ELECTRICAL ISSUES IN MINING

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Introduction

Going to talk about three electrical issues in mining which have harmed, or had the potential to harm.

- counterfeiting/substandard equipment
- variable speed drive risks
- arc flash risks
Asset lifecycle is in 4 stages:

- specification of plant and equipment and its **Procurement**
- initial integrity and its **Commissioning**
- through life integrity and its **Maintenance**
- end of life or extension to life and its **Decommissioning**
Counterfeiting/Substandard

A growing problem ????
Fake caplamps for use in potentially explosive atmospheres

Front view of KL2.5LM (B) & HL

Rear view of KL2.5LM (B)

Rear view of KL2.5LM (B) HL

CE Marked, marked as suitable for mines and label shows ATEX certificate detail and number of a UK notified body
Atex assessment certificate
Certificate detail

• SIRA assessment for lamp types
  KL2.5LM(A), KL2LM(A), KL1.4LM(A),
  KL1.4LM(B) and KL1.4LM(C)

• Faked certificate
  –KL2.5LM(A) ✓ KL1.4LM(A) ✓
  –KL2LM(A) HL ×
  –KL2.5LM(B) ×
  –KL2.5LM(B) HL ×
The tip of the iceberg?
Variable speed drives

Benefits

• Eliminate fluid couplings/fire risks
• Soft start
• Energy saving
• Reduced wear and tear
Variable speed drives

Problems

• reduced motor speed can lead to overheating insulation failure and fire from ineffective cooling
• issues with bearings
• raised potentials/electric shock risks
• harmonics/insulation failures
Basic Invertor
Basic Inverter

- Basic Inverter Diagram
- Filter
- Rectified AC
- DC Bus
- NER
- Rectified Voltage
- Current
- Peak DC Bus
- Higher impedance return path
- Low impedance high frequency return path
Basic Invertor

Filter

Rectified AC

DC Bus

NER

Higher impedance return path

Low impedance high frequency return path
Arc flash

Arc Flash what it is

• where can it be present
• how can it be determined
• how to control the risks
Arc Flash is the result of a rapid release of energy due to an arcing fault between a phase bus bar and another phase bus bar, neutral or earth. During an arc fault the air is the conductor...
Arc Flash – Slow Motion

- https://www.youtube.com/watch?v=P35HRYHHz7c
Arc Flash - when is it present?

Arcs are produced when load bearing contacts are opened or closed, when any live phases are shorted together and when any live phase is connected to earth or neutral – so why don’t they produce effects like those just seen.

Due to the level of energy available – systems where the energy isn't enough, or there is some form of current limitation – known as the fault level.
Arc flash calculations

Establish energy levels – many free software tools are available, input elements include

- available energy based on supply
- fault clearance from protections
- working distance (Proximity to fault)

= answers in XX cal/cm²
Determining the energy available

- energy exposure to a worker in calories per square centimeter.
- risk high enough - then consider alternatives
- Arc-rated flame resistant clothing and other PPE shall be used by the worker based upon the incident energy exposure
- overregging may not be appropriate
Controlling risks - hierarchy

- Eliminate
- Substitute
- Reduce inventory
- Engineering controls
- PPE
Arrangements

- determine where Arc Flash potential exists
- post notices to warn of dangers
- inform, instruct and check competencies for all who operate equipment
- eliminate switching live wherever possible if arc flash risk is present
- new equipment specify Arc Flash protection built in
- last resort use PPE
Summary

Areas covered

• Counterfeiting/substandard
• Variable Speed Drives/benefits and concerns
• Arc flash hazards

The link to all these issues - Failure of asset integrity arrangements.

Have you got it adequately covered?
Questions?

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