DAVEY BICKFORD

2011 COMMUNICATION ON PROGRESS

Aerospace - Security Systems - Fireworks - Mines - Quarries - Construction - Seismic - Tunneling

high-tech initiation company

THE GLOBAL COMPACT

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Statement from Kim GREENOCK
General Manager of Davey Bickford Australia

*As with every year since we started with the Global Compact, we are strongly renewing our commitment to the Global Compact and the ideals that this encompasses. The staff members of **Davey Bickford** around the world continue to make efforts and progress incorporating these ideals into our daily business activities. Our technology and products are used to enhance the mining process whilst simultaneously improving the environmental situation for the wider community.*

Our initiatives this year include operations in our manufacturing facility to promote eco-friendly behaviours and also working closely with many customers to decrease environmental issues associated with blast induced vibrations.

*The examples below illustrate that **Davey Bickford** is committed to the Global Compact in both the manufacture of our products and also the use in mining operations around the world, and indeed on the other side of the world.*

Kim GREENOCK
General Manager
DAVEY BICKFORD Australia

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THE GLOBAL COMPACT

7/ Businesses should support a precautionary approach to environmental challenges
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ENVIRONMENTAL CHALLENGES OF AN OPEN PIT MINE IN NEW ZEALAND.

- Martha Mine Open Pit gold mine is in the township of Waihi, New Zealand a town with a population of 4500 people. The location of the pit adjacent to the township means that strict vibration and environmental controls are in place. Martha mine is a major employer of the local community so both the economic sustainability of the town and environmental issues must be controlled at all times.

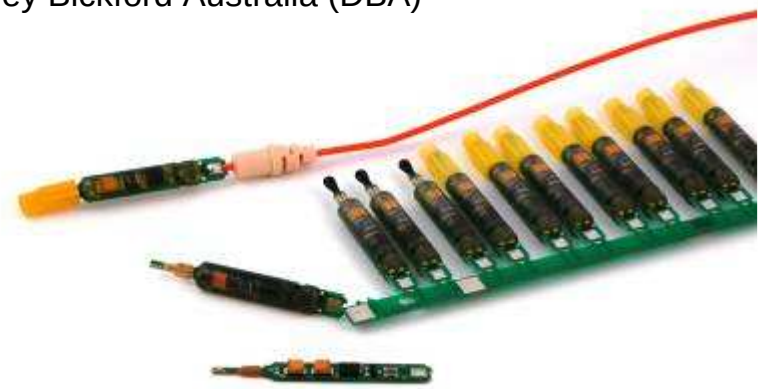
- The mine operators conduct regular Social Impact Assessment (SIA) to understand the effect of the mine operation upon the local community.

- For the operation at Martha, a key criteria to avoid environmental concern, is the blast induced vibration.

- After various modelling and engineering studies it was concluded that electronic detonators and Daveytronic in particular would enhance vibration control and lead to a more sustainable operation. The mine operator and Davey Bickford approached this with a precautionary approach, given that the Daveytronic product is purchased at a premium price compared to less accurate and therefore potentially less environmentally friendly products. It was decided that Daveytronic products could be used exclusively over a prolonged period and give a greater confidence in the ability to minimise damage caused by blast induced vibration.

- As a way to manage the introduction of this product into the environmentally sensitive area local agents were appointed by Davey Bickford Australia. The local agents were (over time) given the task of ensuring product compliance, training in the use and implementation of the product by on site operators, in order to minimise risk.

- In order to ensure that staffs take the environmental and social issues seriously a number of initiatives were introduced in late 2009 and early 2010 by Davey Bickford Australia (DBA)



- **A comprehensive audit of the company was undertaken by an independent 3rd party. This company reviewed all health, safety and environmental policies and work practices of DBA. A number of recommendations and conclusions were made that would be implemented in order for DBA to reach the highest level of sub contractor health safety and environmental compliance.**

- **Measure such as:**
  - **- Full staff inductions covering, remote site work, heat induced stress, chemical and explosive substances,**
  - **- Full audits of all transport companies and suppliers to ensure they all had strict compliance to HSE protocols**
  - **- Job descriptions, work procedures, Job Safety Analysis, Risk Assessments**
  - **- Full state and National Police Clearance of all staff**
  - **- Driving courses and training**

- **At time of printing approx 100,000 detonators have been fired at the mine without a misfire or safety incident.**

- **A special project was undertaken by the site to blast near to the crushing plant.**

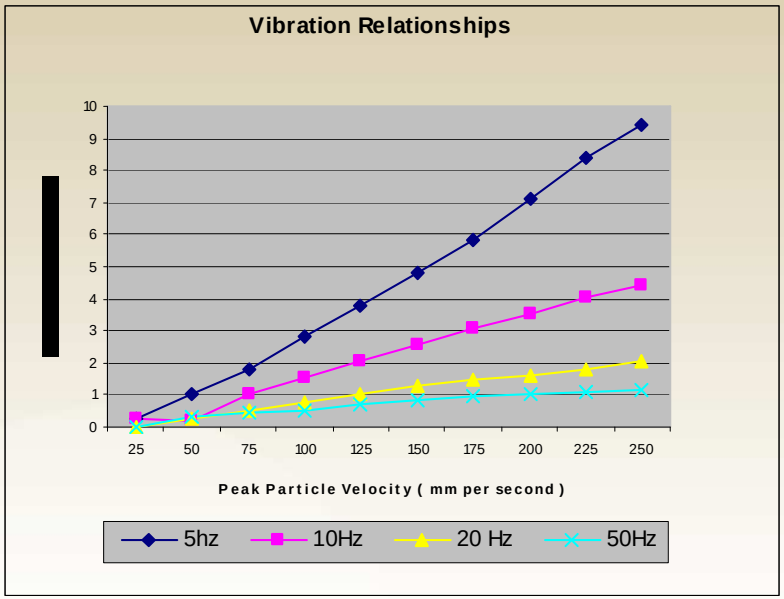
- **The use of highly accurate electronic detonators (+ or - 0.10mms) has proven to have great environmental advantages. The very high accuracy ensures that optimum blasts can be achieved with minimum environmental damage to nearby fixed structures (such as crushing plant and equipment) or old historic buildings like the old pump house.**

- **Similar work has been conducted or is being considered at other mines using electronic detonators. Such projects as, controlled blast near farms, bridges spanning busy highways, to wall control in open pits. Wall control blasts require highly controlled blast to predict, design and implement blasts with minimal damage to the surrounding pit wall. This is crucial to maintain a cost effective and efficient operation but its environmental impact on mine safety and in the long term mine rehabilitation is crucial.**

- A useful tool implemented by Davey Bickford Engineers is to use signature hole analysis to predict vibration frequencies and then shift the frequency component (of the blast induced vibration) to a higher frequency (this is difficult if not impossible without the use of electronic detonators)

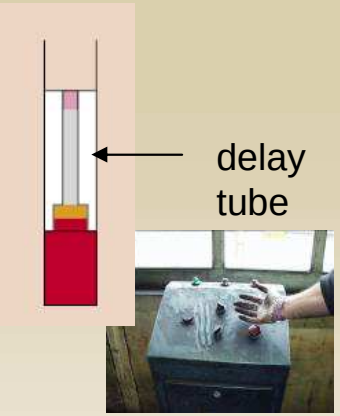
- The calculation (and graph below) show that an increase in frequency (for a given particle velocity will have a proportional decrease in displacement – or movement of the wall or structure). This displacement reduction will in turn lower the strain in the structure and thus minimise damage and environmental impact.

$V=2\pi FD$, $A=2\pi FV$, $D=V/(2\pi F)$
Where: V = velocity
A = acceleration
D = displacement
F = frequency
π = 3.14



- Utilising these types of technologies and working with clients to understand the environmental aspect of the mining operation allows Davey Bickford to work with the clients to reduce environmental impacts.

CHALLENGES AND OBJECTIVES OF TRIBOFINISHING



Our stamping workshop supplies all metal cases and delay tubes which form the containers of all detonators and fireworks manufactured by DAVEY BICKFORD.
Delay tubes are cylinders made from a zinc or aluminium alloy, filled with multiple pyrotechnic compositions. These tubes are then inserted into metal cases which contain a secondary explosive charge.

The final phase of the process of manufacturing delay tubes by drawing consists of three stages.

- **a deburring operation**
- **followed by a drying operation**
- **and, finally, graphitising the parts (coating the outer surface of the delay tubes with a graphite film, which makes it easier to insert the tubes into the cases when loading detonators).**

Before 2009, the deburring and graphitising operations were carried out one after another using the same piece of equipment (one centrifuge).

- **The delay tubes were inserted into the machine with ceramic cones and a detergent in the aqueous phase, then stirred in order to polish and deburr the parts by abrasion. They were then rinsed, spun and dried.**
- **All wash and spin water containing metal particles (zinc, copper, aluminium), cone residue, detergent and graphite were released into the natural environment.**
- **Several deburring operations were carried out one after another. At the end of a deburring cycle, all dry cases were removed and the centrifuge switched to graphitisation mode (tribofinishing).**
- **Resin cones were inserted into the machine with a suitable quantity of graphite. The delay tubes were then added and the machine rotated. The friction of the delay tubes against the graphite-coated cones covered the delay tubes in a very fine layer of graphite.**

In 2009, Davey Bickford installed a new facility which completely eliminates the release of water containing metal particles, detergent and graphite into the natural environment.

- The deburring/washing operation is carried out in an independent vibrator, from which all effluent is collected and sent to a centrifuge.
- Sludge containing particles and detergent is collected by centrifugation and the wash water, after clarification, is recycled and reused for further deburring and washing operations in the delay tube washing machine.
- After drying, the delay tubes are sent to the TRIBOFINISHING machine which was originally present in the workshop but which is now dedicated to graphitisation operations.
- In addition, an automatic graphite dispensing system has been added in order to prevent dust from being generated when discharging the graphite.

BEFORE

AFTER

Before 2009		After 2009	
One machine working on one task at a time Deburring – washing – spinning Or Graphitising		Two independent machines operating continuously	
Advantages	Disadvantages	Advantages	Disadvantages
▪ Only one machine to be maintained ▪ Cost already amortised ▪ No waste processing costs	▪ Environmentally toxic and polluting sludge released into the natural environment ▪ High level of water consumption o 350 m3/year ▪Machine dirty (metal dust and graphite in the machine's surroundings) ▪ Slow and dirty cleaning phases ▪ 3 successive intermittent cycles ▪ Long total cycle time ▪ Work-in-progress stock obligatory ▪ Frequency ▪ Frequent production stoppages	▪ Nothing released into the natural environment ▪ Almost zero water consumption ▪ Very low cleaning frequency o Holiday period ▪ Independent automatic cycles ▪ Cycle time halved ▪ Low work-in-progress stock ▪ No cones used for deburring operations o (friction of cases against each other sufficient) ▪ Significant reduction in servicing time o 132hrs/year for purifying/graphitising o 480hrs/year for sorting o 396hrs/year awaiting drying ▪ No production stoppages ▪ Clean workshop	▪ Machine purchase price (vibrator + centrifuge): €55k + graphite dispenser €6k ▪ Cost of sludge treatment by an external organisation: €0.6k / year

IMPLEMENTING THE PROJECT

- First and foremost, it was Davey Bickford's desire to make this facility environmentally friendly, whilst significantly improving working conditions in the stamping workshop, which led to the creation of this project.

- The investment was financed as follows:

  - Cost of the vibrator line + centrifuge: €55k
  - Cost of the graphite dispenser: €6k

- Part of this project (€34.4k, representing the cost of the centrifuge) benefited from financial aid from the 'Agence Française de l'Eau' (French water agency) (€5.2k) and a 0% interest loan over 8 years (€17.2k).

- This facility is now in service and providing complete satisfaction.

- No more waste is released into the environment, hardly any water is used and transfer operations are much more ergonomic. The results speak for themselves!