Innovation – SAFE STOP (Anti Jam Door Unit)

Redpath Australia Pty Limited

The Problem or Initiative

The interface of underground mobile equipment and operators continues to be a significant risk in the mining industry. A particular concern to Redpath has been the risks associated with operators accessing and egressing heavy mobile equipment operator cabins. There are a number of hazards accociated with this routine task which have been the mechanism of many incidents over the years. Of specific concern to Redpath has been the debilating incident of an operator jamming his or her hands and fingers in the door jam area of a piece of underground heavy mobile equipment. In recent years, this mechanism of injury has resulted in a number of disabling injuries and countless near miss incidents. The outcome of such an incident has resulted in major ramifications and life long diabilities to operators.

In a typical working shift a mobile equipment operator can open and close a cabin door up to 15 - 20 times increasing the potential for an incident to occur. Mobile equipment parked on steep angles and gradients can also contribute to cabin doors closing prematurely without notice to the operator resulting in a potential for crush injuries to hand and fingers. A typical door can weigh up to 40 kg and unrestrained can close quickly with maximum force.

Picture 1: Potential Crush Zone in cabin door jam area when operator closing door from outside of cab

Picture 2: Potential Crush Zone in cabin door jam area when operator closing door from inside of cab

The Solution

The Redpath Engineering team were tasked with investigating options to mitigate or even eliminate the potential for future re-ocurence of these door jam type crush injuries. The solution needed to be robust enough to meet the challenges of a repetitive opening and closing action of a heavy equipment door and the harsh environmental condition of the underground mining environment. (mud, water, corrosion, etc.)

The intial concept came from a similar plastic product used for cupboards and doors to stop children having their fingers caught. After a number of designs and proto types the SAFE STOP Anti Jam Door Unit was commisioned for a trial on the fleet of Jacon spray rigs over a period of 3 months in the underground environment. The trial proved a success but also identified oppurtunities to improve the durability and service life of the mechanism. A further trial has now resulted in the SAFE STOP Anti Jam Door Unit being retro fitted across the Redpath fleet.

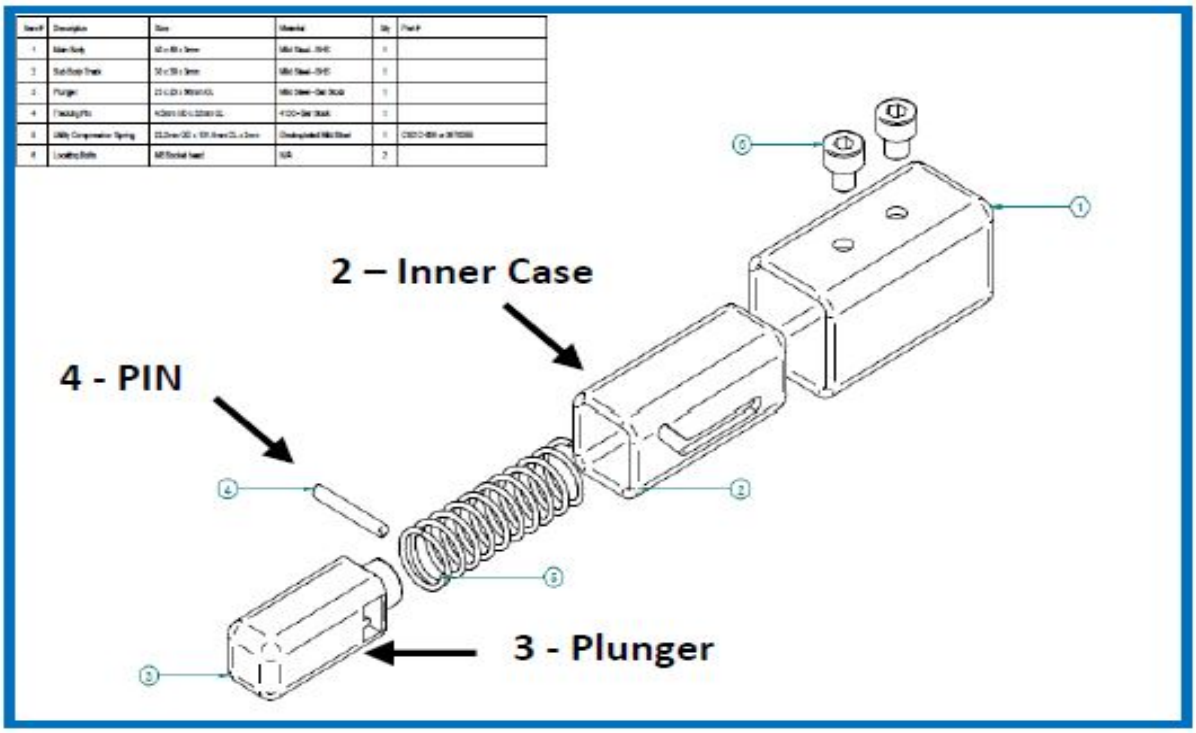
An additional challenge with the design was that the SAFE STOP Anti Jam Door Unit needed to be fitted to a variety of makes and models of a modern day underground mining equipment fleet without jeoperdising the structual integrity of a Rops/Fops designed and certified operators cabin.

Picture 3: Front on view of unit fitted to Spray Unit Cabin

Picture 4: Top view of fitted unit

Picture 5: Operators have a tendency to position hand on cabin pillar when exiting cabin, this creates a crush hazard when door self closes due to machine being positioned on an angle or gradient in underground Environment.

Picture 5: Drawing of SAFE STOP Anti Jam Door Unit



The SAFE STOP Anti Jam Door Unit consists of 6 parts all capable of being replaced as individual items as shown in Picture 4 above. The SAFE STOP Anti Jam Door Unit should be used in conjunction with a door strut where possible to prevent the habit of slamming the doors. If the strut fails, the SAFE STOP Anti Jam Door Unit unit will come in to play and prevent the cabin door from slamming completely closed.

Normal opertion

If the door is closed slowly then item 4 (Pin) will follow the contour of Item 2 (inner case) and move into the lower cut out of item 3 allowing item 3 (plunger) to fully retract into Item 2 (inner case) allowing the door to close fully.

Forced Opertions

If the door is slammed or closed at a fast rate (that could potentially create a crush zone situation in the door jam area) then the Pin item 4 will not be able to follow the contour of the inner case Item 2 and will **lock** into the upper cut out section of the plunger item 3 therefore not allowing the plunger to full retract into the inner case, this then prevents the door from closing fully (gap of 2 – 3 inches) and eliminates the potential for a crush zone situation should the opertor have his hand/fingers positioned in the door jam area of the cabin.

Obviously, the most appropriate control to prevent this type of injury is to eliminate the hazard by removing all doors, however this is not possible nor practical.

Benefits/Effects

The SAFE STOP Anti Jam Door Unit offers several benefits to the safety of employees and are as follows:

- Eliminates the potential for crush injuries to operators should they position there hands or fingers in the door jam area of the cabin whilst the door is intentionally or unintentially closed;
- Minimises damage to door mechanisms and broken windows from doors being slammed shut;
- Easliy fitted to most equipment cabins in approximately 2-3 hours;
- No requirement for any equipment cabin modifications, keeping the integrity of the cabins ROPS/FOPS certification.

Transferability

The SAFE STOP Anti Jam Door Unit has the capability of being retro fitted to all types of mobile equipement across the Redpath fleet. With minor modifications the design could also be transferable to many applications where there is a potential for crush zones to occur where doors, latches, manhole lids etc are utilised.

Innovation

The innovation came from the need to eliminate the potential for personnel being exposed to debilitating crush injuries from the simple task of opening or closing a heavy mobile equipment cabin door.

The Cost

The approximate cost to design and develop the unit was approximately $10,000. Cost per unit fitted = $850.