OPTIMAL SUBASSEMBLY NORMS

P & TS – ASSET MANAGEMENT

CONTENTS

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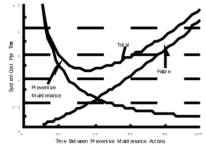
PROBLEM STATEMENT



- Given the need to minimise running cost, the use of gut feel to estimate repair/replace points can have negative impacts on future cash flows.

- The paper to be presented is to show how one can use a combination of statistical methods and the concept of present value of money (LCC) to determine the optimum replacement time.

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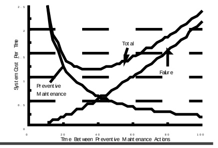
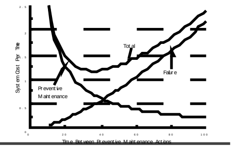
OBJECTIVES



To resolve the above-stated problem, the following objectives were set:

- To calculate the optimal lives of subassemblies
- To determine the Life Cycle Cost (LCC) implications for both the current paradigm and the scientific approach (Time Value of Money)
- To determine the failure and reliability profiles of the various subassemblies
- To determine the failure characteristics of the various subassemblies

PROPOSED STRATEGY



To meet the set objectives the following strategy using asset management techniques is proposed:

- **Renewable theory** of electromechanical subsystems to determine optimal cost for a specific tonnage carried by each subassembly
- **Weibull Distribution** to analyse equipment failure characteristics, reliability profiles and spreading out the cost on a continuous distribution
- **Net Present Value** Analysis to determine **Life Cycle Cost**

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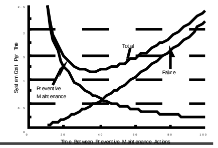
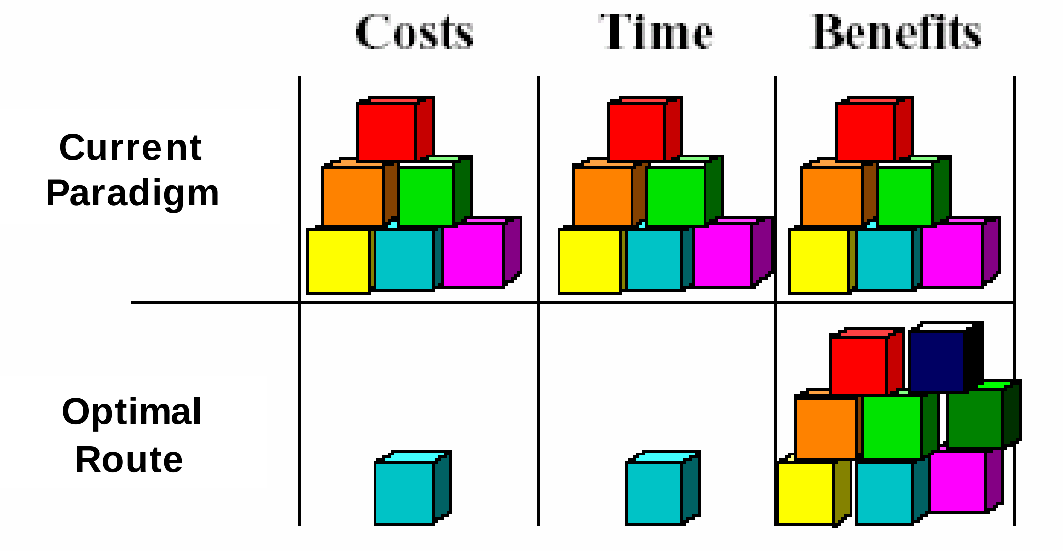
ANTICIPATED BENEFITS



The following benefits are anticipated:



- More accurate **budgeting** process.
- Time saved on unnecessary cost on late or too early PM intervals
- Net reduction in Life Cycle Cost of a CM from one **overhaul** to the next.
- **Management** will have reliability information data at subsystem level for an informed **decision-making** purposes.

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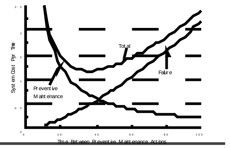
SCOPE



Using a subassembly from one of the Continuous Miners from one of the mines at Sasol Mining, the following exercise will cover the work as follows:

- Collect historical data SAP R/3 regarding cost and life history
- Conduct a literature review on the subject
- Carry out a thorough mathematical modeling
- Generate a model usable for section engineers and planners at the mine

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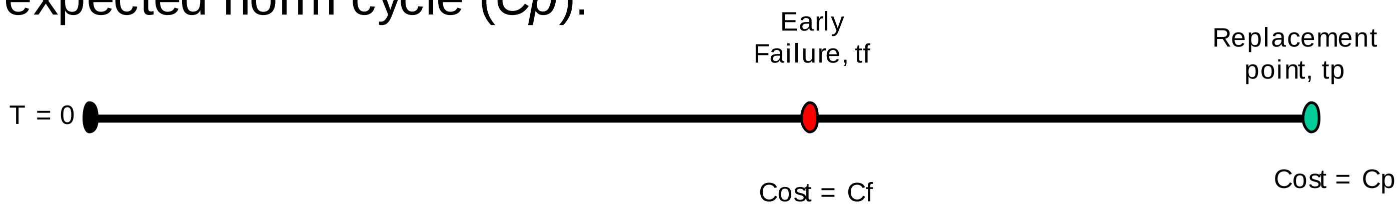
ILLUSTRATIVE APPROACH

A sub assembly in operation will follow either the failure cycle (*Cf*) or the expected norm cycle (*Cp*):



- The total cost Ct for the entire cycle is given by:

$$C_T = \frac{C_p R + C_f (1 - R)}{(t_p)R + \int_{\infty}^{t_p} f(t)dt}$$

- Where *Cp* is the cost of preventive maintenance, *Cf* is the cost of a failure, *tp* is the time or tons between preventive or **‘norm’** maintenance actions and *R* is the reliability given by the Weibull Function.

- The optimum time or ton between maintenance actions is found by minimizing the total cost equation above.

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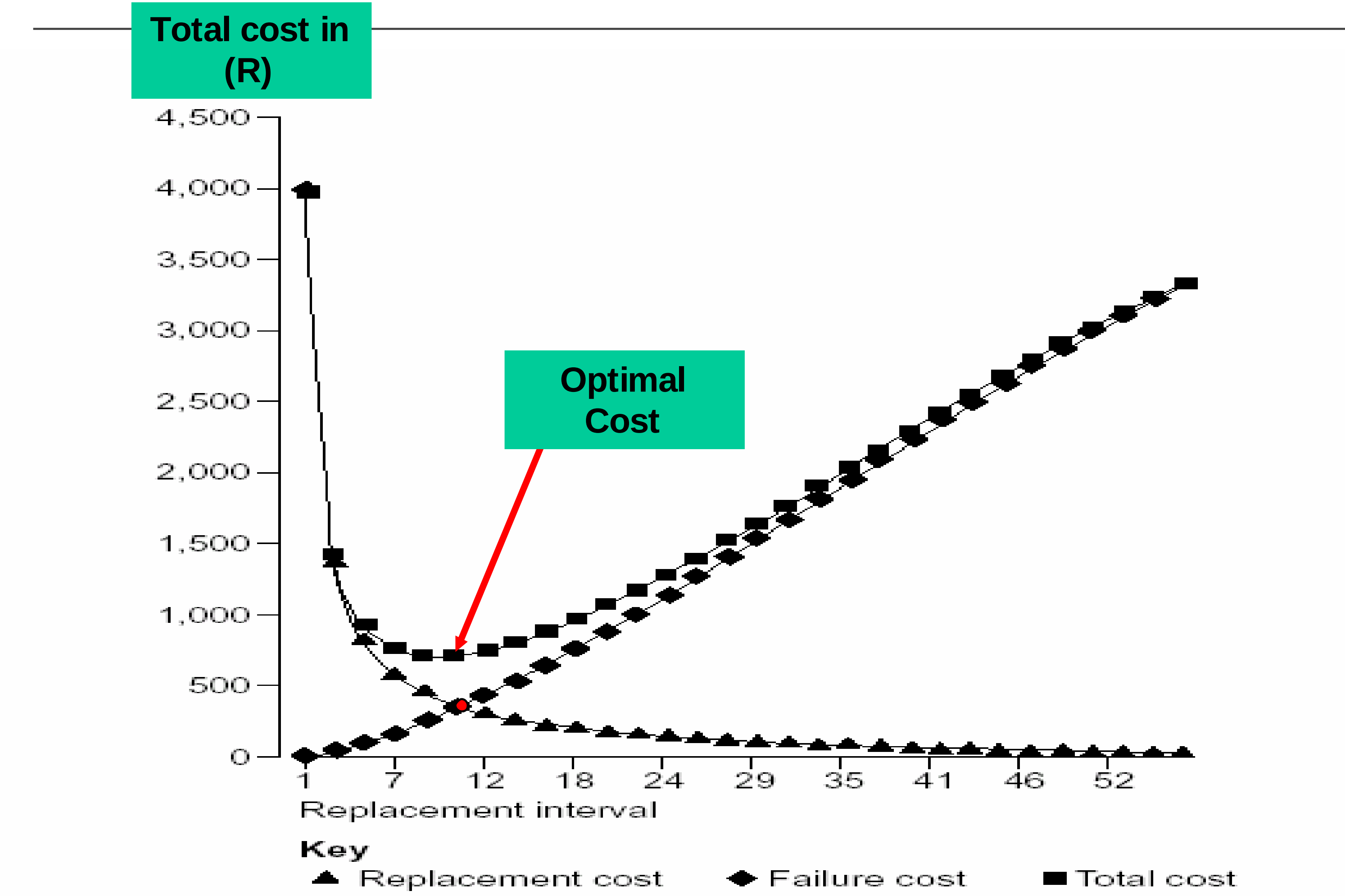
OPTIMALITY (Hypothetical Data)



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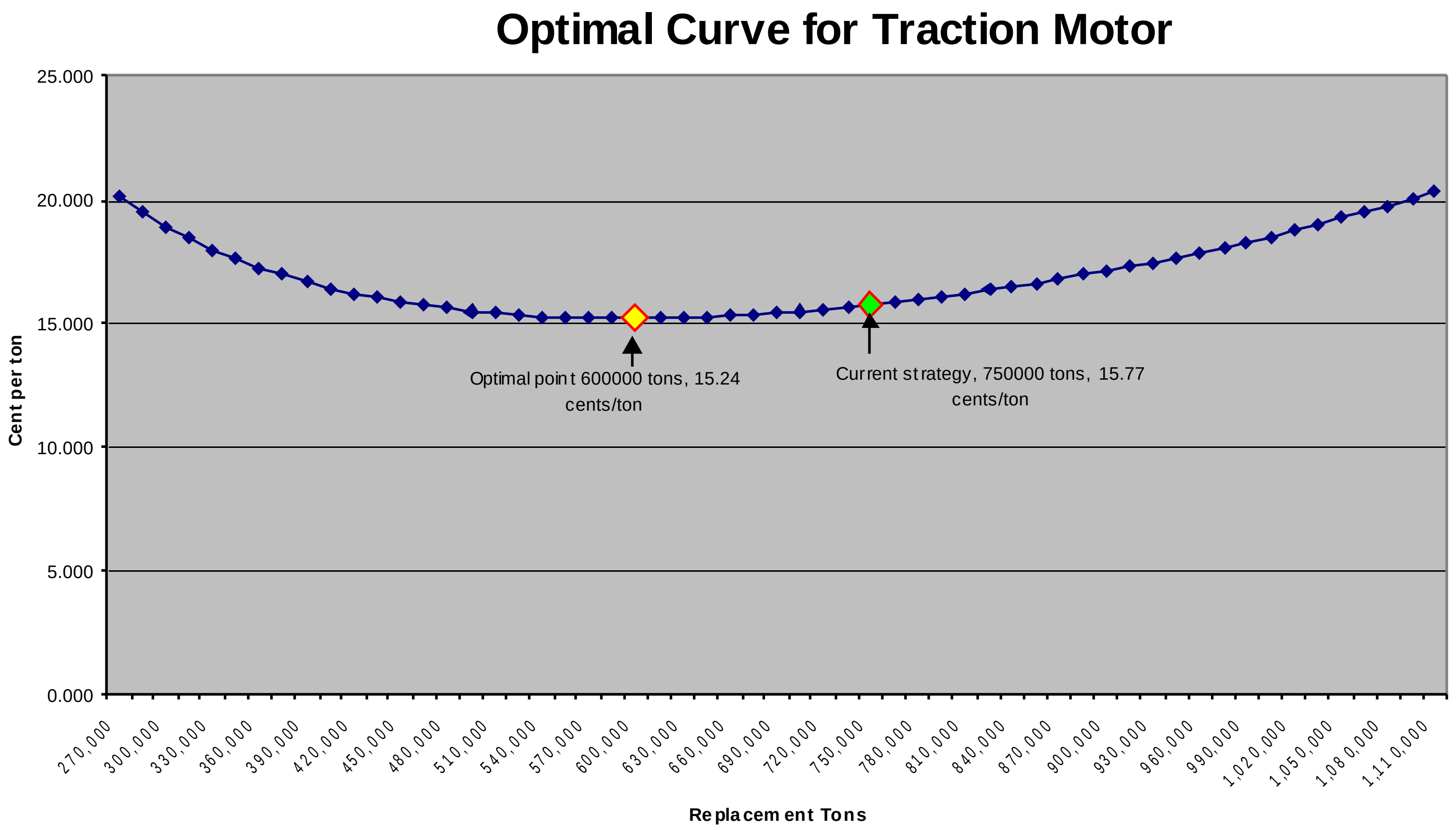
OPTIMALITY – Real Data



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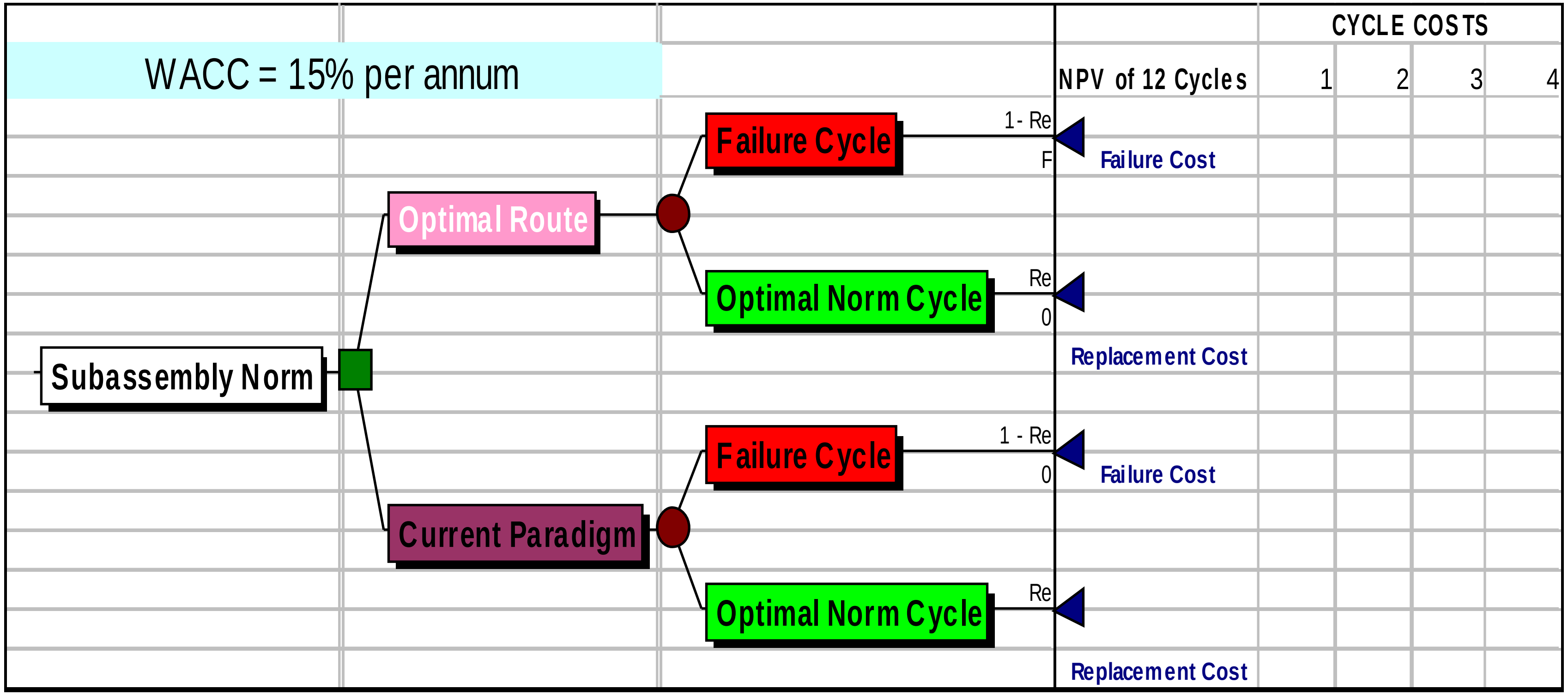
CASE FOR CHANGE – LCC IMPLICATION

Decision Complex: Maintain Status Quo or follow the optimal approach?



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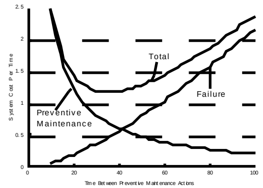
BASIS FOR RECOMMENDATION



FOR A PERIOD OF 12 CYCLES LET :

Lp = LIFE CYCLE COST OF OPTMIMAL METHOD

and

Ls = LIFE CYCLE COST OF CURRENT PARADIGM

IF Lp < Ls, then optimal norms should be adopted.

Benefit: Implicitly - Budget Value will also be minimised.

NB: Non-optimal Cycles do not carry minimal costs regardless of higher or lower number of tons

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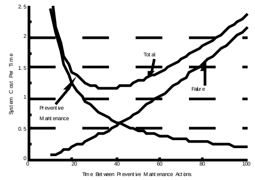

KEY SUCCESS FACTORS

- Quality data from the information management system
- Management Buy-In
- Continuous improvement in relevant data storage
- Willingness to shift paradigms

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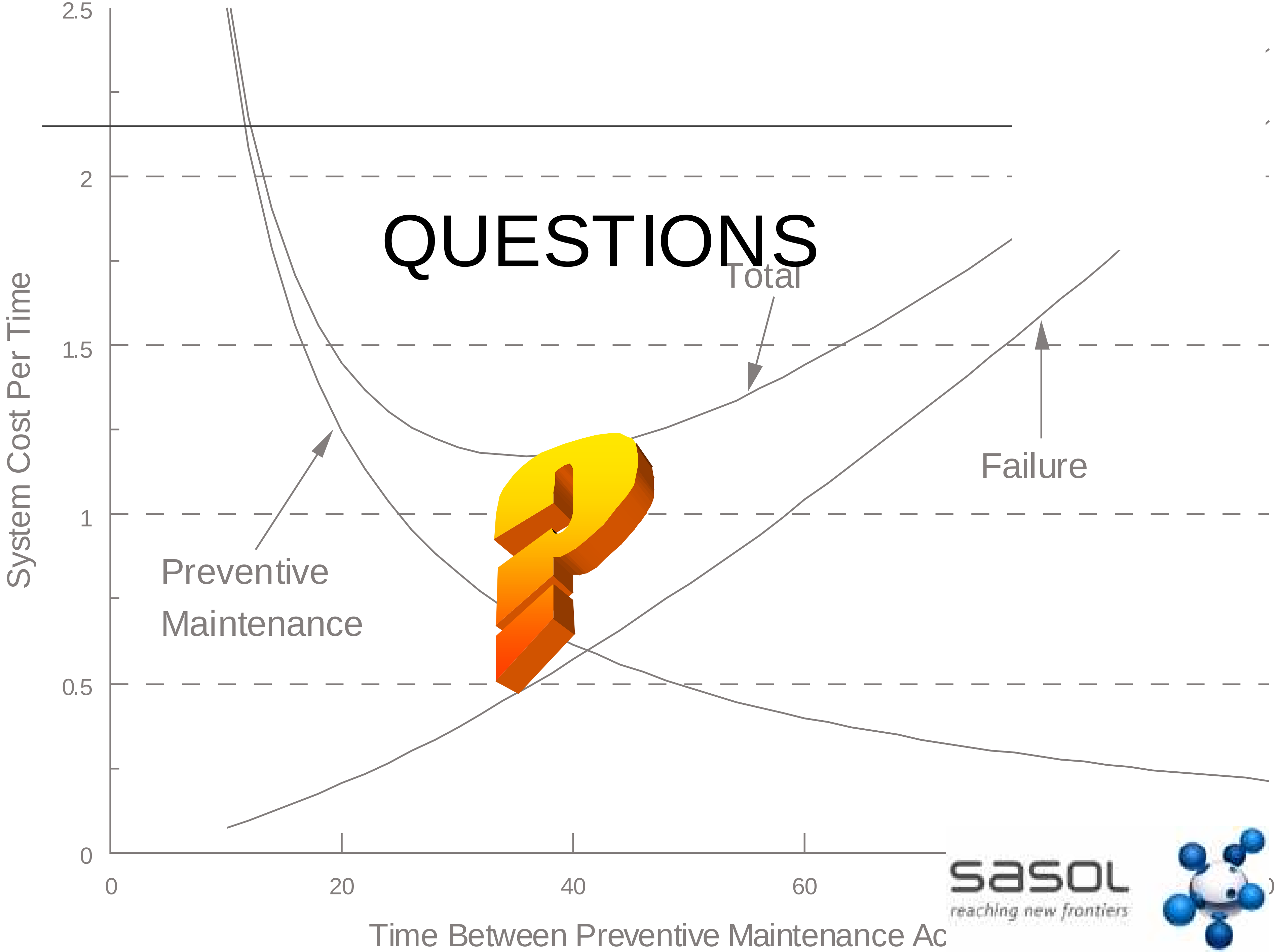
QUESTIONS


2.5
2
1.5
1
0.5
0
Total
Failure
Preventive
Maintenance
System Cost Per Time
0
20
40
60
)0
Time Between Preventive Maintenance Ac