



SAFETY ALERT

Anti-friction washer ignites

INCIDENT

There have been two recent incidents of the ignition of an anti-friction washer during bolting operations. The two events resulted in a naked flame in the hazardous zone that persisted for several seconds before self-extinguishing.

CIRCUMSTANCES

Both incidents occurred when the anti-friction washer broke down at temperatures of about 340 degrees Celsius, generating vapours with an auto-ignition point of 380 degrees Celsius.

On one occasion the heat was generated by the use of an incorrect spanner that applied direct pressure to the anti-friction washer, the steel dome ball and the steel volcano plate. On the other occasion the angle of the bolt resulted in point loading on the washer and the plate, causing a rapid wearing of the washer and resultant steel/steel friction.

INVESTIGATION

The anti-friction washers in both cases were made of polyethylene. It was determined that sufficient heat to break the washer down and generate a vapour with an auto ignition point of 380 degrees could occur in many ways – over spinning, point loading and worn/incorrect spanners. The generation of temperatures in excess of 300 degrees could be reached in 10 – 20 seconds where steel/steel friction occurs.

The anti-friction washer plays an important role in the ground support plans of most mines. It enables a sizeable increase in tension to be achieved during the bolting process.

One supplier has determined that a teflon anti-friction washer will provide the required tension and lower risk of auto-ignition. This is achieved by having a much higher auto-ignition temperature – around the temperature required to ignite methane.



Photo: A partially melted washer (left) and an ignited washer (right).

RECOMMENDATIONS

Manufacturers:

1. Review the composition of the anti-friction washer to minimise the risk of auto-ignition.
2. Determine the optimum bolt make-up (including domes, plates, etc) to reduce the likelihood of high temperatures and failure of the anti-friction washer between non-mating surfaces.
3. Provide information to end users on the effects of changing the bolt make-up on potential temperatures when over-spinning occurs.
4. Provide information to end users on the pre-tension that can be achieved with and without anti-friction washers.

Mines:

1. Review all standard bolt assemblies in conjunction with the supplier to determine the appropriate assemblies for that mine to minimise the risk of heat generation by steel-on-steel friction.
2. Review the requirement for pre-tension of bolts under the mine's strata failure management system and ensure that it is attained with the lowest practical risk of auto-ignition.
3. Check that all spanners used in bolting are suitable for the task.

Note: The removal of the anti-friction washer without adequate assessment of the risks from the loss of pre-tension is inappropriate. It is expected that in many cases the benefits of pre-tension will point to the requirement for a change to an alternate anti-friction washer (eg teflon rather than polyethylene washer) with a lower auto-ignition risk.

Ensure all relevant people receive a copy of this Safety Alert, are informed of its content and recommendations and process it in a systematic manner. This Safety Alert should also be placed on the mine's notice board.

Signed

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