uplift to refiners in substituting dilbit and other heavy crudes with HI-Q®
3. should obtain a favourable price which captures greater than 50% of the expected light-heavy differential

Figure 18 is taken from the Muse Stancil report and shows the expected price for HI-Q®. Muse believes HI-Q® should command a premium to Maya, WCS and Dilbit. From 2016 onward, the forecast for the crudes shown in Figure 18 all increase in price at the same rate. Using the year 2020 as an example,

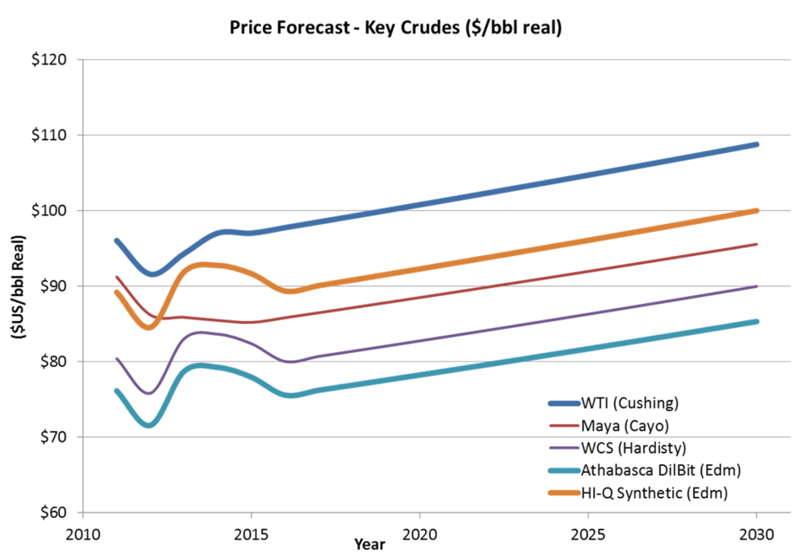


Figure 18 – Price forecast for HI-Q product and other comparison crudes (Source: Muse Stancil Report October 2012)

which coincides with the likely first commercial HI-Q® production, WTI should command $100/bbl, while Athabasca DilBit should receive $78/bbl. Using these two streams as the MEG proxy for the light-heavy differential (WTI (light) and Athabasca Dilbit (heavy)), the midway point between these two crudes is $22/bbl. HI-Q® is priced at $92.50/bbl which is more than 50% of the differential.

The Muse Stancil HI-Q® pricing model is based on manipulating five independent variables:

1. Crude Oil Price
2. Natural Gas Price
3. Cracking Margin
4. Coking Margin
5. Gasoline – ULSD Differential

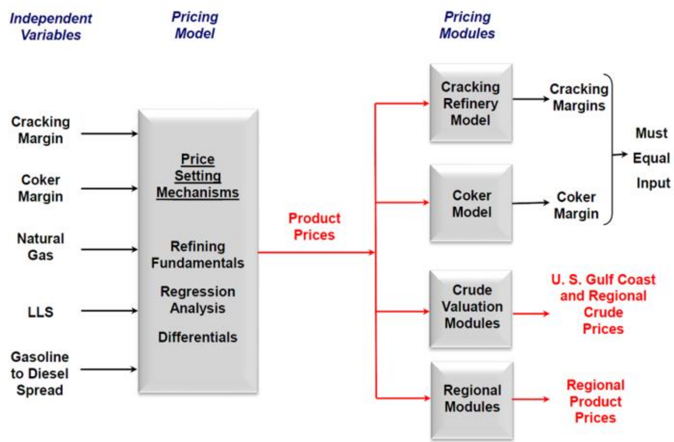


Figure 19 – Muse Stancil Pricing Model
(Source: Muse Stancil Report October 2012)

The five independent variables are used in the Pricing Model to generate prices for the refinery product slate. The refinery product slate contains standard grades of LPGs, gasoline, jet, diesel, fuel oil, coke and specialty products. The refinery models are then optimised with a typical feed basket to align their Cracking and Coking margins with the input margins and create a base case. New crudes, such as HI-Q® are valued by analysing their impact on calculated margins as they are run through the refinery models and compared to the base case.

All crude pricing models start with a "marker crude" and use deterministic methods to calculate a relative market value for other crudes. The Oil Price marker in this study is based on Louisiana Light Sweet LLS crude. The model incorporates WTI being landlocked temporarily distorting USGC vs Cushing prices and the slowed increase in pipeline capacity to the Gulf Coast (see the jump in prices in 2012 in Figure 18). The LLS price is based on history, statistics, and EIA & IEA prices. Relative crude value is calculated based on refinery outcomes and market substitutes. The model uses two macro-economic variables: crude oil price and gas price and three refinery economic variables cracking and coking margins and gasoline – diesel spread as inputs.

Once the refinery model has determined relative pricing at the USGC, a transport model adds the forecast pipeline costs to determine the Netback pricing at Edmonton. The Pipeline Transport Model is Tariff-based and backs out to Edmonton pricing.

9.0 Overall Project Achievements (relative to Phase 1A)

Phase 1A has elucidated that the HI-Q® process concept (MCRU + SDA) is technically viable and can process 5 BPD of dilbit and produce the desired products consistently and reliably at this scale. The product produced has a market and should command a favourable market price resulting in economics that allow the project to proceed to the next phase of development.

Valuable information has been obtained from the integrated pilot operation to solidify/validate/prove our IP position resulting in a Canadian Patent (#2,764,676) being issued in November 2013. The process results from the integrated pilot operation in Phase 1A are crucial in setting necessary design parameters for the successful design of the 1,500 BPD demonstration facility.

Figure 20 summarizes the key quality parameters and shares the distillation distribution for the HI-Q® product generated during Phase 1A.

In the absence of the HI-Q Process®, MEG Energy has the alternative of adopting a delayed coking process (upgrading process most widely used in the Oil Sands industry). In an upgrader, the delayed coking technology operates with other technologies such as hydrotreating technologies. During upgrading, the way in which the producer blends the streams of upgrader intermediate products (as in refineries) while meeting a particular product specification will impact the quality of the SCO being produced. MEG Energy would entertain a low cost delayed coking approach where hydrotreating is used at a minimum to meet pipeline specification. The product would be a medium sour SCO (synthetic crude oil) with an API closer to 27 than the typical range of 32-35 for Oil Sands SCO's. A lower cost, lower complexity delayed coker was chosen as the benchmark/baseline technology to compare to the HI-Q® process. Table 10 (repeat of table 1) provides a comparison between the base technology Delayed Coking and the P1A outcomes for the HI-Q® process. Hi-Q® performs substantially better in each measure and thus provides confidence to MEG Energy to continue with the development activities to commercialization the HI-Q® process.

Key Quality Parameters

Property	Unit	HI-Q	Bitumen
Density (relative)	(SG)	0.9334	1.014
Density (absolute)	(kg/m 3)	932.6	1014
API	(°)	20.1	8.0
C	(wt%)	84.9	83.4
H	(wt%)	11.44	10.6
N	(wt%)	0.21	0.39
S	(wt%)	3.5	5.6
Cetane Index	(Cdn)	35.2	36
MCR	(wt%)	2.7	15.5
C5 Insoluble	(wt%)	0.24	19.0
TAN		0.29	2.5
Nickel	(ppm wt)	5.4	104.0
Vanadium	(ppm wt)	10.1	279.4
Phosporous	(ppm wt)	<0.5	<0.5
Viscosity			
Temperature			
32 °F	(cSt)	191.32	
41 °F	(cSt)	152.7	
50 °F	(cSt)	107.4	31,200,000,000
68 °F	(cSt)	58.52	166,000,000
77 °F	(cSt)	44.77	25,600,000
104 °F	(cSt)	24.61	275,016

Distillation Distribution

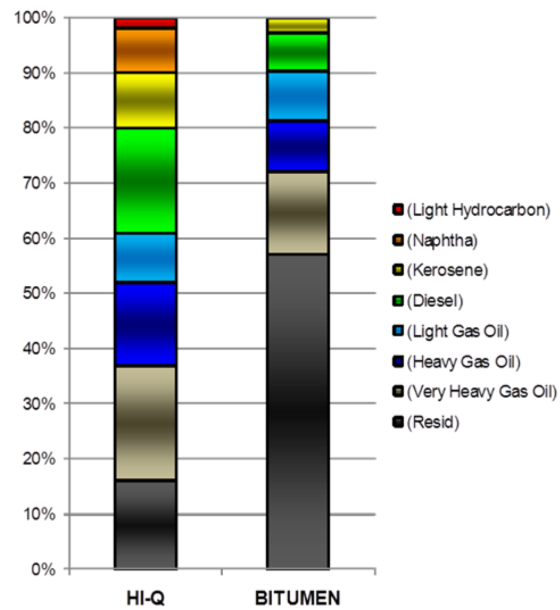


Figure 20- HI-Q quality parameters and distillation distribution from Phase 1A

Measure	Delayed Coking Base	MEG Field Upgrading (HI-Q® Process) Target	MEG Field Upgrading (HI-Q® Process) MS#2 outcome	Comment
Gas Yield (%wt)	7	lower	2.5	64% reduction in Gas produced
Coke/Asphalt Yield (%wt)	20.1	lower	16.5	18% reduction in solids produced
Liquid Yield (%wt)	72.7	higher	81.3	12% increase in mass yield (with diluent slip)
			81.2	11.8% increase in mass yield (diluent/solvent free)
Liquid Yield (%vol)	82.7	higher	91.0	10% increase in vol yield (with diluent slip)
			87.9	6.3% increase in vol yield (diluent/solvent free)
Liquid Product API	27.3	Pipeline ready	20.1	~130 cSt @ 7.5oC << 300 cSt pipeline spec
Liquid Product %S (wt)	2.81	market	3.48	<4.1wt% for dilbit; positive from market

Table 10 - Success Criteria for MEG Field Upgrading (source: Attachment 1 to Schedule B in AIEES contract)

10.0 Financial Summary

MEG has provided a copy of all eligible expenses incurred during Phase 1A (also noted as MS-2 by SDTC). No revenue was generated with expenses incurred during the reporting totaling $3.1MM CAD.

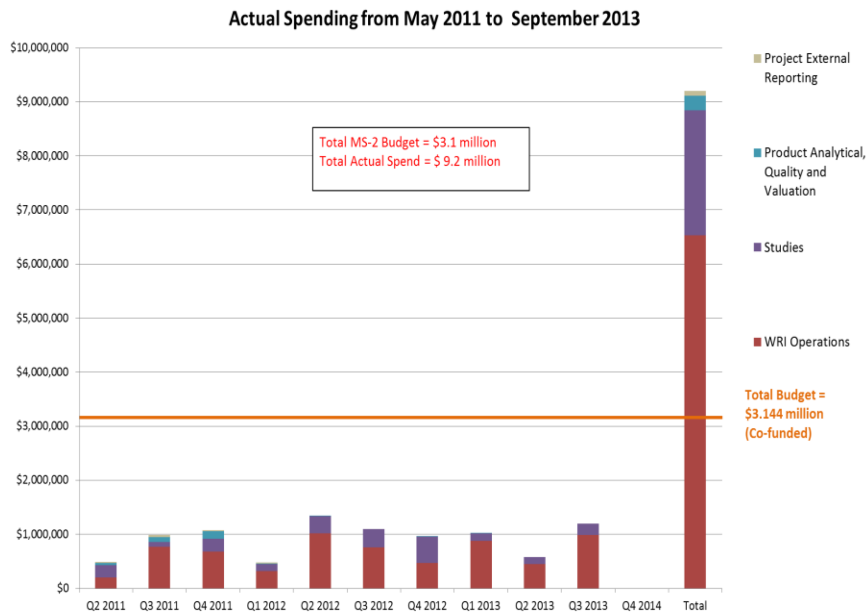


Figure 21 – Eligible Expenses during Phase 1A (MS-2)

11.0 Experience with Funding Agency (AIEES)

MEG values the support and guidance provided by AIEES during phase 1A. The visits by AIEES representatives to the pilot facility emphasize and highlight to the MEG/WRI consortium the importance this project has in the AIEES portfolio.

Research and development is not a linear activity, and even though a schedule was developed, we do appreciate the patience and understanding afforded by AIEES to allow the research process to fluidly develop without unnecessary "time consumption" through overly burdensome reporting and "justifying" activities during times of challenge (mechanical failures, plugging, unplanned shutdowns) with the operating the pilot facility. AIEES has allowed MEG/WRI ample opportunity to focus on getting the pilot plant operational and into a steady state operation to achieve the necessary success to proceed to the next stage of development!

The overall involvement by AIEES and the structure provided by AIEES has been noticeably beneficial to the success of the project through the first phase of the project.