NSW DEPARTMENT OF
PRIMARY INDUSTRIES

SAFETY ALERT

Longwall staple failures

INCIDENT

There have been a number of recent incidents of failed staple lock fittings with respect to hydraulic connectors on longwall equipment.

CIRCUMSTANCES

Personnel have been sprayed with fluid under pressure when staple lock fittings have failed or migrated out of the fitting due to a variety of failure modes. Fluid injection injury and other injuries (such as bruising and abrasions) have resulted from these failures.

INVESTIGATION

Visual audits of the longwall equipment have failed to identify any broken staples. The investigation is continuing to determine the causal factors in the incidents. General staple failure modes include, but are not limited to;

- Broken staples
- Cracked staples
- Physical abuse of staples
- Fatigue exceeding service life of the staples
- Overload of staples, evidence by witness marks (i.e., the staple has been overloaded past its design yield loading which has weakened the staple)
- Mechanical overload from external sources being hit by debris or excessive bending moment
- Wear of staples
- Wrong specification for staple material and dimensions
- Poor quality control of staple manufacture
- Corrosion.

Staples falling/migrating out of position because of:

- Vibration
- Lack of retention
- Bending and twisting moments
- Staples not installed correctly (not locking into position)
- Wrong staple used in fittings
- Cyclic loading of staple.

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RECOMMENDATIONS

1. Audit staples in the high-risk areas on longwall equipment for damaged staples (outlined above in general failures). Also look for staples migrating out of position.
   Note: The cracked staple legs may not be visible in situ.
2. Staples should be correctly positioned and positively retained.
3. Replace a sample of the staples in the high-risk areas and have these staples inspected and tested for integrity. (Attempt to determine the staple life). This may require advice from suppliers and manufacturers in assisting to determine a wear rate for staples, given service life and location within a hydraulic system.
   High-risk areas may be:
   - Areas nominated by the operational risk assessment
   - High-duty cycle operations
   - Staples located around the walkways
   - High-pressure positive set applications
   - Areas where intensification is likely.
4. Periodically audit the face for staple condition and retention.
5. Appreciate that staples have a limited service life (undetermined). This same approach is to be used for hoses, fittings and all components.
6. Replace the staples when hoses and components are replaced (i.e., use the staples once).
7. Provide suitable levels of safety where the personnel usually operate. Consider a hard barrier (guard/cover) between the high-risk areas and where the personnel usually operate (both operators and maintenance personnel).
8. Provide suitable levels of safety for employees and contractors when performing maintenance.
9. Generally operate the equipment from a remote location to limit exposure (time and space between the employee and the hazard).
10. Consider a secondary means of retaining the staples (consult with the manufacturer to determine if they have alternate methods).
11. Identify the special staples in the circuit and ensure correct spares are available at the mine and that tradesmen are aware of the special staples (special staples could be the long staples that retain two or three hoses/ports or components).
12. Only use compatible staples and fittings. Do not mix and match different types and manufacturers' staples and fittings.

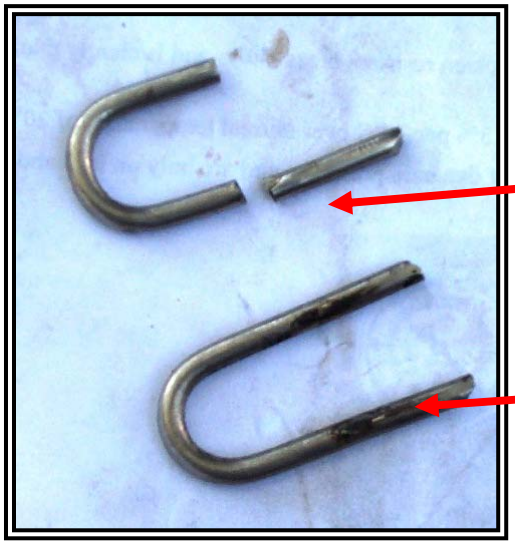
REMEMBER:-

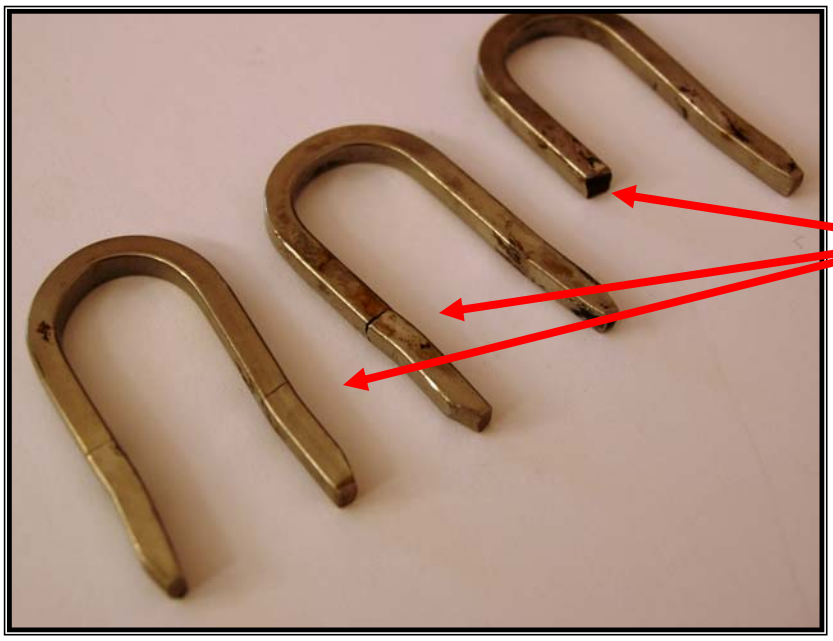
Treat all hydraulic components as having stored pressure (i.e., live and dangerous).

1. Always isolate the hydraulic supply and lock the isolation valve into the closed position (use danger tag if locks are not part of the mine's isolation procedure).

2. **Depressurise the hydraulic system**
3. Check that hydraulic pressure has been dissipated.
4. Check that hydraulic pressure has been dissipated by two independent means.
5. Confirm isolation and depressurisation have been successful (i.e., test for dead).

NOTE: Staples from different mines and suppliers





NOTE: Please ensure all relevant people in your organisation receive a copy of this Safety Alert, and are informed of its content and recommendations. This Safety Alert should be processed in a systematic manner through the mine's information and communication process. It should also be placed on the mine's notice board.

Signed

Rob Regan
DIRECTOR
MINE SAFETY OPERATIONS BRANCH
NSW DEPARTMENT OF PRIMARY INDUSTRIES

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