For those confused by happenings in the global explosives sector, the Managing Director of AEL, Graham Edwards, explained it well at the time in his company’s magazine Blasting News. He noted that under the break-up deal announced in September 2005, “Macquarie Bank – in conjunction with Orica – bought Orica’s biggest global competitor, Dyno Nobel, whose Australian and North American interests remain as Dyno Nobel under the ownership of Macquarie Bank. But, all its businesses in Europe, South America and Asia will become Orica’s. This means that Orica will increase its global market share from 20 to 25%, while Dyno-Nobel’s proportion will drop from 18 to 13%. Orica now becomes twice the size of its biggest competitor.

“This international consolidation of the explosives industry is driven by the fact that the global mining industry has been consolidating over the past decade, resulting in huge global mining companies. Consolidation of the explosives industry was inevitable for it to match the structure of its customer base. AEL is focused on expanding internationally, and we intend growing our business in areas where we can add value. We are able to operate efficiently in developing countries with our modern and top rate technology and equipment, and are capable of assuring a reliable, efficient and cost-effective service to our customers, despite the remoteness of their locations.”

On June 1 this year, Orica stated it had completed the transfer of the remaining acquired Dyno Nobel businesses in Europe, the Middle East, Africa, Asia and Latin America. Orica further announced on June 9: “With the businesses transferred earlier in the year, the transfer today of businesses in some 28 countries successfully completes the acquisition announced in September last year within the time frame previously advised. Orica Managing Director and CEO, Graeme Liebelt, said that the focus was now on successful integration of the Dyno businesses while maintaining the high level of performance of both organisations in customer service, productivity and SHES (Safety, Health, the Environment, and Security).”

Emulsion in the hole
Mark Cross, AEL Mining Engineer Blast Consult notes that his company “has been selling emulsion as a bulk alternative to packaged explosives in the surface and massive mining environments for many years. However, it has remained a niche product in narrow reef mining because of costs - particularly with regard to capital requirements, ongoing maintenance, machinery and accessory equipment.” In April 2004, an underground blasting project was started in a production stoping section, aimed at succeeding with emulsion blasting. By late last year there had been four main achievements:

- Proof that rock-breaking of small diameter holes in a narrow reef environment is feasible with emulsion explosives
- Development of improved and simplified piston pumps and their ancillary equipment for emulsion charging
- Substantial reduction of capital requirements by the removal of silos, transfer pumps, cassettes and piping
- Creation of a simplified logistic system for moving emulsion by means of bags.

Cross explains that a number of improvements to the US05 pump have improved its reliability and robustness to the extent where it is satisfactory in the stoping scenario when primers are used. However, one of the main objectives of the new project is ‘primer-less’ blasting, hence a product of the highest quality is required in terms of energy, sensitivity and density. The decision was taken to develop a new pump which would eliminate current shortcomings through the following key features:

- Better quality of product
- A pump mass of less than 35 kg
- A batching unit to batch pre-determined masses of product varying between 0.5 and 3.0 kg
- A more suitable system to dispense emulsion into the pump
- A safety device to stall the pump when gassing solution is below a certain level
- A pump at the lowest possible cost.

Three prototypes were developed for extensive surface and underground testing during the period up to the end of October 2005. The following features make...
the US06 pump superior to any other pumps created to date:

- The pumping mechanism is simple and generates a high quality product
- The batching unit delivers a fixed mass of the product to each blast hole
- The dispensing unit delivers emulsion to the pump inlet from bags
- The safety device will stall the pump when there is no gassing solution.

In South Africa's mines, emulsion has traditionally been delivered in bulk, stored in surface silos and sent underground in 1.5 t cassettes. As a cost-effective alternative, since June 2005 AEL has been delivering emulsion in bags of a format similar to Anfex. Individual bags are 25 kg, comprising two bags of 12.5 kg each. Plastic specifications are currently 250 micron thickness in order to prevent rupture. Orders are delivered to mines in 500 or 1,000 kg multi-bags. They are loaded into a standard mine car and sent underground. The multi-bags are offloaded at the underground store, and the 25 kg bags are then removed and transported by hand to the reef horizon. In the stopes the bags are further transported in special bags for protection until final delivery at the pump.

Charging with emulsion underground is now a realistic alternative to conventional packaged explosives for three main reasons:

- Portable, lightweight, robust pumps are now available for emulsion charging in narrow reef
- Application of the batcher ensures the correct mass of emulsion per hole – hence minimal overall cost
- The removal of silos, cassettes transfer pumps and containers saves capital costs.

Bulk Mining Explosives’ (BME) Megapump is a gas-sensitised waterproof explosive that is carried underground in bulk containers and pumped into blastholes in a similar fashion, but with modified technology, to charging holes in open pits. The non-explosive emulsion is transported as an oxidiser chemical to the mine, stored in silos or tanks at the shaft head and underground and is sensitized and pumped into the blastholes using a specialised delivery unit.
Megapump has a high viscosity that allows it to be pumped into up-holes where it will stay without falling out. Its nominal density is 1.15 g/cm³ and, compared with ANFO at a density of 0.82 g/cm³, its relative weight strength is 0.92 and its relative bulk strength is 1.32. Indeed, the density of Megapump can be changed on site to increase or decrease the relative bulk strength. The VOD varies between 4,500 and 5,400 m/s and depends on hole diameter and charged density.

Megapump offers safe storage and handling because it is non-explosive until charged into a blast-hole. It is cost effective because of savings in labour, storage and transportation, and because of improved fragmentation and face advance. Charging the holes is faster and it is waterproof compared to ANFO. The density is controllable. Finally, Megapump offers full coupling compared to cartridge explosive. It is cap sensitive and can be initiated using an 8D strength detonator. It is advisable to use a 15 g booster for efficient initiation.

Ground Force offers a complete line of proven explosives support equipment for surface mines, including heavy ANFO mix & delivery trucks, blasthole stemming trucks and blast crew transport trucks. In bulk mix units, the company offers a wide variety of ANFO and blend bodies, on the vehicle chassis of the mine's choice for both on-road or off-road use. Users can choose from standard designs or custom builds to fit specific requirements.

These units feature stainless steel construction on all nitrate bin contact surfaces (Full stainless body optional). Body spring mounts allow the chassis to flex to minimize stresses, prolonging body life. The complete hydraulic system features tank, suction and return line filtration gear or variable-volume type hydraulic pump for reliability and long life. (Hydraulic systems vary to conform to specific requirements). The complete fuel system has a reinforced tank and hydraulic-drive fuel pump for accurate oil ratio mix, with totalizer to count fuel delivered. Electronic counter systems are available to monitor mix delivery up to and including full predetermined load delivery and computer tracking of drill hole loads. Bin capacities from 5 to 30 t are offered, with augers sized to suit delivery rate requirements. An optional side auger design is available in place of standard front overhead design. Auger delivery rates are up to 900 kg/min.

Delivery underground

Normet's Charmec is a special unit for easy and safe explosive loading. It is primarily designed to handle ANFO, but other types of explosive can be used. It can be fitted with different lifting devices, making it suitable for all stopping methods. It can be used for short hole loading, and both up and down holes. The Charmec has been widely adopted for mechanized charging.

Charmec is a genuine solution for charging explosives in large drifts of up to 150 m² in cross section. It is purpose built for multi-person charging work. Storage facilities appropriate to the charging jobs are mounted on the rear bridge of the carrier. Operating air is delivered by a diesel-hydrostatically or electrically driven compressor mounted on board.

The Charmec's heavy duty boom, in the single lift configuration, allows a charging height of 10.5 m from one working position. In the twin lift configuration the reach is extended to 11.4 m and the face coverage is large. Maximum lifting loads are 1,500 kg for single lifts and 500 kg/lift for twin lifts. Charmecs comply with new European man lifting safety rules and regulations.

Charmec explosive chargers are designed to comply with emulsion charging requirements. The Charmec 9B25 E concept has developed in cooperation with customers and explosive system suppliers for automated charging of modern emulsion explosives. It is suitable for both short and long hole charging and is fully programmable, but several preprogrammed

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features are built in to ease the operator’s work. It consists of a Normet NC 98 mining carrier, emulsion module and boom lifter with 500 kg lifting load and a maximum 5.8 m platform height to reach to 8 m high back. The emulsion module is comprised of emulsion pumping and sensitizing systems, safety systems, storage facilities for emulsion components and water. Automatic charging hose feeder and hose, as well as an automated CAN-Bus control system. Depending on the charging hose diameter and pumping length, this can provide a charging capacity of up to 80 kg/min.

Normet recently introduced a new value-added concept – Life Time Care (LTC) – that aims to increase cost-efficiency from the initial machine purchase to the end of its life, perhaps decades later. In this case it can include training and supervision on explosives and blasting systems. LTC can include maintenance and repair agreements, spare parts contracts and various warranty options.

Such customer/supplier relationships are quite common these days. Normet’s LTC can reach far beyond these. For example the concept can be extended to rebuilds or modification of machines for other tasks, widening the utilization of machines. Other options include rental or the purchase of second hand machines.

Getman’s range of ANFO charging vehicles is suitable for charging development or production face rounds measuring from 6 m high x 9 m wide (optionally up to 6 m x 14.2 m) to 9 m high x 12 m wide. Onboard ANFO capacity can range from 566 litres (or 454 kg) to 2,264 litres (or 1,816 kg) allowing for high productivity by keeping the hose in the hole.

The ANFO delivery system is suitable for both horizontal drifting, development rounds and vertical uphole production rounds up to 102 mm in diameter. These machines are designed for single man charging and allow for either self contained operation with an on-board air compressor or the use of mine air circuits.

Operator safety is assured and productivity enhanced by the telescopic boom and man basket mounted on a base rotation turret. Man baskets are self-leveling and rotate to keep the basket tailing close to the face. These products are designed and manufactured to satisfy the major standards for man lift devices.

The carriers provide safe, high-durability, low-maintenance operation. Engine bays incorporate hot sidetilt side design, keeping hydraulic lines and the fuel tank on the cold side of the engine. The electrical system is sealed to avoid moisture entry and corrosion. They also provide three-point contact at operator mounting points. Daily checks are accomplished from the ground without climbing on the machine.

Power train components by Detroit Diesel, Deutz, Dana Clark Hurth, New Holland and John Deere all provide clean operation with high operating availability. The main frames carry a five-year or 10,000-hour warranty.

Underground, Orica is now taking the skills and know how of its Hypercharge Total production loading system and applying it to development mining where speed of advance is, of course, a priority. Hypercharge Drive is a low capital input system with all of the advantages of the production service, but scaled down to fit development applications.

Hypercharge Total enables each delivery to be tailored to the blast design and needs of the job. It uses Orica equipment operated by Orica personnel to load production or development blasts. Hypercharge Drive is designed for customer operation in development mining applications with the provision of Orica training and maintenance of proprietary equipment.

One user of Hypercharge Drive is the Perilya Broken Hill mine in New South Wales, Australia, where there exists a variety of ground conditions. The ground varies from laminar, sheared, to massive. Blasting holes in development faces vary from dry to wet, and holes are often partially blocked with broken rock (due to sheared ground conditions), making it difficult to blow load these holes with ANFO. Blow loading ANFO is a two-person task.

Orica’s Hypercharge Drive has made possible the development charging of faces in varied ground conditions, with a range of variable density products. Bulk emulsion eliminates the issues associated with loading ANFO into damp or wet blastholes, and eliminates the need for packaged product in these situations. It can also be a single-person operation and allows charging of partially blocked blastholes. The hole can be pressurized allowing emulsion to be pumped past the partial blockage. A feature previously unavailable with blow loaded ANFO charging.

The Perilya Broken Hill operation notes the following improvements with the introduction of the Hypercharge™ Drive Bulk Emulsion System.

- Reduction in face charging time
- Pattern expansion in development mining
- Reduction in the amount of jumbo scaling
- Improved perimeter control (less overbreak)
- Elimination of packaged product for wet hole charging
- Increase in metres advanced (butt reduction)
- Product variation capabilities for different ground conditions (gasser options)
- Reduction in explosives usage (less blastholes drilled per round)
- Elimination of product manual handling issues
- Elimination of additional perimeter products.

Marcotte’s Emulsion Loading Truck, based on a Minejack Carrier (four-wheel drive, centre articulation) will carry emulsion explosives underground and is capable of loading up holes, down holes and drift holes in a fast efficient manner from a scissor lift platform. It features a 3,180-kg emulsion bin with loading attachments and hydraulic power Orbitrol type steering for bi-directional operation. There is also the High Speed Ramanfo truck is designed to load drift holes with ANFO in a fast efficient manner. The service platform covers 147 m².