

How Dyno Nobel Reduced \$40 per Tonne in Explosives Costs



Project Summary

DRIVING DOWN FUEL COSTS FOR BULK EXPLOSIVES

Dyno Nobel has been an industry leader in introducing technology that utilizes mine waste oil in blasting agents. With recent escalations in fuel prices, this initiative continues to generate substantial savings at our major customer sites in the region.

This savings has been achieved through the direct replacement of 50% of the fuel (DFO) cost for blasting. In addition, the technology has delivered further cost and environmental gains to our customers through the elimination of storing, handling or shipping used oil to a third party for re-refining or disposal.

The project is now fully integrated into the daily operations of all major Dyno Nobel customers in Asia and is currently being considered for suitable sites in Australia.



To reduce risk to the onsite supply of critical raw materials

Fuels on remote mine sites are used to power many systems, from vehicles to generators to blasting activities. When a potential threat to supply was identified, Dyno Nobel helped the mine by trialing and then installing used oil in blasting projects to conserve fuel for mine-critical operations.

Background

EMPLOYING USED OIL IN ANFO

Although motivations vary from site to site, common reasons for adopting used oil for explosives application include:

To reduce the cost of blasting

Direct replacement of 50% of the diesel in ANFO with used oil delivers an immediate reduction in blasting costs to mining operations. As is the current case, our customers in Indonesia faced increased fuel costs during the late 1990's (and early 2000's) caused by rapid inflation and reduced state subsidies. To offset this, Dyno Nobel established continuous improvement programs with our customers to offset these costs.

To maintain or improve environmental management

Mines historically have used costly or undesirable disposal methods for used oil. It is now normal practice to implement environmental management programs for hydrocarbons used at all of our major internationally operated customer sites. The re-use of used oil in explosives is aligned with the customers' environmental objectives.

Project Goals

REDUCING COSTS WHILE MAINTAINING BLAST PERFORMANCE

The main purpose for all used oil projects is to reduce the blasting cost. However, it would be poor practice for a simple cost reduction program to come at the expense of blast performance.

Therefore to facilitate a sustainable blasting solution, Dyno Nobel developed the technology to utilize used oil in blasting.

The following areas were addressed:

- We developed a set of tests to determine the suitability of the site specific used oils as a substitute for DFO.
- We conducted small-scale trials to demonstrate that there was no adverse change to blast performance.



Groundbreaking Performance

How Dyno Nobel Can Reduce \$40 per Tonne on Your Explosives Costs



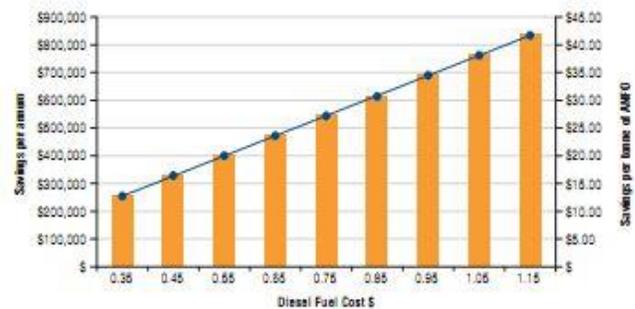
- We demonstrated the sustainability of the project, from a supervised technical trial, to an everyday quality-based management practice.

Key Project Elements

The key components of the initial trial periods for Used Oil in ANFO were:

- Establishing the metrics and success criteria for the project.
- Oil testing for quality and compatibility with emulsion.
- Field trials and blast characterization of Used Oil ANFO based products including ANFO, Heavy ANFO and gassed blends.
- Management of the source used oil and operation of the blending facility.

Savings generated by used oil application for 20,000 tonnes of ANFO



Technology Applied

DEVELOPING SYSTEMS, PROCEDURES AND TESTING

Dyno Nobel R & T and the site personnel worked together to develop the testing, procedures and systems required to make the product including:

- Development of a used oil specification appropriate for use in explosives.
- Emulsion stability testing at multiple stages of the production process.
- Developing the plant and processes to modify used oil for use in explosives.

The primary measure of product performance in the field was the equivalent of VoD results when benchmarked against VoD for standard products.

Through this development, Dyno Nobel has also designed a used oil process module that can be easily mobilized to a customer's site to quickly implement our cost saving technology.

Value Added

CAPTURING COST SAVINGS THROUGH REUSE OF USED OIL

Work carried out using mine-generated used oil in blasting, delivered significant direct cost benefits compared to the equivalent cost of diesel in ANFO.

In the case of PT Dyno Nobel Indonesia, it has been proven that used oil implementation at our two major customer sites in Indonesia, delivered savings in excess of US\$1 million over five years. With inherently higher fuel costs, it is expected that the potential savings for the Australian market, would be even greater. As demonstrated in the graph, savings per tonne of ANFO consumed are significant when used oil is applied on a 50% basis.

For example, the saving for a single mine consuming the equivalent of 20,000 tonnes of ANFO would be AUD\$723,273 per year, using current diesel prices.

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