



# Electrification Upgrade

## ABB servomotor actuation system assists Australian melt shop

ABB

When Australian steelmaker InfraBuild needed two new circuit breakers to provide backup for its main electric arc furnace, ABB had the solution—its VD4-AF vacuum circuit breaker with an innovative servomotor actuation system that delivers more than five times the operations of a standard breaker, supporting greater reliability and safety as well as lower operational costs.

But because this high-performance equipment was based on electronic technology rather than the spring-actuated mechanism of InfraBuild's aged circuit breaker, the company was cautious.

"Even though it sounded great, we felt things could go wrong because there are a lot of electronics involved, compared to the old mechanical-linkage style of construction, and we needed to hear from others who had already applied the technology," said Jorge Aguilar, electrical project engineer at InfraBuild in Laverton, Victoria.

InfraBuild recycles, manufactures and distributes steel long products. They are a fully vertically integrated steel manufacturer spanning scrap metal recycling, steel manufacturing and downstream distribution. Steel products include reinforcing bar, reinforcing mesh, tubular and hollow sections, merchant bar and wire products. Internationally, the company owns and operates recycling centers in Poland, the United States and Hong Kong. In addition, they have global scrap metal traders working in India, South Africa, Netherlands, Spain and the UK. They also have a manufacturing facility in Dalian, China.

With a global installed base of more than two million units of the well-known ABB VD4 vacuum circuit breaker product family, ABB had no difficulty finding two similar

customers who were able to reassure the Australian steelmaker of the VD4-AF circuit breaker's performance. "We were pleased with their responses and experience with ABB's technology and felt reassured that they were very satisfied with the technology," said Aguilar.

InfraBuild proceeded with orders for two VD4-AF vacuum circuit breakers specifically designed for protecting steel furnaces. The circuit breaker is integrated with the air-insulated single panel UniGear ZS3.2 switchgear, which fits within the footprint of the original equipment.

"Power reliability for this panel was critical," says Henry Lin, project manager for electrification service at ABB Australia.

VD4-AF is based on servomotor actuators that increase circuit breaker performance up to 10 times compared to standard solutions and reduce operational costs up to 50 percent by ensuring zero downtime for breaker overhaul.

### **Advanced circuit breaker technology engineered for power reliability and uptime**

ABB developed the VD4-AF circuit breaker specifically to provide a high-quality, reliable solution for electric arc furnaces. It can provide up to 150,000 mechanical operations, including switching the furnace on and off, without refurbishment, and offers rapid replacement with a roll-in and roll-out solution when overhaul is required.

InfraBuild recycles scrap metal to produce steel "long products" such as reinforcing bar, merchant bar and rod for mesh. Aguilar describes the electricity-powered arc furnace as being "like a giant welder that creates a lot of heat and melts the steel". With this sustainable

process—the circular economy in steel, and the potential to be powered entirely by renewable energy, compared to coal-fired and catalyzed steel production—it supplies a variety of industries, from civil and commercial construction to residential and rural sectors.

At InfraBuild’s Laverton “melt shop”, scrap metals are loaded into the furnace for melting, and molten steel is poured into a ladle which moves it on for further processing. “The full cycle takes 40 minutes,” explained Aguilar. “On either side of melting, power to the furnace has to be stopped.” The melt shop operates 24/6, allowing one day for what he calls “housekeeping.” Continuous, dependable operation of the circuit breaker, a sophisticated, designed-for-safety, remotely operated device is essential.

Aguilar and his project team are responsible for capital projects at InfraBuild’s Laverton plant. In recent years these have included upgrades of the medium-voltage transformers supplying the melt shop and powering of a new electric arc furnace.

The circuit breaker was the final component of electrical infrastructure to be upgraded. Having carried out a significant number of operations, its risk of unreliability was growing and its age meant it became increasingly difficult to repair as spare parts were no longer available. “We got to the point where even our spare just couldn’t be replaced if it showed signs of approaching failure,” said Aguilar.

## Circuit breaker technology

ABB’s medium voltage vacuum circuit breakers for primary distribution—as well as secondary distribution—protect the evolving grid by safely interrupting the power flow when a grid anomaly happens and then re-establishing it once it is fixed. Grid anomalies can be caused by over currents—the overload through lightning or malfunctioning electric equipment or a short circuit in the system. ABB’s medium voltage vacuum circuit breakers are key components, in a medium-voltage switchgear, to ensure continuous and safe power flow to industrial, commercial, and residential users.

ABB’s circuit breakers have been a market benchmark for over 35 years. ABB’s vacuum interrupters, within the circuit breakers, are embedded in poles for protection against humidity, shocks and dust. ABB’s circuit breakers are available for original equipment manufacturers (OEM), panel builders and engineering, procurement and construction (EPCs) partners to incorporate in their own installations or for use in repair, retrofit and upgrade projects.

ABB supports customers and partners in staying ahead of increasing electrification needs, technology, and regulatory changes, providing the power to adapt to a rapidly evolving energy landscape.

The main purpose of a protection and control relay is to recognize any abnormal power system conditions or

*The switch to the ABB VD4-AF circuit breaker has the potential to increase power to the furnace and increase efficiency.*



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abnormally operating system components. Grid anomalies can be caused by over currents—the overload through lightning or malfunctioning electric equipment or a short circuit in the system. Based on the information gathered, the protection and control relay will initiate corrective actions that return the power distribution system to its normal operating state providing a safe environment for personnel and equipment.

Selecting the right protection and control functions and methods, that meet local legislation, safety requirements and engineering practice, improves the performance and the reliability of the power protection system, thus minimizing the effects of network faults and preventing the disturbance from spreading to healthy parts of the network.

### **An underlying, future-proofing bonus**

The need for increased reliability drove this upgrade project. “Just knowing that we’ve got something that will run for another 10 or 20 years and with greatly reduced maintenance requirements,” said Aguilar, “are the greatest outcomes of the system which has now been operating since early 2022.” But there are additional benefits to the VD4 technology and its 2,500 amp rating compared to the previous circuit breakers’ 2,000 amps.

“The potential is for the circuit breaker to increase power to the furnace, reducing melt shop cycles from 40 minutes to a *hypothetical 35 minutes*,” said Aguilar. “So, you could maybe save five minutes on each cycle, which gives you greater productivity.”

Lin said, “Whenever any upgrades have been carried out at InfraBuild, there has been an element of ‘future proofing’ involved. In this case it allows for a higher power input to the electric arc furnace if needed in future.”

“This project demonstrates how ABB Electrification Service combines deep expertise in complex upgrades, extensions and retrofits with cutting-edge technology like the VD4-AF circuit breaker, delivering major gains in efficiency and reliability, and ensuring InfraBuild’s melt shop is ready for the future.”

Despite having to crane the new 1.9-tonne panel through the roof of the facility to position it in the switchgear room which is at four-story level, and almost five days of painstaking connection work, Aguilar and his team received well-earned recognition when the circuit breaker fired up the furnace. “It’s always great to see the result of a project, when it’s in place and working!” he concluded.

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