

Joining the jetset

India and Australia continue to dominate global garnet supply while the market has become ever more competitive, particularly in the waterjet cutting sector

by Paul Moore, *Deputy Editor*

THE GLOBAL GARNET market is dominated by supply from Australia and India, while the consumption hotspots remain North America, the Middle East and Europe. The continued growth of low cost Indian supply in recent years has put pressure on the margins of the Australian and US producers, and as a result, most suppliers now also offer Indian material, particularly in the blasting sector.

Leading US supplier, Barton Mines, for example, imports both Indian and Australian garnet, while continuing to focus its own New York material on high value waterjet and other markets. The global garnet leader, GMA, also sells Indian garnet in addition to its own main supply from Australia.

Sandblasting and waterjet cutting are the two large volume garnet users, but there are also a number of other uses including glass polishing (eg. CRT screens), pool filtration, coated /bonded abrasives (eg. sandpapers), water filtration and textile stonewashing.

In general, the Middle East and Asia are the main markets for sandblasting garnet (ship repair/ship building/oil rig maintenance and repair), while the USA and Europe are the largest waterjet cutting consuming regions. The main difference between the two markets is that in waterjet cutting, garnet dominates,

while in sandblasting there are a number of cheaper competing materials.

Given the market structure, new projects or sources of supply are thin on the ground. Olympia Resources still plans to get its Harts Range mine in Australia into production by 2006, while in Ukraine, Black Sea Minerals is aiming to develop garnet supply from a tailings deposit (see Europe section). In North America, Freeport Resources is continuing work on the Hutton Garnet deposit in Labrador, with a bulk sample already taken and an extensive drilling programme completed in 2005. There is also thought to be some garnet being exported from Mexico, but according to a leading importer the material has tended to be of low grade.

Garnet quality

Most of the garnet produced worldwide is either alluvial almandine in beach deposits (Indian and Australian product) or almandine contained in hard rock deposits (such as Barton in New York). Almandine is used as it is the strongest of the garnet varieties. One of the key properties is the impact strength of the garnet crystals, which is reflected in the specific gravity and hardness of the material. Low purity can cause the garnet to explode on impact when used for blasting, which means it cannot be recycled – an obvious cost factor.

Hard rock garnet is often used for waterjet cutting, particularly for cutting hard and thick alloys, because of its hardness and sharp edged grains that allow for a higher cutting speed. Alluvial garnet tends to be sub-angular so is more suited to blasting markets. As the particles have not been crushed, they contain fewer stress fractures so do not break down as easily during blasting and are more recyclable.

Logistics

Most garnet around the world is shipped in big bags, including 1 or 2 tonne bags and smaller bags (eg. paper, PP 25kg bags wrapped in pallets or sometimes inside bulk bags themselves). Shipments to North America are mostly 2 tonne (4,400lb) and 25kg (55lb) bags.

Loose bulk shipments are also made to the key warehouses in the largest consumption areas such as the Middle East. As with most other speciality industrial minerals, the shipments form part of a larger shipment of other commodities rather than a vessel shipping garnet only.

Both bulk shipping of bags and container shipping of bags is done depending on the destination. From India and Australia the garnet is shipped to a network of warehouses for onward delivery.

All of the GMA garnet produced in Australia is shipped from the port of Geraldton, where bagged and bulk garnet is stockpiled in large storage sheds. There are two main routes for shipping of garnet from Australia to Europe. For the UK and most of western and central Europe, the garnet is shipped in bulk bags or bags in breakbulk to a warehouse in Antwerp, and from there distributed to customers. If the demand is large enough, 3,000 tonne coasters may be used to onward ship material within Europe – some deliveries to Scandinavia have been conducted in this way. This method may be used more in the future as demand in certain areas increases. Russia and eastern Europe (particularly Poland and the Czech Republic) are some of the fastest growing regional markets for garnet. Germany and Scandinavia are the prominent blasting garnet users.

One of the largest waterjet cutting markets for garnet in Europe is in Italy, to serve the needs of the dimension stone market, such as the marble industry. This material is shipped direct to Italy from Australia in containers, either in big bags or 25kg bags. The aerospace industry such as Airbus in France is also a large waterjet garnet user.

From India, almost all of the garnet is shipped from the port of Tuticorin in Tamil Nadu, where the main garnet producers have their warehousing facilities. Vetri Vel Mineral (VVM) delivers finished garnet from its processing plants to a 90,000ft² warehouse by truck. The company operates four wet concentration plants with an ore feed capacity of 600 tph, however, this is being increased to a level of 750 tph.

For the North American market, garnet is shipped into whatever port is most cost effective and as close to the major consumption areas as possible. Nearly all garnet is then onward shipped from the ports to warehouses and ultimately,

into the major consumption areas by truck. Barton, for example, maintains garnet stocks at Chesapeake, Virginia; New Orleans, Louisiana; San Diego, California and Olympia, Washington.

The other main market is the Middle East, where there are also large warehouses to handle Australian and Indian alluvial garnet shipments.

Waterjet versus sandblasting

While these are the two largest markets for garnet worldwide, they are also very different. Garnet totally dominates the waterjet cutting market, with 99% or more of the market, while in sandblasting, it only accounts for 1% or less.

The reason for this is that in sandblasting, there are a whole host of materials on the market, with their use by country depending on availability, silica legislation variations, the material being blasted and customer preference. Materials used include silica sand, various slags (copper, nickel, coal, aluminium), olivine, staurolite, crushed glass, aluminium oxide and iron oxide. Baking soda is even used for more delicate substrates.

In Germany, for example, there are large wastepiles of copper slag, and in some cases the German government pays companies to use up the material. Slag materials are also widely used in China in place of natural mineral products.

In sandblasting, blasting of steel ship hulls and oil rigs/tanks is now the largest consuming market. Blasting tends to use coarser garnet, such as the 30/60 grade, which is the workhorse product for general purpose blasting, but coarser materials are also used for very heavy duty coating removal. Finer grades such as 80 mesh are used for delicate blasting work on aluminium and stainless steel.

As shipbuilding and ship repair have moved to the Middle East and Asia, there have been major account losses. Danyard in Frederikshavn, Denmark, for

example, used to use as much as 11,000 tpa of garnet but closed in 1999. South Korea and Singapore with their large shipbuilding and ship repair industry are now large garnet markets, with users such as the Hyundai yard in Ulsan and Singapore Technologies Marine.

The Middle East and the United Arab Emirates (UAE) are still the largest users of blasting garnet, from shipbuilders such as Dubai Drydocks and Abu Dhabi Ship Building Co., and oil service companies such as the Gulf Marine Maintenance & Offshore Service Co. (GMMOS). In Saudi Arabia, the ARAMCO oil company is a major user.

GMA has dedicated bulk handling and warehouse facilities in both Dubai and the UAE. VVM's distributor in the UAE is the Abu Dhabi Construction Co. China is likely to be a larger user of blasting garnet in the future as the world's largest shipyard is under construction on Shanghai's Changxing Island. Areas of increased oil and gas activity are also focus markets, including the Caspian region and Far East Russia.

A key component of the waterjet market is the waterjet equipment itself. Several large companies manufacture and supply the equipment together with the servicing aftermarket that comes with it, and it is through these companies that a lot of the garnet abrasive orders are placed. These orders are then passed on to the garnet producers/distributors. Major global waterjet companies include Flow International Corp. and OMAX.

Different garnet sizes are also used in different waterjet systems – 120 mesh for a very smooth surface, 80 mesh for general purpose uses, and 50 mesh, which cuts faster than 80, but gives a slightly rougher surface. Flow International cites delivered US waterjet garnet costs at between \$0.16/lb to \$0.40/lb delivered (roughly \$350-880/tonne), "depending on the type and quantity you purchase". Barton occupies the upper end of this

The GMA wet plant at Port Gregory Courtesy GMA Garnet Group



The Sinogarnet hardrock garnet mine, pre-crushed and crushed garnet stockpiles and finished bagged product in China
Courtesy Sinogarnet



market with its high quality hardrock grades, where it is difficult for others to compete.

Large users of waterjet abrasives include the aerospace and automotive industries, where precision parts are cut from high strength materials such as titanium, special steels, aluminium and carbon composites. The dimension stone industry also uses waterjet systems, eg. for cutting slabs for kitchen countertops.

The rise of GMA Garnet

In the space of 15 years, the GMA Garnet distributors in Europe, Middle East and Asia (owned and operated by Ketelsen Enterprise and Jebesen & Jessen Group) have gone from being regional sales companies to 100% owners of the largest garnet mining, processing and distribution network in the world.

The core asset is the mine, located near Port Gregory, 150km north of the port of Geraldton in Western Australia. The garnet is mined and concentrated in a wet process using spirals, hydrosizers and fresh water washing and dewatering.

Prior to April 2002, the GMA Garnet operations in Australia were 50% held by US garnet group Barton Mines LLC, and 50% by Australian investment group Hancock and Gore Ltd (HGL). In 2001, HGL announced the sale of its stake for \$18m. to Garnet International Resources Pty Ltd, a company established by the shareholders of GMA Garnet (Europe) GmbH (Ketelsen/J&J).

The sale went ahead despite Barton having preemptive rights to acquire the stake within a 90 day period. Barton continued to hold its 50% stake from April 2002 to March 2005, when Garnet International Resources Pty Ltd took 100% control of GMA Garnet Pty Ltd. However, Barton continues to be a buyer of GMA garnet for the North American market (as it was before, during and after the partnership with Garnet International Resources). GMA also has its own distribution office in Houston.

The GMA Garnet Group (comprising GMA Garnet Pty Ltd, Australia plus the distribution companies in Europe, the Middle East, Asia and the USA) distributes and sells GMA Garnet worldwide through a well established network of distributors with strategic stockpiles of product throughout those regions. Other areas are serviced directly from the Perth head office. GMA also distributes Indian garnet under its GMI brand for the sandblasting market, though it is unclear which Indian producers this is sourced from.

GMA has continued to invest in global garnet facilities. In March 2004, GMA Garnet Middle East FZE established a fully integrated garnet processing facility in the Jebel Ali Free Zone, United Arab Emirates (UAE), with a design capacity of 50,000 tpa, to service its customers in the UAE and throughout the Middle East and Caspian Region. This operation added to existing bulk handling facilities in Saudi Arabia and Antwerp.

China – gathering pace

With the rapid growth in the Chinese economy, the production capacity and demand for garnet have also been increasing in recent years. Leading domestic producer and supplier, Wuxi Ding-Long Trading Co. Ltd (Sinogarnet), now estimates the total production quantity of garnet in China to be in the region of 90-100,000 tpa. Some estimate that the Chinese garnet market is now increasing at a rate of 10-15,000 tpa.

There are two major domestic producers – Sinogarnet with mining operations in Liang Cheng City, Inner Mongolia, a hardrock deposit with more than 1m. tonnes of reserves, and Leshan Carborundum Natural Abrasives Co in Sichuan province. The Inner Mongolia XL Abrasives Processing Co. Ltd (XL Garnet) also produces some material from the same area as Sinogarnet but on a small scale.

Sinogarnet has increased its production capacity to 20,000 tpa in 2006, with 90% destined for overseas export markets. According to managing director, Raymond Ding, broadly speaking, Chinese local production can meet Chinese garnet demand currently. But the company also imports 2,000-3,000 tpa of alluvial garnet from GMA in Australia and some Indian beach garnet.

Some of the best Chinese garnet is exported for waterjet markets, adding to other exports of blasting grades. K. Chockalingam, CEO at Indian Ocean Garnet Sands (IOGS) commented,

“Chinese garnet is filling up the extra demand where there is not enough Indian garnet, especially the coarse grades like 20/40. The coarse grades are exported to Japan and the Gulf countries and China has its own demand. But they also import waterjet grades from India, the USA and Australia”.

China domestic market demand has been increasing for two main applications – garnet powder for cathode ray tube (CRT) and other glass polishing, and waterjet cutting. The sandblasting market for garnet in China is very small, as copper slag is mostly used due to its much lower cost. The CRT market has been boosted as plant capacity has been shut in North America and Europe, and new plants have been constructed in China.

With electricity prices so high, there are also reportedly some brown fused alumina (BFA) producers that have been mixing garnet powder into BFA powder to cut costs.

Imported garnet still has to compete against local Chinese material, especially 60 and 80 mesh product from numerous small suppliers in Hebei’s Xingtai area for the waterjet cutting and glass polishing markets. But while the price from these producers is lower than that for the imported products, the quality also tends to be not as good.

India – a garnet powerhouse

Having begun as a small producer of powder garnet grades for CRT polishing in Japan in the early 1980s, India is now well established as the largest single source of alluvial garnet in the world, and garnet from the main deposits in Tamil Nadu now reaches all of the world’s main areas of consumption.

Total production of garnet in India is much higher than in China – probably in the region of 260,000 tpa. The key to the importance of India is the sheer abundance of garnet in the beach deposits, the relatively simple and low cost mining, basic processing route and very low labour costs. Both VVM and Beach Mineral Co. (BMC) mine garnet around Kuttam, near Tuticorin, while IOGS mines garnet at Karaichittupudur on the tip of southern India.

Some estimate that as much as 50% of India’s total garnet production is now consumed by Gulf countries for sandblasting oil tanks and rigs or ship cleaning. Another 25% market is used in Asian countries and with the balance exported to Europe and the USA.

There is often confusion about the Indian market as over the years different

producers have emerged, while distribution relationships with western importers have changed. The largest producer in India remains VVM (Super Garnet grades). VVM has large mining areas and six processing plants for producing garnet and ilmenite products. The main warehouse is in nearby Tuticorin port, from where major competitors also ship their material.

The company claims to produce about 135,000 tpa of the Indian total. Like the production in Australia, Indian production is largely for export, which accounts for 90% of sales. There has not been a significant increase in domestic Indian demand, where steel sandblasting and other abrasive markets remain the largest users. Indian labour costs remain very low, so the gas cutting is used to cut steel instead of waterjet systems. In addition, the water jet cutting machine capital cost is very high as are the spare parts costs. Silica sand is still dominant in the domestic blasting market.

The other main Indian producers are IOGS (Power Garnet grades), which produces about 36,000 tpa and BMC, also based in Tamil Nadu. Like VVM, both of these companies also very active on the European and US markets. All three have a global network of distributors to handle their products (see USA and Europe sections for international trade). Other suppliers include Indian Rare Earths and Industrial Mineral Co. (IMC) with its Supreme Garnet grades.

The main export markets for Indian garnet remain the UAE, South Korea, Australia, USA, Japan and Europe. The market advantage of Indian garnet has been the availability of large volumes and its low cost. Estimates for the FOB India price for garnet are as low as \$70/tonne in some cases, though by the time the product reaches Europe or the USA this rises to about \$250-300/tonne.

Transworld Garnet India Pvt Ltd has a unique position, as it is majority owned by WGI Heavy Minerals, one of the main US suppliers. Transworld operates a plant about 18km from Tuticorin, supplied from subsidiary Bengal Bay Garnet and has built up an important export trade to the US waterjet market. Flow Industries has purchased Indian garnet from WGI, marketing it worldwide as 80 mesh Paser Plus for use in waterjets. It has not been an easy ride for WGI in India more recently, however, and in 2005/2006 the company has been trying to resolve licensing and permitting issues with the Indian government.

North American market

The US market, like Europe, has become more and more dominated by imports from India and Australia. According to USGS figures, imports have increased from 23,000 to 32,200 tonnes between 2001 and 2005, while production over the same period has declined from 52,700 to 28,400 tonnes. However, market players say the actual import figure is much higher than this, and the overall market for garnet in the USA is over 100,000 tpa.

The imported garnet satisfies much of the demand in the filtration and blasting markets, as well as some of the mid-range waterjet market. The high end markets – premium waterjet grades and lapping polishing grades are dominated by crushed hard rock supply from Barton Mines, which is much too expensive for the blasting market.

Consumption of garnet for blasting in the US is approximately 50-60,000 tpa. This has been overtaken by consumption of garnet for waterjet cutting, which is now approximately 60-70,000 tpa. Consumption of garnet for water filtration in the US is now approximately 20-30,000 tpa.

There are only three actual producers of garnet in the USA – Barton Mines LLC in New York, WGI Heavy Minerals in Idaho (through subsidiary Emerald Creek Garnet), and NYCO Minerals in New York (produces garnet as a byproduct). NYCO’s material is trucked to a processing plant in nearby Keesville, operated by International Garnet, which is now part of Canada’s Opta Minerals. According to Opta sales and marketing manager, Jacques Decarie, the Keesville plant is currently sold out. Opta, like all the other players is also an importer from India, but also from China.

Barton produces garnet products for many diverse applications but its specialities are high value grades for waterjet cutting, bonded and coated abrasives and specialty lapping and grinding medias. It owns and operates mining and milling operations in the Adirondack mountains of upstate New York. Barton was unwilling to comment on its market position but is listed by VVM as one of its two main distributors in the USA. However, according to industry sources, the company has more recently been importing garnet from BMC. Barton also purchases garnet from Australia’s GMA for the North American market.

The other main importer in the USA of Indian garnet is California-based S2K Abrasives, which is a major distributor of VVM garnet throughout North America. It

also supplies garnet to another distributor, Universal Minerals Inc. based in Texas.

The issue of whether more Chinese garnet will be imported to the lucrative US waterjet cutting market is a matter of debate. One source commented, "Chinese garnet may have the potential to play a role in the waterjet market, however consistent quality needs to be achieved before that will happen". It is thought unlikely that Chinese garnet will make much of an impact in the US blasting market, as the current material sent to the USA for blasting is not recyclable. It could potentially still be used for blasting if the price was competitive with slag products, however the cost of shipping the material from China to the US negates that benefit.

Consumption of garnet in Mexico and South America is negligible compared to the US market and is mostly supplied from Australia.

European market

Like the USA, the European market is dominated by Australian and Indian product, and indeed even more so given the complete lack of European garnet production. All the main Indian producers – VWM, BMC and IOGS – have distributors in Europe.

VWM's material is handled by Germany's specialist abrasive supplier Asikos Strahlmittel GmbH, based in Dinslaken and part of the Steag Group. Asikos has processing and warehousing sites in Duisberg and Herne.

The sole distributor in Europe for IOGS is Power Garnet, based in Denmark. It has its main warehouse in Denmark, with

smaller warehouses in the UK, Ireland and Finland. Beach Minerals garnet is also in the European market, but is thought to sell through several different channels as opposed to a single distributor.

GMA has a number of sales offices in Europe, with the head office, GMA Garnet (Europe) GmbH, located in Hamburg. Further sales sites are elsewhere in Germany, as well as Sweden, Denmark, and the UK. Distributors are used in other European markets. Warehouse stocks of garnet are located in Poland, Finland, Sweden, the UK, Spain, Italy, Belgium and Germany.

The garnet market worldwide is quite fragmented, and Europe is not exception, with many small users buying a few tonnes of material as needed. GMA's managing director, Torsten Ketelsen commented, "garnet is not sold as a commodity product but requires extensive marketing and distribution effort and investment in terms of technical promotion and strategic stock holdings to satisfy on the spot requirements. The individual sales lot sizes are extremely small compared to other industrial minerals, commonly no more than two to four metric tons per sale. Success is more related to understanding the end user market and providing the necessary distribution infrastructure".

For many years, Ukraine has been touted as an imminent new garnet source for Europe. US company Black Sea Minerals Inc. (BSM), headed by Walter Stunder, has spent a number of years trying to get the Ivaniv garnet deposit into production. Ivaniv is located in the west central part of the country.

However, BSM has to date been unable to raise the \$5m. plus of investment that would have been required and the project is currently on hold, though the quarry is producing some aggregate. Some toll processing or garnet was done from ore supplied by the Zavaloye Graphite Combine, and a joint venture project was considered, however, the Zavaloye garnet had high levels of impurities and therefore disintegrated more easily than the purer almandine at Ivaniv. It is thought that Barton also looked at the Ivaniv project but at the time exports of Indian garnet had begun to increase and the company chose to concentrate on premium products from its home mine in New York in combination with lower cost imports.

BSM is currently looking at a tailings deposit in Ukraine, which could be brought into production for a much lower cost. The company has standing orders for 11-12,000 tonnes of garnet if it gets into production, and the target production for the tailings deposit (which would also produce rare earth minerals) would be in the region of 15-20,000 tpa of garnet. The current plan is to list BSM on the Vancouver Stock Exchange in 2006 with a view to increasing the profile of the new project.

Stunder told IM that the market advantage for BSM would be the short delivery time to consumers in central and eastern Europe. The Austrian market could be reached in only a day by truck or rail meaning just in time deliveries could be satisfied. The material would also be well located to supply markets in Poland, Czech Republic and Italy.



Bulk sampling at one of the Hutton Garnet beach deposits in Labrador, eastern Canada Courtesy Freeport Resources

