

PRESSURE VESSEL DATA SHEET				Data Sheet No.:		DS-CL03A-C-100-V107			
Specification No.:				085354-3010-PV-10		Requisition No.:		508298-100-45-MR-5180-0001	
DESIGN DATA					PAINTING & INSULATION				
Service: Treater					External Surface Preparation: Per Spec 085354-3010-PC-50 Table 3, System B1				
Operating Temperature: 125.7 °C Pressure: 537 kPag					Internal Surface Preparation: N/A				
Design Temp. Min.: -29.0 °C Max.: 178.0 °C					Structural Surface Preparation: Per Spec 085354-3010-PC-50 Table 3, System S1/S5/S6				
Design Pressure @ Minimum Temperature: 862 / FV kPag					Vessel External Prime: Per Spec 085354-3010-PC-50 Table 3, System B1				
Design Pressure @ Maximum Temperature: 862 / FV kPag					Vessel Internal Prime: N/A				
Sour Service: No Lethal Service: No					Structural Prime: Per Spec 085354-3010-PC-50 Table 3, System S1/S5/S6				
New Vessel MAWP Limited by: Head @ 913.4 ³ kPag					Vessel External Finish: Per Spec 085354-3010-PC-50 Table 3, System B1				
Corrosion Allowance - Shell / Heads: 3.2 / 3.2 mm					Vessel Internal Finish: N/A				
Wall Thickness - Shell / Heads: 19.0 / 18(nom), 18(min) mm ³					Structural Finish: Per Spec 085354-3010-PC-50 Table 3, System S1/S5/S6				
Joint Efficiency - Shell / Heads: 1.0 / 1.0					External Insulation - Shell: Per Spec 085354-3010-IN-00 (Note 10)				
Registration: Alberta Design Code: ASME Sec VIII D1					External Insulation - Head: Per Spec 085354-3010-IN-00 (Note 10)				
Code Stamp: Yes, U Stamp Orientation: Horizontal					Internal Insulation: N/A				
Post Weld Heat Treatment: Per Code					External Cladding: Per Spec 085354-3010-IN-00 (Note 10)				
Head Type: 2:1 Semi-elliptical					Insulation - Bottom Head: N/A				
Allowable Stress @ Design Temperature: Per Code kPa					Insulation - Skirt: N/A				
Ambient Temperature: -39 to 39 °C Max Wind Speed: 31.4 m/s					Fireproofing - Skirt: N/A				
Minimum Metal Design Temperature: -29 °C					Fireproofing - Saddles: N/A				
Fluid: See Page #3 Fluid Density: Varies kg/m ³									
MATERIALS					QUALITY CONTROL / INSPECTION / TESTING				
Shell: SA516 Gr 70N Repads: SA516 Gr 70N					Hydrotest Pressure: Per Code kPag				
Heads: SA516 Gr 70N Fittings: SA234 WPB					Hydrotest Medium: Water				
Trays: N/A Supports: SA516 Gr 70N					Hydrotest Duration: Min 1hr hrs				
Bolts/Nuts: SA193 B7/A194 2H Flanges: SA105N					Radiographic Inspection: RTI				
Nozzle-Necks: SA106 Gr B Gaskets: SPW SS 316					Ultrasonic Inspection: Per Spec 085354-3010-EW-20 (Note 29)				
Internal Lining: N/A Pipe: SA106 Gr B					Magnetic Particle Inspection: Per Spec 085354-3010-EW-20 (Note 28)				
Internals: SA516 Gr 70N Mist Eliminator: N/A					Dye Penetrant Inspection: Per Spec 085354-3010-EW-20				
Structural Attachments - External: SA516 Gr 70N					Material Mill Test Reports: YES				
Structural Attachments - Internal: SA516 Gr 70N					Post Weld Heat Treatment Records: YES				
Material Impact Test Required: Per Code					Hydrotest Reports: YES				
Certified Elevated Temp Tests Req'd: No					Radiographic Inspection Reports: YES				
DIMENSIONAL/SHIPPING DATA					Ultrasonic Inspection Reports: YES				
Vessel Size: 4267 (Note 18) mm ID x 30480 (Note 18) mm S/S					Magnetic Particle Inspection Reports: YES				
Boot/Gas Dome: N/A mm ID x N/A mm S/S					Dye Penetrant Inspection Reports: YES				
Capacity: 457 m ³					Fabricator Quality Control Manual: YES				
Centerline/Bottom Seam Elevation: 2600 mm					Shop Inspection by Owner: YES				
Weight - Empty: 122,429 kg ³ Weight - Hydrotest: 579,637 kg ³					Welding Procedure Review/Approval: YES				
Weight - Operat'g: 608,216 kg Weight - Shipping: 111,129 kg									
O/A Shipping Dimensions (LxWxH): 33.6 x 5.2 x 5.8 m					NOTES				
Nozzle Covers/Connection Plugs: Required					(*) Seller to specify / confirm				
Shipping Cradles: N/A					1) Design condition - vessel full of the liquid with SG = 1.				
Ocean Transport Protection: Required (if applicable)					2) Structural attachments are defined as any non-pressure part welded directly to the shell or head.				
ACCESSORIES BY FABRICATOR					3) All manways shall be completed with internal grab rungs.				
Manway Davits: Y Ladders: Y					4) All davits on inclined manways shall open horizontally.				
Ladder and Platform Clips: Y Platforms: Y					5) All internals except permanent supports shall be removable through manway and shall be designed and supplied by seller.				
Pipe Support and Guide Clips: N Lifting Lugs: Y					6) Paired flanges to be used for instruments shall be set with a jig to avoid cumulative errors in alignment.				
Insulation Supports: Y Pipe Coil: N					7) Caged ladders and platforms with railings and safety gates. Refer to 2B drawings attached with MR for reference. All ladders and platforms shall meet applicable requirements of Alberta Occupational Health & Safety code and regulations and project specification. Ladders/platforms shall be painted per painting specification				
Insulation Supports Bottom Head: N Anodes: Y					8) 30 Activated Sacrificial alumina anodes for each Treater Vessel to be installed by Seller. The anodes shall be supported by teflon rollers.				
Fireproofing Supports: N Nameplate: Y									
Saddles: Y Mist Eliminator: N									
Tray/Packing Supports: N Vortex Breaker: Y									
Manway Internal Grab Rungs: Y Grounding Lugs: Y									
Siphon Drains on Nozzles: Y									
REVISIONS					MEG Energy Corp. SNC-LAVALIN				
REV NO. DATE BY CHK APP DESCRIPTION					PROJECT MEG Energy Christina Lake Regional Project Phase 03A- Central Plant Facilities				
3 5-Nov-15 MJ EG NZ NB Issued For Purchase					JOB NO. 508298 TAG NO. 3A-V-107A/B				
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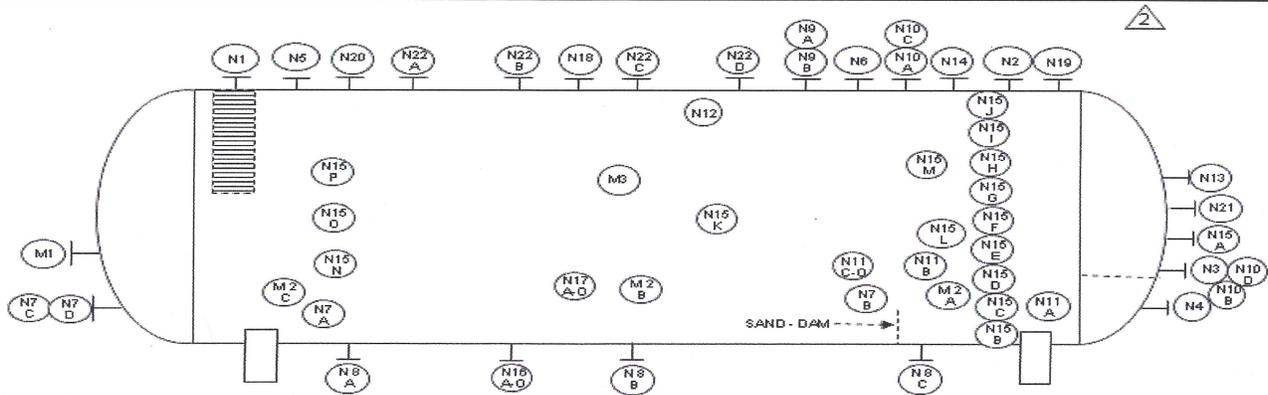
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CONNECTION SCHEDULE

Mark	Nominal Size	Qty	Flange		Service	Projection (Note 34) (mm)
			ASME	Type		
N1	10	1	150	RFWN	Emulsion Inlet c/w removable degassing device (G-Sep).	2749
N2	4	1	150	RFWN	Vapour to Diluent Recovery System / Gas Blanket	2749
N3	16	1	150	RFWN	Dilbit Outlet	1260 (TL - FOF)
N4	4	1	150	RFHB	Produced water outlet c/w collection header	960 (TL - FOF)
N5	6	1	150	RFWN	Vent	2749
N6	8	1	150	RFWN	PSV (HOLD SIZE for PSV sizing)	2749
N7A-D	2	4	150	RFHB	Steam-Out	2470
N8A-C	6	3	150	RFWN	Drain	2470
N9A/B	6	2	150	RFWN	Level Indicator Transmitter (Interface) - LIT c/w still wells	2479
N10A-C	4	2	150	RFWN	Level Indicator Transmitter - GWR type - LIT	2749
N10B-D	4	2	150	RFHB	Level Indicator Transmitter - GWR type - LIT	1140 (TL - FOF)
N11A-O	4	15	150	RFHB	Anode connection c/w two anodes and Teflon rollers (total 30 anodes)	1652
N12	2	1	150	RFHB	Temperature Indicator with Transmitter-TIT	1250 (TL - FOF)
N13	2	1	150	RFLWN	Temperature Gauge - TG	1360 (TL - FOF)
N14	2	1	150	RFLWN	Pressure Gauge - PG	2749
N15A	2	1	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	2420
N15B/J	2	2	150	RFHB	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	1500
N15C/K	2	2	150	RFHB	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	1750
N15D	2	1	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	2097
N15E/L	2	2	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	2325
N15F	2	1	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	2416
N15G	2	1	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	2389
N15H/M	2	2	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	2238
N15I	2	1	150	RFHB	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	1931
N15N	2	1	150	RFHB	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	1552
N15O	2	1	150	RFHB	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	1787
N15P	2	1	150	RFLWN	Sample connections, c/w 3/4" pipe (SCH160), blind flange, gasket, bolts & nuts	1954
N16A-O	2	15	150	RFLWN	Desand drains c/w Blind flange, studs ,nuts and gasket	2420
N17A-O	2	15	150	RFHB	Desand jets c/w Blind flange, studs, nuts & gasket	1600
N18	4	1	150	RFWN	Spare, c/w blind flange, gasket, bolts and nuts	2749
N19	10	1	150	RFWN	Maintenance Vent c/w blind flange, gasket, bolts and nuts	2749
N20	3	1	150	RFHB	Utility	2749
N21	6	1	150	RFWN	Pump Recycle	2749
Deleted					Deleted	
N22A-D	10	4	150	RFWN	Future Transformer Nozzles c/w blind flange, studs, nuts and gasket (Note 32)	2749
M1	24	1	150	RFWN	Manway-Head, c/w blind flange, studs ,nuts and gasket (c/w inner ring) and davit	1355.2 (TL - FOF)
M2A/B/C	24	3	150	RFWN	Manway-Shell, c/w blind flange, studs ,nuts and gasket (c/w inner ring) and davit	2580
M3	24	-	-	-	Deleted	

VESSEL SKETCH



NOTES

- 9) Vessel shall be equipped with Building Flashing Ring.
- 10) Seller shall provide 64mm mineral wool insulation with 0.8 mm stucco embossed aluminum cladding.
- 11) All internal attachments shall be attached to the vessel.
- 12) Oil residence time in the vessel shall be 92 minutes. Oil residence time in the oil box shall be 5 minutes.
- 13) All process nozzles of pressure vessels shall be designed to withstand loading and moments as specified in the allowable nozzle load specification 085354-4060-PS-001.
- 14) Typical Produced Water composition is shown on page 7.

REVISIONS

REV NO.	DATE	BY	CHK	APP	DESCRIPTION
3	5-Nov-15	MJ	EG	NZ	Issued For Purchase
2	22-Apr-13	VK	DL	AA	Issued For Purchase
1	7-Jan-13	VK	DL	AA	Issued For Purchase
0	4-Dec-12	DL	--	LA	Issued For Purchase

MEG Energy Corp. **SNC-LAVALIN**

PROJECT: MEG Energy Christina Lake Regional Project Phase 03A- Central Plant Facilities

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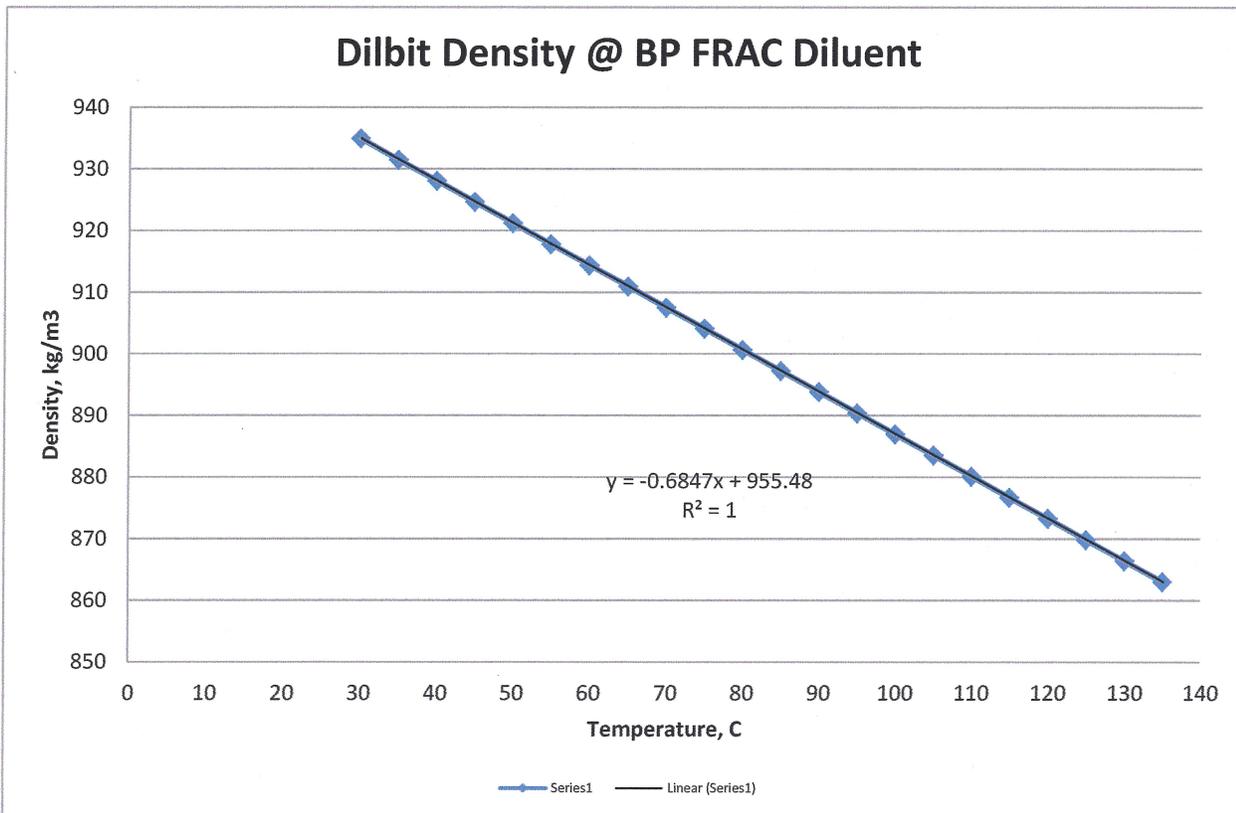
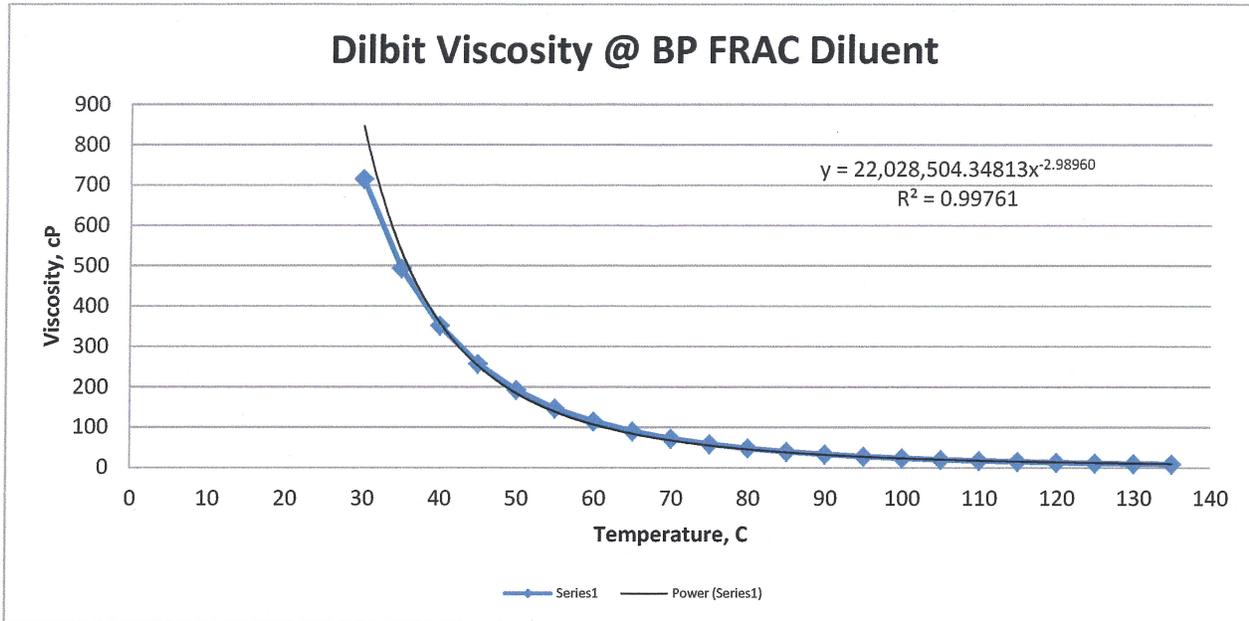
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PROCESS CONDITIONS								
OPERATING CASE				CASE 1		CASE 2		
Fluid				Naphtha Dilbit Production		BP Frac Dilbit Production		
Operating Pressure		kPag		537		537		
Operating Temperature		°C		125.7		117.7		
Design Pressure		kPag		Refer Page # 1		Refer Page # 1		
Design Temperature		Min/Max °C		Refer Page # 1		Refer Page # 1		
Slug/Surge Volume		m ³		0		0		
Hazard Level								
VAPOUR								
Mass Flowrate		kg/h - Sm ³ / h		4983 / 2170		5440 / 2238		
Density		(@ P & T) kg/m ³		11.15		12.19		
Viscosity		cP		0.0102		0.0098		
Molecular Weight				54.29		57.47		
LIQUID HYDROCARBON								
Mass Flowrate		Bitumen / Diluent kg/h		209,267		202,839		
		Am ³ /d		5,773		5,564		
Oil Gravity		°API		18		18		
Oil Specific Gravity				0.87 (Note 15)		0.875 (Note 15)		
Viscosity		cP		10.14 (Note 15)		14.2 (Note 15)		
Surface Tension		dynes/cm		18.61		18.37		
LIQUID AQUEOUS								
Mass Flowrate		kg/h		24,890		24,384		
		Am ³ /d		636		619		
Water Specific Gravity				0.939 (Note 15)		0.946 (Note 15)		
Viscosity		cP		0.218 (Note 15)		0.234 (Note 15)		
VESSEL								
Horizontal / Vertical						Horizontal		
Shell Diameter (ID)		mm				Refer Page # 1		
Shell seam to seam length		mm				Refer Page # 1		
Vortex Breaker Required				No				
Other Internals				By Seller				
Sand content				< 280 kg/hr				
NOTES								
15) Density and viscosity varies with temperature as per the attached curves on pages 4 to 6								
16) Bulk liquid and gas separation performed through upstream inlet separator. Diluent blends with bitumen carried out directly up stream of FWKO/Treater train, which may result in flash gas as indicated.								
17) Treater oil outlet viscosity shall be designed to be ≤ 0.5% BS&W, maximum oil concentration in produced water is 1000 ppmv. The separation efficiency of the vessel shall be 150 microns liquid droplet size.								
18) Seller to confirm vessel size is sufficient for separation requirements as specified in the datasheet.								
19) Flow is controlled to vessel. Flow control valves let down pressure from the FWKO pressure to the Treater operating pressure.								
20) Desand internals to be included with the vessels as well as desand nozzles to/from vessel.								
21) H2S in gas phase is up to 0.019%mol, CO2 in gas phase can be as high as 0.12%mol, Chloride content in water phase is 1140mg/l.								
22) Treater flow rates shown above represent the flow rate to each vessel. Two vessels will operate in parallel.								
23) The lines from the samples points to the sample connections shall be of 3/4" seamless tubing (316SS), and shall be located inside the vessel. Sample connections shall consist of a 2" flanged connection with 3/4" pipe SCH160 (SA106 Gr.B) passing through and seal welded to a 2" blind flange. Externally, the SW block valve shall be provided within 200mm of the vessel connection. Piping downstream of the block valve will be supplied by others. All external sample connections (N15 A-P) shall be located inside the building close to the vessel outlet.								
24) Seller to confirm sizes and quantities of all connections.								
25) Seller shall design, supply and install all internals. Seller to supply 'cyclone' type degassing section (or equal) in the treater inlet.								
26) Seller shall supply internal desand system consisting of internal clips, sand pans (316SS), sand jets and sand drains.								
27) Design shall be capable of handling both cases described above. Flowrates shown represent flow rate to each vessel.								
28) Magnetic particle examination required on: all edges of pressure retaining plate prepared for welding; all attachment welds (internal, external, lifting lugs)								
29) UT examination required on: 100% of Cat D Welds;								
30) Vessel shall include the following: Support rings for two future matrix packs, Flooded weir configuration, Foam rakes 316-SS c/w CS supports (removable-bolted in), Under flow/Over flow baffle (removable) (baffle shall be vented and secured by bolts/clips; This will allow operations to change configuration if required)								
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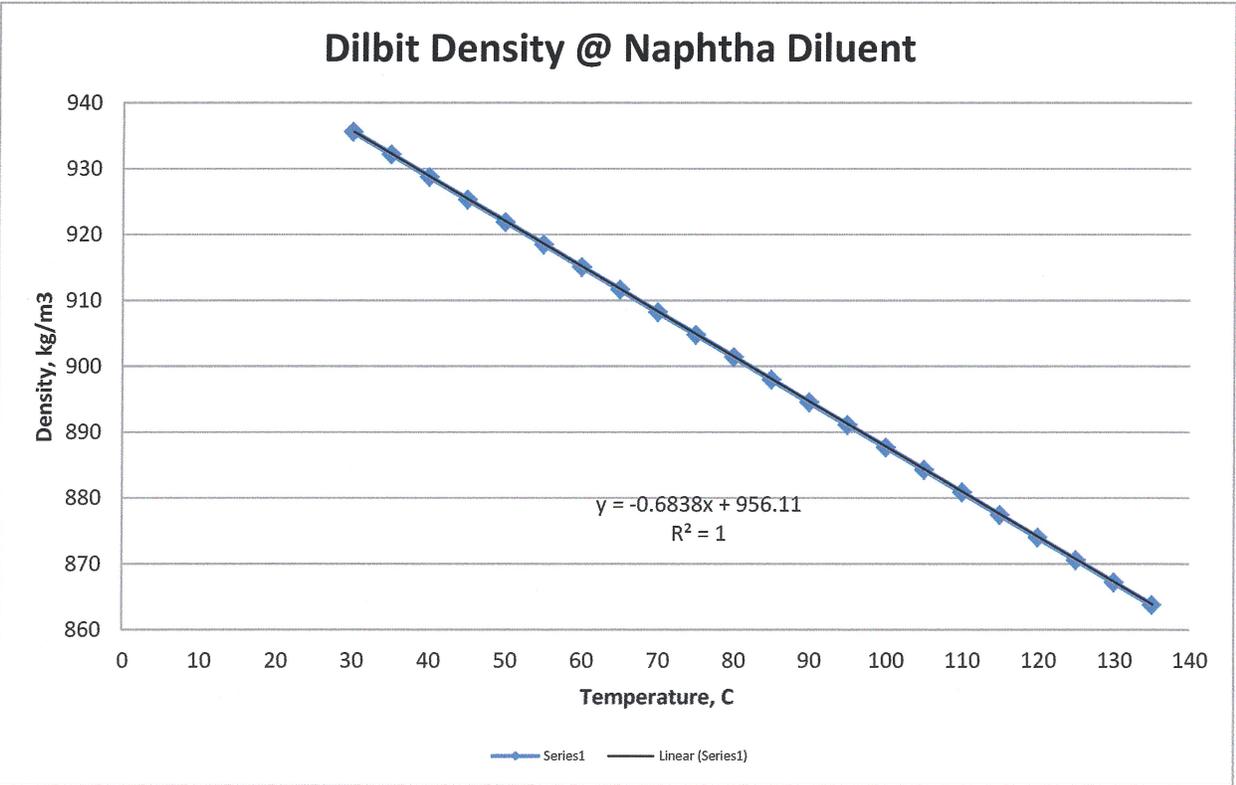
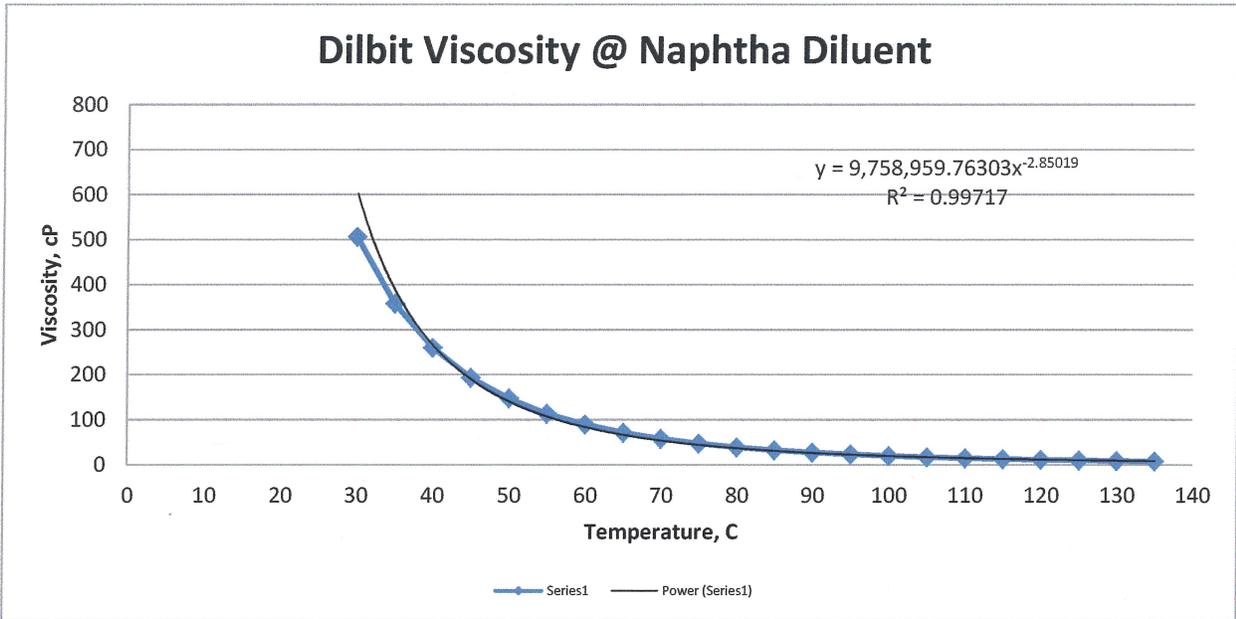
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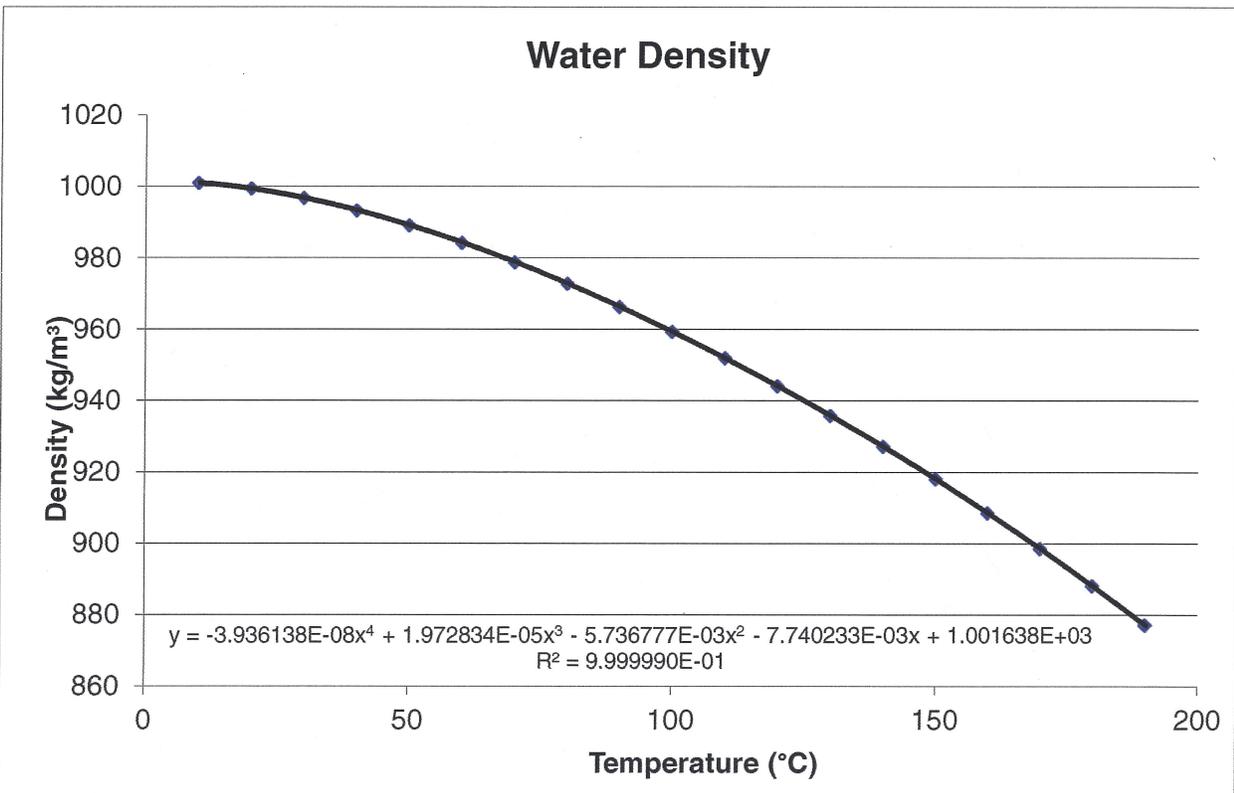
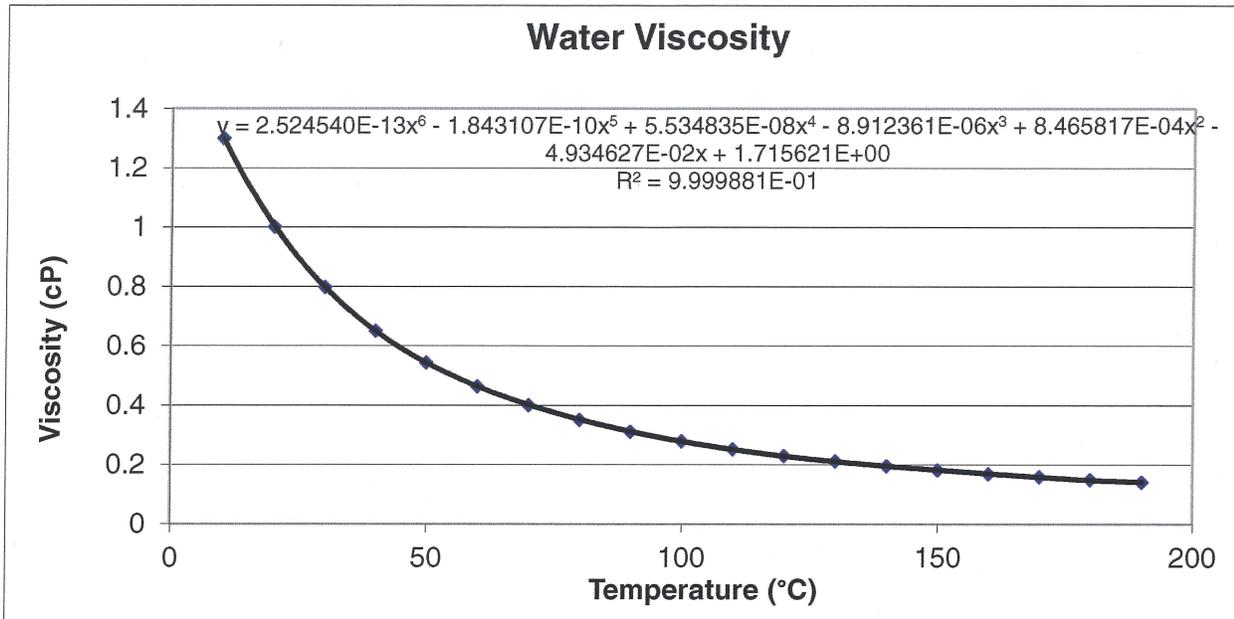
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Typical Produced Water Composition shown as following (From PDC)

Component	As Ion (mg/L)
Calcium (Ca)	5
Magnesium (Mg)	1.2
Sodium (Na)	815
Potassium (K)	0.4
Barium (Ba)	0
Lithium (Li)	0
Manganese (Mn)	0
Ferrous (Fe)	1.1
Strontium (Sr)	0
Boron (B)	0
Bicarbonate* (HCO3)	229
Carbonate (CO3)	0.5
Sulfate (SO4)	0.3
Chloride (Cl)	1140.5
Fluoride (F)	0
Silica (SiO2)	217
Hardness	17.42
TOC	0
TSS	0
TDS	2364
Oil & Grease	0
pH	7.3

- 31) If the equipment fails to meet Seller's stated performance, Seller, at his own expense, shall remove the equipment and replace it with equipment that will meet the stated performance or modify existing equipment such that it meets stated performance.
- 32) Seller to design vessel such that it may be converted to an electrostatic treater mode of operation in future. Seller to supply nozzles/manways for future addition of transformers and internal clips to support installation of electrostatic grids.
- 33) Manways shall be located as to ensure the maximum egress distance inside the vessel is less than or equal to 6.1 m (20').
- 34) Nozzle Projection on shell is referred from Vessel Centerline to flange face.
- 35) Treater vessel shall be provided with Desand system.Desand system components shall be removable without cutting.All internal bolting shall be SS.All internal piping shall be minimum schedule 80 and shall be flanged such that all components are removable from the vessel without cutting.Desand pans shall be SS,minimum thickness of 10 gauge.All pans shall have adequate stiffening and support structures provided.Insulator material shall be used to prevent contact between vessel and Desand pans.

INTERNALS							
NAME	QTY.	PROC. DESIGN	MECH. DESIGN	FAB.	SUPPORTS	INSTALLATION	
Diffusion Baffles	4	APS	APS	APS	Fabricator	Fabricator	
Transverse Baffle	1	APS	APS	Fabricator	Fabricator	Fabricator	
Foam Rake	1	APS	--	APS	Fabricator	Fabricator	
Desand Internals	15	APS	--	APS	Fabricator	Fabricator	
Stilling Well	2	APS	Fabricator	Fabricator	Fabricator	Fabricator	
Water Outlet Collector	1	APS	Fabricator	Fabricator	Fabricator	Fabricator	
Oil Inlet Distributor (G-Sep)	1	APS	APS	APS	Fabricator	Fabricator	
Oil Outlet Collector	--						
Oil Box	1	APS	Fabricator	Fabricator	Fabricator	Fabricator	
Vortex Breakers	--						
Matrix Packs (Future)	2	APS	APS	APS	Fabricator	--	
Flow Baffle	1	APS	APS	Fabricator	Fabricator	Fabricator	
Anodes	30	APS	APS	Fabricator	Fabricator	Fabricator	
Sand Weir	1	APS	APS	Fabricator	Fabricator	Fabricator	
Sample Tubing	16	APS	Fabricator	Fabricator	Fabricator	Fabricator	
EXTERNALS							
Ladder and Platform Clips	*	--	Fabricator	Fabricator	Fabricator	Fabricator	
Manway Hinge / Rung	4	--	Fabricator	Fabricator	Fabricator	Fabricator	
Insulation Support Ring	2	--	Fabricator	Fabricator	Fabricator	Fabricator	
Lifting Lugs	2	--	Fabricator	Fabricator	Fabricator	Fabricator	
Ground Lug	2	--	Fabricator	Fabricator	Fabricator	Fabricator	
Piping Support Clips	*	--	Fabricator	Fabricator	Fabricator	Fabricator	
Building Rings	1	--	Fabricator	Fabricator	Fabricator	Fabricator	

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