Silicon – a ticking clock for Aluminium?

By **Jayson Tymko***

Is the clock ticking for aluminium cans and alloy wheels? The answer is yes unless real progress is made on shoring up supply chains for certain critical raw materials and not least supply chains for silicon metal.

The drive to net zero, which necessarily involves a massive increase in electrification of all manner of infrastructure and lightweighting of transport will put unprecedented demands on a range of rare earths and other minerals, most of which are already in short supply and the production of which are restricted to a small number of territories outside of the US and Europe.

To be clear Sinova wholeheartedly supports the energy transition and is building what should be one of the most sustainable quartz mining and silicon metal processing operations in North America.

However, silicon metal isn't even on the current American critical raw materials list and we are very aware of the misconceptions that abound in relation to this material. It's essential to a large number of sectors and we are committed to setting the record straight and highlighting the very real risk of supply constraints that will affect industrial applications including aluminium, unless coordinated actions are taken soon to address it.

Quartz, from which silicon is derived, is one of the most abundant minerals on earth, it's in sand and we all know how much sand there is just laying around for the taking.

However, when you're talking about silicon metal in particular, quality is king. Refinement gets rid of some impurities but not all – essentially what you put in; you get out.

Additionally, the process to create silicon metal involves temperatures of around 3000 degrees Celsius. Most rocks shatter at 1200 degrees so you need a primary rock source that is both thermo-resistive and low in impurities. That means you can't just go to the beach with a bucket and spade to get your quartz. In fact, only a fraction of a fraction of all the quartz that's out there, is actually usable for silicon metal.

The primary resource is, in fact, scarce and so any uptick in demand is going to be felt by every sector that relies on it.

Enter the drive to net-zero. Any way you slice it, silicon metal is one of the base building blocks that will deliver the energy transition because of its use in solar panels, energy storage, chips and EV batteries. There is no chemical alternative silicon metal for these technologies so competition for the material is going to intensify.

To put this into context in the US already uses twice as much silicon as it produces but by 2030 its demand for silicon will increase:

- x2.6 to supply the energy efficiency sector
- x5 to supply the microchip and semiconductor sector
- x5 to supply the solar power sector
- x100 to supply the grid storage sector
- x400 to supply the EV battery sector

Similar patterns are already playing out in the European and Asia Pacific regions – in fact by 2030 global demand will reach three times supply.

The trend is global. Historically China produced around two thirds of world-wide capacity of silicon metal. However recent issues around quality have seen the country importing silicon metal to mix with their existing stock. China now imports silicon from Brazil and the US just to make polysilicon for solar panels - that is a seismic shift. In fact, China's five-year plan will see silicon exports going to zero as they struggle to meet their own internal consumption.

The competition for silicon will impact the aluminium sector

A decade ago industrial applications made up about 90% of silicon consumption - today they're less than half.

That shift is not because of solar or microchips – it was the rising demand from the aluminium sector that changed the market. Over the last decade aluminium demand for silicon has increased from 10% to about one third of total consumption.

But over the next five years the energy transition will see aluminium's share of silicon capacity cut from 32% to 10% - and that's despite the sector's demand for silicon growing 5-6% per year.

This is because solar and semiconductor demand will grow from 19%-33% and demand from EV manufacturers from 1% to 28%.

Those three products are going to drive competition for supply and when you consider that an EV car requires 140% more aluminium by weight than an ICE vehicle and given the concentration of silicon metal in automotive aluminium is around 10% - ironically, even lightweighting is going to run into problems if supply can't be secured.

The risk to the aluminium industry is plain to see – the exponential demand from the high-end sectors like solar and EV is going to constrain supply of the highest quality silicon and drive up the cost of lower grade stocks. This will impact all sectors relying on silicon and not least the smelters and producers of aluminium alloys.

There are solutions being built in North America to help plug the looming global supply gap and as a producer of quartz and silicon, Sinova is in active discussions with EU and US clients to supply them with the materials they need. However, the race to meet climate targets risks being lost along with unprecedented supply constraints to the aluminium sector without effective collaboration between governments, suppliers and customers to create supply chains fit to support domestic manufacturing. We need leaders from all sectors, including aluminium, to make this happen. ■

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