

CLEAN CARS, HIDDEN TOLL

“It’s not just regular getting old. Because I’m not that old.”

Lekgetho Mosimaneotsile, 64, below, of the village of Ga-Mopedi, worked at an Assmang mine for 27 years, many of them spent blowing manganese dust out of storerooms. He said he started experiencing chest pains and forgetting things while still working in the mine.



“How long is it going to take until people start realizing what is happening? Another 30 or 40 years? Must we wait until people start dying?”

Dirk Jooste, 65, below, worked as an electrician blowing manganese dust out of broken truck air conditioners at the Mamatwan mine near Hotazel in South Africa’s Northern Cape. In the vast landscape of the Kalahari Basin, left, manganese mining operations have expanded as demand for the ore grows.



SOUTH AFRICA FROM A1

demand for manganese has quintupled over the past five years, and analysts predict it could increase a further ninefold by 2030.

For years, however, manganese has taken a toll on the health of those who mine and process it, according to scientific research that shows that high-level exposure can be toxic, causing a spectrum of neurological harm. In South Africa, home to the world’s biggest manganese reserves, interviews with dozens of current and former employees in mines and smelters, as well as with doctors and researchers, underscore the peril.

Amid the new global fervor for manganese, however, the industry has shown little consideration of these occupational risks, according to analysts who focus on the energy transition.

The shift to EVs already figures prominently in the global battle against climate change, and that transition is stoking demand for a wide range of minerals used in manufacturing them, such as manganese, cobalt, lithium and nickel. To run, EVs typically require six times the mineral input of conventional vehicles, as measured by weight, excluding steel and aluminum.

But there remains little recognition of the harm that the extraction and processing of such minerals could have on workers and surrounding communities.

Current and retired manganese miners in the remote Kalahari Desert said their memories have declined after years of working in the mines, while former smelter workers found themselves unable to walk a straight line. One recent study found that 26 percent of manganese miners studied in Hotazel, the Northern Cape mining town where Jooste worked, exhibited symptoms similar to those of Parkinson’s disease. Many current and former miners said they were never warned about the potential dangers of exposure. Former miners and smelter workers who raised concerns said they were ignored.

Analysts who closely follow the EV industry note that there has been little discussion among automakers and their suppliers about the potential health hazards, adding that the companies are mostly concerned about whether there is enough high-purity manganese — which is specifically required for EV batteries — to meet demand. Tesla, Ford and Chevrolet, which sold the most-popular EVs in the United States last year, did not

For S. African miners, lasting health effects



respond to requests for comment.

Aloys d’Harambure, executive director of the International Manganese Institute, which represents the manganese industry, agreed that excess exposure to the mineral can lead to irreversible neurological damage that is associated with the disease known as manganism. But, he added, “thanks to current technologies and labor regulations, as well as measures on safety matters, manganism is rarely seen today.” He said the use of manganese in EV batteries is still such a small part of the overall market — the vast majority of manganese goes toward steel — that “we have not yet seen any increased discussion or additional research on the topic of potential health impacts of high-purity manganese.”

The issue is especially urgent in South Africa, which has seen its production of manganese increase by more than one-third since 2017 and, as the world’s largest producer, now accounts for about 36 percent of the global total, followed by Gabon and Australia.

South32 and Assmang, two major manganese mining companies in South Africa, said their risk-mitigation strategies are informed by research on the poten-

tial health effects of exposure to manganese dust.

Doctors and medical researchers agree that protecting human health will take greater recognition of the threat and more vigilance than in the past, including rigorous monitoring, protective gear and proactive medical surveillance programs.

Jooste, for one, has little confidence. Sitting in his doctor’s office, Jooste, now 65, said he fears that South Africa is repeating its ugly history with asbestos mining, which continued for years after the health risks to workers and nearby communities were known.

“How long is it going to take until people start realizing what is happening?” Jooste said of manganese, his voice rising in irritation. “Another 30 or 40 years? Must we wait until people start dying?”

A long history and a ‘new frontier’

As far back as 1837, a Scottish physician, John Couper, detailed the suffering of workers exposed to manganese at a bleach factory outside Glasgow. He reported men staggering after losing strength in their legs and struggling to speak clearly, their face muscles paralyzed.

As more studies were done on

the condition that became known as manganism, researchers recorded other symptoms, including tremors and emotional instability, sometimes termed “manganese madness.” They determined that manganese poisoning occurs when the substance is inhaled or ingested, gets into the bloodstream and is deposited in the basal ganglia, the part of the brain that controls movement and balance.

Thanks to improvements in workplace conditions in recent decades, full-blown manganism is now rare, researchers say. What is more common, they say, are subtle symptoms including slowness of movement, stiffness in joints, irritability and forgetfulness, all of which can be difficult to diagnose. Tomás R. Guilarte, a professor of environmental health sciences at Florida International University, said that although the links between high manganese exposure and toxicity are clear, the genetics that make some people more vulnerable still need to be studied.

In Hotazel, a town surrounded by giant mines filled with dark gray manganese ore, neurologist Brad Racette examined 187 manganese miners, whose average age was 42. Racette, chair of neurology at the Barrow Neuro-

logical Institute in Arizona, found that a quarter of these miners experienced Parkinsonian symptoms, such as abnormally stiff and slow movement. His team, which conducted the study between 2010 and 2014, also found that these symptoms were associated with a lower quality of life, as reported by the workers in surveys.

“We’re still peeling the layers off this onion,” Racette said. “My question at this point is how low the [exposure] levels need to go before they are safe.”

Studies of workers at an Italian plant producing manganese alloys for steelmaking in the late 1990s also found that they exhibited unusual slowness of movement and loss of balance, said Roberto Lucchini, a professor of occupational and environmental health at Florida International University. Lucchini, who is still studying those workers, said that over the years they have developed relatively high levels of a type of plaque buildup in the brain that is often an indicator for Alzheimer’s disease.

He and other researchers said legal exposure levels remain far too high in much of the world, including South Africa. Studies in Italy, Taiwan, Bangladesh and Ohio have highlighted the potential danger even of exposures

below the legal limits.

Because EV batteries require high-purity manganese, Lucchini said, there is likely to be an even greater threat in refineries than in mines, where the dust is coarser and thus less likely to reach the brain directly.

“This,” Lucchini said, “is a new frontier.”

Difficulty handling a cup of coffee

After 10-hour workdays at the massive open-pit mine, Jooste said, he would return to his house and find his nose, teeth and even tongue covered in fine black dust. “It was all black,” said Jooste, who worked as a contractor blowing the dust out of broken truck air conditioners at the Mamatwan mine. “Everything.”

After that long-ago day when his supervisor asked if he had a hangover, Jooste headed to the clinic at the mine, which was then owned by the Australian mining giant BHP Billiton and later spun off with other operations under the corporate name South32. He said the doctor diagnosed him with Parkinson’s disease.

But Jooste, a tall man with a shock of gray hair, noticed that some of his symptoms weren’t identical to those associated with

ABOUT THIS SERIES

As the global demand for electric cars begins to outpace the demand for gas-powered cars, Washington Post reporters set out to investigate the unintended consequences of a global EV boom. This series explores the impact of securing the minerals needed to build and power electric vehicles on local communities, workers and the environment.

Parkinson’s. When another doctor prescribed medication for Parkinson’s, it didn’t work.

Eventually, Jooste landed in the office of Yidu van der Merwe, an occupational health doctor in the nearby mining town of Kathu. Earlier in his career, van der Merwe had presciently warned about hazardous conditions at a manganese smelting plant, where a spate of suspected manganism cases were later reported. He knew that Jooste’s job at the mine had entailed high exposure — he’d worn only a thin mask — and recognized that his symptoms mirrored many in the medical literature. He diagnosed Jooste with manganism.

More than a decade later, Jooste’s hand-eye coordination has become so bad that he has trouble handling his wife a cup of coffee without spilling it. “This is no life,” said Jooste, whose case was first reported last year by Carle Blanche, an investigative outlet in South Africa.

A spokesman for South32 declined to comment on individual cases but said in a statement that the company takes “proactive steps to reduce the risk by applying controls in line with international best practice,” including the use of protective equipment for certain work groups, dust-suppression systems and ventila-

tion in underground mines. The spokesman said that if workers display “any symptoms of occupational illness, we take it very seriously,” and that after screening, they would be sent for medical evaluation.

While science is clear about the potential peril posed by manganese, the extent of the harm being done to workers in South Africa remains less certain, in part because there is so little monitoring and so little research. Jaco Cilliers, a neurologist in Bloemfontein, said that screening for manganese poisoning is rare and that when he meets with his medical colleagues, it is “not something that gets talked about.”

Evert Bohnen, a doctor whose firm is on contract with the companies to run health clinics at five manganese mines in the Northern Cape, said he’s had no suspected manganese poisoning cases over 15 years. The majority of cases he’s heard about, he said, come from smelters, which primarily process manganese for steelmaking.

In towns near the mines, many other doctors declined to talk to reporters about manganese. A doctor at Assmang Black Rock mine hung up when a reporter said why she was calling. Four suppression systems and ventila-

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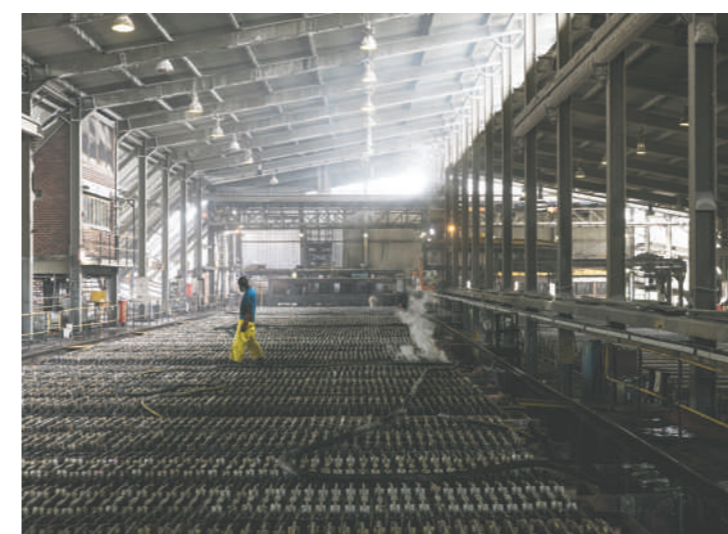
Ore that is used to produce high-purity manganese metal waits to be washed before processing begins at the Manganese Metal Co.



Manganese ore from the Kalahari is dissolved in huge vats of sulfate solution at the MMC refinery in Mbombela.



The purple sulfate solution used to dissolve manganese ore at the MMC refinery; the process is used there instead of smelting.



Men work at the MMC refinery, where executives say they take steps to try to reduce the risk of manganese poisoning.



Saichile Mashole, 28, shatters sheets of manganese metal at MMC, part of a multistep extraction process at the refinery.



Shards of manganese metal are washed. The shards will then be crushed and eventually shipped to MMC’s customers.