

VALUE ENGINEERING & VALUE MANAGEMENT

MINING: REDUCING OPERATIONAL COSTS

INTRODUCTION

The Value Methodology was applied to turn around a Gold Mine in South Africa with the main purpose of reducing operational costs without sacrificing the safety, sustainability and employees rights.

In an example of good leadership the first step was to determine why such an intervention was necessary.

What would be the reason for such a change?

The answer was explained by the General Manager of the Mine:

The current operational costs are too high and will continuously increase. It is necessary to create a new way of doing things where we manage the mine together with our employees and optimise operational costs, improve efficiencies and extend the mines life to ensure sustainability for many years to come. This will have an implication on how we operate our business and we are aware that we have to come up with a new way of thinking. To achieve this we need to involve management and our employees, ensuring that our people do know where we waste money and where our in-efficiency is.

PROCESS EXPLAINED

The initial change process took place within a facilitated workshop environment with the Management Team (MANCO - horizontal representation of organisational structure), where the Vision and Mission of the company was reviewed and confirmed. After that the Purpose Statement of the Turn Around initiative was created. It must be noted that the whole management team had the opportunity to be exposed to the principles of Value Management, therefore understanding the process and the benefits associated with it.

To establish clear strategies to reduce operational costs by 15% by (a given date), without compromising sustainability of the mine.

The major strategies identified were:

01.)	Ensure correct Ore Resource Management
02.)	Optimise Power & Water Utilisation
03.)	Eliminate Waste – Stores and Salvage
04.)	Align Labour Costs (Bonus & Overtime)
05.)	Eliminate Shrinkage, Theft and Fraud
06.)	Introduce Value Adding Blasting
07.)	Ensure Quality Health Services
08.)	Manage Contractors & Service Agreements
09.)	Reduce Equipment Abuse
10.)	Resolve Grading Inconsistency of Panel Crew
11.)	Ensure Optimum Grind

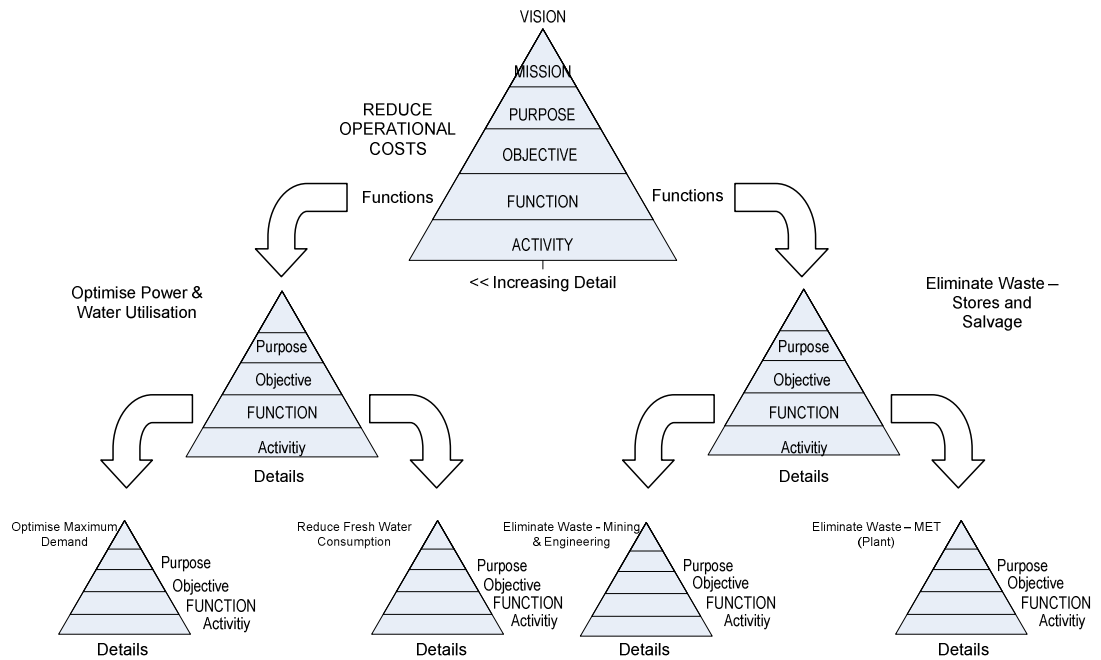
Cascading Strategies:

It was also agreed that each of the strategies established will be “cascaded” into the organisation, responsibility would be allocated to a MANCO member to manage detailed investigations and workshops with representation from the relevant stakeholders (vertical representation of organisational structure).

Since the strategy included the empowerment aspect of employees all the consequential workshop activities included the implementation of Value Management Principles with the objective of creating an environment of continuous improvement initiated by all employees.

Find below an example of how some of the major strategies were cascaded down into more detailed activities utilising the same process principles applied in the initial VM workshop:

From *Reduce Operational Costs* to *Optimise Power & Water Utilisation* to *Optimise Maximum Demand* and *Reduce Fresh Water Consumption* etc.



Another way to show the systematic approach of addressing all the requirements is shown below.



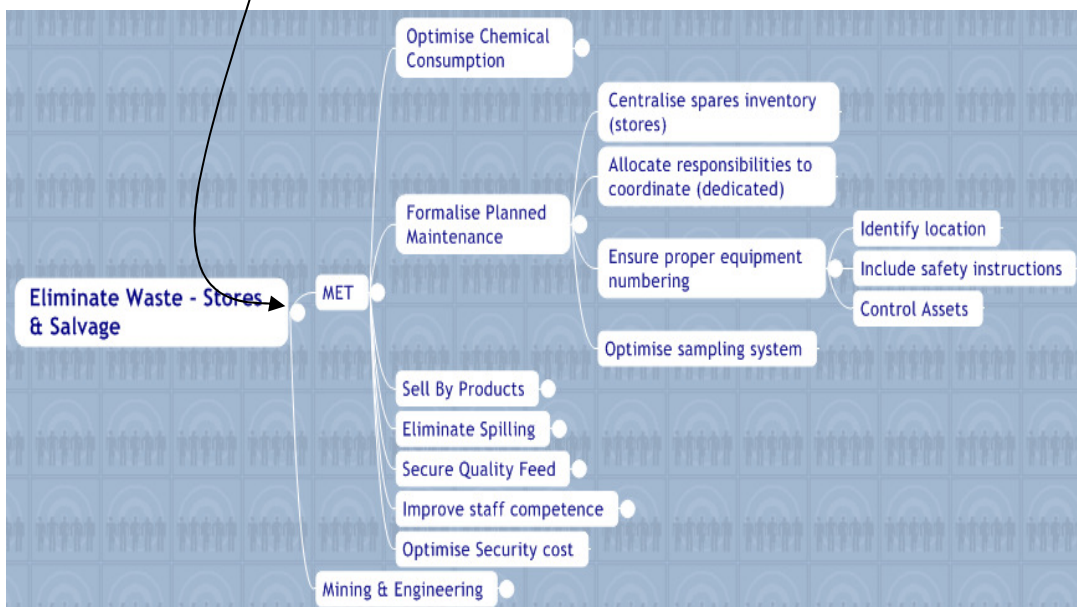
THE EXAMPLE SHOWS THE “ELIMINATE WASTE – STORES & SALVAGE” STREAM OF INVESTIGATION

The stream was divided into MET and Mining & Engineering.

The example shows the cascading of MET to “Formalise Planned Maintenance” to “Ensure Proper Equipment Numbering” to the details of “Identify Location”, “Include Safety Instruction” and “Control Assets”.

Each area was managed by a senior person of the mine and opportunities identified with the relevant participation of employees and external experts.

Note the definitions of the functional requirements, they are all expressed in verb / noun to clearly state WHAT has to be done.



Each of the project streams included the basic Value Management principles. To understand the various principles an example with explanation of one of these interventions is shown below: (*VM Output in italic*)

OPTIMISE POWER & WATER UTILISATION

- Establishing a Purpose
 - This refers to the purpose of the study.
 - Clearly scope the area of investigation thus ensuring a focused approach when selecting appropriate technology for the project & determine how many days the workshop / study will take.
 - Selecting the right participants for the workshop.

Reduce power and water cost at XY Mine

- Listing Issues and Concerns
 - List all the Issues & Concerns applicable to the project.
Include real & perceived Issues & concerns.

01.) *Leaks in compressed air pipes*

02.) *Leaks in water pipes*

03.) *Excessive use of equipment:*

- *Fans (too many)*
- *Pumps (too many)*
- *Pipes (pressure)*
- *Winders (unnecessary trips)*

04.) *Wrong schedule of pumping hours (peak periods)*

05.) *Unnecessary stops of mills and unscheduled start ups (peak period)*

06.) *Lack of knowledge on power / water business*

07.) *Open valves (lack of control)*

08.) *Lights burning at night / day*

09.) *Air conditioners / heaters*

- Establishment of a clear Objective
 - Establish an objective with measurable target and being time bound.
Include “Results to Achieve”. “Results to Prevent”, Available Resources” & “Constraints”
 - Environmental complexity of scope is referenced in terms of current risks and available support.

Objective: Reduce current average power cost by 15% and reduce Water cost by 5% (with improvements in operational conditions) before the end of June 200x

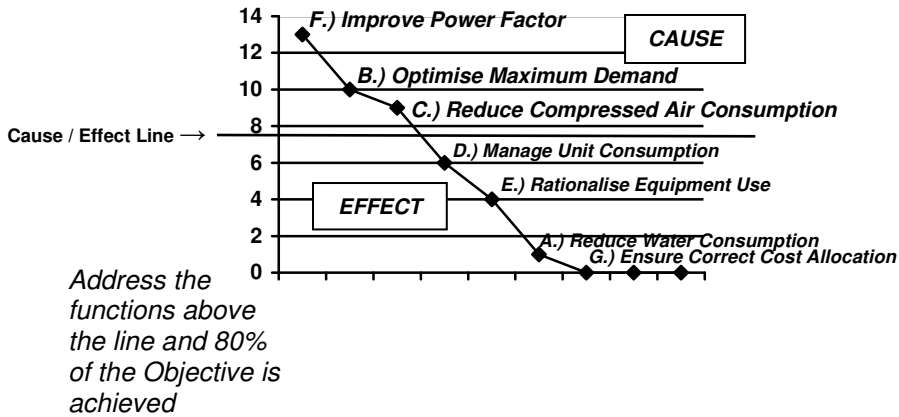
RESULTS TO ACHIEVE	RESULTS TO PREVENT
<ul style="list-style-type: none"> - Measure unit consumption - Optimise maximum demand - Reduce compressed air consumption - Rationalise equipment use - Reduce water consumption - Schedule effective start-up of equipment - Educate user on power and water savings - Improved power factor - Reduce choking of pumps / pipes - Reduce smelting cost - Revisit 3rd party user - Correct cost allocation 	<ul style="list-style-type: none"> - Production loss - Retrenchment - Prevent flooding - Closure of mine - In-adequate supply of power and water
AVAILABLE RESOURCES	CONSTRAINTS
<ul style="list-style-type: none"> - Maximum demand controllers & equipment (4 #) - Mine water (dolomite) - Skilled people - Other miner (experience)i.e. Western Deep Levels) - Environmentalist - Planned maintenance - Equipment 	<ul style="list-style-type: none"> - Capital - Time - Actual mine plan (resources) - Government / legislation - Unions - Lack of education - Lack of motivation - Ignorance (power / water cost) - RC factor

- The identification of the Functional Requirements to achieve the Objective and priorities
 - List all the Functions that need to be addressed in Verb / Noun statements
 - Evaluate all functional requirements against each other to define priorities and the cause and effect scenario.
 - FAST Diagram, Function / Cost Analysis or Numerical Evaluation

NUMERICAL EVALUATION

<i>Functions</i>							<i>Scr</i>	<i>Rnk</i>	
A	B3	C3	D3	E2	F2	A1	Reduce Rand Water Consumption	1	
B	B1	B1	B2	F2	B3		Optimise Maximum Demand	10	2
C	C2	C2	F2	C2			Reduce Compressed Air Consumption	9	3
D	D1	F2	D2				Manage Unit Consumption	6	
E	F2	E2					Rationalise Equipment Use	4	
F	F3						Improve Power Factor	13	1
G							Ensure Correct Cost Allocation	0	

CAUSE AND EFFECT GRAPH



- Listing and Evaluation of Recommendations
 - Choose the highest rated functional requirement first and brainstorm for better solutions, recommendations & alternatives.
 - Apply a “Star rating” to each recommendation
 - Alternatively the “Perspective Modeling Matrix can be applied

- Finalisation of Action Plan with Responsibilities and Time frames.
 - Establish an action plan for all high rated recommendations for implementation, feasibility studies etc.. (who and when)

Functional Requirement: Improve Power Factor

<u>Recommendations:</u>	<u>Comments:</u>	<u>When:</u>	<u>Who:</u>
01.) Obtain real power factor on all incoming supply: <i>Utility Supplier Electrical Contractor</i>	<i>Some of the information will be available from XYZ</i>	10/07/200X	HY
02.) Obtain Consultant report for potential savings (evaluate report)		15/08/200X	JP
03.) Finalise proposal / report for MANCO Approval		20/08/200X	KL
04.) Identify reactive power at each shaft / station & prioritise	<i>Obtain assistance from Electrical Engineer and Shaft Boss</i>	15/09/200X	JP

Note that the examples are only snippets of the actual outcome and are there for showing in principles how the process was applied.

CONCLUSION

During a period of 6 months over 200 people participated in over 17 VM workshops / studies, establishing strategies and solutions that reflected in a reduction of more than \$1million (>15%) of initial operating costs per month.

Not one person was retrenched. The Mine's life was extended by allowing for cost effective mining in less profitable sections.

All improvements were implemented by the Mine's Management and its Employees thus ensuring ownership of their actions and pride in their achievements.

At least 100 people obtained training in the VM Methodology instilling a culture of continues improvements.

Special Note: The General Manager's role in this venture was crucial and had a major impact on the success of this turn around intervention.

None of the above would have happened without mature management thinking, able to question it self on its current position and future stance.

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THE AUTHOR:

KJ Huber, Pr Tech Eng. CVS (Life)

Managing Director, VM Services Pty Limited

Kurt Huber is currently Chairman of the Standards Generating Group – Value Engineering (part of the Engineering SGB of the Engineering Council of South Africa). Kurt graduated from the University of the Witwatersrand as an Industrial Engineer in 1991 and is a Certified Value Specialist (for Life) registered with SAVE International. Swiss born, Kurt is also an appointed part time member of staff at the University of the Witwatersrand and lectures at various Business Schools. He has over 24 years of Value Engineering experience. He facilitated more than 350 Value Engineering Workshops / Studies and lectured in the Value Engineering / Value Management Methodology to over 3000 people worldwide

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