METHODOLOGY APPLICATION

APPLICATION NO:	VM/VE001
APPLICATION TITLE:	Optimise Functionality and Costs on Offshore and Onshore Expansion
INDUSTRY:	Oil & Gas
VALUE METHODOLOGY APPLIED:	Value Management & Value Engineering

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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

VALUE METHODOLOGIES APPLIED

Value Management (Strategic)
Value Engineering (Technical)

Pre VM / 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)

Value Management Application Tools

- 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)

Value Engineering Application Tools

- 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)

VE Workshop Reporting

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

VM & VE Participants:

Client	Project Manager for Onshore
	Project manager for Offshore
	Technical Manager
	Cost Engineer
	Electrical Engineer
	Instrument Engineer
	Structure Engineer
EPCM	Project Director
	Project Manager
	Project Engineering Manager
	Acting Project Engineering Manager
	Lead Discipline Engineers

Consultant: Project Manager
Resident Engineer (Project)
Piping Engineer

PROCESS EXPLAINED

VALUE MANAGEMENT SESSION

VM Workshop Agenda

Day 1

01.) Introduction & Project Briefing	Project Manager
02.) VM Process Overview & Workshop Agenda	VM Facilitator
03.) Confirmation of Purpose Statement	
04.) Issues / Concerns / Opportunities	
05.) Objective Matrix	
06.) Establish Functional Requirements	
07.) Evaluate Functional Priorities	
08.) Closure	VM Facilitator

Day 2

09.) List recommendations	VM Facilitator
10.) List recommendations (continued)	
11.) Evaluate and priorities recommendations	
12.) Allocate responsibilities and time frame	
13.) Where to from here?	
14.) Closure	Project Manager

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.

Issues & Concerns:
(only few listed)

1. Delay of approval process
2. High competition (projects)
3. Contracting procedure
4. Safety / security (region) situation
5. Visa / permits / customs / duties
6. Remoteness
7. Delay in Government approval
8. Steel price / availability
9. Etc.

Objective Matrix

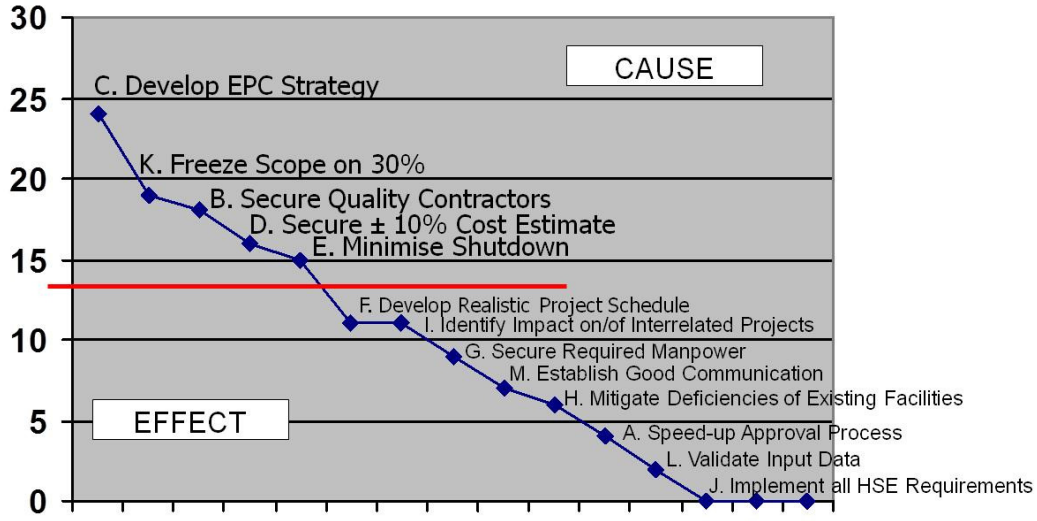
Objective:

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
A. Speed-up Approval Process B. Secure Quality Contractors C. Develop EPC Strategy D. Secure ± 10% Cost Estimate E. Minimise Shut-Down F. Develop Realistic Project Schedule G. Secure Required Manpower H. Mitigate Existing Facilities I. Identify Impact On / Of Interrelated Projects J. Implement All HSE Requirements K. Freeze Scope on 30% L. Validate Data M. Establish Good Communication	• Cost overrun • Scope creep • Schedule slipping • Miscommunication • Short of project performance criteria • Over complicate • HSE compromise • Quality compromise
AVAILABLE RESOURCES	CONSTRAINTS
• Client • Contactors • Vendors • Existing project at nearby site / company • Lesson learned • Industry best practices • Design Review Workshop	• Remoteness • Government approval • Steel price / availability • Cost escalations • Client Standards • Weather / Sea conditions • Force Majore

Functional Analysis & Cause and Effect Graph

															Functions	Scr	Rnk
A	B2	C2	D2	E3	F1	G2	H2	I2	A3	K3	A1	M2			**Speed-up Approval Process**	**4**	
	B	C2	B2	B1	B2	B1	B1	B2	B3	K1	B3	B1			**Secure Quality Contractors**	**18**	**3**
		C	C2	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**	
													N				



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; Sparing; 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

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)

VE Workshop Agenda

Day 3

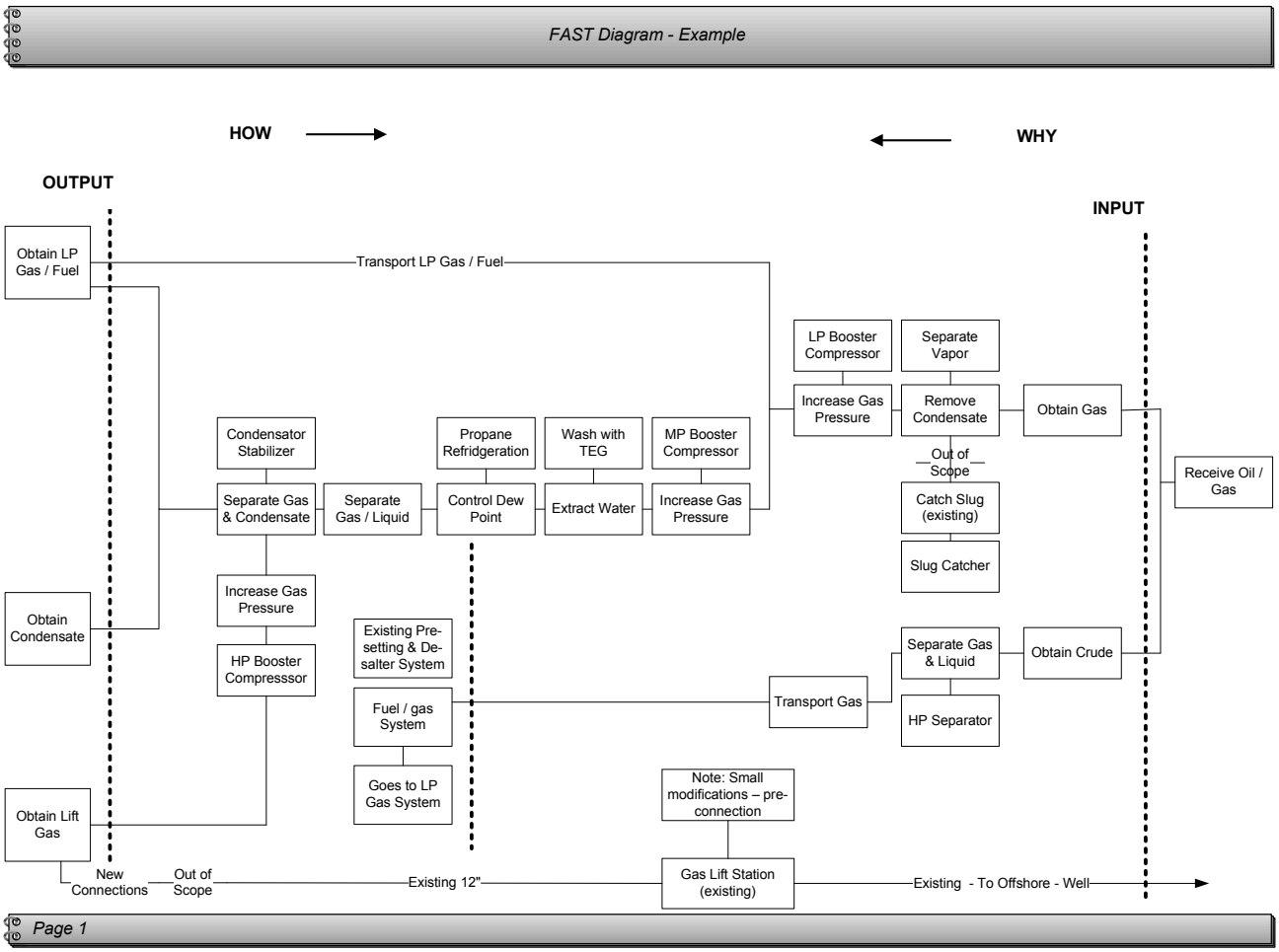
01.) Introduction & Project Briefing	Project Manager
02.) VE Process Overview & Workshop Agenda	VM Facilitator
03.) Confirmation of Purpose Statement	
04.) Review / Discussion / Analysis of the FAST Diagrams	
05.) Agreement and Finalisation of the Design Parameters to	
06.) be investigated	
07.) Agreement and Finalisation of the Cost Drivers to	
08.) be investigated	
09.) Establish Functional Requirements for each Cost Drivers	
10.) Close	VE Facilitator

Day 4

11.) List recommendations	VE Facilitator
12) Evaluate and priorities recommendations	
13) Allocate responsibilities and time frame	
14) Where to from here?	
15) Closure	Project Manager

FAST Diagram Example:

(only one shown)



Design Parameters:
(only few listed)

From the Work Breakdown Structure all the Design Parameters were listed and then discussed with the team, deciding which of these Design Parameters should be "Value Engineered". The highlighted areas showed great potential for possible improvements and included into the next step of selecting areas of investigation.

7	8	9	10	11
PIPELINE SCRAPING	MECHANICAL AND MACHINERY DESIGN BASIS	PIPING MATERIAL SPECIFICATIONS	ELECTRICAL DESIGN BASIS	INSTRUMENTATION & CONTROL SYSTEM DESIGN BASIS
Crude Oil Gathering Pipelines	Pressure Vessels & Drums	Joints, Flanges and Fittings	Prefabricated Substation Building (Electrical Switch room, Instrumentation / Control Room, Galley)	Process Control System (PCS)
Gas Gathering Pipelines	Instrument Air Compressor	Flange Stud Bolts and Nuts	AC Uninterruptible Power Supply (UPS) System	Emergency Shutdown System (ESD)
36" Diameter Crude Oil Transmission Pipeline	Pumps	Insulation Gaskets / Kits	Transformers	Fire & Gas Protection System (F&G)

Cost Drivers:
(only few listed)

For each selected Design Parameter (i.e. Mechanical and Machinery Design Basis) all the Cost drivers were included in this "Scanning Frame Matrix" to identify potential opportunities against various criteria.

	SCANNING MATRIX - OPPORTUNITIES SELECTION / FUNCTIONALITY - DESIGN PARAMETERS												
	1 FACILITIES OIL & GAS New Flow Stations XX & YY New Oil and Gas Gathering and Transmission Lines							OFFSHORE				8	
	MECHANICAL AND MACHINERY DESIGN BASIS	Reduce CAPEX	Reduce OPEX	Improve Quality	Minimise Shutdown Period	Optimise Operation / Maintenance	Accommodate Future Demand	Improve Project Schedule	Improve HSE	Improve Environmental Conditions			
A	Pressure Vessels & Drums	5	1			1		1					
B	Instrument Air Compressor	2	1			1		1					
C	Pumps	5	5			3		4					
D	Firewater Pumps	1	1			1		1					

Some of these results show big potential for the Pressure Vessels & Drums for reduction in CAPEX and the Pump reduction in CAPEX and OPEX, plus opportunities for optimised Operability and Maintenance and Project Schedule.

The purpose of this "scanning" of opportunities was to obtain an 80/20 (Pareto Principle) breakdown of all the design parameters and cost drivers, addressing approximately 20% of the design but giving 80% of potential cost and schedule improvements.

Cost / Function Analysis with Recommendations:
(only few listed)

For each selected design parameter and specifically each cost drivers (element) the functional requirements was defined and knowing what the element is supposed to do we invited recommendations that could be applied as an alternative solution, modifications or exclusion of the design if the function was not required or duplicated in another component or system.

REF. NUMBER	DESIGN PARAMETERS / PHILOSOPHY	REF. NUMBER	DESIGN COST DRIVERS / ELEMENTS	FUNCTIONAL REQUIREMENT	REF. NUMBER	VALUE ENGINEERING RECOMMENDATIONS - OFFSHORE
8.0	Mechanical and Machinery Design Basis	8-A	Pressure Vessels & Drums	Separate Oil/Gas	8-A01	During detail design consider size, internals and layout
		8-C	Pumps	Transfer Oil	8-C02	Change Configuration (Capacity versus Number)
		8-E	De-sanding Units / System, Sand Container	Remove Sand	8-E01	Investigate acceptable de-sanding system
					8-E02	Question need for de-sanding
					8-E03	Client Practice (Benchmark)
		8-G	Flare Stack and Ignition System	Release Excess Gas	8-G01	Current proposal is preferred (check accessibility)

Above includes: (only headings showed)

RESPONSIBILITY	DUE DATE	BENEFITS (or any other comments)	Estimated CAPEX in US$1'000.00	Estimated OPEX in US$1'000
Process Engineer (Name)	Date	Utilising Client's Standards will reduce spare holding and therefore reduce OPEX	US$230.00	US$1 580.00

Detailed Recommendation:
(only one listed)

Below a typical example of duplication of a function.

XXY Project - Value Engineering Theme Sheet

Subject: OFFSHORE **Design Parameter No: ___2__ /__B__**
(Use Number from Scanning Frame (i.e. 1 / B) = Maintenance / Condition Monitoring)

DESIGN PARAMETER DESCRIPTION:

1.Isolation and Drainage: Emergency Isolation Valve

BASIC AND SECONDARY FUNCTIONS OF DESIGN PARAMETER:

2. Isolate Flow, Trigger Alarm

RECOMMENDATION / JUSTIFICATION / POTENTIAL SAVINGS / OTHER BENEFITS:

4.Use alternative product (YFR Product) without alarm since the general system will pick up any emergency at the Main Control Centre. Savings: (230 units @ a saving of US$ XXXX.00 per unit = US$ XXX XXX.00 (Change drawings and specifications before tendering) Who: Joe Doe When: 23rd June 200X;;

CONCLUSION

For this application we utilised the Value Management Process to optimise non technical project management FUNCTIONS, resolving all the so called peripheral issues that could have a major impact on cost and schedule thus allowing for a overall common understanding of the project before the actual Value Engineering was applied.

Value Engineering then focused on the analyses of the technical design and operational readiness ensuring correct FUNCTIONALITY performance for the least cost.

The savings exceeded the expectation, not only on the technical CAPEX but future OPEX savings and Revenue optimisation.