



Mines Safety Significant Incident Report No. 191

Serious high voltage (HV) arc flash incident results in equipment damage

Summary of incident

A worker was performing a process (not electrical) isolation associated with routine maintenance for a pump. On switching the high voltage (HV) 3.3 kV isolator, a large arc flash and blast occurred, forcing the switchgear control cabinet door partially open. The switchgear equipment was damaged and there was the potential for serious injury to the worker. Fortunately, the worker was wearing category 4 arc blast-rated personnel protective equipment, including hearing protection, and was physically unharmed.

The main isolating switch was upstream of a fused contactor for an associated variable speed drive, which had an active front end for ongoing correction of harmonic distortion. This meant that although the pump was not running, the variable speed drive still delivered reactive power back into the site power system. The active front end had recently been added to the installation but operational instructions were not updated to reflect this retrofit.

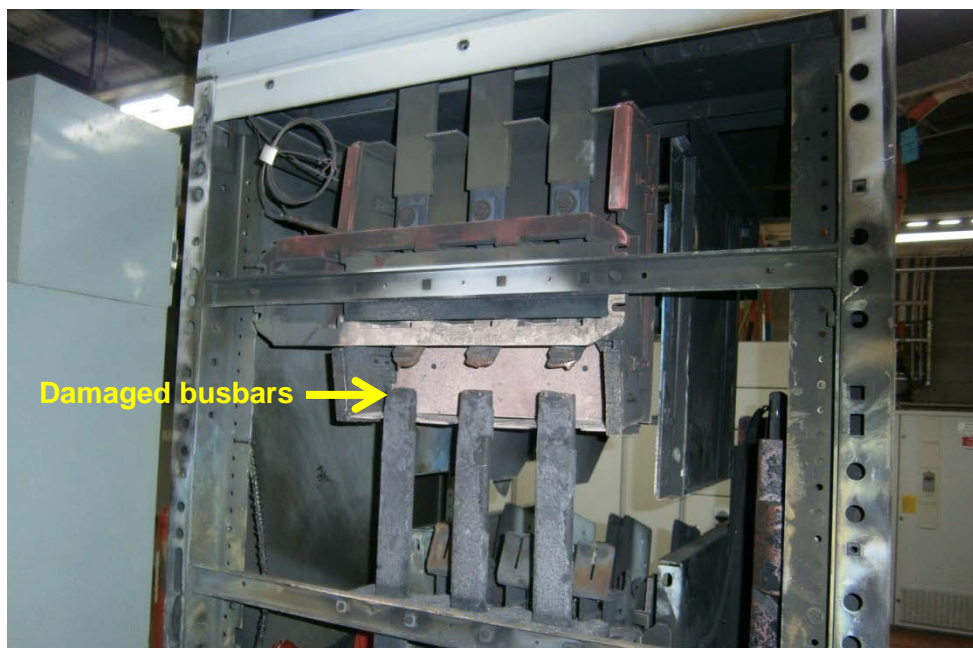


Figure 1 Photograph of the switchgear cabinet (front and rear panels removed) showing damage from the arc blast. Note the condition of the busbars (i.e. gap)

Probable causes

Direct:

- The main isolating switch was designed to be operated once the contactor for the variable speed drive had opened but the isolation was performed with the contactor still closed, while reactive current was still flowing.
- The main isolating switch could not break the highly reactive current flow as it had not been designed to do so.

Indirect:

- A mechanical interlock between the contactor and isolator failed, allowing the isolator to be operated while the contactor was still engaged.
- The switchgear cabinet did not contain the arc blast.
- The switching procedure did not take into account the design and operation requirements for this type of drive.

Actions required

Electrical safety awareness is particularly important for tasks involving HV equipment. Relevant safety measures must be known, understood and applied appropriately by all. To achieve this:

- incorporate design, operation and maintenance information developed at the time of installation into operational instructions
- develop the operational instructions by consultation between design, site engineering and operations personnel
- record installation design drawings and operation and maintenance manuals
- develop, implement and maintain competency-based training systems so that workers are aware of the critical tasks involved with HV equipment.

Any change to an existing installation, such as the addition of power factor correction in this incident, must be:

- reflected in the design drawings and operation and maintenance manuals
- communicated to relevant personnel.

Note: Under regulations 5.10 and 5.11 of the Mines Safety and Inspection Regulations 1995, the statutory electrical supervisor is responsible for ensuring that electrical equipment and installations are maintained in a safe working condition. For very large sites, this may require the appointment of a senior electrical supervisor, commonly known as an electrical engineering superintendent.



Simon Ridge

STATE MINING ENGINEER

22 November 2013