

Case Study



Remote Racking Solution Mitigates Arc Flash Hazards At Cascade Steel

“With the threat of an arc flash incident at circuit breakers, distance is your best friend. That’s why our steel mill decided to evaluate the latest offerings in remote racking technology. We wanted a system that was quick and easy to deploy. Otherwise, we’d be wasting our money on a piece of equipment our electricians won’t use.”

- Tim Burttram, Plant Electrical Engineer, Cascade Steel Rolling Mills, Inc.

Background

Founded in 1968, Cascade Steel Rolling Mills is a state-of-the-art steel manufacturing facility that takes recycled metal and turns it into high quality finished steel products. Located in McMinnville, Oregon, the company’s electric arc furnace (EAF) mini-mill produces a wide range of hot-rolled products such as reinforcing bar (rebar), coiled reinforcing bar, wire rod, merchant bar and other specialty products.

Cascade’s steel manufacturing process begins in the melt shop with the melting of scrap metal in an electric arc furnace. The molten steel is then sent to the refining furnace, where adjustments to composition and temperature are made to produce a specific grade of steel. Finally, molten steel is cast into long bars called billets in a continuous billet caster.



Cascade Steel Rolling Mills, McMinnville, Oregon

Like other industrial operations, Cascade Steel is faced with safeguarding its workers, plant assets and the environment. Any company that generates, transmits, distributes, or uses electricity at high, medium, or even low voltages has an obligation to protect its personnel from hazards such as arc flash, which may occur in switchgear equipment.

Each year, thousands of electrical arc flash victims suffer serious injury or death. Aging equipment, inadequate preventative maintenance and human error all contribute to safety incidents.

Challenges

Arc flash hazard mitigation is at the top of every plant’s electrical-system-safety list. Employers must ensure their electrical-system workers go home at night by understanding arc flash risks and the latest technologies designed to minimize them.

The simple act of manually racking a circuit breaker, with an operator positioned in front of the device, creates an arc flash hazard. Parts break or don’t line up. Equipment malfunctions. Even with the best personal protective equipment (PPE) made, workers are still going to get hurt in some way if things go badly. At the Cascade Steel facility, plant personnel recognize the NFPA70E standard as the basis for their electrical safety program. To work on electrical apparatus with elevated energy levels, electricians must de-energize upstream equipment to avoid the potential for an arc flash. This means opening and closing circuit breakers, and eliminating power to various areas of the melt shop or rolling mill — a potentially dangerous situation for both people and plant assets.



NFPA70E is the basis for Cascade Steel's electrical safety program

Solution

History has shown there is no better protection against the deadly possibilities of an arc flash incident than a safe working distance between the operator and the switchgear. This approach has clear advantages over flash suits designed only to decrease exposure to burns, and also minimizes the risks posed by airborne projectiles often associated with arc blast fatalities.

To reduce hazards to employees, many industrial organizations are installing remote circuit breaker racking systems, which allow operators to safely rack breakers from a remote location.

A remote racking system offers a safe alternative to manually racking circuit breakers and reduces the requirement for service personnel to wear a full-body arc flash hazard suit for protection. These systems permit the insertion and removal of electrical devices while the operator is outside the flash protection boundary. They are specifically designed to remove operators from close proximity to the breaker being racked.

Recognizing the benefits of remote racking for arc flash remediation, Cascade Steel evaluated the latest racking technologies on the market. The company decided upon the Safe-T-Rack[®] (STR[®]) system from Remote Solutions LLC. This system is specifically designed to provide users of low- and medium-voltage circuit breakers a comprehensive alternative to arc flash protection garments. The STR[®] places a protective barrier of up to 150 feet between the operator and the energized breaker.

The compact and lightweight STR[®] contrasts with alternative "land-based" systems, which are either moved to the breaker location on a cart or affixed to a large base with a motor-driven mast. Many users find these systems cumbersome, since they typically weigh hundreds of pounds and are not very portable. The operator must properly finesse the device to the face of the

work on the circuit breaker compartment, register the X/Y/Z coordinates relative to the racking points, and then secure the tool. This procedure can take up to 20 minutes per breaker and also introduces human performance concerns. Tool alignment problems can result in physical damage to the circuit breaker, rendering it un-serviceable.

According to Tim Burttram, plant electrical engineer for Cascade Steel, the simplicity and easy of use of the Safe-T-Rack[®] solution was an important advantage over other remote racking techniques. "After an initial evaluation, all of the electricians at our mill really liked the STR[®] system," Burttram said. "It's very fool-proof and straight-forward. Everything is keyed and color-coded, so you don't have alignment issues at the breaker. Once you put the bracket on it, you're done with the alignment."

He added, "After seeing how well STR[®] worked, I got capital money approved to purchase the system and we've installed it on every rackable breaker regardless of voltage level that we have here in the plant. We are now working on getting remote racking for three 480-volt, molded-case SPB rackable breakers."

With the unique STR[®] tool alignment philosophy, the operator uses the switchgear as a reference, aligning the device only once in just a matter of seconds. The unit is delivered with the exact racking point coordinates for a given circuit breaker design, and then affixed to the breaker compartment door to allow all racking tool pieces to be quickly loaded or mounted. The racking point coordinates are fixed so that any time the user mounts dry brackets, for example, the center point for the tool is perfectly aligned for insertion directly at the racking screw. "Human factor" engineering is also employed to establish a "chain of rejection" to minimize human error. These innovative features enable technicians to consistently handle racking applications on multiple breakers of various configurations.



Safe-T-Rack[®] system from Remote Solutions, LLC

The STR's® color touch screen Human-Machine Interface (HMI) with true "closed-door" racking capability is also unique in industry. Redundant digital drives with battery backup provide fail-safe racking in the event of a power failure. Real-time breaker travel indication and user controls include an emergency stop at any time during racking, manual start/stop, and automatic retrieval and recovery of a circuit breaker. The unit has a torque limiter for different manufacturers' breakers; it counts the number of turns as well as displaying real-time travel position. Different transmissions are offered for the different breaker types/frames. The system properly stimulates all OEM breaker interlock systems and automatically operates and monitors positive interlock.

In addition, the STR's® patented LimiTilt® (tilt angle monitoring) tracks the pitch and roll of the breaker during racking to minimize potential equipment damage. Should the device detect an out-of-level situation, it will stop the racking process. The system also provides over-torque protection for the racking motor should the shutters not open, or if the breaker becomes bound in the racking process.

Burttram commented, "With manual racking, a breaker will get racked to a different position every time a different person does it. But with the STR® system you go to the same place every time without fear of over-torquing. And you don't have to wonder if the breaker is fully seated on the bus. It's just a more consistent process and, in my opinion, I think it will extend the life of our switchgear."

For More Information

To learn more about the STR® system, please visit our website www.safe-t-rack.com or contact your local representative.

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Benefits

The STR® system is characterized by its portability (easily operated with switchgear elevated off of the ground), flexibility (designed to rack out many different manufacturers' breakers) and usability (includes fail-safe mechanisms to keep personnel from misapplying the device to the wrong breaker).

Remote Solutions' approach in developing the STR® as a modular tool system is unique in the marketplace. Unlike "one-size-fits-all" solutions, the user purchases common, portable elements such as the drive motor and then adds specific attachments and software to address particular racking parameters such as torque and breaker travel. The switchgear-based racking apparatus is designed to mount either on the breaker itself, or on the breaker compartment door so it can be registered correctly to the racking points. This means each STR® tool is complimentary to a given application, as well as the requirements to rack the breaker properly by its original design. Installation of the temporary attachment apparatus is also quick and easy; Remote Solutions works with customers to validate and commission the system and provide hands-on training for site personnel.

Burttram noted the value of STR® engineering: "If you go out and make a big investment in a cart-based racking device and it sits in the corner and nobody uses it, you've wasted money and not accomplished your objective of getting people out of the danger zone."

He concluded, "During a recent scheduled outage, we performed some power distribution work that required racking a number of circuit breakers. One of our electricians said to me, 'I don't want to manually rack any breaker because we've got a system that works very well and that's what I want to use.' When I heard that, I realized our guys really have bought into Safe-T-Rack® and they refuse to rack a breaker without it."

