



VAC Date: 22 Jan 2020

Project MAXI

MoC No. : R-P1-2019/059

Project Title: Install S-1401S (NHT feed filter)

Location: R-P1

Proposal for:

- ☐ **Gate 1 (+/-50%)**; Approval to develop and select conceptual design
- ☐ **Gate 2 (+/-30%)**; Approval to define and develop Basic Design and/or Front End Engineering & Design (FEED)
- ☒ **Gate 3 (+/-10%)**; Approval to perform Detailed Engineering, Procurement, and Construction
- ☐ **Revise Budget**; Approval for additional budget as scope and/or schedual change

Project Engineer: Nuttapon O <E-PS-MS>

Process Engineer: Jeeranun N <R-P1-TE/1520>



Objective of Today

Project request VAC to endorse **Gate 3 (+10%)**

Project budget: **22 MTHB**

Investment type: **BAU** (Maintain Reliability)

Benefit (CM): 9.58 MTHB/Year

IRR: 41.3 %

Payback: 0.82 Year

Project Schedule: 15 Aug 2019 – 31 Dec 2020

Value Assurance Checks

Phase 1 Deliverables are required :

			YES	NO	N/A	Review/Comment
General Project Deliverables	1)	Project Master Schedule	Y			
	2)	EIA / EHIA approval document	Y			
	3)	Project justification / Benefit calculation sheet	Y			
	4)	±10% project cost estimate document			Y	
	5)	VAC Check List (Project budget more than 30 Million Bath)			Y	
Engineering Deliverables	6)	Block flow PFDs P&IDs (Completed material review)	Y			
	7)	PHA i.e. HAZOPs, What-If, Checklist			Y	
	8)	Heat & Material balance / Utility balance			Y	
	9)	Equipment list	Y			
	10)	Overall plot plans	Y			
	11)	Single line diagram			Y	
Project Justification	12)	J-Factor (>0.2)			Y	
	13)	IRR Core uplift (>15%)	Y			
	14)	IRR Energy /Reliability(WACC = 9.73%)			Y	
	15)	Payback period	Y			

1. Background
2. Proposal
3. Cost estimate
4. Benefit and Project justification
5. Project schedule
6. Project cash flow
7. Risk Assessment



U1400: NHT FEED SECTION

S1402 coalescer

S1401 feed filter

V-1411A/B mercury removal unit

Process Parameters:

- 14PDA001:** 0.197 bar
- 14PDA002:** 0.459 bar
- 14PDA003:** 33.22 barg
- 14PDA004:** 28.09 barg
- 14PDA005:** 25.31 barg
- 14PDA006:** 220.8 barg
- 14PDA007:** 24.42 barg
- 14PDA008:** 24.42 barg
- 14PDA009:** 23.52 barg
- 14PDA010:** 16.64 barg
- 14PDA011:** 90.2 barg
- 14PDA012:** 23.52 barg
- 14PDA013:** 56.8 degC
- 14PDA014:** 89.7 t/d
- 14PDA015:** 419.80 t/d
- 14PDA016:** 280.7 t/d
- 14PDA017:** 3203 t/d
- 14PDA018:** 2886 t/d
- 14PDA019:** 54.3 degC
- 14PDA020:** 0.179 barg
- 14PDA021:** 0.167 barg
- 14PDA022:** 54.3 degC
- 14PDA023:** 181.4 degC
- 14PDA024:** 192.8 degC
- 14PDA025:** 24.42 barg
- 14PDA026:** 24.42 barg
- 14PDA027:** 23.52 barg
- 14PDA028:** 56.8 degC
- 14PDA029:** 89.7 t/d
- 14PDA030:** 419.80 t/d
- 14PDA031:** 280.7 t/d
- 14PDA032:** 3203 t/d
- 14PDA033:** 2886 t/d
- 14PDA034:** 54.3 degC
- 14PDA035:** 0.179 barg
- 14PDA036:** 0.167 barg
- 14PDA037:** 54.3 degC
- 14PDA038:** 181.4 degC
- 14PDA039:** 192.8 degC
- 14PDA040:** 24.42 barg
- 14PDA041:** 24.42 barg
- 14PDA042:** 23.52 barg
- 14PDA043:** 56.8 degC
- 14PDA044:** 89.7 t/d
- 14PDA045:** 419.80 t/d
- 14PDA046:** 280.7 t/d
- 14PDA047:** 3203 t/d
- 14PDA048:** 2886 t/d
- 14PDA049:** 54.3 degC
- 14PDA050:** 0.179 barg
- 14PDA051:** 0.167 barg
- 14PDA052:** 54.3 degC
- 14PDA053:** 181.4 degC
- 14PDA054:** 192.8 degC
- 14PDA055:** 24.42 barg
- 14PDA056:** 24.42 barg
- 14PDA057:** 23.52 barg
- 14PDA058:** 56.8 degC
- 14PDA059:** 89.7 t/d
- 14PDA060:** 419.80 t/d
- 14PDA061:** 280.7 t/d
- 14PDA062:** 3203 t/d
- 14PDA063:** 2886 t/d
- 14PDA064:** 54.3 degC
- 14PDA065:** 0.179 barg
- 14PDA066:** 0.167 barg
- 14PDA067:** 54.3 degC
- 14PDA068:** 181.4 degC
- 14PDA069:** 192.8 degC
- 14PDA070:** 24.42 barg
- 14PDA071:** 24.42 barg
- 14PDA072:** 23.52 barg
- 14PDA073:** 56.8 degC
- 14PDA074:** 89.7 t/d
- 14PDA075:** 419.80 t/d
- 14PDA076:** 280.7 t/d
- 14PDA077:** 3203 t/d
- 14PDA078:** 2886 t/d
- 14PDA079:** 54.3 degC
- 14PDA080:** 0.179 barg
- 14PDA081:** 0.167 barg
- 14PDA082:** 54.3 degC
- 14PDA083:** 181.4 degC
- 14PDA084:** 192.8 degC
- 14PDA085:** 24.42 barg
- 14PDA086:** 24.42 barg
- 14PDA087:** 23.52 barg
- 14PDA088:** 56.8 degC
- 14PDA089:** 89.7 t/d
- 14PDA090:** 419.80 t/d
- 14PDA091:** 280.7 t/d
- 14PDA092:** 3203 t/d
- 14PDA093:** 2886 t/d
- 14PDA094:** 54.3 degC
- 14PDA095:** 0.179 barg
- 14PDA096:** 0.167 barg
- 14PDA097:** 54.3 degC
- 14PDA098:** 181.4 degC
- 14PDA099:** 192.8 degC
- 14PDA100:** 24.42 barg
- 14PDA101:** 24.42 barg
- 14PDA102:** 23.52 barg
- 14PDA103:** 56.8 degC
- 14PDA104:** 89.7 t/d
- 14PDA105:** 419.80 t/d
- 14PDA106:** 280.7 t/d
- 14PDA107:** 3203 t/d
- 14PDA108:** 2886 t/d
- 14PDA109:** 54.3 degC
- 14PDA110:** 0.179 barg
- 14PDA111:** 0.167 barg
- 14PDA112:** 54.3 degC
- 14PDA113:** 181.4 degC
- 14PDA114:** 192.8 degC
- 14PDA115:** 24.42 barg
- 14PDA116:** 24.42 barg
- 14PDA117:** 23.52 barg
- 14PDA118:** 56.8 degC
- 14PDA119:** 89.7 t/d
- 14PDA120:** 419.80 t/d
- 14PDA121:** 280.7 t/d
- 14PDA122:** 3203 t/d
- 14PDA123:** 2886 t/d
- 14PDA124:** 54.3 degC
- 14PDA125:** 0.179 barg
- 14PDA126:** 0.167 barg
- 14PDA127:** 54.3 degC
- 14PDA128:** 181.4 degC
- 14PDA129:** 192.8 degC
- 14PDA130:** 24.42 barg
- 14PDA131:** 24.42 barg
- 14PDA132:** 23.52 barg
- 14PDA133:** 56.8 degC
- 14PDA134:** 89.7 t/d
- 14PDA135:** 419.80 t/d
- 14PDA136:** 280.7 t/d
- 14PDA137:** 3203 t/d
- 14PDA138:** 2886 t/d
- 14PDA139:** 54.3 degC
- 14PDA140:** 0.179 barg
- 14PDA141:** 0.167 barg
- 14PDA142:** 54.3 degC
- 14PDA143:** 181.4 degC
- 14PDA144:** 192.8 degC
- 14PDA145:** 24.42 barg
- 14PDA146:** 24.42 barg
- 14PDA147:** 23.52 barg
- 14PDA148:** 56.8 degC
- 14PDA149:** 89.7 t/d
- 14PDA150:** 419.80 t/d
- 14PDA151:** 280.7 t/d
- 14PDA152:** 3203 t/d
- 14PDA153:** 2886 t/d
- 14PDA154:** 54.3 degC
- 14PDA155:** 0.179 barg
- 14PDA156:** 0.167 barg
- 14PDA157:** 54.3 degC
- 1**



Problem

After TA 2016, feed filter (S-1401) cleaning frequency is higher impact to coalescer (S-1402) pressure drop increase and lower performance as figure 1. The impact of higher free water carry over to MRU (V-1411A/B) is adsorbent agglomerate as figure 2.

Objectives

To design another feed filter (S-1401S) to prevent particles in feed bypass to S-1402 coalescer during S-1401A cleaning that impact downstream equipment (S-1402 and V-1411A/B) high pressure drop problem.

Benefit of the project

1. Improve operation reliability
2. Extend mercury removal unit adsorbent life (V1411A/B)
3. No S-1402 by-pass and change out on the run

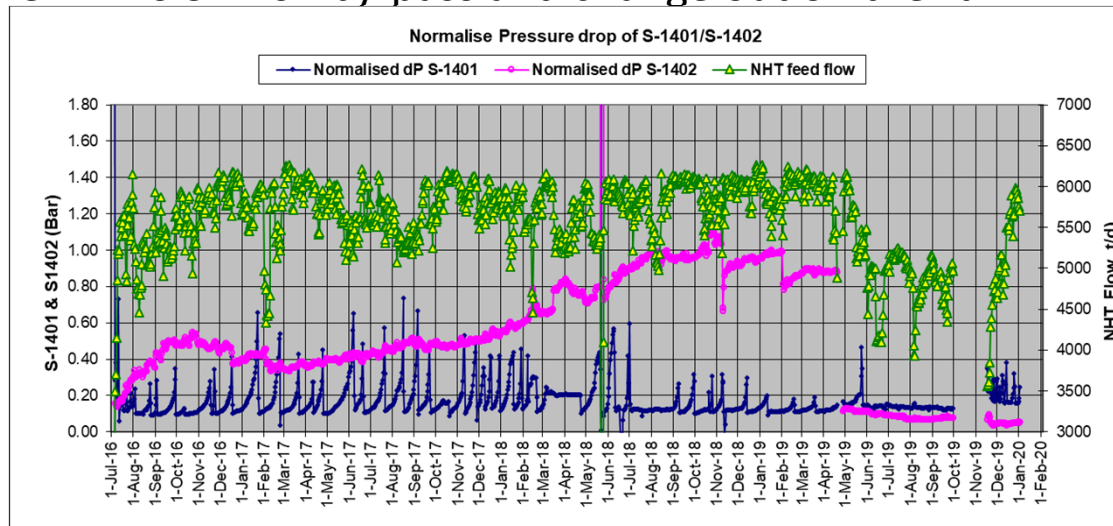


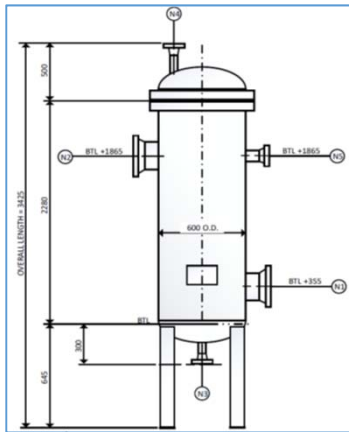
Figure 1 Pressure drop of S-1401 and S-1402



Figure 2 V-1411A/B MRU adsorbent agglomerate from free water

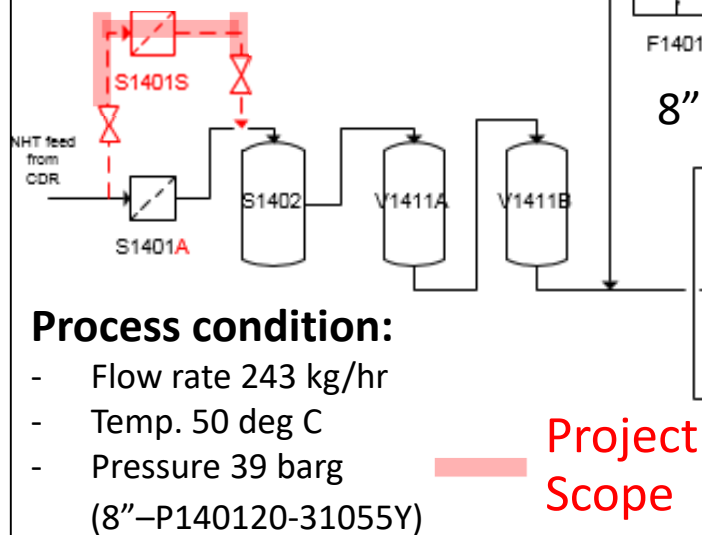


Simplify diagram / Plot plan / Drawing



Filter capacity:

- Flow rate 243 kg/hr
- Particle Size 10 μm and over



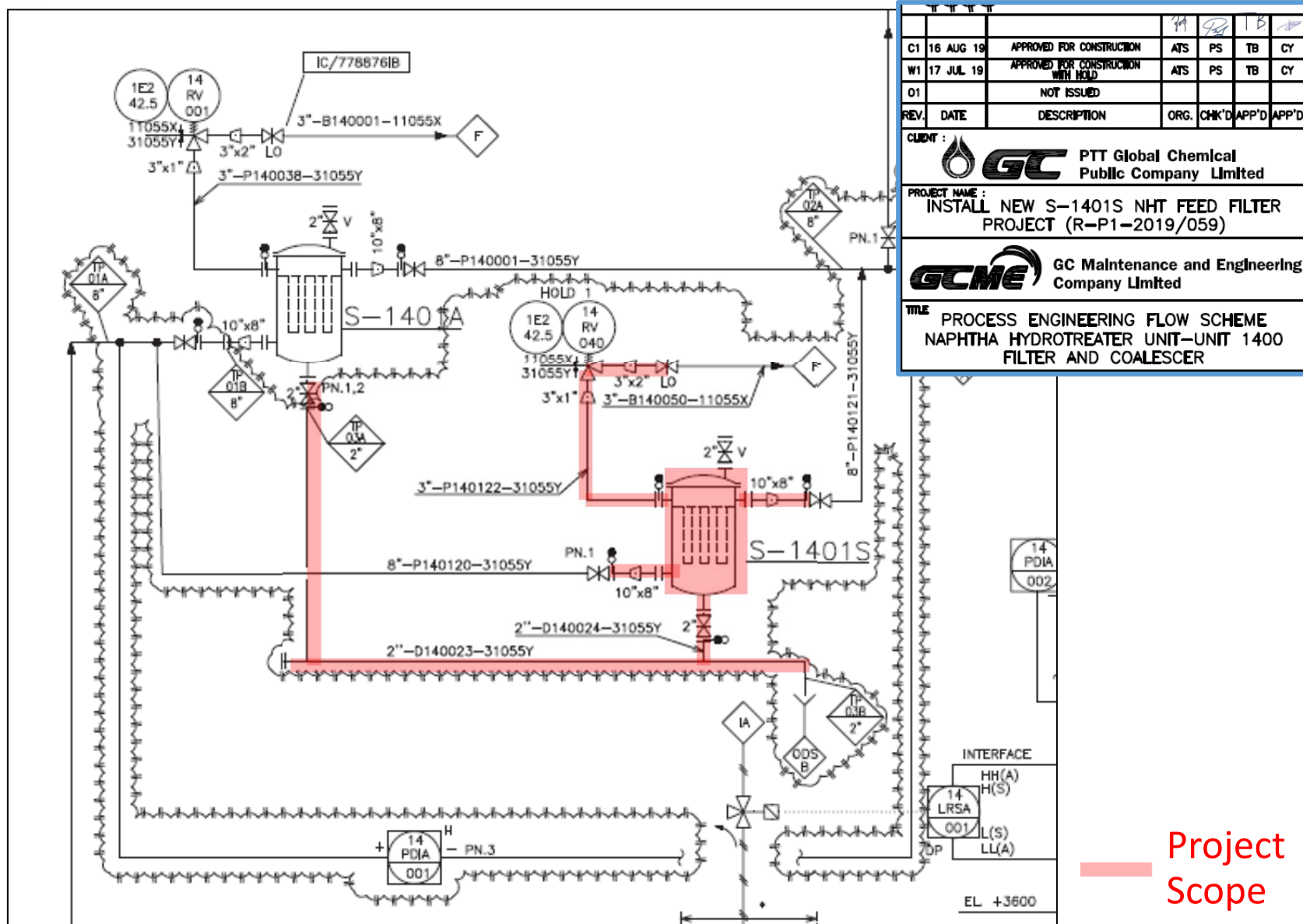
Process condition:

- Flow rate 243 kg/hr
- Temp. 50 deg C
- Pressure 39 barg
(8"-P140120-31055Y)

Project
Scope



Simplify diagram / Plot plan / Drawing



Project Objective:

To design new feed filter (S-1401S) to prevent particles in feed bypass to S-1402 coalescer during S-1401A cleaning that impact downstream equipment (S-1402 and V-1411A/B) high pressure drop problem.

Scope of Modification:

- S-1401S filter housing with cartridges will be designed.
- The other facilities for support S-1401S such as piping, block valves, relief valve, filter foundation, operation platform and lighting.

Scope of work

1. Detail engineering for new filter include piping design and calculation.
2. Install new filter S-1401S. Rated capacity of new filter is 243 kg/hr same as existing.
3. Install new Relief Valve for new filter.
4. Install piping system.
5. Install lighting and grounding system.
6. Modify operation platform and excess way.

3. Cost estimate

COST ITEM	DESCRIPTION	TOTAL (THB)	REMARKS
1	ENGINEERING	1,178,936	Detail Engineering
2	PROCUREMENT	6,949,575	
2.1	EQUIPMENT	5,544,170	
2.1.1	MECHANICAL	5,440,000	New Filter
2.1.2	ELECTRICAL		
2.1.3	INSTRUMENT	104,170	New Relief valve
2.2	BULK MATERIALS	1,405,405	
2.2.1	PIPING	1,030,942	Piping Materials (SOUR), Valve
2.2.2	ELECTRICAL	374,463	Lighting, power/grounding cable, junction box
2.2.3	INSTRUMENT	-	
3	CONSTRUCTION	12,168,008	
3.1	CIVIL WORK	26,125	Filter Foundation and Modify platform
3.2	PIPING WORK	3,369,032	
3.2.1	PIPING WELDING WORK (SHOP)	302,400	270 DB (1120 THB/DB)
3.2.2	PIPING WELDING WORK (FIELD)	252,000	180 DB (1400 THB/DB)
3.2.3	PIPING WORK (OTHER)	2,814,632	Demolish (Piping), NDE, Hydro Test, Cold cut
3.3	MECHANICAL WORK	461,983	Filter Installation
3.4	ELECTRICAL WORK	926,547	Lighting, Grounding
3.5	INSTRUMENT WORK		
3.6	PROJECT MANAGEMENT , SUPERVISION AND TAX DUTY	7,384,321	Management Cost, Transportation, Safety Management, Scaffolding, Supervisor
4	COMMISSIONING / RUN-IN & START-UP / WARRANTY	-	
5	OWNER COST	-	
6	CONTINGENCY (8.4%)	1,703,481	
	OVERALL PROJECT COST	22,000,000	



4. Benefit and Project justification

Basic Assumptions			
Price Assumption:			
Feed/Product	BP 2020 corporate price assumption R 1.3	THB/Unit	
Utility		THB/Unit	
Others (i.e. Land Cost)		THB/Unit	
Financial:			
Project Life Time / Depreciation	20	Years	
Equity	100	%	
Interest Loan Rate*	4.5	%	
WACC	8.53	%	
FX Rate	35.2 30.9	THB/EUR THB/USD	
Tax	20	%	
CPI	Corporate Assumption		%
Contingency Cost	10	%	
Others:			
Operating Days	350	Days/Year	
Maintenance (OPEX)	1.5	% of Investment Cost	
Maintenance (CAPEX)	1	% of Investment Cost	
Insurance	1	% of Investment Cost	

* Include Interest During Construction / Working Capital Interest /Short term Loan



4. Benefit and Project justification

Benefit calculation for S-1401S base on following items

1. Save S-1402 maintenance cost in between T/A cycle (36 months) from 2 times/cycle (Historical data in 2019) → 1 time/cycle
2. Utilize MRU (V1411A/B) until max pressure drop reached from 24 months → 60 months by take 70% of success on adsorbent service life

Cost saving per time	
Coalescer S1402 shutdown	5 MTHB
Adsorbent cost saving	27 MTHB
Maintenance cost saving	2 MTHB
Waste disposal cost saving	15 MTHB
Total benefit	49 MTHB

Benefit Calculation		
Investment	29	MTHB
Benefit	49	MTHB/time
Benefit avg. 20 yr.	9.58	MTHB/yr.
IRR @ 20 yr.	41.3	%
NPV @ WACC 8.53%	60.1	MTHB
Payback	0.82	Yr.

Remark investment 29 MTHB

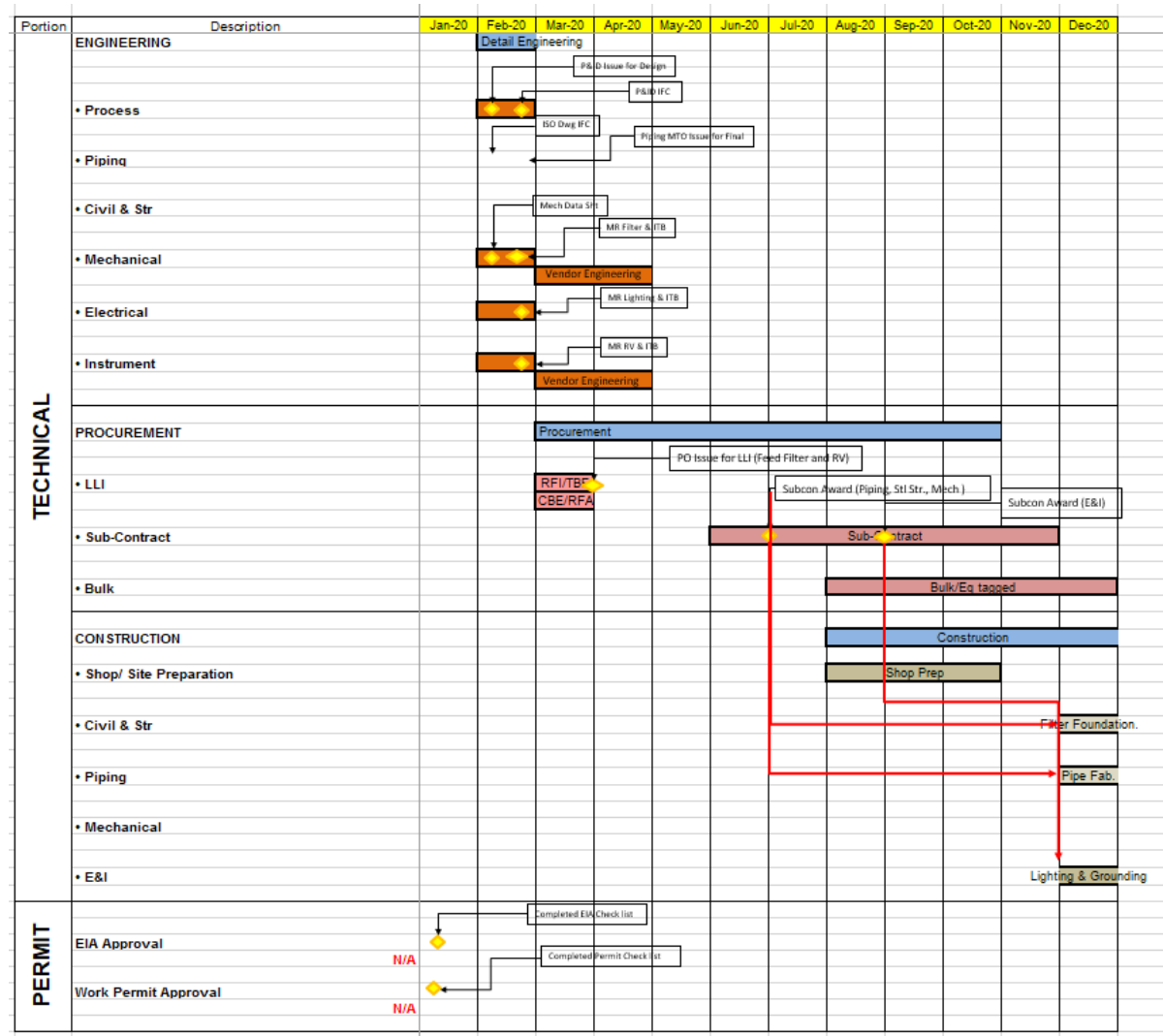
- CAPEX 22 MTHB
- ER (CE-1011-19006) 7.843 MTHB
(MoC No. R-P1-2019/111 (Tie-in))

Reviewed by
Wanee S. /M-SE-SO



5. Project schedule

- Prelim Target plan to completed in **December 2020**

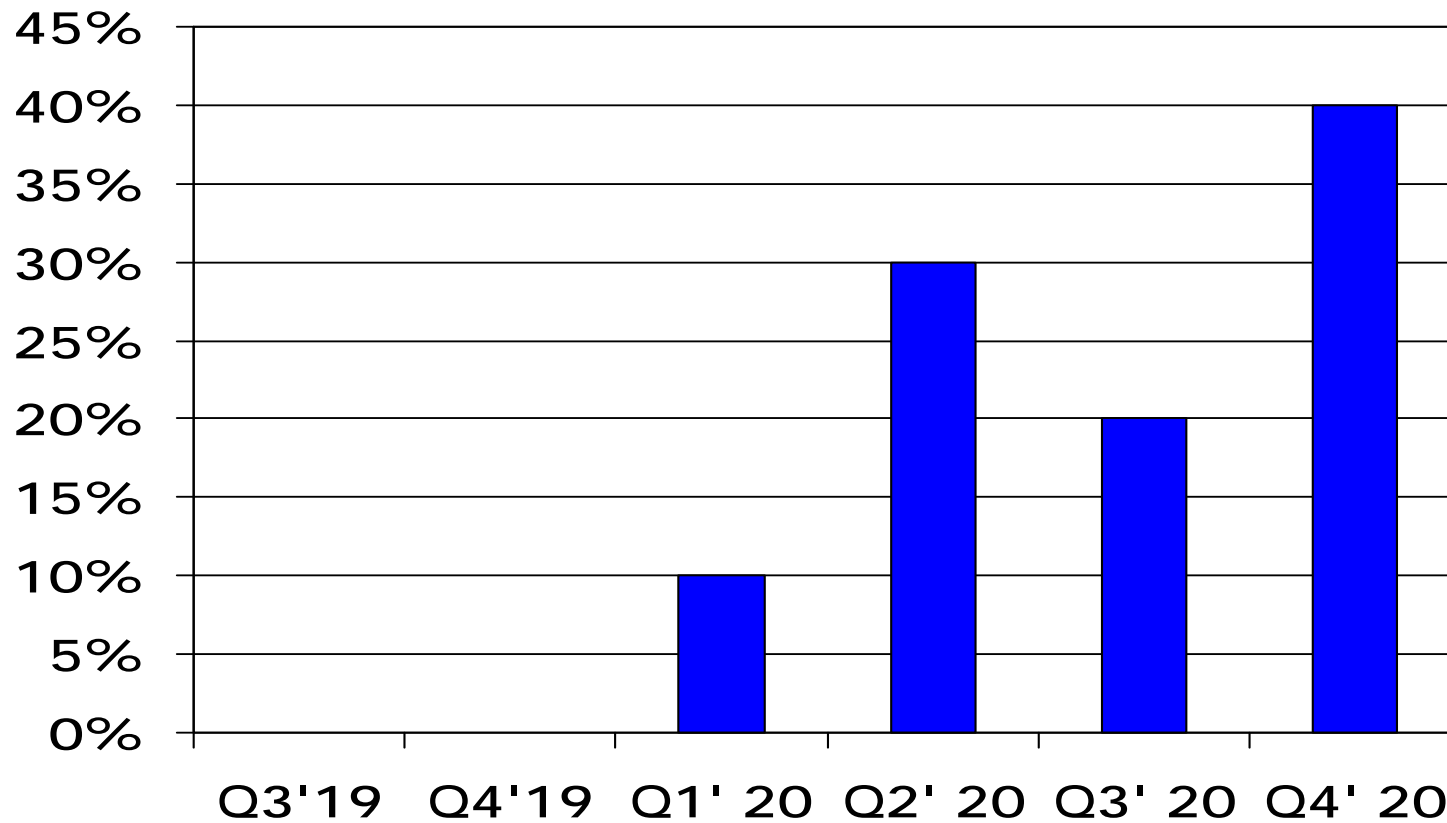




5. Project schedule

Present Gate III (VAC)	Jan 2020
Engineering and Procurement	Feb 2020 – Dec 2020
Pre-Fabrication	Oct-Nov 2020
Execution	Dec-2020
Commissioning and Complete	Dec-2020

6. Project cash flow





7. Risk Assessment

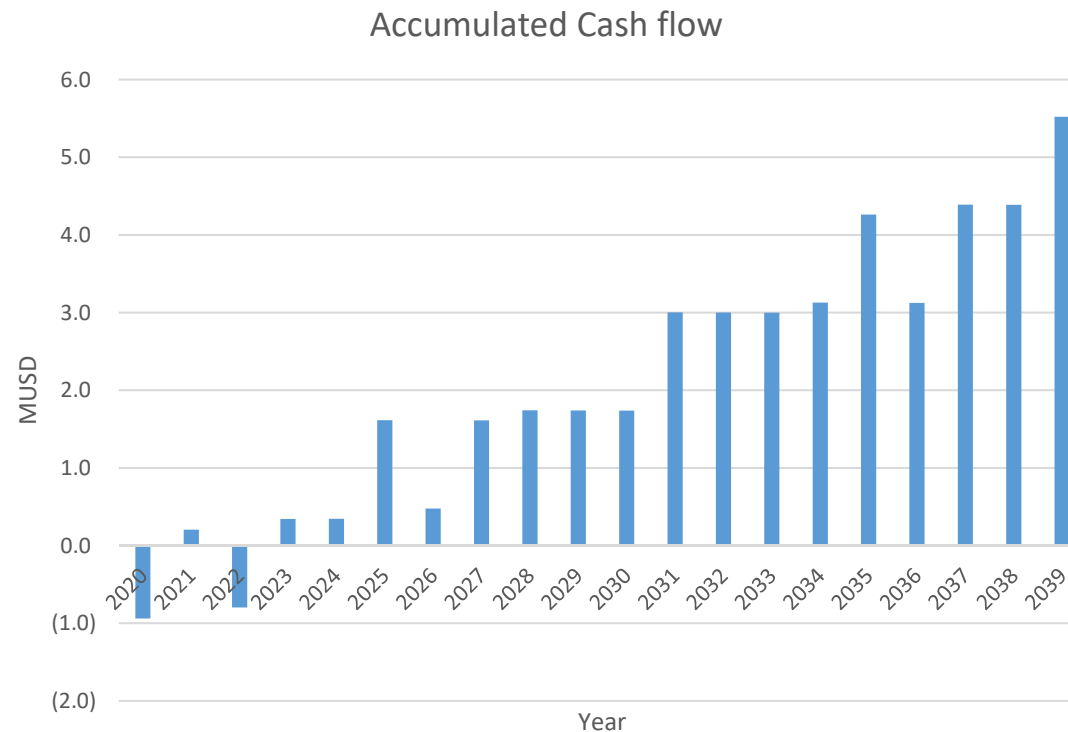
Risk (Issue)	Mitigation plan (Action Item)	Risk Owner (Action By)	Expected Mitigation Completion Date (Plan Finish Date) (dd/mm/yyyy)
1. Tie-in wok (hot/cold tap) during plan in operation.	Perform tie in work during plant shutdown.	R-P1-OP/ TP-PP-PB	REF T/A 2019
2. Fail to achieve performance.	The performance test the will be performed, vendor will take full responsibility incase filter performance is not pass.	TP-PP-PB	Dec 2020
3. Existing condition, operate with bypass line during filter cleaning. (Filter need to be cleaned every 4-5 days)	Minimize time during filter cleaning (use bypass line).	R-P1-OP	Dec 2020



Thank you



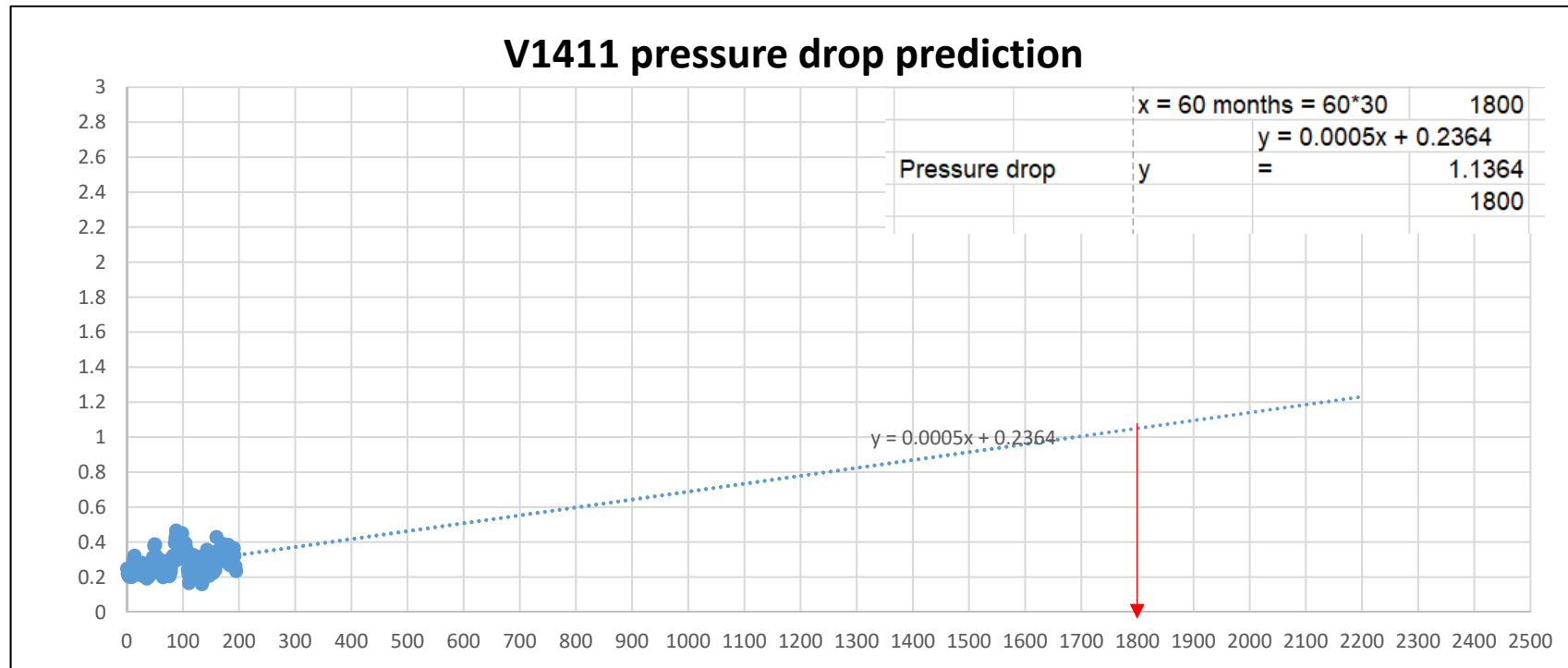
Back-up



Gain benefit within the first year from adsorber cost → Payback period = 0.87 yr.



MRU pressure drop trend

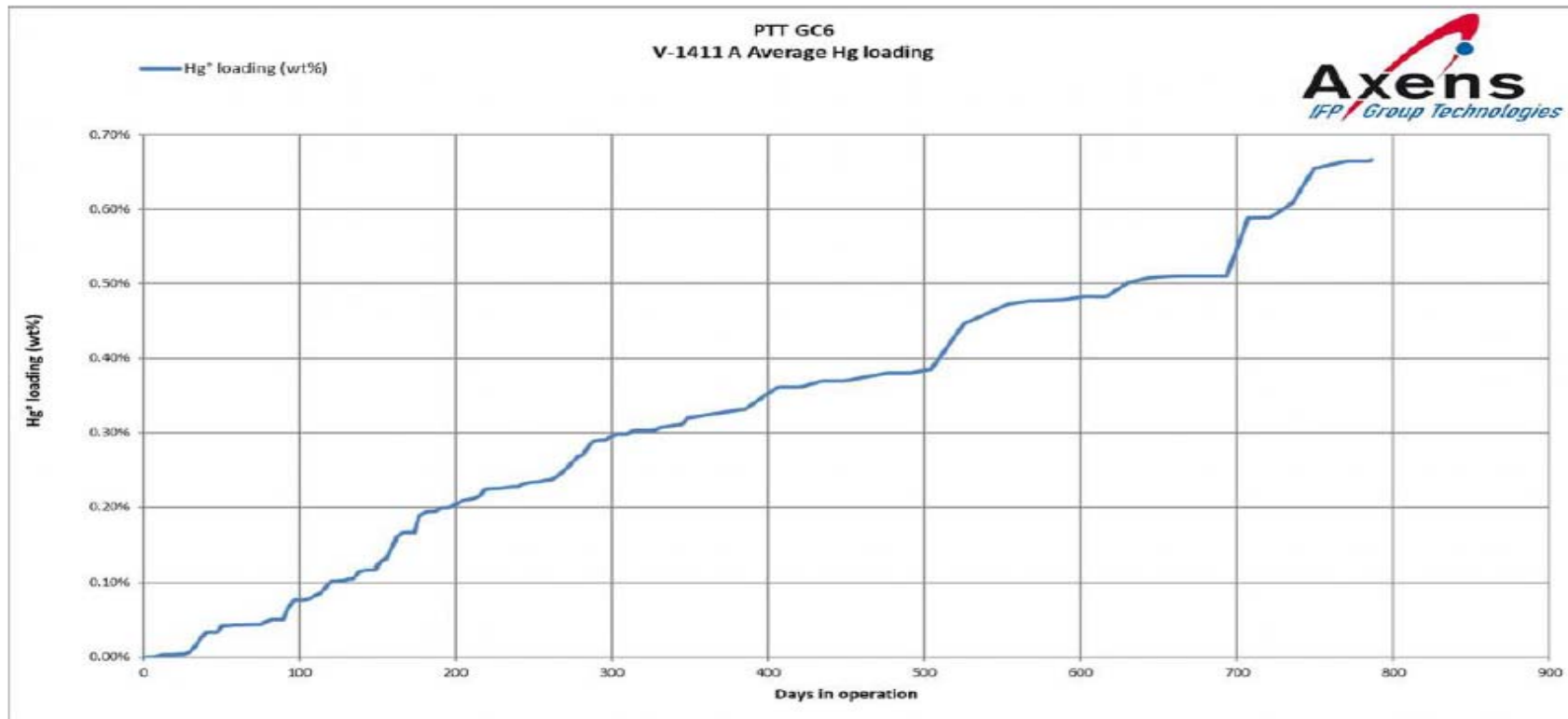


Based on the first period , there is no water content impacted to pressure drop , the prediction of pressure drop at 1800 days is 1.13 bar



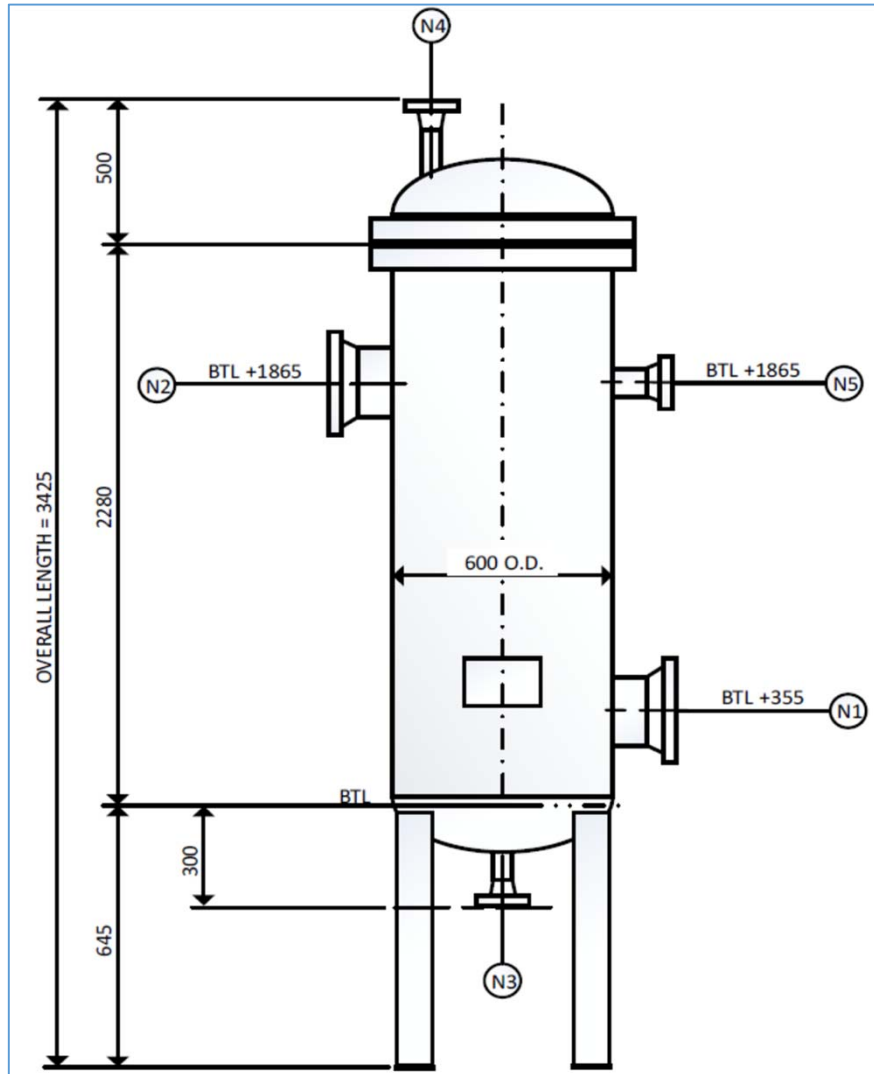
Spent adsorbent analysis

Spent adsorbent analysis



Mercury from spent adsorbent analysis = 0.67 %wt. after service for 29 months (design 4.23 %wt.) so no concern for service 60 months.

Filter Drawing



MECHANICAL DESIGN DATA				Rev
		Shell	Coil Steam Tracing	
Contents	-	NHT Feed (Naphtha)	-	
Process Fluid Hazards	-	Wet H2S (H2S=3000 ppmwt)	-	
Design Pressure (Min / Max)	Bar G	- / 42.5	- / -	
Design Temperature (Min / Max)	°C	- / 170	- / -	
Operating Pressure (Min / Nor / Max)	Bar G	- / - / 39	- / - / -	
Operating Temperature (Min / Nor / Max)	°C	- / - / 50	- / - / -	
Hydrotest Pressure	Bar G	Per Code	-	
MDMT	°C	-	-	
Density	kg/m ³	658	-	
Corrosion Allowance (Internal / External)	mm	3 / 0	- / -	
Layout		Loads		
Vertical / Horizontal	-	Vertical	Basic Wind Pressure	N/m ²
Vessel Diameter (OD)	mm	600 (VTC)	Earthquake Factor	775 (Based on K= 0.8)
TL. To TL. Length	mm	See Sketch Drawing		N/A
Shell Thickness	mm	VTC	WEIGHT	
Head Type	mm	See Sketch Drawing	Empty	kg
Type of Supports	-	Haft Skirt	Operating	kg
Insulation	-	N/A	Test	kg
Insulation Thickness	mm	N/A		
Vessel Volume	m ³	VTC		
Fireproof	-	N/A		

5. Project schedule

- Prelim Target plan to completed in **December 2020**

Master Execution Plan Project New Filter S-1401S			2020											
Item	Task Name	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Detail Engineering work (Completed end of Y2019)													
	Engineering with Filter vendor	1		↔										
2	Procurement (Filter Long Lead Item)	9			↔									
3	Construction Work													
	- Civil (Filter foundation/platform)	0.5												↔
	- Piping work (80% completed during T/A Oct, 2019)													
	- Piping work (20% remaining)	0.5												↔
	- Filter installation	0.5												↔
	- Electrical work (Lighting & Grounding)	0.5												↔
	- Instrument work (impulse line for PDI)	0.1												
4	Mechanical Completion	End Dec, 2020												★
5	Commissioning and PSSR	End Dec, 2020												★
6	New filter (S-1401S) in service	End Dec, 2020												★