

The History and Evolution of Track Machinery used for the purpose of Avalanche Clean up on the Alaska Railroad

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ABSTRACT: Avalanches pose unique challenges to transportation corridors in Alaska. The states distance from the contiguous lower 48, coupled with extreme weather conditions, constitutes an aggressive approach for both avalanche mitigation and clean up. With a high number of avalanches that cover the tracks each year, it is important that efficient and safe procedures are followed to reduce train delays and offer the best protection to employees. This paper will address the evolution of track machinery and practices for the use of clearing avalanches.

KEYWORDS: Avalanche cleanup, Snow Rotary, Alaska Railroad, Risk Reduction, Excavator, Bulldozers

1. **INTRODUCTION:** From the beginning of construction of the Alaska Railroad, to present day, avalanches have posed a significant challenge to men and equipment. This has caused delays in service and ultimately impacting the financial benefits to the company. The evolution of avalanche equipment on the Alaska Railroad has evolved into a safer and more efficient operation.

2. THE CONSTRUCTION YEARS

The actual construction of the Alaska Railroad started in 1904. Railroad construction began in Seward, and cut through the Kenai Peninsula, edged around Turnagain and Knik arms, and up to Fairbanks. The "Kenai Peninsula," extends the first 100 miles (160.9 km) of track starting at Seward to Anchorage, traverses through mountainous terrain with 3% grades and multiple avalanche paths along the railroad route. A maritime climate exists on the Kenai Peninsula, with average annual snowfalls of 15 meters (+) of snow, thus creating unique hardships and challenges for the men and equipment. Avalanches repeatedly halted work along the construction route. Colonel Fredrick Mears, the builder of the Alaska Railroad, understood, that avalanches would continue and could not be ignored. He estimated about 8000 linear feet of fortress type sheds, strong enough to withstand the shock of an unpredictable slide would have to be built.
(Fig. 1)



Figure 1: Actual construction of snow shed at mile 75.5, October 12th, 1919



Figure 2: Alaska Railroad snow shed 1920

3. THE ADVENT OF AVALANCHE CLEANUP

Snow Rotaries were often used in the early days for avalanche clean up. Rotaries augured into the avalanches, leaving slotted paths behind. Workers with shovels and picks often helped feed the snow to the rotaries, a particularly hazardous and a laborious job at best. Some of the hazards associated with using rotaries in slide paths were trees and rocks transported down from

the slopes above. The blades or paddles had the potential to be damaged during the clearing process. Another known risk was derailing the rotary while auguring into the slide path. Weight compression forces of the avalanche would often create an ice layer on top of the tracks, thus prohibiting movement of the rotary wheels. There was little room to get men and tools in position to re-rail such a large piece of equipment. Avalanche control measures were non-existent, leaving work crews vulnerable to post-avalanche releases.



Figure 3: Rotary snow blower working avalanche path 49



Figure 4: Rotary number 1. Alaska Central Railway

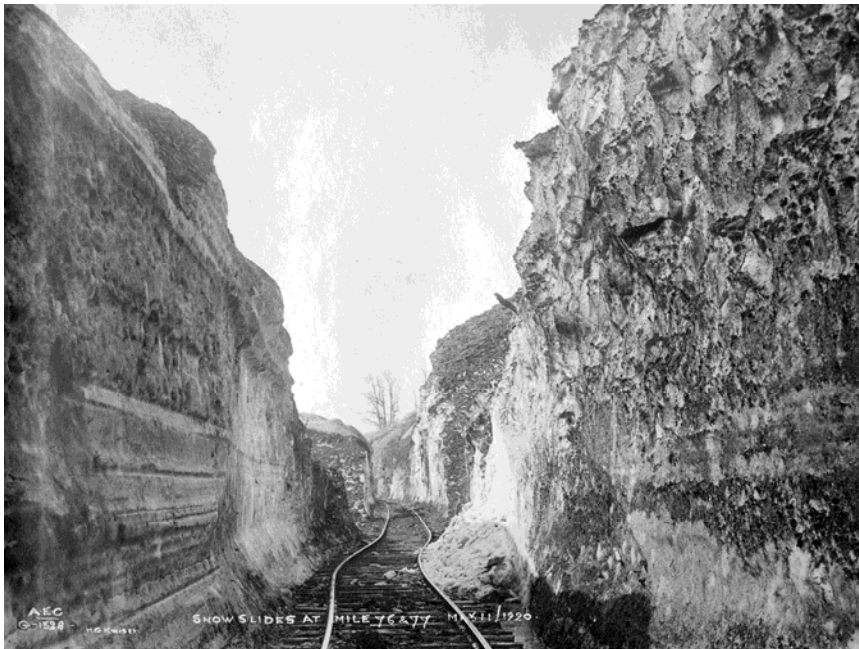


Figure 5: ‘Slotting’ through avalanche with Snow Rotary

4. THE GROWTH YEARS

Due to the high cost of maintaining the snow rotaries and the transformation from steam to diesel generated power, new options were available for avalanche and snow removal cleanup. Bulldozers were now the choice of equipment due to the flexibility from summer to winter operations, and the cost of maintenance was much lower. Bulldozers were now able “push” the avalanche debris away from the tracks and not leave an open cut behind. Some of the disadvantages were, open cabs, exposure to the elements, the bulldozer tracks were not wide and often got stuck in deep snow.

5. PRESENT DAY PRACTICES

Presently, the Alaska Railroad is using a mixture of equipment ranging from wide track bulldozers, to excavators (“diggers”) with a 5 yard (4.57 m) snow bucket and transported by a modern tracked equipment mover. The equipment mover makes it possible to bring the required large machinery to the remote avalanche areas, that are not accessible by roadways, in rapid time. Currently using the 345 excavator, coupled with the 5 yard (4.57 m) snow bucket, 20 + yards (18.28 + m) of snow can be removed per minute. This equates to over 1200 yards (1,097.3 m) per hour at the sustained rate. Back walls of the avalanche can be dug back to allow for any unusual high wide loads transported by rail, allowing for extra snow storage. Modern bulldozers work alongside the excavator in the avalanche cleanup process. Wide tracks on the D6 bulldozers offer better flotation on the snow and are not as apt to get stuck in loose dry snow. Another feature of the modern bulldozers is the ability for the operator to adjust the pushing blade angle inside of the cab for maximum advantage. The Alaska Railroad now uses a modern rail equipment mover for transporting equipment to the avalanche. The equipment mover can safely transport a 90,000 lb. (40,8233 kg) at speeds up to 25 m.p.h. (40.2336 km) on flat grade. The equipment mover can also climb a 3% grade with this same load but with less speed and the ability stop with air equipped brakes. For smaller slides and sloughs, a modified D6 bulldozer with “notched tracks” can position itself onto the running rails where the notched section of track overlap the rail and then follow the tracks to any trouble spot without having to get off the tracks. This system is valuable for getting over bridges and through tunnels.



Figure 6: Modern railroad equipment mover hauling a D6 wide pad cat



Figure 7: 345 Caterpillar excavator with 5 yard (4.57m) snow bucket

6. WHAT THE FUTURE MAY HOLD

With the rapid growth of technology, future developments may see remote avalanche clean up.

Removing the operator completely from the cab while operating the bulldozer or excavator from a safe distance. Currently the Alaska Railroad does not clean up avalanches at night. By using a remote operation for cleanup, this may become a reality in the future. Reducing the risk for the equipment operators is the number one safety goal.

7. CONCLUSION

Avalanches have been and will continue to be a detriment to rail operations on the Alaska Railroad. History has proven this. With the advent of modern machinery coupled with safe operating practices, minimal down time can be achieved so that freight can arrive at the appointed destination on time.

8. ACKNOWLEDGMENTS

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