PG BISON

Trends in Forest Roads

Building winning partners

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Introduction

- NECF is situated between Elliot & Maclear at the foot of the southern Drakensberg, with the geology being the Elliot formation of clays, sandstone, mudstone, etc
- Very little suitable material – therefore we must improvise on how to best use what we have available rather than spending large sums of money importing material from other towns
- With the substantial increase in construction equipment (+45% over 6yrs) & materials over the past few years, road costs will steadily increase
- There is a general tendency for road budgets to be cut year on year
- This has resulted in a need to reduce road costs

Introduction (cont.)

- The future trend of forestry roads will be to find cheaper & more cost effective methods to maintain, construct & manage forest roads

- There are a number of products available on the market some of which I would like to share with you

Alternative methods for road construction

- Use of Polymers
  - This is a substance which is a water based polymer product used as an admixture for the stabilization of road layers.
  - It forms a thin oily layer on the surface of soil particles especially clay.
  - Which facilitates compaction of the soil and allows water to be driven out of the soil matrix.
  - Generally soils should have a PI between 3 to 15, depending on which product is used.
  - Polymers can either be sprayed onto the road surface or mixed into insitu materials or the imported layer.

Alternative methods for road construction

- Use of Polymers (cont.)
  - The product I am using has a two week reaction process, whereby the road surface must be kept wet to allow the substance to leach out
  - This causes the surface to be very slippery initially
  - It is therefore not a quick fix product
  - There are some products on the market that do not do this but these products can be very expensive
  - Costing ranges between R5,000/km to R150,000/km

Alternative methods for road construction

- Use of Geo-textile Separators

This helps to improve the structural strength of the road layers

  - Its function is to:
    - Prevent the ingress of fine material from the sub-grade which then maintains the integrity of the better quality imported material
    - Allows the transverse drainage of excess pore water, allowing reduced thickness of imported layer due to less loss of material to the sub-grade
    - Road maintenance that would have been required is therefore reduced
  - Allows better compaction of imported layer

Alternative methods for road construction

- Use of Geo-textile Separators (cont.)
  - The separation layer is placed between the insitu sub-grade material & the better quality imported layer
  - Geo-textiles can cost between R10 to R15/m^2

Kaytech

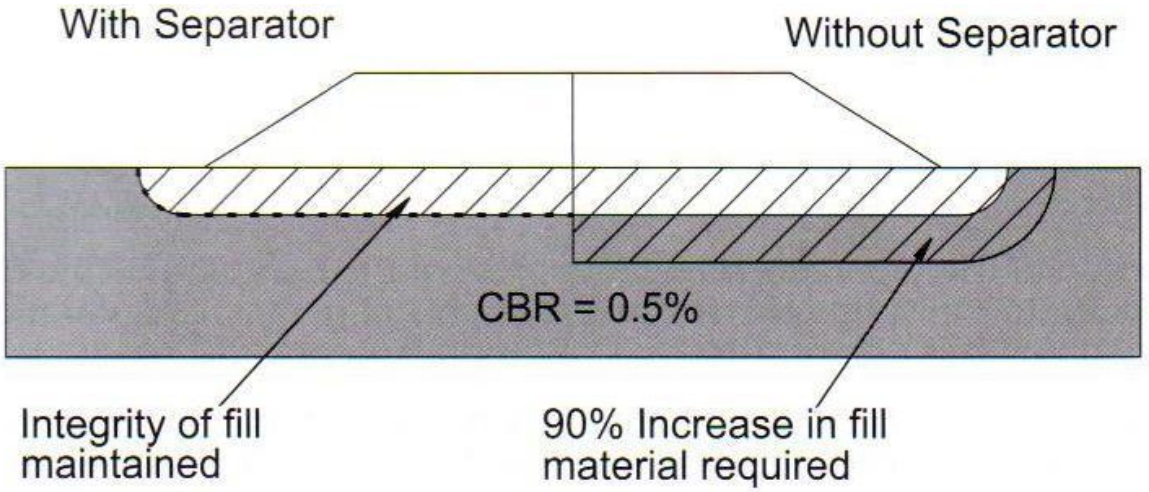


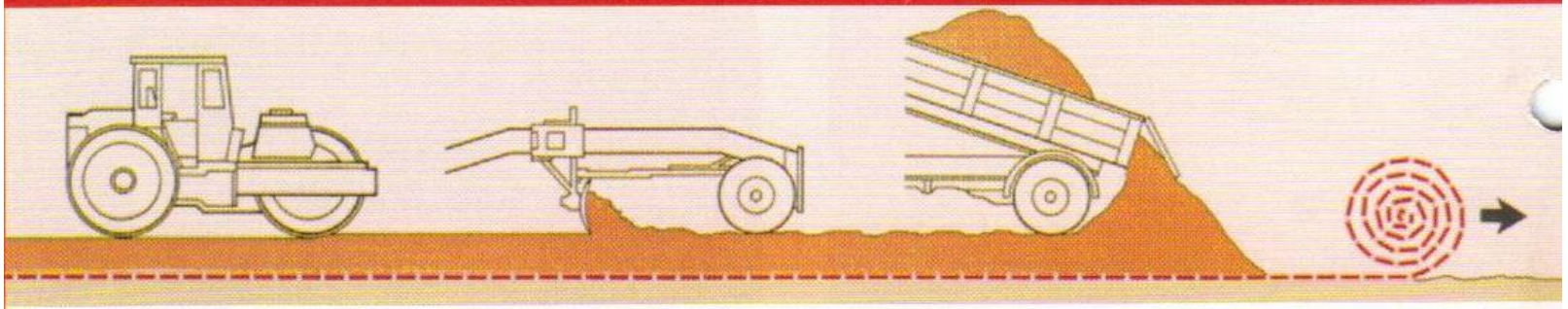
Figure 4. Fill Contamination

Alternative methods for road construction

Use of Geo-textile Separators (cont.)

Kaytech

Laying



Geotextiles are often abused during placement. Although **bidim** has a high tensile strength and is very resistant to piercing, heavy equipment must not be driven directly over it. A suitable laying sequence would be as follows:

1) Roll out **bidim** over roughly prepared ground and dump fill by back tipping. Use only light equipment initially over very weak soils.
2) Level the fill by dozing and grading.
3) Several sequences of compaction and grading then follow.

A portion of the laying sequence is depicted above.

Alternative methods for road construction

- Blending of Substandard Materials with Stone
  - I have noticed that a lot of plantations do not have suitable road building materials, but do have substandard materials in the form of sandstones, mudstones, clays, ect.
  - Samples of each can be taken to soil laboratories for testing purposes whereby the labs will determine the quantities of each materials that can be blended together to form a suitable material for road construction
  - This reduces the need to spend large sums of money trying to procure the correct road building materials

Alternative technologies to aid road maintenance

- Use of GPS Technology

(Real-time Road Maintenance Management System or RT-MMS)

  - The general practice in routine road maintenance is for adhoc or scheduled blading of roads, pot hole repair and drainage control on the extensive forestry network of roads

  - This leads to the potential to generate excessive road maintenance costs

  - Another disadvantage is the difficulty in accommodating rapid localized road deterioration due to structural failure, failure of wearing course, effects of rain, etc.

  - A trial has been carried out on a mine haul road based on a truck onboard diagnostic system linked through a centralised communication and GPS backbone to monitor road condition on a real time basis through onboard vibration signature analysis.

Alternative technologies to aid road maintenance

- Use of GPS Technology (cont.)

(Real-time Road Maintenance Management System or RT-MMS)

- The results showed it was possible to differentiate between most road defects.

- Advantages:

  - Histories that would show consistently poor sections of road
  - More effective utilisation of existing road equipment
  - Road networks could be better managed with less equipment
  - Rapid response to identified road defects

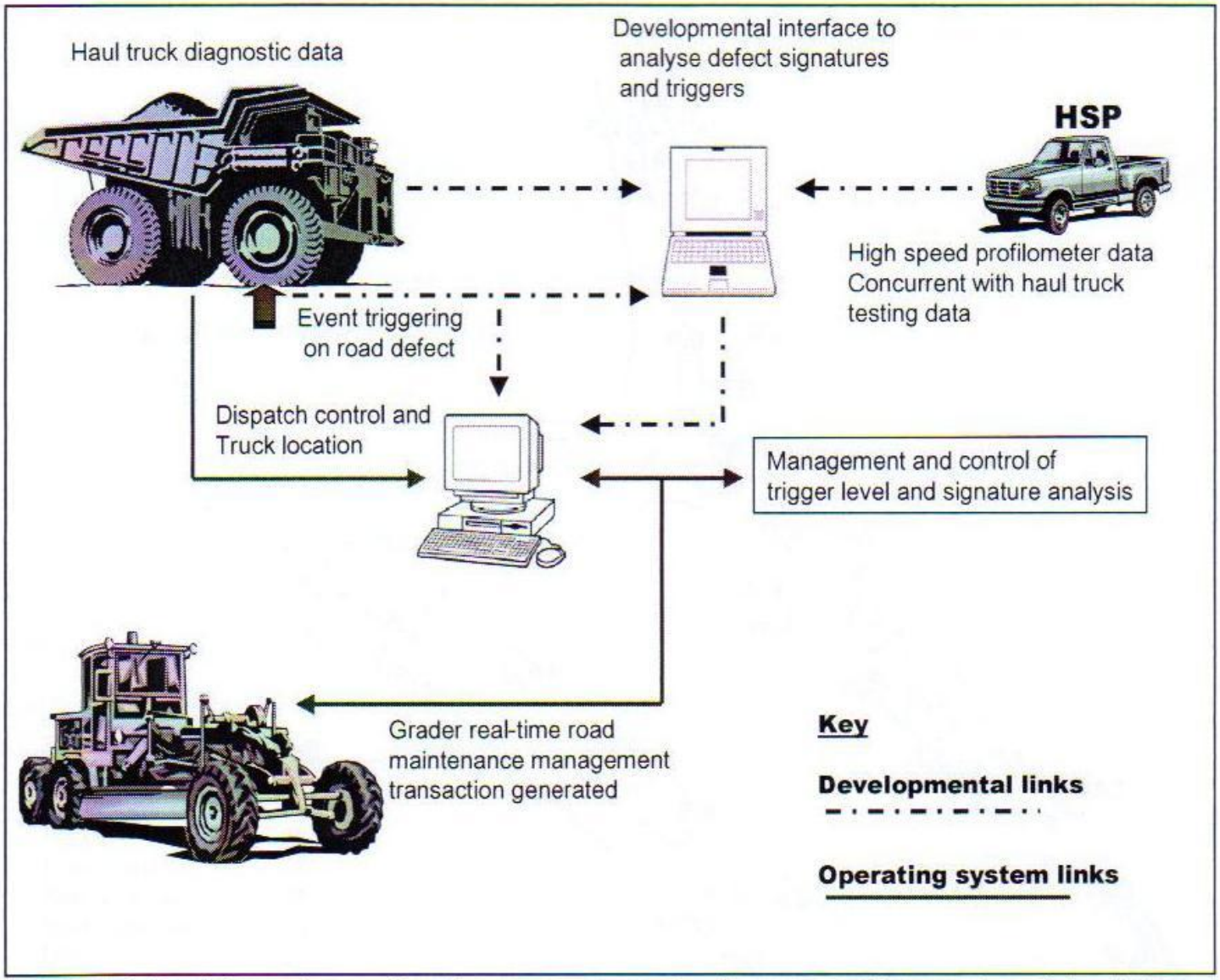


FIGURE 2 Real-time mine road maintenance system development and integration with existing communication, location and truck monitoring.

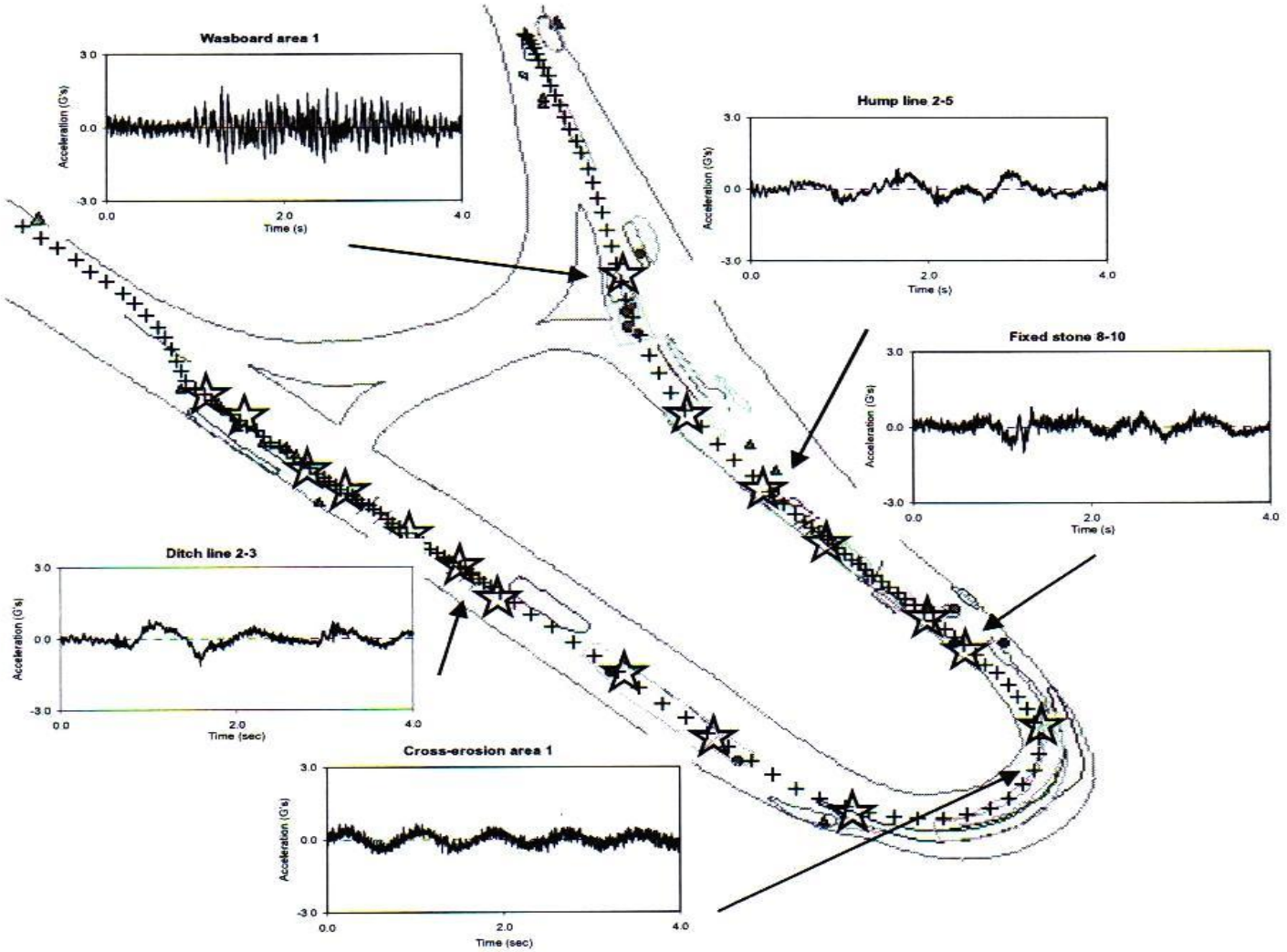


FIGURE 4 Truck position over field trial course showing location of defect triggers and typical vibration signatures for selected defects.

Alternative technologies to aid road maintenance

- Central Tyre Inflation (CTI)
  - Correct tyre pressures = better roads for everyone to enjoy as there is less wheel spinning, harsh braking, road surface damage due to blow outs & less vibrations = less road surface material lost
  - Also reduces silt runoff which in turn reduces the need to re-gravel roads as often
  - The use of CTI allows the tyre to kneed the road surface allowing it to smooth out irregularities in the road surface & provide better ride quality

Improved Harvest Planning

- Phasing of compartments between wet and dry comp & seasons

  - It is important to phase the harvesting between wet & dry compartments & seasons, through the use of soil maps & weather patterns

  - This will allow the roads to be constructed according to the weather conditions

  - Dry weather allows a reduction in all weather roads which reduces road cost

  - Identified wet weather compartments allows these roads to be upgraded to all weather roads for the wettest months of the year

  - By identifying these areas & spending the money to upgrade the roads will lead to a cost savings benefit especially if these compartments do not require harvesting in any particular year but only when the need arises

Road Management

- Selection of road personnel & equipment
  - Due to the remote location of NECF these is a need for own equipment as there are not many contractors.
  - We work with own equipment & rent in plant as required.
  - We are mainly upgrading roads for timber extraction.
  - Our land holdings covers 80,000ha of which 33,000ha is planted
  - We have 1756km own roads & 210km of district which we maintain (53m/ha)
  - Due to the lack of skills in the area we had to train many of our operators

Road Management

- Selection of road personnel & equipment (cont.)
  - Gravel Upgrade Team
    - 120G grader*, 10,000L water truck, two 10m3 tippers, TLB, 30t tracked excavator with hydraulic hammer, 12t smooth roller
    - We rent in the following – more 10m3 tippers & dumpers, two TLB's, padfoot roller, grid roller. Crusher
  - Drainage Team (outsourced)
    - 8 labour with own transport & supervision
  - Specialized Team (outsourced)
    - A specialized concrete team for all bridge, culvert & storm water work (minimum 6 labour) with concrete mixer

Conclusion

- We need to start managing our forest road assets more carefully allowing for the use of newer technologies that will in turn provide a cost savings
- Further trials are needed to help us test these technologies to find out how they can benefit forest road development
- More communication is needed between the different forestry companies