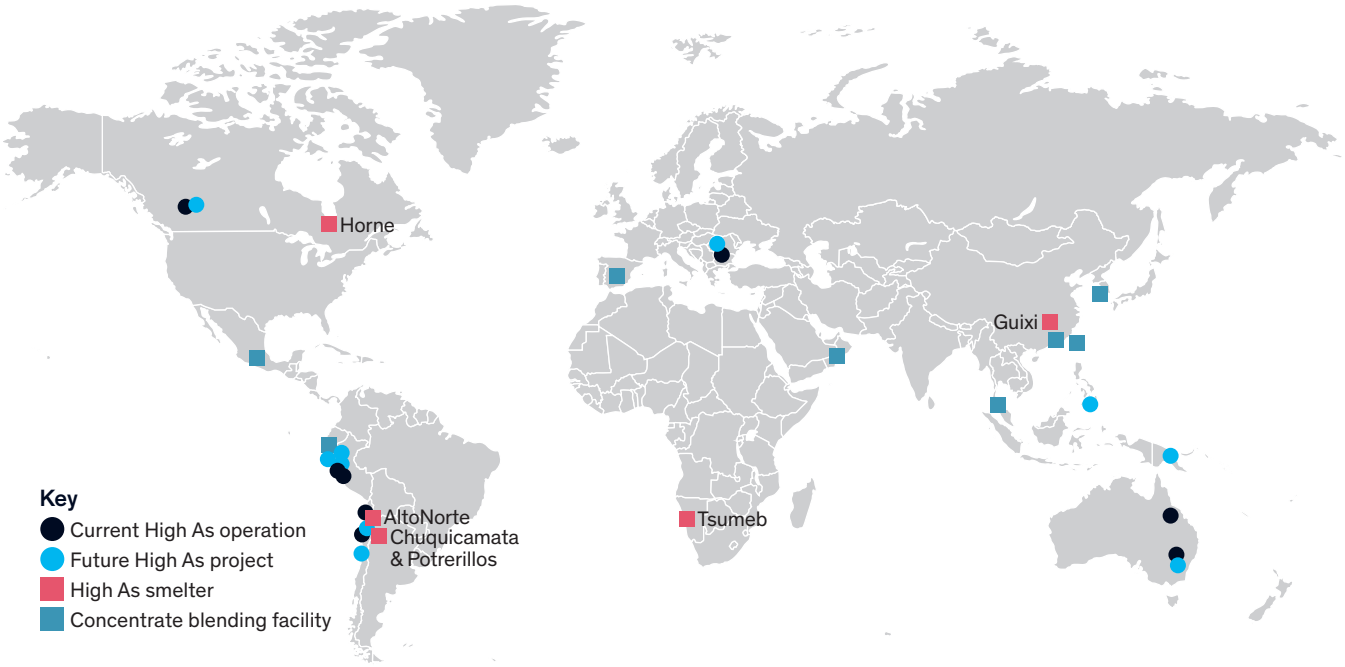
Arsenic: Will it take the shine off the red metal?

MineSpans

With environmental regulations becoming increasingly stringent, arsenic looks set to pile ever more pressure on copper producers

Arsenic mines, projects and complex concentrate treatment facilities



High arsenic concentrate as a percentage of total concentrate supply

Arsenic is a poisonous element found within minerals at many of the world's copper mines. As a consequence of sulphide ore processing, arsenic is concentrated along with copper; this becomes more acute as the in-situ grade increases. The largest copper supply region in the world, Latin America, has high arsenic content in many of its ageing copper mines. With many of the upcoming projects also having high arsenic content, the volume that needs to be treated is set to increase, intensifying the environmental and financial risk to producers.

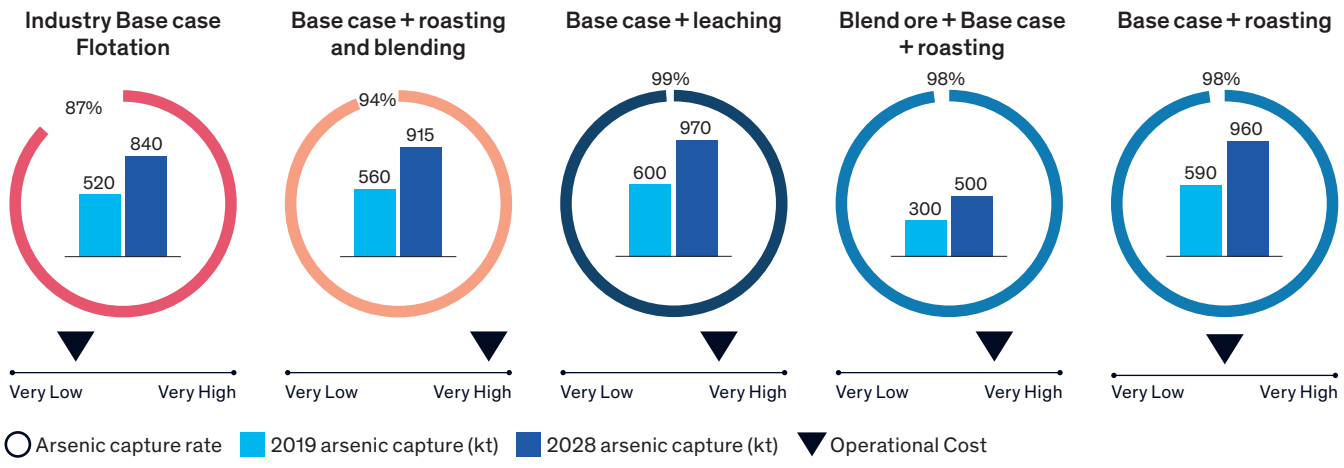
Although different processing methods result in different arsenic by-products, all of them require long term storage or expensive handling. This is set to add more pressure to operating costs and, notably, the reputation of copper miners and processors. With China having set a benchmark maximum of 0.5 percent arsenic in imported concentrate, this could become the new global trading standard – requiring additional processing and raised costs.

High arsenic mines and projects

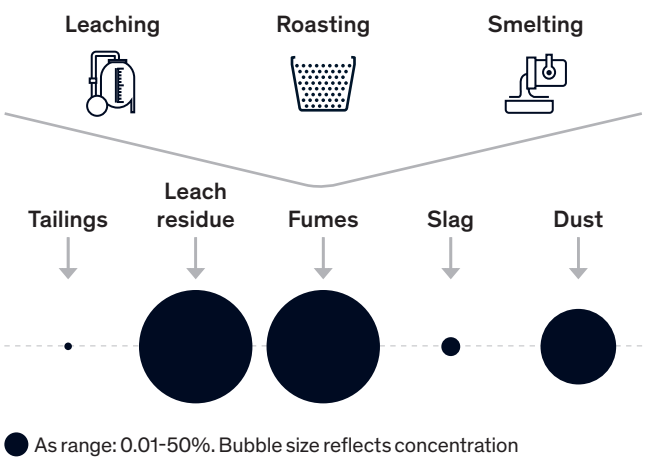
● Canariaco Norte	● El Galeno	● Mount Carlton	● Tajo Norte
● Chelopech	● Frieda River	● New Afton	● Tampakan
● Chuquicamata	● Huaron	● New Afton Expansion	● Timok Upper Zone
● Chuquicamata Expansion	● Marcapunta Norte	● Norte Abierto	● Toromocho
● Collahuasi	● Michiquillay	● Northparkes	● Toromocho Expansion
● Collahuasi Expansion	● Ministro Hales	● Northparkes Expansion	

● Current High As operation ● Future High As project

Modelled complex ore processing



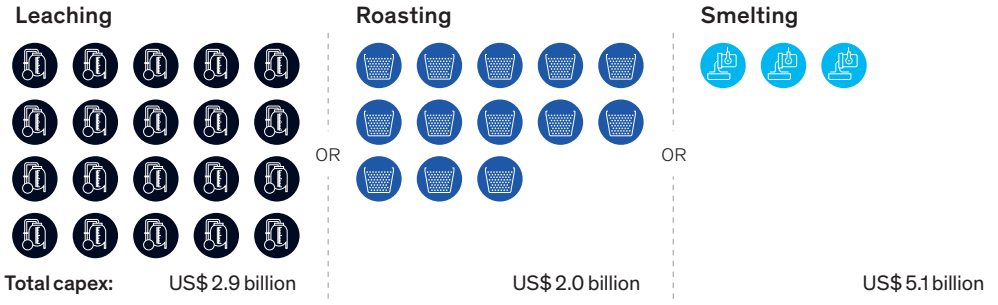
Arsenic waste generated by process



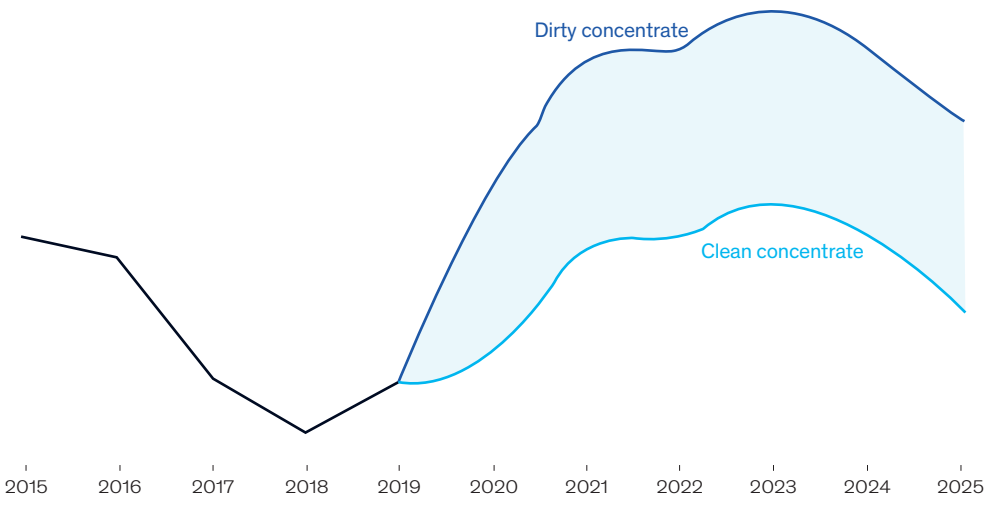
Capturing arsenic in early stage processing has cost advantages compared to processing high arsenic waste. Due to the relatively low capture rate of standard copper sulphide processing methods such as flotation, it cannot be applied to high arsenic ores in isolation. Several processing methods exist, as seen right, and in future higher arsenic volumes will likely be treated by a mixture of solutions, from early stage arsenic separation during leaching to roasting and smelting in modern smelting facilities.

Throughout the beneficiation circuit, arsenic is disposed of in multiple by-products and in various concentrations. Each by-product may require different treatment and storage with associated cost impacts. Smelters, for example, must install dust treatment plants with their by-products stored in monitored ponds or pits on site. Arsenic trioxide, which is a commercially saleable product, is complex and expensive to produce in relation to its low market value.

Number of new facilities required in 2028



Potential future TC ranges for copper concentrate



Treatment charges are likely to become bi-furcated with costs for clean concentrate on the lower side, and complex concentrate on the higher side. Producers of clean concentrate may charge premiums to traders and blending agents, while complex concentrate suppliers are likely to have to offer discounts – which could split the market in two.

To deal with the additional volume of complex concentrate, more treatment capacity will be required globally, but this will come with trade-offs between capex and opex as well as environmental concerns. Currently, the most environmentally friendly treatment is hydrometallurgy, and investment may flow into the technological development of these treatment facilities, as well as the management of waste from roasters and smelters.

In addition, after the recent high-profile tailings dam failures in Brazil, any arsenic rich tailings dams will fall under additional scrutiny. Events such as leaks at the Potrerillos smelter, and reports that Polish smelter arsenic emissions are more than ten times the legal limit, are adding to the environmental hazard. Industry will remember the failure of the Los Frailes tailings dam in 1998, an event that released an estimated 9,000 tonnes of arsenic into the environment.

Arsenic looks likely to become an ever larger concern for producers in the future, and high arsenic miners and processors would do well to invest in treatment and storage capacity now, or risk being at a competitive disadvantage in the near future.

For more information on MineSpans go to www.mckinsey.com/solutions/minespans/overview or email us at minespans@mckinsey.com

SOURCES: MineSpans by McKinsey; ICSG

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