State of Alaska Epidemiology **Bulletin**

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Power Take-off Units and Mechanical Guards: A Simple Solution Could Prevent Injuries and Save Lives

A series of injuries involving vehicles equipped with power take-off units has raised concern about preventing these often fatal or disfiguring injuries. Power take-offs (PTOs) are components that transfer rotary motion from an engine drive line to another operation point (e.g., an engine powering the movable bed of a dump truck). Because of the high power transmitted from a large engine to a small, rapidly rotating shaft, tremendous forces are developed. Victims unintentionally caught in PTOs suffer terrible injuries or death. The three incidents described below illustrate the hazards of PTOs in Alaska.

Case 1: On January 9, 1990, a female worker died while dumping a load of snow at a designated municipal snow dump area in Anchorage. While shifting gears, the transmission of her truck jammed. She engaged the PTO and, while the dump bed was rising, left the truck to clear the jammed gears. She crawled under the vehicle and her hair and coverall hood were caught by the rotating PTO drive shaft. She died from severe neck injuries.

Case 2: On December 23, 1992, a male snow removal worker in Anchorage died in very similar circumstances. He was also attempting to clear jammed gears, when his hair and clothing became entangled in the PTO drive line. He died of asphyxiation due to chest compression.

Case 3: On January 2, 1995, a male worker in an isolated work site was seriously injured while working on a fuel pump truck; the pump unit was powered by a PTO. The worker attempted to repair a pump leak while the PTO was engaged. While adjusting the packing on the pump, the victim's coverall sleeve was caught by the PTO. He received multiple traumatic injuries, including multiple bone fractures and the complete loss of the biceps muscle of one arm.

These incidents have a number of common features:

1. They tend to occur in winter months when people wear bulky clothing.
2. Victims crawled under vehicles to make repairs or adjustments.
3. In each case the victim's clothing or hair was caught in the drive line.
4. PTO drive lines were not guarded with a cage or other mechanical device.

PTOs on farm equipment have been previously recognized as a serious hazard in other states; however, the potential danger of PTOs in the commercial trucking and construction industries has not been fully addressed in Alaska.

The occurrence of PTO injuries can be readily reduced by using equipment with hydraulic PTOs. This eliminates the drive shaft required by mechanical PTOs. In some cases, individuals must continue to operate older equipment with mechanical PTOs or newer equipment that still uses this design.

The following recommendations address ways to reduce PTO hazards related to vehicles with mechanical systems:

1. All unguarded PTOs should be retrofitted with solid mechanical barriers.
2. Safety regulations should be devised that require employers with equipment powered by mechanical PTOs to install a substantial barrier around the PTO drive shaft. Evidence indicates that these drive shafts are not "guarded by physical location." In fact, workers have tragically encountered these devices during routine work.
3. Workers should avoid contact with PTO drive shafts by not working on PTOs or in the vicinity of PTOs while they are operating. Workers should avoid wearing loose clothing or having unrestrained long hair whenever near rotating machinery.

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