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# Operation and Benefits of a Tailgate for Off Highway Rear Dump Trucks

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EARTH MOVING. Consider, gentlemen, those two words, EARTH MOVING, and take a moment to reflect on the impact of those words on the entire world. Realize and appreciate how the moving earth affects each of us individually. I have had a great difficulty beginning this paper, not in knowing what I wanted to say, because that subject is endless, and believe me, I have never had the reputation of being at a loss for words. The real problem has been with keeping myself from reminiscing, looking back on the chain of events that has developed this productive industry.

We have come so far since the two wheeled cart and, though you might not believe it, the cart was definitely before my day. Seriously, the most staggering thought is that the greatest technological progress in earth moving has been in the last four decades. Continued advancement is why we are here today, to look ahead and work toward greater efficiency.

In my reflections on this industry, I recognize the accomplishments of automotive engineers and the group of individuals you represent. I hope that each of you will take the time to reflect on your importance to the continued growth of the industry. I believe your progresses will be implemented by others and that we will always have a healthy interchange of ideas and beliefs.

The subject matter is the operation of tailgates installed on off-highway rear dump trucks. Rear gates on haulage trucks is not a new concept. However, the original idea, a hinged, swinging type of gate presented many operational problems to the user. The load would pile on top of the gate causing damage and the need for

maintenance; in dumping the gate would dig into the stock pile; nor was the gate suitable for hauling soupy materials. In an effort to keep the load in the box and work around the problematic tailgate, trucks were designed with a “scoop end”.

As early as the 50's, I had been advising companies in many sectors of the mining/construction industry of the feasibility and adaptability of an automatic, high clearance tailgate. In 1952, I installed automatic tailgates on a fleet of 20 ton Dart trucks hauling bauxite. From this early beginning, crude privately made automatic tailgates began to appear. Steel mills and contractors operating in the steel mills were the largest segment of the off-highway truck users group to capitalize on the automatic tailgate concept. In 1965, a steel mill contractor installed gates of their own manufacturer on all of their trucks operating at the Great Lakes Mill of the National Steel Co., in Detroit, Michigan. In 1967, another steel mill contractor installed similar gates on their fleet of off-highway trucks operating at Kaiser Steel in Fontana, California. Steel mills and their contractors were the ones to pursue this usage of the automatic tailgate concept since both highway vehicles and off-highway units had to operate in conjunction on the same steel mill roads and split haul road material was blamed for many needless tire repairs and accidents.

It was in 1970 that we refined the Automatic tailgate concept and developed it into a commercially marketable, usable product. But let us approach this discussion from three points. First we will consider the benefits and advantages of attaching a tailgate to off-highway rear dump trucks. Second, we will consider the

refinements of the Automatic tailgate; and thirdly, we will run a film depicting the automatic, high clearance type of gate in operation on a variety of trucks in many different applications.

The benefits and advantages of tailgates liken themselves to synchronized gears. One benefit leads to another, and then another and all benefits intermesh with each other. Perhaps the most obvious advantage is through closing the rear of the bed, the tailgate equips a truck to utilize the entire length and width of the bed. Since larger loads can be contained, production can increase 10 to 20 per cent. Without a tailgate the rear body corners will be void and material slope for the heaped capacity would begin at a point further away from the rear of the box. In practical terms, most quarrying and mining operations haul on an up grade of as much as 10%. Even the shift of the automatic transmission will jerk some of the load out the rear.

Spillage may also begin with the loading process. With an open dump bed only 75% of the body can be used effectively. Therefore, the loading bucket width often exceeds usable body length, so material falls off the back and sides. The spillage mollifies the effectiveness of a larger loader and multiplies loading area difficulties. The tailgate turns the entire bed into a loading target and loading is faster and easier.

In order to avoid rear end spillage, it is common to overload the front of the truck body. This poor load placement increases stress on front tires and hoist mechanism. Most off-highway rear dump trucks are designed to haul 1/3 of the weight on the front axle, and 2/3's on the rear. Through installation of the tailgate and full loading on the rear edge, a 1/3-2/3 weight distribution can be achieved. Better weight distribution enables each tire to support equal load, thus reducing the load on the front tires.

Better load distribution simplifies dumping. The load is counterbalanced behind the hinge pin, reducing hoist system pressure by 15 to 25 per cent depending on the truck model.

When you consider controlling spillage while hauling and in loading, and improved weight distribution, a significant advantage with tailgates is that they may reduce tire costs up to 40%. Everytime any tire runs over spilled rock,

it is susceptible to both internal and external damage.

By reducing spillage, the tailgate can also substantially reduce haul road maintenance. It takes time and equipment to clear haul road debris; time that could more profitably be spent in other areas of an operation.

Finally, a benefit not to be overlooked is fuel savings. Bullitt County Stone, Shepherdsville, Kentucky, foresaw the possibility of shortages because of a cut in diesel fuel. The following case study by this Kentucky firm demonstrates savings obtained with the installation of tailgates on their trucks.

They installed PHIL AUTOGATE Tailgates on two 35 ton trucks and subsequently saved 35 gallons of fuel daily – 8.750 gallons per year. Before tailgate installations they were using three 35 ton trucks each consuming approximately 45 gallons of #2 diesel fuel daily. These trucks due to the peculiarities of the operation were experiencing delays waiting to load in the pit and unload at the crusher.

With the tailgate installation one truck has been transferred to a new operation and the required production was maintained with no more waiting at the pit or crusher. The trucks are loaded at 35 to 40 ton which is a 7-9 ton increase. Total fuel usage of the two trucks is 50 gallons each of #2 diesel fuel daily which is a fuel savings of 26.4%. This is all done with an overall reduction in tire wear and the front tires are no longer running overloaded.

The second section of my paper elaborates on the operation of an automatic, high clearance tailgate. Recognizing the inherent problems with the hinged, swinging type of gate, I saw the need for a maintenance free tailgate with a large throat opening.

The automatic, high clearance tailgate, which we will now refer to as the AUTOGATE tailgate, to differentiate from the hinged, swinging type, is designed in four (4) major sub-assemblies.

The center rear plate, located across the rear is bolstered for strength, and is open at both sides. The left and right sidearms are pivoted to the sides of the truck body, with L shaped flanges that slide into the open sides of the center rear plate.

This feature of slide together construction allows the gate width to be varied up to twelve inches. Without a variable width there would be no way to compensate for body growth and the Autogate tailgate would freeze up on the truck body sides. This variable width makes it possible to adjust the Autogate tailgate for any truck it might be installed on, as well as compensating for future expansion or contraction of the body.

The fourth sub-assembly, the outrigger is attached to the truck frame and controls the gate in the dumping of the body. It is built well enough to steady a body in dumping, and in application has allowed a fully loaded body with a missing body hinge pin to be activated through the entire dumping cycle.

The Autogate tailgate operation is simple. As the body dumps, the gate automatically lifts toward the cab canopy, allowing an 80-95 degree, relative to the body, high clearance opening. There are no controls, locks, or cylinders to trip or malfunction. A high strength alloy chain is used to control the gate and hold it during dumping.

Because of this unique design, the Autogate tailgate is fast acting. By the time the load starts to move the Autogate tailgate has already cleared the body sides. Fast acting means high clearance and a unit that provides as much clearance as the Autogate tailgate can haul most size material effectively.



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