Career Episode 2

AGM7 Project

A) Introduction

[CE 2.1] This project is the work which I did while working as Engineering Manager at National Industrialization Company.

Project Name: AGM7 Project
Duration: 28th July 2015 to 26th May 2017
Project Location: Jubail Industrial City, Jubail, Saudi Arabia
Name of the Organization: National Industrialization Company (TASNEE)
Position: Engineering Manager

B) Background

[CE 2.2] TASNEE Petrochemicals in Jubail comprises of the following affiliate companies, their associated plants and the products they manufacture:

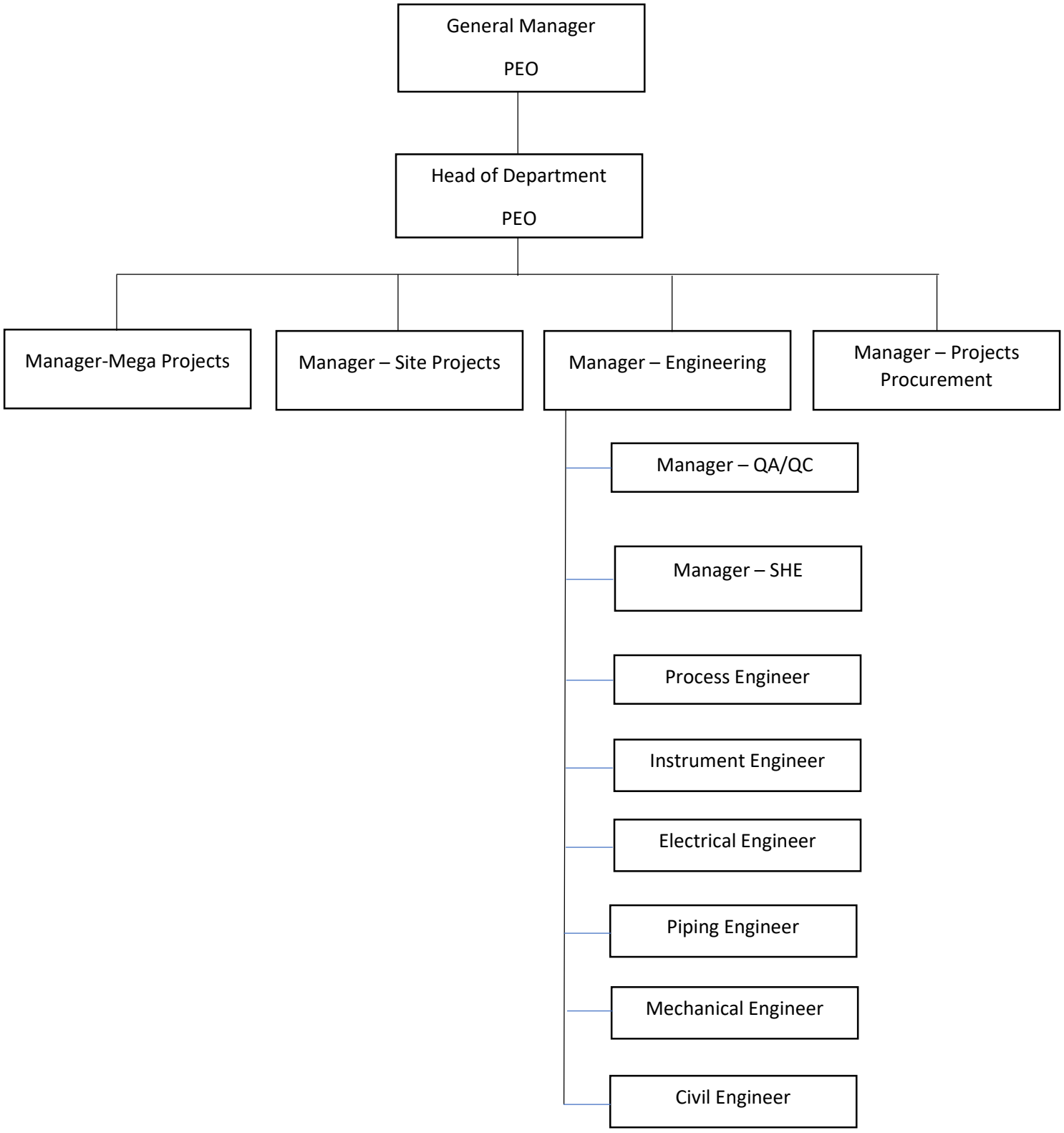
Index	Affiliate Company	Associated Plants	Products
1	Saudi Polyolefins Company (SPC)	PDH (Propane Dehydrogenation) Plant and PP (Polypropylene) Plant	Polypropylene
2	Saudi Ethylene and Polyethylene Plant (SEPC)	Ethylene Cracker, HDPE and LDPE Plants	HDPE (High Density Polyethylene) and LDPE (Low Density Polyethylene)
3	Saudi Acrylic Acid Company (SAAC)	AA Plant	Acrylic Acid
4	Saudi Acrylic Monomer Company (SAMCO)	Integrated AA Complex	Glacial Acrylic Acid
5	Saudi Acrylic Polymer Company (SAPCO)	SAP Plant	Super Absorbent Polymer
6	Saudi Butanol Company (SABUCO)	SABUCO Plant	n-Butanol
7	TASNEE Plastic Research Center	T & I Petchem (Technology & Innovation) Petrochemicals	Research Center

The SAP Plant produces Super Absorbent Polymer. This polymer has the unique capability of retaining water and has wide area of applications. The Polymer produced at SAP Plant was the main component in the manufacture of baby diapers and had the capability to retain water 70 times its own of volume.

[CE 2.3] The grade of Super Absorbent Polymer produced at the plant was AGM5 (which stands for Absorbent Gel Material – 5), and it was decided by the client to upgrade the plant so it would be able to produce AGM7 (Absorbent Gel Material – 7) Grade of product.

AGM7 is a much refined product, making it possible for the manufacture thinner and lighter Diapers without the loss of retention capability.

[CE 2.4] The organizational chart below shows my position in the project.

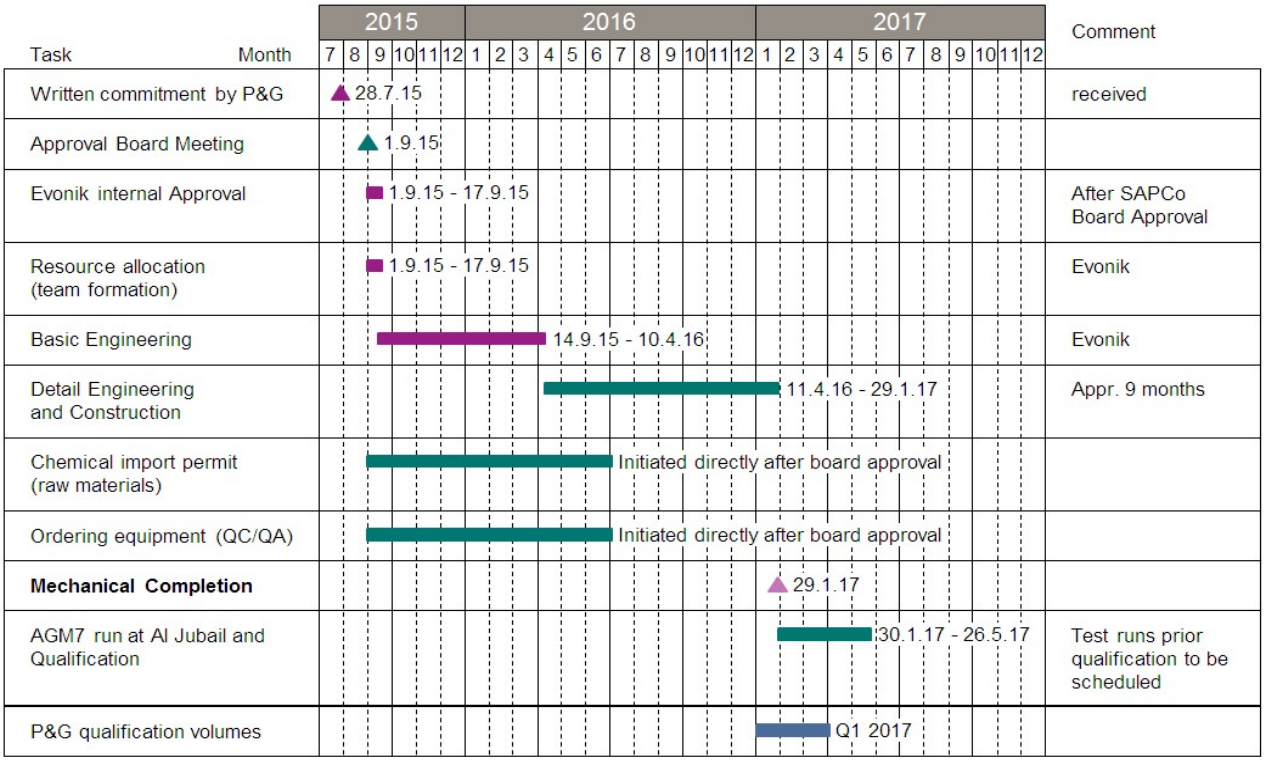


[CE 2.5] My duties in the project were:

- Coordinating Engineering activities and support Technical Operations
- Oversee Engineering requirements for Plant Operation and Maintenance
- Determining and implementing Management of Change (MOCs), review engineering strategies and monitoring implementations as per company policy and procedures.
- Develop process procedures for carrying out various engineering phases
- Present Performance for Projects Costs and Schedules
- Ensuring compliance to applicable Engineering Standards and Codes
- Support Research Center for R&D related projects
- Coordinate with Business Planning and Marketing team for modifications, revamp and update of Plant as per Market requirements.
- Selection and Recruitment of Discipline Engineers
- Lead team of discipline engineers
- Prepare Scope of Work for suppliers/contractors to execute jobs at the plant

C) Personal Engineering Activity

[CE 2.6] I was assigned by my Supervisor to work in this project from the very early phase, when it was decided by the Shareholders to execute the project. I determined the requirements of the external client i.e. the customer and the internal client, the plants manager. Below is the high level (Level 1) Project schedule I developed:



[CE 2.7] Based on the project requirements, I put together a team of engineers and each of them expert in their discipline. Kindly refer to the organization chart. Each team member was assigned duties and responsibilities, and certain deliverable targets were set. They were required to review all transmittal packages as per their respective engineering discipline, and performance was measured based on the number of items Closed in a week.

[CE 2.8] During the Basic Engineering Package phase, I had developed the following basic deliverables for the project requirements

- Process Flow Diagrams
- Process Instrumentation Diagram
- Variable Speed Drive Datasheet
- EX classification report
- EX classification drawings
- Piping Sketches
- Piping MTO (Materia Take Off)
- Piping Line List
- Instrument Data Sheet
- DCS Program red marking
- Rotary Feeders
- Belt Dryer Specification

[CE 2.9] For project cost estimation, I used bottom up approach. I clubbed the activity estimates into work package estimate then into control account estimates. I then added contingency reserves to reach cost baseline. A miscellaneous & financing management reserve was added to reach the total project cost budget.

Project Key Performance Metrics

Parameter	Estimated / Approved	Actual / Forecast
Basic Engineering Package, SAR	2.50 MM	TBD
Engineering Procurement Construction, SAR	15.50 MM	TBD
Owner (Spares, Commission & Startup & Project Management), SAR	7.00 MM	TBD
Miscellaneous & Financing (10%), SAR	2.50 MM	TBD
Contingency (10%)	2.50 MM	TBD
Total Project Cost, SAR	**30.00 MM**	TBD

I found that the cost estimation in high level helped managed costs and prevented budget overruns.

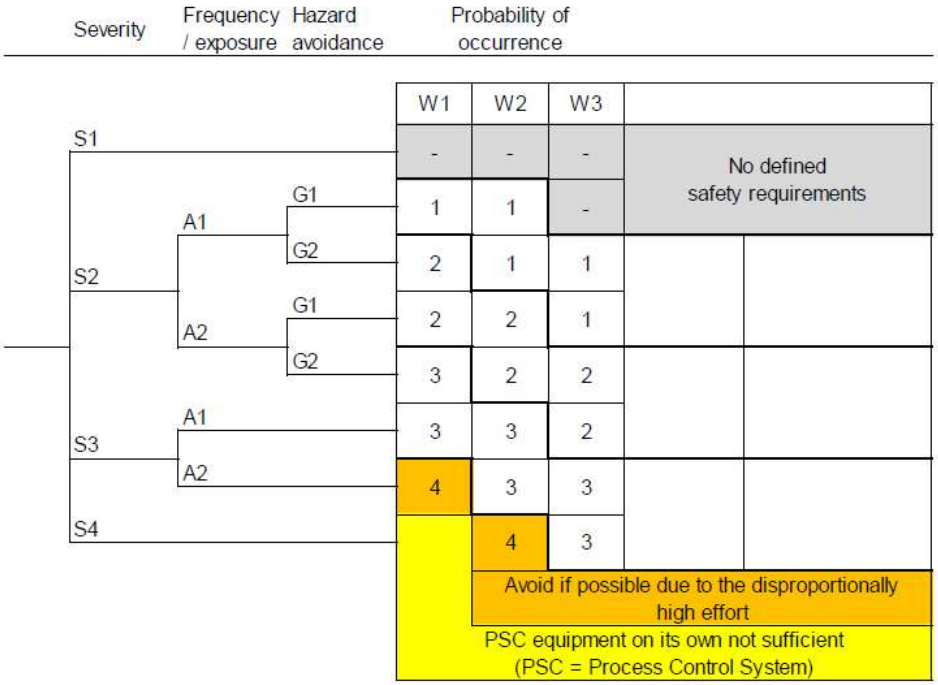
[CE 2.10] To manage project risk through the early identification of potential process hazards, I prepared the core objectives of the HAZOP study, which were:

- Identify and document hazard and operability issues

- Identify planned or proposed actions to mitigate the hazards and operability concerns
- Document results so management can address the risks (accept risk or provide direction to
- the operation team)

This was an assessment of potential causes, consequences and the capture of potential mitigating and/or preventative actions.

[CE 2.11] I had developed the basic skeleton of the Risk Matrix as below which was later used in the HAZOP study.



[CE 2.12] At the completion of Basic Engineering, I had identified and prepared a list of LLE (Long Lead Equipment), the Chemicals required for the new grade of Absorbent Gel Material) and the Lab Equipment needed to be able to test the new AGM7 Grade. I helped in vendor selection for these items. I included the required quantities of electrical VSD/VFD (Variable Speed Drive/Variable Frequency Drive), Airtight rotary valves along with the seal belt dryer and screen in long lead equipment. I noted down the amount of Polyether as a chemical used in project work, this was the initial startup quantity and quantities required for Operation would be ordered through Operation & Maintenance Department.

Procurement List (LLE, Chemicals & LAB Equipment) التصنيع TASNEE

LLE List:

SN	Description	Quantity	Estimated Delivery
1	Electrical VSD	04 No	5 – 6 Months
2	Air Tight Rotary Valves	02 No	
3	Mechanical Seal Belt Dryer	02 No	
4	Screen Inserts	17 No	

Chemicals List:

SN	Description	Quantity	
1	Polyether (ALP 0635)	3.2 MT	5 - 6 months

LAB Equipment List:

SN	Description	Quantity	
1	Dual T20 Tester Clone FY 15/16	01 No	6 - 7 months
2	Screens (T20 Tester)	12 No	
3	FHA frames	03 No	
4	Devices for FHA	36 No	
5	Cylinders for FHA	20 No	
6	Funnels for FHA	20 No	

[CE 2.13] I had taken the duration of these items which were based on the quotations received from the qualified vendors and added the shipment time based on the mode of transport. For Sea Freights from Europe to Saudi Arabia, I estimated 4 weeks with 1 week customs clearance from Dammam Seaport, and for Air Freights from Europe to Saudi Arabia, I had estimated 1week transport and 3 business days' customs clearance from Dammam Airport. The Estimated Delivery time or Lead Times were shared with the stakeholders. After placement of Purchase Orders, I followed up with suppliers to ensure on time deliveries. I used to track PO date, PO value and their delivery dates so I can expedite shipments as per project schedule and raise concern if a delay was seen

S.No.	PO Scope	SC Number	RFQ Date	Original Proposal Reciept Date	TE Completion Date	PO Number	PO Date	PO Value (€,$)	PO Value (SAR)	PO Delivery Date
1	Supply of LAB Equipment	1700023734		10.02.16	N/A	4800008688	11.02.2016	€ 73,435.00	SAR 298,511.81	01.05.2016
2	ALLGAIER Screens TSM1600/TSM2600	1700024334	11.02.16	17.02.16	18.02.16	4800009050	03.03.2016	€ 29,890.00	SAR 122,459.93	27.03.2016
3	RHEWUM Screens	1700025172	16.02.16	02.03.16	07.03.16	4800009246	10.03.2016	€ 25,341.10	SAR 103,822.99	05.06.2016
4	Technical Support for BEP	1700023467	N/A	12.01.16	N/A	4800009279	13.03.2016	€ 511,915.00	SAR 2,097,325.99	15.03.2016
5	BUHLER Belt Dryer System	1700025364	11.02.16	23.02.16	29.02.16	4800009310	13.03.2016	$141,110.00	SAR 529,162.50	23.05.2016
6	HAZOP Study	1700025376	N/A	03.03.16	N/A	4800009327	14.03.2016	€ 49,740.00	SAR 203,785.77	25.03.2016
7	DANFOSS VFDs	1700024172	11.02.16	08.03.16	06.04.16	4800009757	05.04.2016	SAR 145,630.00	SAR 145,630.00	14.06.2016
8	ZEPPELIN Rotary Valves	1700024214	11.02.16	16.03.16	05.04.16	4800009767	06.04.2016	€ 80,000.00	SAR 339,248.80	02.09.2016

[CE 2.14] During the execution, I had identified the level risk for the project work and updated to the stakeholders about the project work. As the Job Site was a congested space, an 8 story high closed building with process piping and equipment from the ground floor to the top floor, the impact of the risk would be a Safety Concern and due to limited spaced of barging in outside equipment, the construction contractor may inflate the cost and length the project schedule as a part of his contingency plant. I came in conclusion that the risk of congested job site could be overcome by alignment with ISD (Industrial Security Department) along with the Plant owner, so that Permits would be issued in a timely manner as well I recommended engaging class A contractor, that had demonstrated executing technically challenging projects in the past. I also observed that lengthy EPC tendering and Award process increased the risk of the project by resulting in a delay. I decided to conduct close follow up with PMT organization so that the EPC package can be prepared early on, and start the selection and solicitation of EPC Contractors prior to the completion of BEP (Basic Engineering Package), this helped to mitigate the risk of lengthy EPC tendering process.

[CE 2.15] I also noted down the risk of tight project time frame and suggested mitigation plant as to do the testing validation of lab equipment in Kingdom (IK) and not fly out for Factory Acceptance Tests at the manufacture’s premises. I also recommended expending deliveries of material, Air Freighting where possible to meet project schedule requirements. Furthermore, I liaised with Project Procurement manager to speed up the EPC tendering process for the rapid implementation of the project.

Challenges / Major Risks

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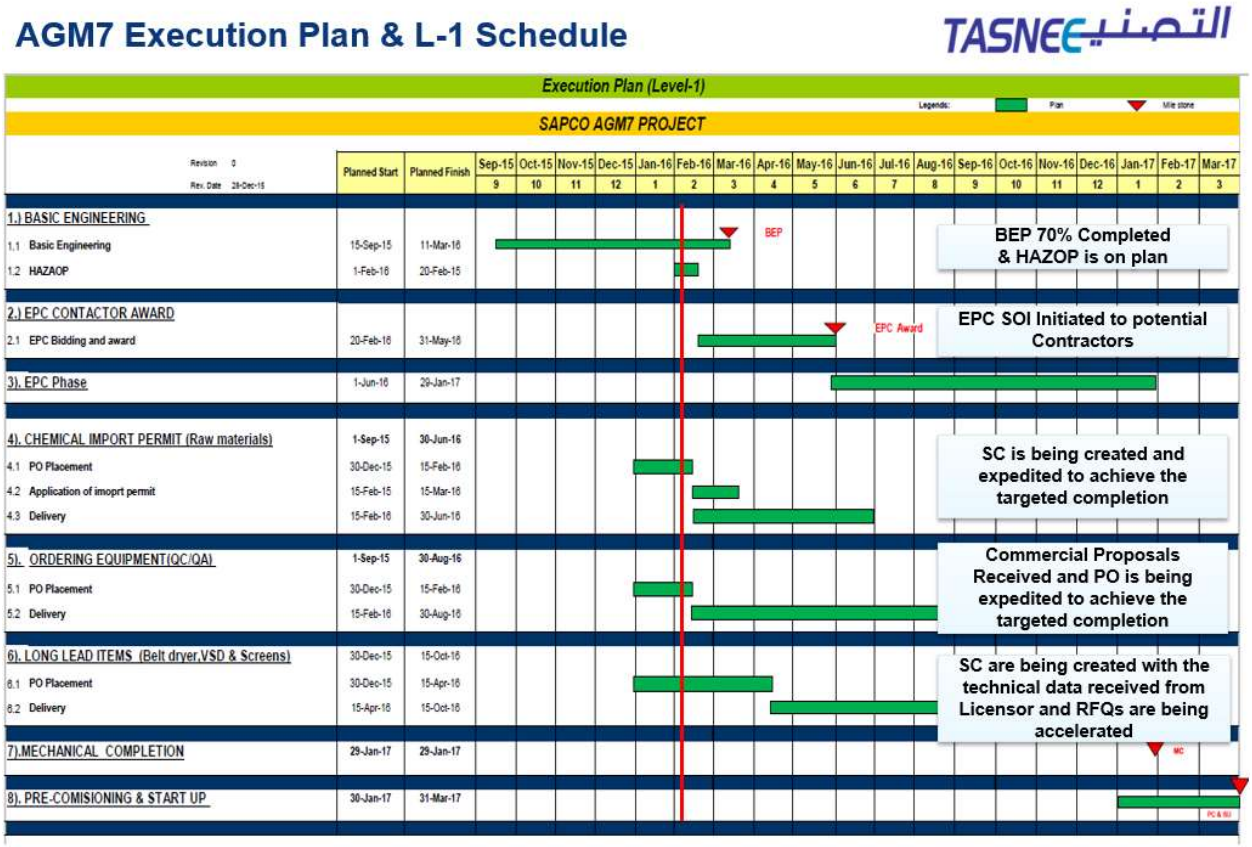
Project Name: AGM7		Stage Gate: Project Definition
Risks		
Description	**Impact**	**Mitigation**
▪ Congested Job Site (Revamp project)	▪ **Safety** Concern (JSA / Shift Permits) ▪ **Schedule** / **Cost** Inflation	▪ Engage an A Class EPC Contractor ▪ Alignment with Plant owner and ISD
▪ Lengthy EPC Tendering & Award Process	▪ EPC Award **Schedule** Delay	▪ Initiate solicitation prior BEP completion for early EPC Contractor engagement. ▪ Alignment with project procurement and accelerate the EPC Tendering process. ▪ Proper planning and close follow up – PMT organization Full Time.
▪ Equipment delivery to match completion	▪ **Schedule** Critical	▪ Chemicals, LAB & LLE Commitment prior EPC phase. ▪ Expedite deliveries by air shipments (if required).
▪ Very Tight project time frame	▪ **Cost** / **Schedule** compact ▪ S/D work	▪ Speed up BEP completion ▪ Accelerate the EPC Tendering process.
▪ LAB Equipment Validation and Training at Licensor's Germany Plant (OOK)	▪ **Schedule** / **Cost** Inflation	▪ Alignment with plant owner and QC team over validation / training to execute in IK. ▪ Expedite deliveries.

Fig. Major Risks and Mitigation Plan

[CE 2.16] To promote a culture of Safety, I initiated a Safety Campaign with project team members, including construction contractor staff to appreciate safe practices during project execution and boost team morale. Below are two photos from that event, at the project Site Office.

[CE 2.17] I generated the Gantt chart in Microsoft-Excel and final report in Microsoft-Word. I developed the appropriate plan and schedule to conduct the task of upgrading project sequentially along within specified period.



I used to conduct monthly project progress review meeting over video conference with Client i.e., Proctor & Gamble company, and sought feedback on the project delivery.

[CE 2.18] During the implementation phase of the project, I had faced the challenge of increased particle size of the AGM7 project, which was exceeding the limit of 630 µm. It was assumed that the mesh sizes of the sieves defining the quality AGM7 are identical to those of AGM6, mainly 200 µm and 630 µm. This would result in less fines and higher amount in the target range, but this was not considered in the initial stage. From several points of the plants, mainly before and behind mills and sieves, samples were taken and the particle size distribution (PSD) was measured and the problem faced. I proposed to make use of the roller mills and sieves behind the overs dryer. The dryer itself should be operated at mild drying conditions to avoid condensation effects. The fraction bigger than 630 µm coming from the sieves of the second roller mill should be given to the overs dryer and been milled and sieved there, hence achieving the desired result.

[CE 2.19] I had generated Key Performance indicators and monitored the progress of the activity and the human resource assigned to that activity. By considering Actual versus Planned progress, I was able to monitor and track progress.

PROGRESS		WEIGHT %	PERCENT COMPLETE					
			PREVIOUS MONTH		CURRENT MONTH		CUM TO DATE	
			PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL
IK	Engineering Services							
	Procurement Services							
	Equipments & Materials Delivery							
	Construction							
	Project & Construction Management							
Overall Project								
OVERALL	Total Engineering & Design Sevices							
	Total Procurement							
	Construction [Excluding Indirects]							

PROJECT INDICATORS	TOTAL ESTIMATED	PERCENT COMPLETE					
		PREVIOUS MONTH		CURRENT MONTH		CUM TO DATE	
		PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL
# of Eng Drawings Completed (IFC)							
# of POs Issued							
# EQ deliveries received on site							

MANHOURS	MANHOURS					
	ORIGINAL	CURRENT MONTH		CUM TO DATE		FORECAST
	PLAN	PLAN	ACTUAL	PLAN	ACTUAL	AT COMPL
	(000)	(000)	(000)	(000)	(000)	(000)
Engineering Services						
Procurement Services						
Construction, Direct						
Construction, Indirect (Subcontractors)						
Project & Construction Management (EPC)						
TOTAL IK MANHOURS						
TOTAL PROJECT MANHOURS						

COST AS OF:		ORIGINAL BUDGET $(000)	CHANGES TO DATE $(000)	CURRENT BUDGET $(000)	COMMIT TO DATE $(000)	EXPEND TO DATE $(000)	CURRENT FORECAST $(000)	OVER/ (UNDER) $(000)
	Project Management							
	Engineering Services							
	Procurement Services							
	Equipments & Materials							
	Construction							
	Construction Management							
TOTAL COST								

SAFETY	MONTH	CUM	QUALITY	PREVIOUS	CURRENT
Total Project Man-hours					
Total Safe Man-hours			Project Quality Index (PQI)		
Recordable incidents					

COMMENTS
MILESTONES/SIGNIFICANT EVENTS COMPLETED THIS MONTH
MILESTONES/SIGNIFICANT EVENTS TARGETED FOR NEXT MONTH

Fig. Template used to monitor project progress

[CE 2.20] Due to the confined nature of the plant, another hurdle I faced in the project was routing of pipelines. I requested for a layout plot plan and then chalked out (red lined) the possible routing for Additive lines thereby easing the task of the team as shown in the diagram below.

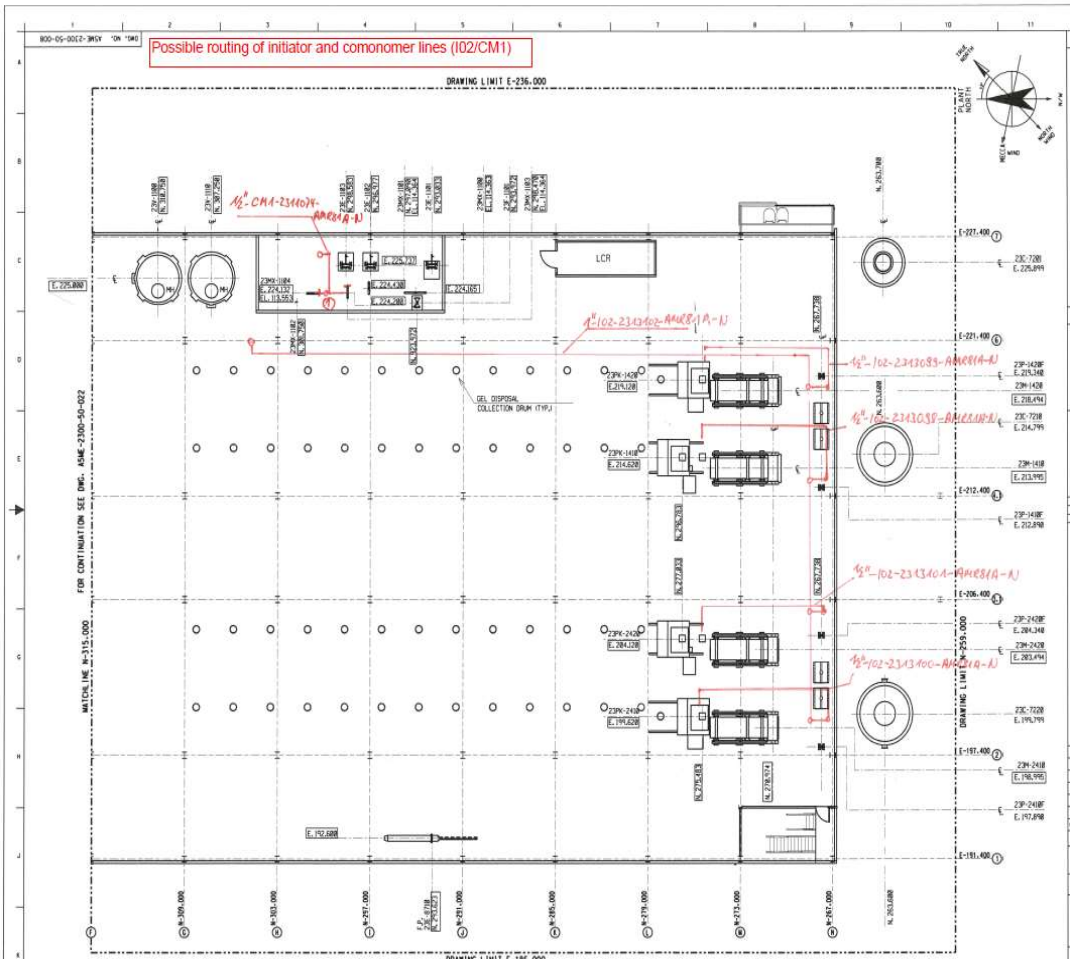


Fig: Possible routing

D) Summary

[CE 2.21] AGM7 project was a fast track project which had tight timelines and the project site itself was a congested space. This was one of the challenging project that I had faced, there were commitments made with the client and the plant was still in operation when the upgrade took place. Due to dual production lines, the upgrade was done one line at a time, hence keeping business continuity. The project completed successfully, on time and within budget. Executing this project was similar to operating on a live heart, as the plant was live when I was executing this project. This also posed Safety threat as we were working on project with live machinery operating in close proximity to the construction

site. I received appreciation certificate for my efforts from the Project Sponsor, the General Manager of PEO and the Project Manager. I had helped the project by solving the routing problem, by addressing the particle size issue and overall closely monitoring projects cost and schedule and fast tracking some activities.

TASNEE التصنيع
Together We Grow

National Industrialization Company
(Tasnee)

Project Execution Organization
(Mega Projects Department)

Certificate of Appreciation

This certificate is awarded to

Hashim Hilal

in recognition for his remarkable contribution and dedication

during the execution and mechanical completion of SAP - AGM7 and PDH - MAPD Project,

given this day, 29 December 2016.

Fahad H. Falqi
Manager, Mega Projects

C.R. 2058004782
PE
National Industrialization Co.

Khaled F. Al-Uraik
GM, Project Execution

At the end of the project, I put together project lessons learned presentation and shared with my team, so they can gain knowledge from this project experience.