

VALUE ENGINEERING & VALUE MANAGEMENT

OIL & GAS: OPTIMISE FUNCTIONALITY AND COSTS ON OFFSHORE AND ONSHORE EXPANSION PROJECT

INTRODUCTION

The Value Methodology was applied to optimise Functionality and Costs of FEED development work on a major onshore and offshore facility in the Middle East.

The following areas have been included in the scope

Offshore Facilities:

New Flow Stations

Modification of Existing Flow Stations

(Demolishing of equipment and New Bridge between new and existing Flow Stations)

Gathering Lines among Flow Stations

Sub-sea Cables between Utility Platform and Flow Stations

New Transmission Line from Flow Station to onshore to transfer crude oil

New Gas Transmission Line from Flow Station to onshore to transfer gas

Onshore Facilities:

Inlet Separators

Gas Processing Plant (dehydration, boosting compressors)

Connection pipelines and cables

New Control Room & Switchgear House

The following areas have been included in the scope

To optimise Functionality and Costs a Value Engineering Study was initiated to take place with the following Purpose Statement:

Maximize project returns by eliminating non-value adding / low-value adding components of the project & increase capital effectiveness by minimizing the capital expenditure required to meet project objectives.

VM Services Pty Limited has been commissioned by the Engineering Contractor to conduct a Value Engineering (VE) Study (Workshop) together with Participation of selected Stakeholders to ensure functional conformity and best-cost options for this project. A Certified Value Specialist (CVS) has been appointed by VM Services Pty Limited to lead the Value Engineering Workshop Activities, assuring VE Process implementation.

Stakeholder Participation:

Engineering Contractor

Client

Suppliers

Subject Matter Experts

VE Facilitator (CVS)

PROCESS EXPLAINED

The following Value Management and later Value Engineering Methodologies have been applied:

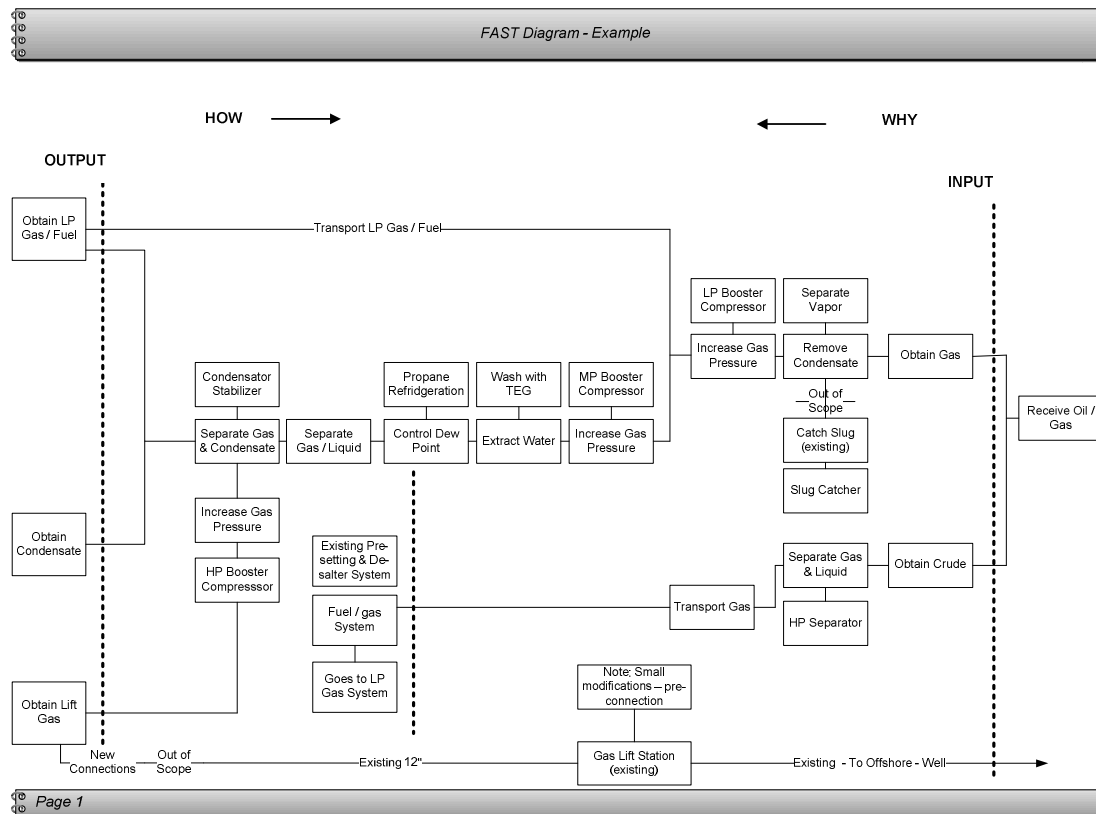
- 01.) Value Management Session to Optimise Project Management issues. (Non-Technical)
- 02.) Value Engineering Study on Offshore (Technical)
- 03.) Value Engineering Study on Onshore (Technical)

Pre VE Workshop Activities:

(3 days external preparation and 1 day at Engineering Contractor's Offices with Process Specialists)

- Analysis of Data related to the Project
- *FAST Diagram (For Offshore and Onshore)*
- VM / VE Methodology Explained (PowerPoint Presentation)
- VE Procedure & Workshop Agenda (detailed)
- Delegate Information Package (to be issued prior to the workshop)

FAST Diagram Example: (only one showed)



VM & VE Workshops:

Value Management Session: 2 Days

- VE Process Overview and VE Workshop Ground Rules.
- Agreement on Scope (Purpose Statement – Workshop Objectives).
- Listing of Areas of concern related to functional performance and cost of design.
- Objective Matrix - Clearly stating the Goal and related environmental influences.
- Results to Achieve / Functional Requirements (Verb / Noun Definitions) translated into established Priority and Level of Importance (Cause and Effect Analysis).
- Listing of recommendations for each identified opportunity area.
- Evaluation of recommendations against Objective, Functionality Requirements and Costs.
- Allocation of Responsibilities and Time Frame of Implementation (Action Plan)

Purpose:

Maximize project returns by eliminating non-value adding / low-value adding components of the project & increase capital effectiveness by minimizing the capital expenditure required to meet project objectives.

Issues & Concerns: (only few listed)

- 01.) Delay of approval process
- 02.) High competition (projects)
- 03.) Contracting procedure
- 04.) Safety / security (region) situation
- 05.) Visa / permits / customs / duties
- 06.) Remoteness
- 07.) Delay in Government approval
- 08.) Steel price / availability
- 09.) Etc.

OBJECTIVE MATRIX

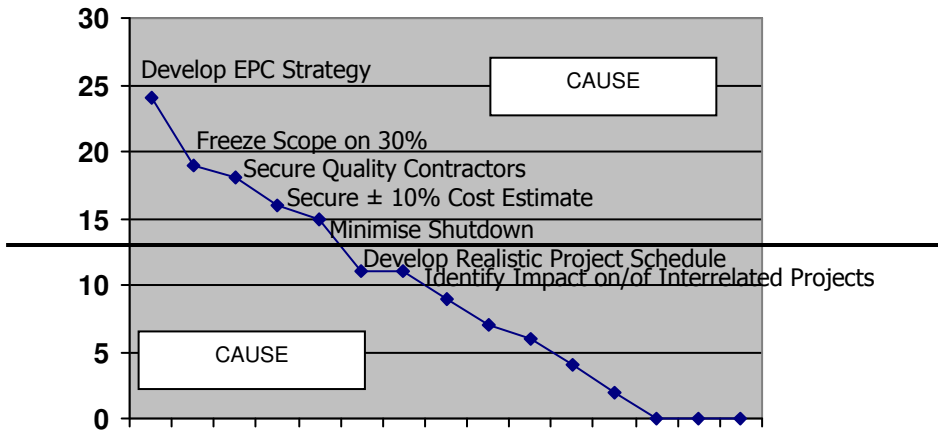
Objective:

To achieve a 10 -15 % saving from the overall Project Cost and complete the project by the established completion date of XXXXX earlier.

RESULTS TO ACHIEVE	RESULTS TO PREVENT
01.) Speed-up Approval Process 02.) Secure Quality Contractors 03.) Develop EPC Strategy 04.) Secure ± 10% Cost Estimate 05.) Minimise Shut-Down 06.) Develop Realistic Project Schedule 07.) Secure Required Manpower 08.) Mitigate Existing Facilities 09.) Identify Impact On / Of Interrelated Projects 10.) Implement All HSE Requirements 11.) Freeze Scope on 30% 12.) Validate Data 13.) Establish Good Communication	<ul style="list-style-type: none"> ▪ Cost overrun ▪ Scope creep ▪ Schedule slipping ▪ Miscommunication ▪ Short of project performance criteria ▪ Over complicate ▪ HSE compromise ▪ Quality compromise
AVAILABLE RESOURCES	CONSTRAINTS
<ul style="list-style-type: none"> ▪ Client ▪ Contactors ▪ Vendors ▪ Existing project at nearby site / company ▪ Lesson learned ▪ Industry best practices ▪ Design Review Workshop 	<ul style="list-style-type: none"> ▪ Remoteness ▪ Government approval ▪ Steel price / availability ▪ Cost escalations ▪ Client Standards ▪ Weather / Sea conditions ▪ Force Majore

Functional Analysis & Cause and Effect Graph

														Functions		
A	B2	C2	D2	E3	F1	G2	H2	I2	A3	K3	A1	M2	Speed-up Approval Process	4		
	B	C2	B2	B1	B2	B1	B2	B3	K1	B3	B1		Secure Quality Contractors	18	3	
		C	C2	C2	C2	C2	C1	C3	C1	C3	C2		Develop EPC Strategy	24	1	
			D	E1	D1	D1	D2	D1	D3	D1	D3	D2	Secure ± 10% Cost Estimate	16	4	
				E	E1	E1	E2	E1	E3	K1	E2	E1	Minimise Shutdown	15	5	
					F	F1	F2	F1	F3	K1	F2	F1	Develop Realistic Project Schedule	11		
						G	G1	I1	G3	K1	G2	G1	Secure Required Manpower	9		
							H	I2	H3	K2	H1	M1	Mitigate Deficiencies of Existing Facilities	6		
								I	I3	K2	I2	I1	Identify Impact on/of Interrelated Projects	11		
									J	K3	L2	M2	Implement all HSE Requirements	0		
										K	K3	K2	Freeze Scope on 30%	19	2	
											L	M2	Validate Input Data	2		
												M	Establish Good Communication	7		



Recommendations:(only few listed)

FUNCTIONAL REQUIREMENT	REF. NUMBER	VALUE MANAGEMENT RECOMMENDATIONS
Develop EPC Strategy	1.01	Determine numbers of contracts, determine contract packages (scope work limits)
	1.02	Select type of tender: single source, open tender, selected tender, selection based on open tender
	1.03	Establish pre-qualification criteria of contractors, Prime contractor selection, check bidders against technical, financial, experience and capabilities, establish a technical & commercial bid review team, establish bid evaluation programme, establish "subcontracting" policy for prime contractors
	1.04	Type of contract (lump sum, rates etc.)
	1.05	Develop / update project execution plan
Freeze Scope on 30%	2.01	Finalise outstanding items: Gas turbine Compressor Configuration; Deep NGL Recovery; Sparring; Number of Risers; Offshore Layout; Onshore Layout
	2.02	Confirm Acceptance of Design Parameters and Output Data Accuracy
	2.03	PMT & Proponent to validate Scope on 30% and Freeze

Value Engineering Study: 3 Days

- Prioritising of Areas of Investigation (All Design Parameters and Philosophies – Cost Drivers, utilising a Scanning Matrix, evaluation against major functional requirements.
- Functional Definition Cost Drivers, Recommendation with Benefits (Tangible – Non-tangible)

Design Parameters: (only few listed)

FACILITY SCOPE	FACILITY OPERATIONS AND MAINTENANCE	PROCESS CONTROL	RELIEVE AND BLOWDOWN	ISOLATION AND DRAINAGE
New Inlet Separator System Onshore	Onshore Facilities Technical Integrity	HP and LP Separators	New Onshore Reception and Separation System	New Onshore Reception and Separation System
New Gas Receiving Compression and Processing Facilities Onshore	Regulatory Compliance	Onshore Gas / Liquid Separator	New Onshore Gas Compression System	New Onshore Gas Compression System
	Facilities Availability	Onshore Slug Catcher (Existing to be reused)	New Onshore Lift Gas Treatment System	New Onshore Lift Gas Treatment System
	Remote Control Capability	Gas Compression and Treatment Facilities	New Onshore Lift Gas Compression System	New Onshore Lift Gas Compression System

Cost Drivers: (only few listed)

DELTA Project PHASE 1 FACILITIES OIL & GAS										
Process Control										
		Reduce CAPEX	Reduce OPEX	Improve Quality	Minimise Shutdown Period	Optimise Operation / Maintenance	Accommodate Future Demand	Improve Project Schedule	Improve HSE	Improve Environmental Conditions
	PROCESS CONTROL									
A	HP and LP Separators	N								
B	Onshore Gas / Liquid Separator	N								
C	Onshore Slug Catcher (Existing to be reused)	5	2			3		5		

Functional Analysis and Recommendations: (only few listed)

REF. NUMBER	DESIGN PARAMETERS / PHILOSOPHY	REF. NUMBER	DESIGN COST DRIVERS	FUNCTIONAL REQUIREMENT	REF. NUMBER	VALUE ENGINEERING RECOMMENDATIONS - ONSHORE
27.0	Mechanical and Machinery Design Basis		Centrifugal Compressors	Compress Gas		Optimise numbers (currently 30 including spares) by revising design of Operating Pressure of HP Separator
			Pressure Vessels	Hold Liquid		Same as Separator
			Tanks	Store Liquid		Reduce size and numbers of tanks (part of chemical injection)
						Look into alternative materials for tanks to improve LCC (Glass Lining), compare CAPEX versus OPEX benefits
			Heat Exchangers	Heat / Cool Fluid		Material selection (reduce corrosion)
						Type and Configuration selection (Fin Fan)
24.0	Sparing		Gas Dehydration	Dry Gas, Remove Water (from Gas)		Propose MS with larger CAPEX but major benefits for LCC (needs confirmation)
						Optimise operating system by adding Heat-exchanger that will reduce Water content
26.0	Process Design Basis		Process Design of the New Onshore Facilities, Including Production Separation, Compression and Gas Treatment Systems	Separate Liquid, Refrigerate Gas, Lift Gas Preparation		Standardise equipment to reduce warehouse spares (consider even if we do up sizing of some equipment - check in detail design, after 50%)
21.0	Process Control	21-C	Onshore Slug Catcher	Catch Slug, Smooth Gas flow	21-C01	Use existing and add additional equipment
					21-C02	Install new slug catcher and optimise size (gasline) - reduce pipeline (42")
					21-C03	Shift to new location (study): Additional equipment (Vapour Separator), Less trenching, relocation costs

Above includes: (only headings showed)

RESPONSIBILITY	DUE DATE	BENEFITS (or any other comments)	Estimated CAPEX in US\$1'000	Estimated OPEX in US\$1'000
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VE Workshop Reporting:

- Prepare and Issue VE / VM Report for Review and Comments