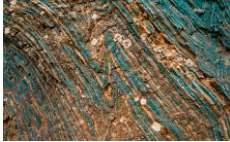




## Iron ore

### How is the iron ore market reacting to restricted supply?



#### Why have iron ore prices peaked this year?

Interruptions to Vale's Brazilian operations earlier this year, after the collapse of a tailings dam caused the death of more than 200 people and took more than 30m tonnes of annual iron ore production out of the market, are partly to blame for iron ore price increases.

Vale subsequently received authorisation to restart its Brucutu mine, but at the same time Rio Tinto, one of the world's largest iron ore extractors, cut its production estimates, not for the first time this year.

This comes after Cyclone Veronica and fires in the Pilbara region in Western Australia combined to disrupt output in the world's largest iron ore-producing region. All in all, three of the big four iron ore producers — Vale, BHP and Rio Tinto — have cut their production forecasts for 2019.

The disruptions in supply have not been alleviated by a decrease in demand, as steel production in China (which imports c 70% of the world's seaborne iron ore) rose to record levels, driven by consumption in the infrastructure sector and notwithstanding new environmental regulations being imposed on the steel mills.

The price of iron ore reached a five-year peak in June, driven by supply disruptions and increased demand, and has remained high since then, with the price of 62% Fe standard product (CIF China) still hovering at [around US\\$120/t compared with less than US\\$70/t](#) this time last year.

#### How do we extract and concentrate iron ore?

Iron ore extraction uses traditional surface, or open pit, mines. Pit crushing machines then pulverise the ore and separate impurities like sand and clay.

The crushed ore must then be purified/concentrated to increase the proportion of iron in a process of beneficiation. Various methods are used in beneficiation, most notably, gravity

separation and flotation (for haematite – see below) and magnetic separation (for magnetite).

A number of beneficiation techniques fall under the banner of gravity separation, ranging from shaking surfaces, not unlike a complex version of panning for gold, to [gravity-assisted centrifuges](#), [pinched spirals](#) and jigs.

In jigging, pulverised ore is suspended in water and pulses of pressure are used to push the ore upwards. The lighter, unwanted minerals fall more slowly, while the heavier iron settles more quickly, separating products in the ore according to density.

So far, iron beneficiation appears to be a mostly mechanical process, but with flotation it becomes a chemical one. In flotation, chemicals are mixed with water and crushed ore. The chemicals make minerals hydrophobic (unable to adhere to water), but allow them to attach to bubbles formed by a (chemical) frother.

Depressants can then be added to cause some minerals to repel the bubbles. Flotation of iron ore can thereby be achieved either by floating the iron onto the froth, where it is concentrated, or leaving it in the liquid and floating off unwanted minerals.

Another common method of iron ore concentration, magnetic separation, uses magnets to shift and

concentrate magnetic particles like iron, most commonly through a drum or cross belt separator.

The processed ore is then graded into 'fines' and 'lumps'. Lump iron is between six and 30mm in size, while anything below six millimetres is considered fines, with lump commanding a premium price in the market, since its particle size allows oxygen or air to circulate around it and melt it more efficiently in a blast furnace. Concentrate typically contains 63–69% iron and can be used directly in blast furnaces. However, fines can also be reprocessed to make pellets that mimic the characteristics of lump in a blast furnace. Pellets are spheres, typically 6–16mm in diameter, which have iron contents ranging from 56% to 66%.

#### Edison Insight

'More than any other commodity, iron ore has confounded the expectations of experts over the course of the past three years. Despite analysts being resolutely bearish in the face of tightening anti-pollution measures in China, the iron ore price has been the second best performing of 17 commodities since September 2016 – outperforming even palladium in dollar terms.'  
Charles Gibson, Edison director of mining

## **Where do we extract iron ore from?**

We predominantly mine two types of rock for iron ore: haematite (iron III oxide) and magnetite (iron II, III oxide). In general, both are found as sedimentary deposits in rocks that are at least 1.8bn years old and thought to be the product of iron-rich waters at a time when oxygen was rare in oceans and rivers. The current predominant scientific theory is that when living organisms began to excrete oxygen into the seas, the oxygen bound itself to the dissolved iron in the water, which then precipitated to create rich banded iron formation (BIF) deposits.

Today, iron ore is mined from these deposits in a few countries, the top five of which produce 85% of the world's iron ore and account for 73% of its reserves, according to The US Geological Survey. Of these, Australia is by far the largest iron ore-producing nation, outstripping its nearest rival, Brazil, in terms of production volume by nearly two to one. In 2018, Australia produced 900m metric tons (Mt) of iron ore to Brazil's 490Mt.

China (340Mt) and India (200Mt) are also major producers. However, despite its large production base, China remains a net importer of iron ore, importing much of its requirements from India.

## **Which companies dominate iron ore extraction?**

Four mining companies control around 70% of iron ore exports, namely BHP, Rio Tinto, Vale and Fortescue Metals.

This is not to say that there isn't an active extraction and exploration market outside the big four, which is mostly centred in Australia. Red Hill Iron recently completed initial preparations for its 2019 exploration programme and continues to hold a 40% interest in the Red Hill Iron Ore Joint Venture in Pilbara. It also retains 100% of the Panasonic Project in the same region. Eastern Iron, Fenix Resources, Fenix Resources and Magnetite Mines are also active in Australia.

Fenix retains a project north-east of Perth, Western Australia and Eastern Iron owns the Nowa Nowa Iron & Copper project through its subsidiary Gippsland. Meanwhile, Mineral Resources has a 50% stake in the Pilbara-based Marillana iron ore project, in addition to its lithium assets.

BCI Minerals is also highly active in Australia, from its salt, potash and iron projects in Pilbara, including its Iron Valley project (in which it has a royalty-type interest with the operator, Mineral Resources). BCI recently reported that, owing to the increase in iron ore prices so far in 2019, it will generate approximately as much EBITDA from Iron Valley in the final quarter of its financial year (to June) as it did in the first three quarters combined.