

MINING IN A DAY

COUNTERACTING FALLING COAL PRICE BY IMPROVEMENTS IN EFFICIENCY

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INTRODUCTION

- *Since 2012 there has been a significant decline in coal price up to now. How to help combat this decline and maintain a positive margin – improvement in efficiency in mine operations.*
- **The reaction to the falling price is the reducing strip ratio – impacting the reserves.** Significant reduction in overburden and parking up equipment fleet.
- **Without the near term improvement in coal price there has to be more focus in operations efficiency from every aspect of business.**
- **Inflation still increases each year 5 - 7%** on spare labour, parts, consumables
- Efficiency and related costs are closely linked together

INTRODUCTION

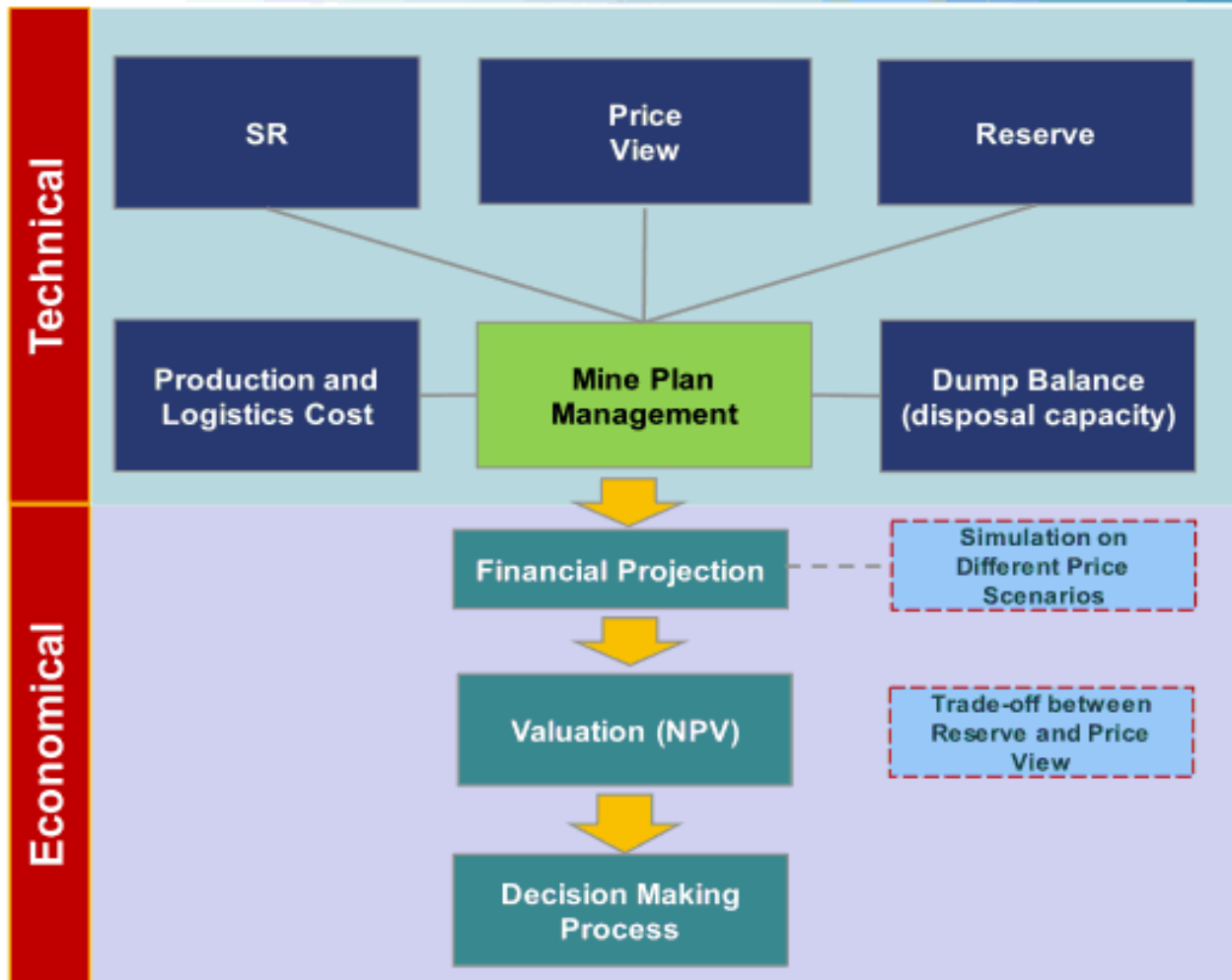
- **Fuel costs**

- Depending on the mines life there needs – asses capital expenditure for return on efficiency improvements, project or expansion.
- Compare against other mining operations – what are they doing better or standard bench mark in the mining industry.
- Small improvements can make a large impact : Fuel use, increase in working time, losses and wastage.
- **Use an independent consultant to advise and help.**

INTRODUCTION

- **MINE PLANNING and IMPLEMENTATION**
- **FUEL MANAGEMENT**
- **RECONCILIATION**
- **DOZER PRODUCTION, AUGER MINING and WASHPLANTS**
- **LOGISITICS**

LIFE OF MINE PLANNING



Controlled Factors	Uncontrolled Factors
<ul style="list-style-type: none"> • SR • Reserve • Dump balance • Production and logistic cost 	<ul style="list-style-type: none"> • Price view • Fuel cost

One of the single largest cost drivers is waste haulage distance

Valuation based on effective mine plan plays critical role in defining strategic plan and business decision



LIFE OF MINE PLANNING

Mine Plan



Why is it important?

Acts as a primary guidance for running effective and efficient mining activities that result in optimum solution



Minimize Costs

Maximize all reserves

Continuous Production Activities

What are the advantages?

Ensure proper mining practice

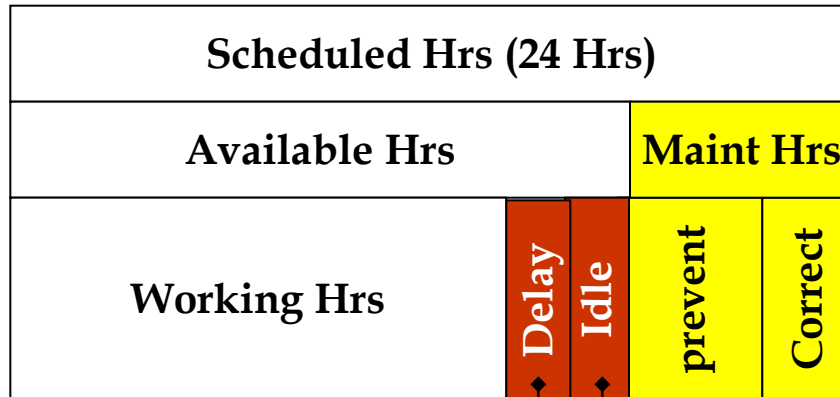
Flexible to changing business environment

Ensure Quantity & quality for marketing

Achievable & applicable target operation/production



AVAILABLE WORK HOURS



- Meal and Rest
- Shift Change
- Moving Equipment
- Cleaning Equipment
- Refueling & Lubricating
- Wait Operator
- Pre Used Check
- Waiting Equipment
- Waiting Engineering
- Waiting Blasting
- Tire Check
- Over Capacity
- Internal Process

7% of Schedule time

- Rain
- Slippery
- Bad Visibility
- Strike and Major Force → 0%

DRILL & BLASTING

● Before Improvement :



Blasted material
Too fine



● After Improvement :



A preferred size with
max fragmentation
30% of bucket size 60cm

BLASTING RESULT

Standard Operational Procedure :

- *Geometry blasting (burden, spacing & stemming) refer to rock hardness*
- *Fragmentation of blasting material should be max 60 Cm*

Key Success :



Technology

- Rock hardness classification accurately

Process

- Effective guidance for drilling - blasting activity
- Optimize drill pattern to get preferred fragmentation

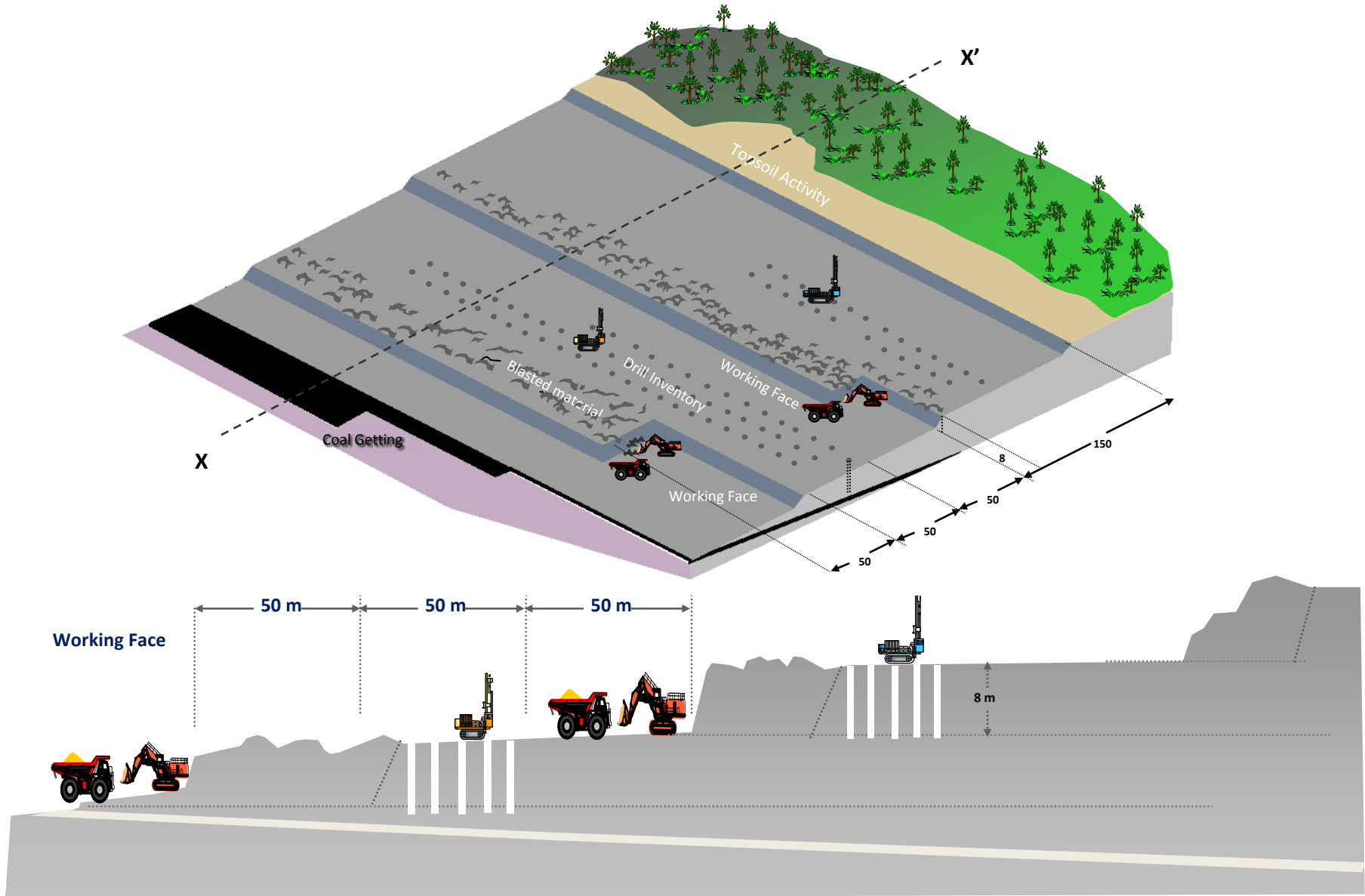
People

- Effective communication and synergy between owner – contractor

Diesel fuel in ANFO can be replaced by a proportion of waste oil

- Building infrastructure for Waste Oil Processing Plant (WOPP)
- Utilize 30% of waste oil to replace diesel

EQUIPMENT WORKING SPACE



EQUIPMENT WORKING SPACE

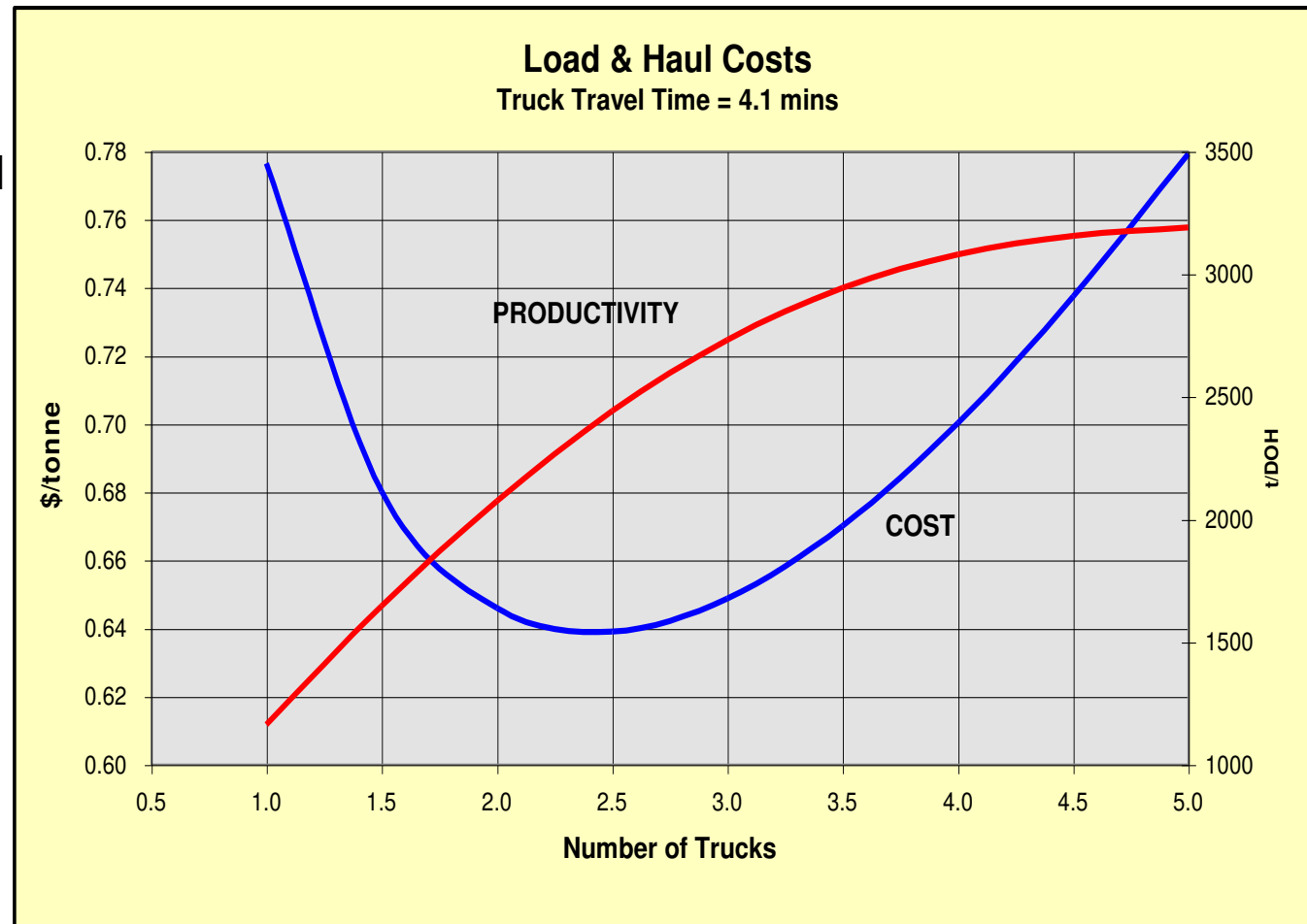


TRUCK MATCH TO LOADER

→ Slight Under trucking is the most cost effective method

✗ Do Not Over truck – better to put trucks on standby

✗ Do Not severely undertruck it is better to put the shovel on standby unless ore exposure/supply is threatened.



$$\text{trucks required per shovel} = \frac{\text{Spot Time} + \text{Load Time} + \text{Travel Time} + \text{Dump Time}}{(\text{Spot Time} + \text{Load Time})}$$

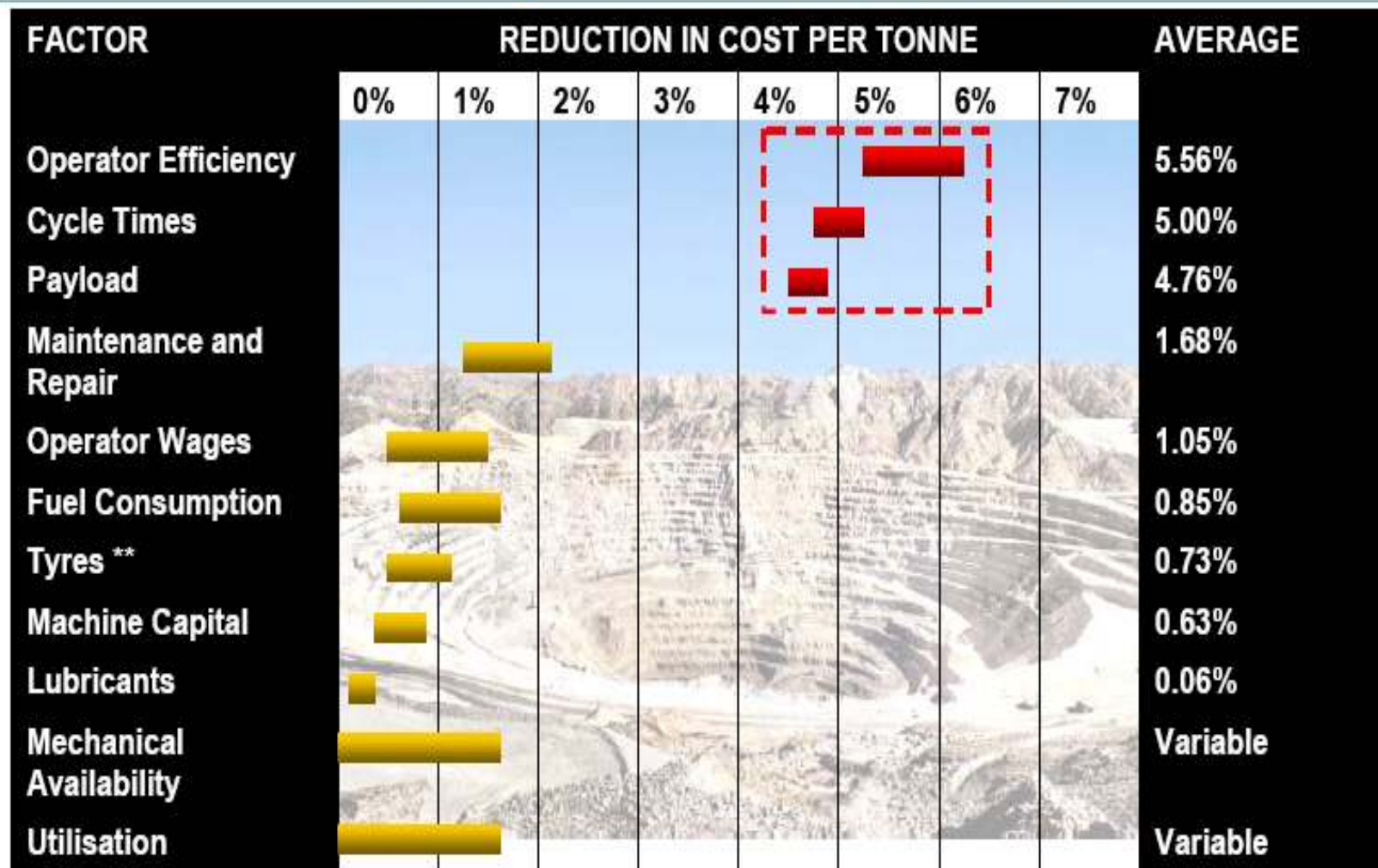
OPERATOR TRAINING - COMPETENCY



- Attitude, Physical ability, safety and discipline
- Technical training – teach standard operating procedures and application
 - know their machine.
- On the job training – training and mentoring
- Evaluation – Operator proficiency, skill, competence, aptitude and rank operators

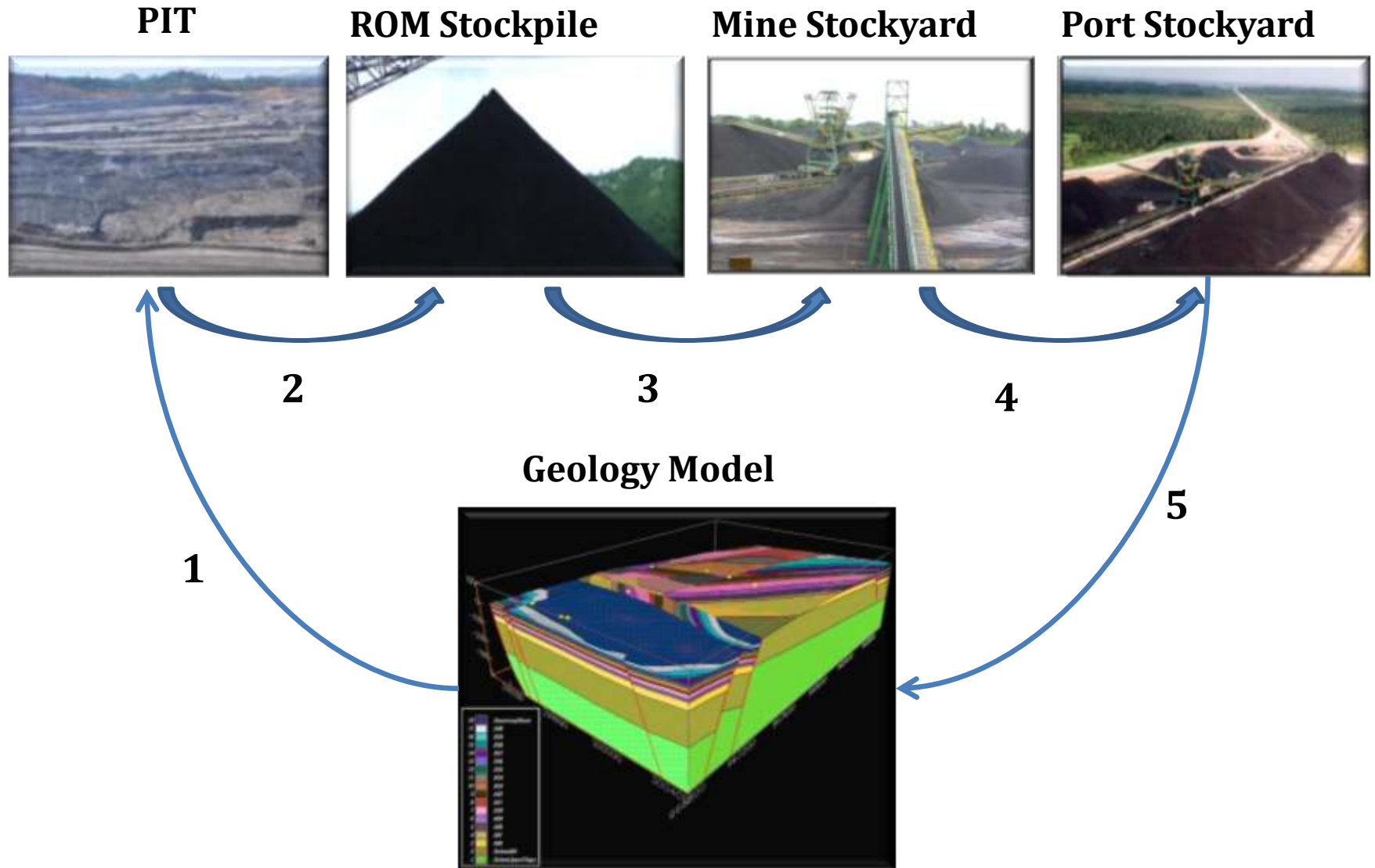
MAINTENANCE & EQUIPMENT PERFORMANCE

A 5% Change in Each of these Factors Results in the Following Reductions in Cost per Tonne...



Approximate range of final results based on analysis to date. Cost parameters including fuel may vary greatly by location and application.

PIT TO VESSEL RECONCILIATION



MINING RECONCILIATION

One of the most important part in the key SOPs

The Objectives

- Monitoring coal recovery.
- To keep the accuracy of resources and reserves estimation.

Discrepancy Problems

- Planned Recovery Actual Survey.
- Planned Recovery Truck Scale.

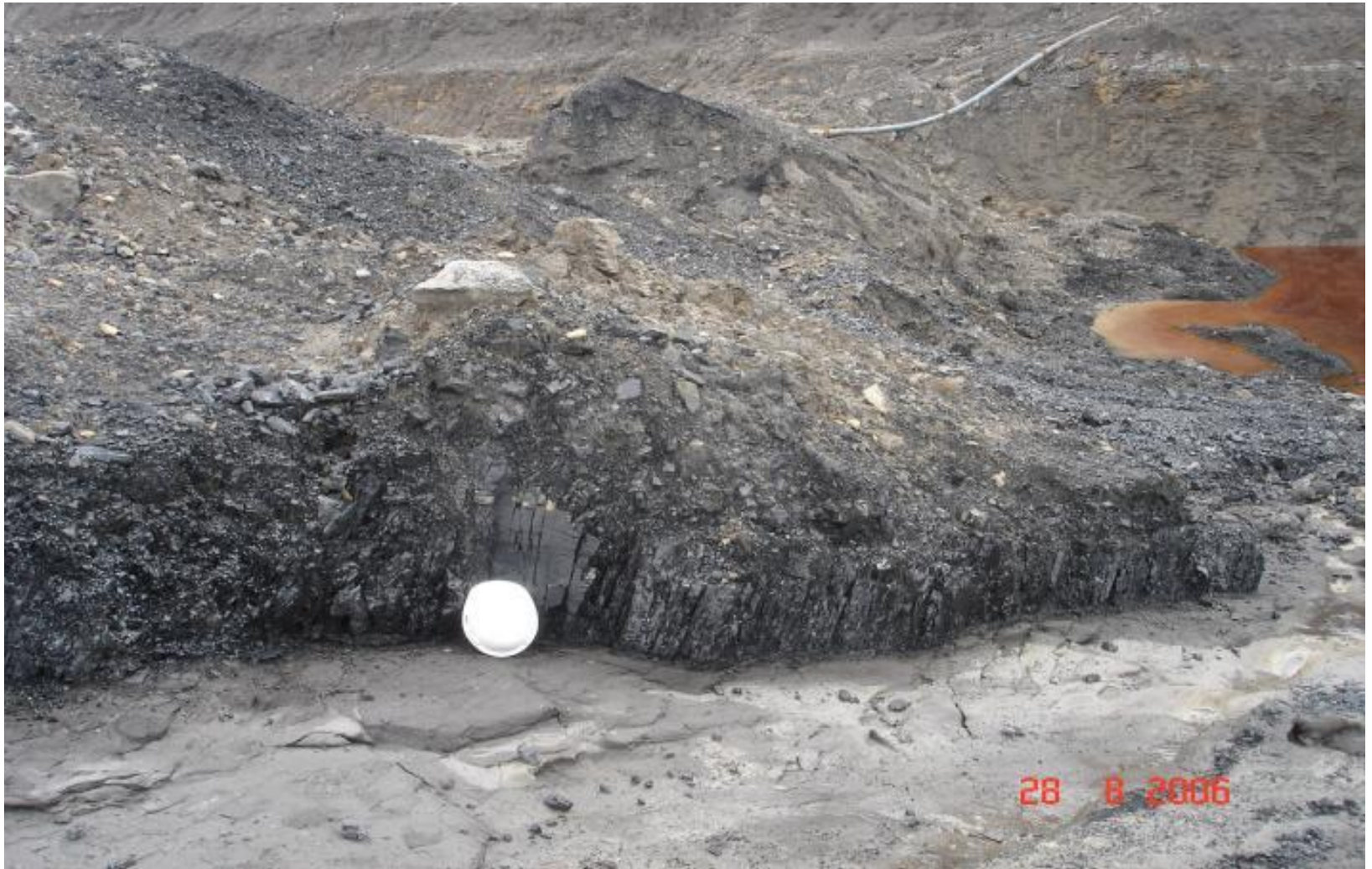
Main Root Causes Analysis

- [Coal loss through blasting.](#)
- [Coal Cleaning by Dozer.](#)
- [Coal left behind.](#)



MINING RECONCILIATION – ROOT CAUSES

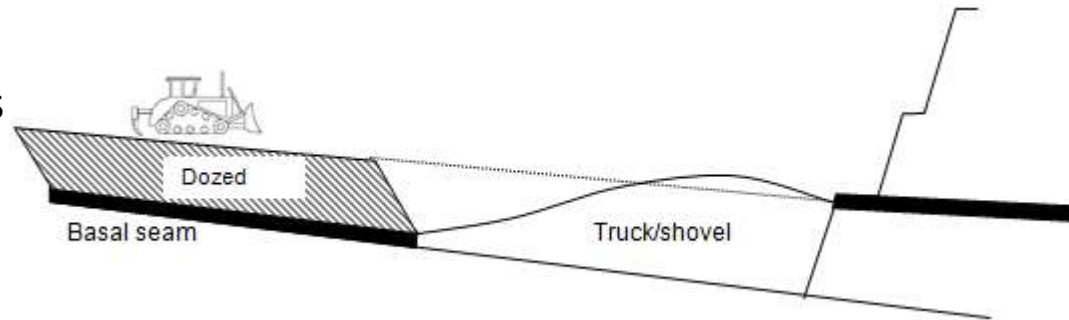
Coal left behind



PRODUCTION DOZING

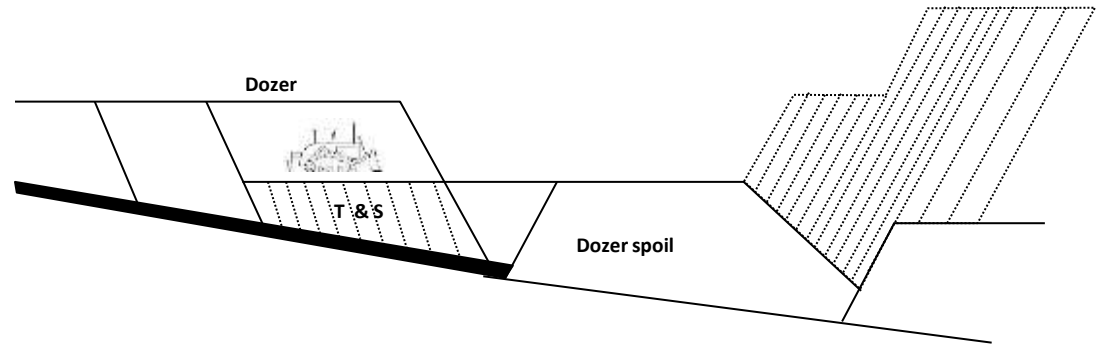
Dozing to Truck/Shovel Slot

The initial slot along the final highwall is excavated using a truck and shovel fleet



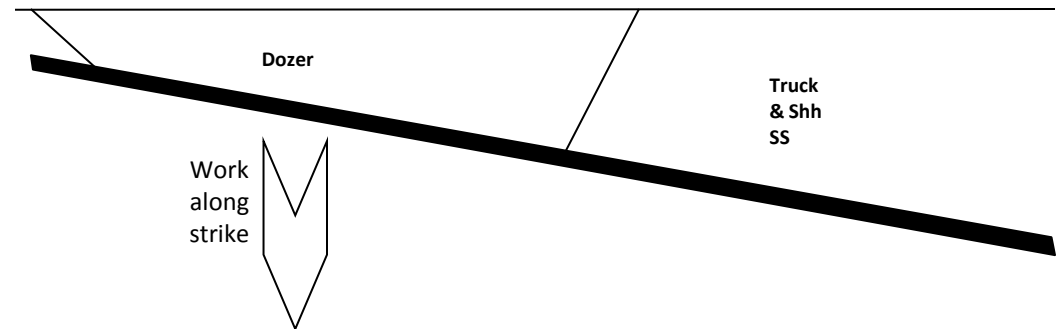
Dozer Stripping

This concept is essentially similar to that of conventional dragline strip mining except the initial strip is removed by a truck shovel fleet instead of a dragline.



Sub-Crop Stripping

An opportunity exists to expose coal along shallow sub-crops using dozers



Potential to half conventional truck/excavator costs in some applications

AUGER MINING (ENDWALLS)

- Coal seams $>1.5\text{m}$ thick
seam dips $<14^\circ$
- Own or contract
- Op cost $< \$7$ /tonne
- Minimal staff to operate
and maintain
- Relatively simple
operation
- We can provide help
with FS, geotech
assessments, cost
estimation and
economics, contract
agreements, SOP's.



COAL WASHPLANTS

- Lab testing the dirty coal extremely important for designing a washplant system. Dense or natural media.
- Own or contract, BOO or BOOT
- Op cost < \$5 /tonne
- Recovery thin seams, thin seam with partings, coal roof and floor, Tailing dams.
- Relatively simple operation



FUEL MANAGEMENT SYSTEMS

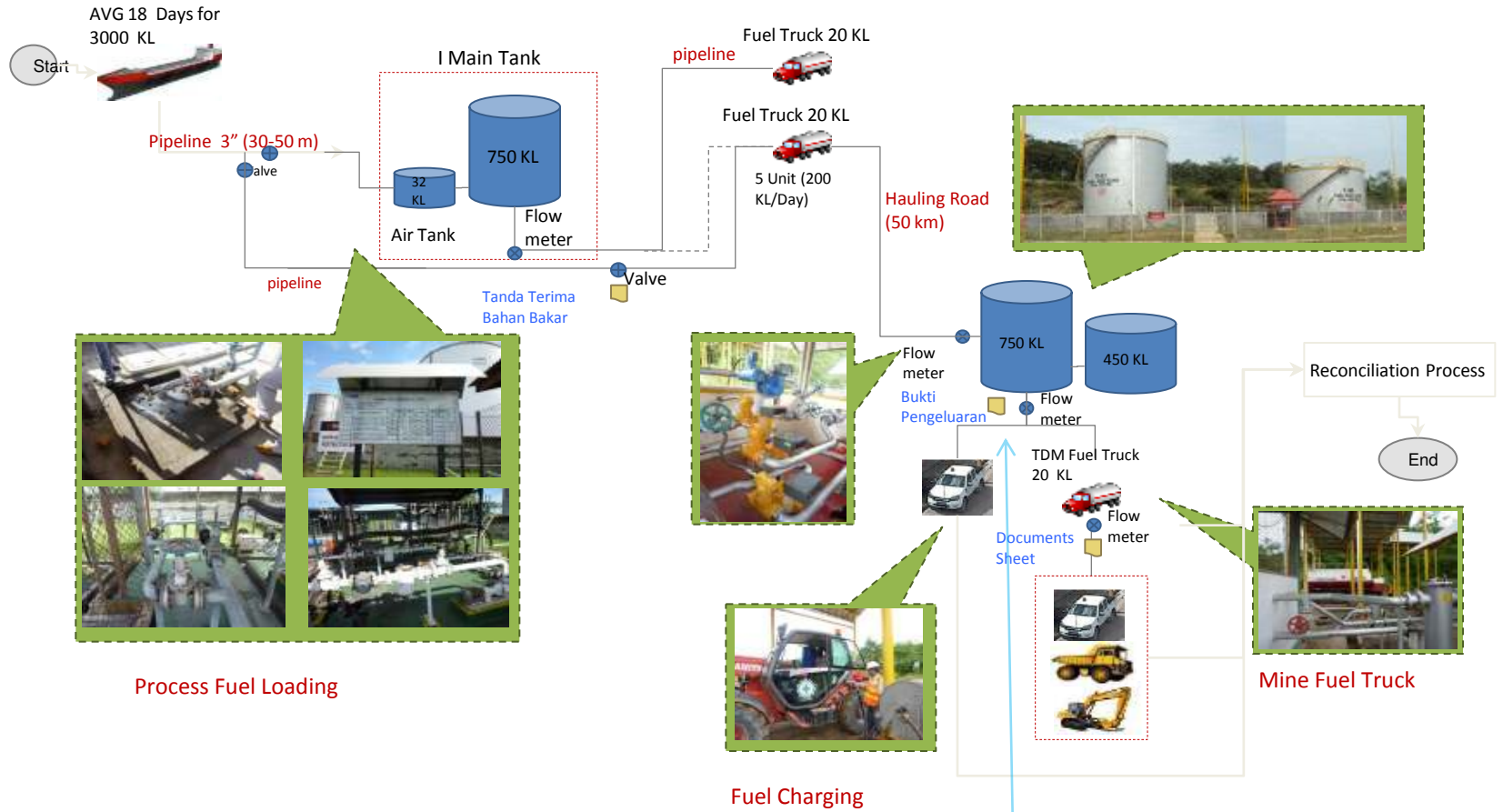
Fuel Receiving

Fuel Storage

Fuel Distribution/
Supply/Issuing

Check and
Balance

MINE



Process Fuel Loading

Fuel Charging

Vendor
Managed
Inventory

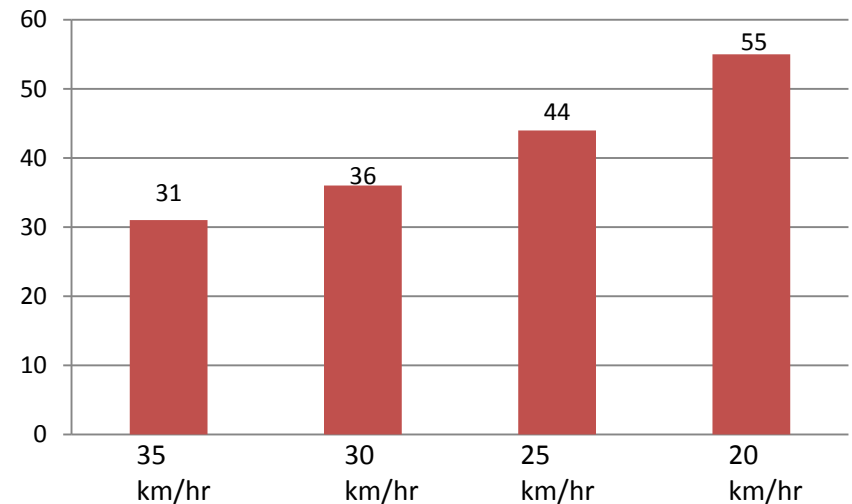
Mine Fuel Truck

LOGISTICS – TRUCK HAULING

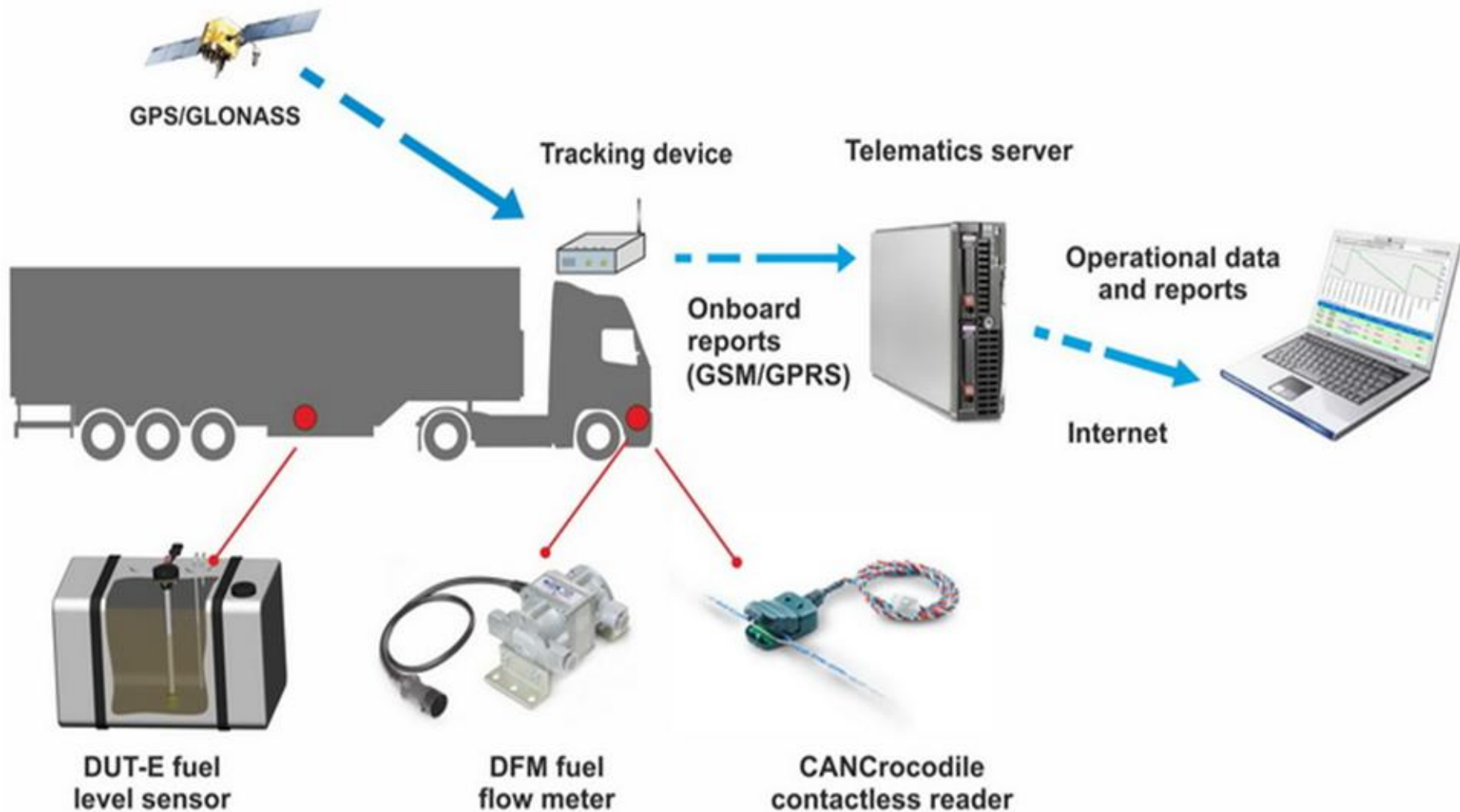


- What size of truck and number units
- Road condition and truck speeds
- Road gradients and curvature
- Correct design for super-elevation
- Fuel use

30t Trucks required - 2Mtpy, 50km



FUEL MONITORING



TUG & BARGE OPERATIONS

- General contracts are either Time Charter or Voyage Charter and both have their responsibilities from:
- Crewing & Management
- Insurance
- Bunkering
- Certification



- **Time Charter** - Operator must be in control otherwise a better solution will be to arrange a Contract of Affreightment (CoF).
- This requires a suitable Charter Party with strict performance clauses.
- Requires well trained knowledgeable operating staff, who can monitor the operation better than the Owners.
- This means all units must be monitored live, Captains must be ordered to slow down or speed up depending on the situation, if there are several units waiting at load port, better to slow down and save fuel, which can be used later to recover lost time.
- It requires a very strict fuel monitoring of all units

TUG & BARGE OPERATIONS

BUNKERING PROCEDURES

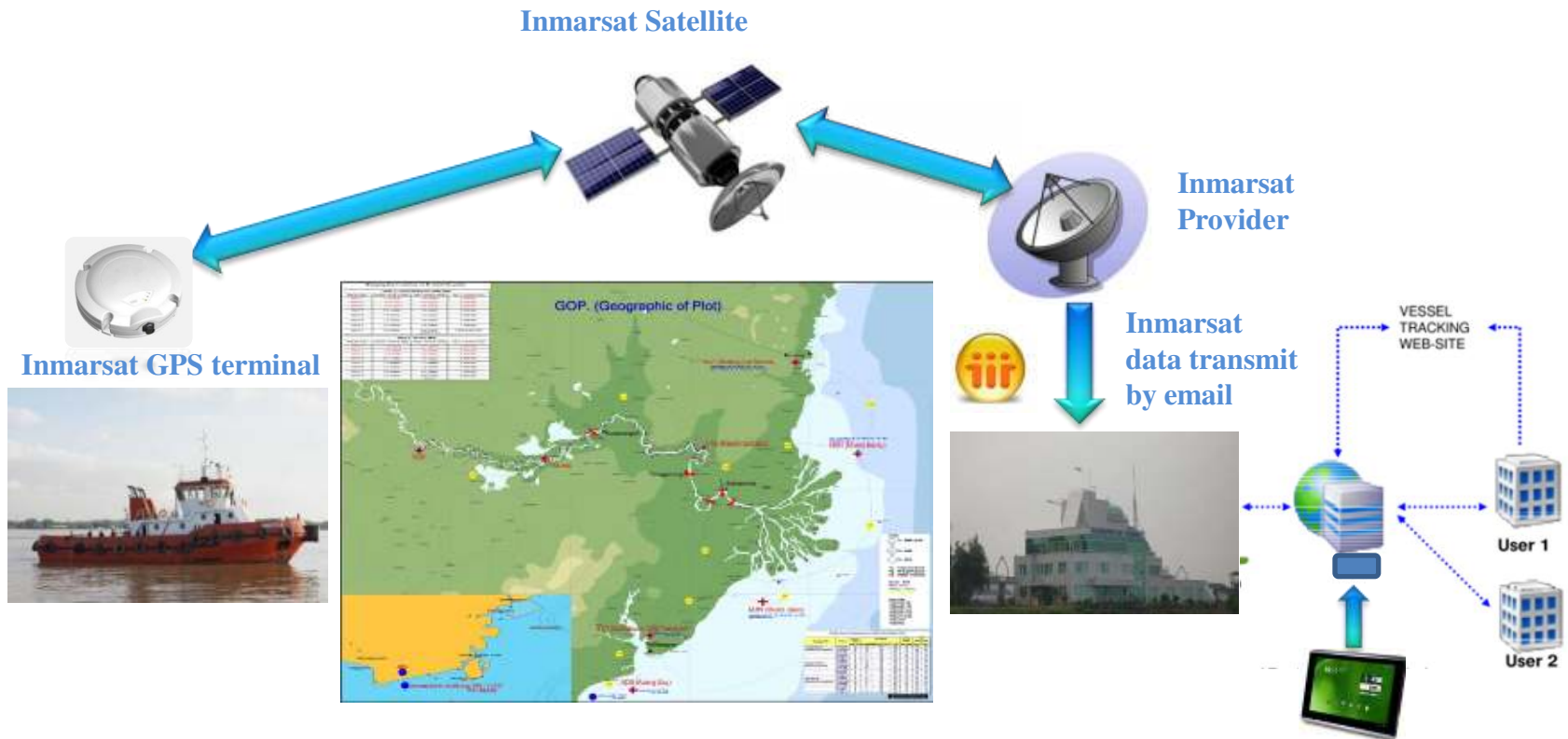
- Charterers has to monitor the Bunkering closely, it is a very difficult job to over see the fuel supply. A detailed manual is supplied with the deliverables and will point out some important things to check.
- Density - To be checked using a fuel density meter at a specific temperature to confirm that the correct fuel density been supplied.
- Viscosity - A Viscometer to be used to measure the viscosity of the Diesel.
- Quantity - Use mass flow meter, not volume flow meters.
- Gauging and taking temperatures of bunker barge and tanks on the tug to determine the volume prior to and after bunkering.
- Fuel Sampling - It is mandatory by Authorities and P&I Clubs to take samples.

TUG & BARGE OPERATIONS

SPEED AND FUEL CONSUMPTION

- All Tug and Barges have an optimum speed, this is a function between time charter rate, consumption and fuel price.
- The fuel consumption depends on the energy required to pull the barge through the water.
- At higher speeds the energy required increases virtually logarithmically and becomes very un-economical
- A common misunderstanding is that a bigger engine requires more fuel than a smaller engine, it doesn't, the deciding factor is the shape of the tug and barge and the water resistance, plus the deadweight of the barge.

TUG – BARGE MONITORING SYSTEM



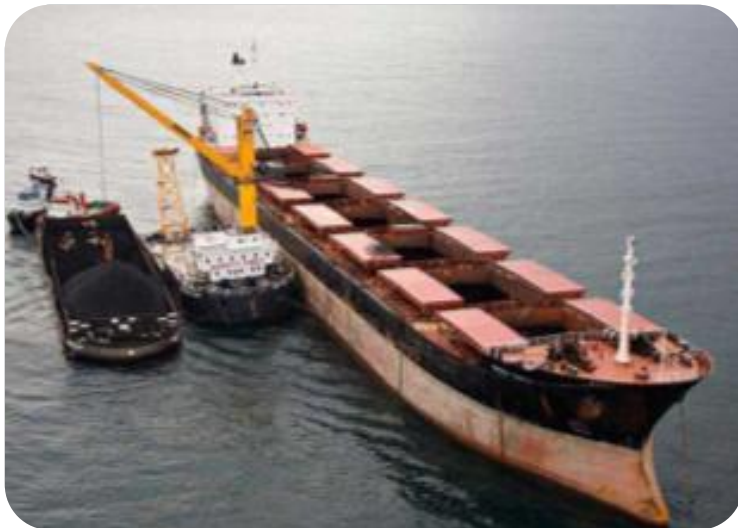
Tugboat and barge position tracking by Inmarsat satellite GPS and update the status from Inmarsat Land Station to Coal Terminal via email with text format.

TRANSHIPMENT – FLOATING CRANES

- Distinguished from floating cranes by the ability to stockpile coal.
- Loading rates.
- Blending facilities (homogeneous blending)
- Consist of quality control systems

Disadvantages include:

- Still reliant on land-based stockpiles but to a lesser extent
- Require good supervision
- Understand the contract conditions



TRANSHIPMENT – FLOATING CRANES

- Guaranteed load rates, the Owner guarantees a very high daily load rate, but this is conditional to perfect conditions, time does not count for: barge shifting, barge cleaning, cargo trimming, shifting of crane etc: the actual load rate is about half of the guaranteed load rate, same time the guaranteed load rate is used in sales contracts, this means unnecessary demurrage and the paradoxical happens to pay demurrage to the ship owner and despatch to the Crane Barge Owner.
- Dead freight, there is no discount for the dead freight, the crane owners saves substantial amounts in fuels and maintenance cost, about 40 - 50 US Cent.
- Each ship operation should have an experienced Master attending loading vessels all the time – to protect the owner. Also the shore office needs an experienced to load master to monitor all operations
- Don't rely on information from agents or stevedores. Once a ship is on demurrage, it is always on demurrage. It is in the Shipowners interest to delay the operation as much as possible to earn demurrage. It is necessary to have a reliable person onboard to monitor the operation it will reduce the lay-time, demurrage and barge cycles.



THANK YOU

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