

Wheeled Tractors or Tracked Dozers Can Achieve Desirable Packing Densities In Horizontal Silos

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Table 1. Summary of samples collected from 168 bunker silos

Characteristic	Haycrop silage (87 silos)		Corn silage (81 silos)	
	Avg.	Range	Avg.	Range
Dry Matter, %	42	24-67	34	25-46
Wet density, lbs/ft ³	37	13-61	43	23-60
Dry density, lbs/ft ³	14.8	6.6-27.1	14.5	7.8-23.6
Avg. particle size, in.	0.46	0.27-1.23	0.43	0.28-0.68

Holmes, B.J., and R.E. Muck. Pack Silage to Achieve High Density, Quality Feed. Hoard's Dairyman, May 25, 2000

Pioneer forage experts have traditionally advocated the use of heavy wheeled tractors to get forage fully compressed to achieve an anaerobic, oxygen free environment for ideal fermentation. However agricultural engineers Dr. Brian Holmes from the University of Wisconsin (UW) and Dr. Jan Jofriet from the University of Guelph in Ontario, Canada agree that tracked

bulldozers can achieve these packing goals equally as well as wheeled packing equipment. They list three important factors in order of importance that should be followed for ideal packing of forages:

1. Silage should be applied in thin layers that are not in excess of six inches and then compacted before the next layer is applied. A New York Pioneer field study indicates that 45-60% of wheeled tractor weight transferred to forage is lost when more than 6 inches forage is packed at a time. The operator of the pack vehicle, just like in highway construction, is highly responsible for ideal forage compaction.
2. The next important factor is the overall weight of the compaction equipment. The packing tractor or dozer should be as heavy as possible to achieve high forage density. The following link provides a decision aid developed by Holmes and Muck from UW to help determine how much compaction equipment weight, based on silo dimensions and forage delivery rates is required for proper compaction:

http://www.uwex.edu/ces/crops/uwforage/bunkdensity_master1-13-02.xls. (You must have Excel to open this file.)

Tractor weight can be augmented by adding weight to the tractor within the limits set by the manufacturer. Adding iron wheel weights, adding liquid to tires, or adding front end and 3-point hitch weight can increase weight. As the harvest rate increases, the need for more than one pushing/packing tractor increases. One 40,000-lb tractor will handle a harvest rate of about 90 tons as fed per hour (T AF/hr) while two or more 33,000-lb tractors may be needed between harvest rates of 90 to 120 T AF/hr. Dual wheels and tracks will improve traction and tractor maneuverability on a slippery surface. Tractor rollover protection (ROPS), the use of a seat belt and selecting an experienced operator helps to improve safety in an inherently unsafe process. A shuttle shift transmission is very convenient for the operator making frequent changes of direction while packing.

3. A distant third may be wheeled versus tracked vehicles. Good packing results will not be achieved if wheeled tractors are used and if the wheels sink into the silage a great distance. In this situation, tracked vehicles have the advantage of getting more uniform compaction, every square foot of the silo.

Well-packed silage densities should be more than 15 lbs. dry matter per cubic foot (cfu/ft) and 17 lbs dry matter cfu/ft for corn silage. Table 1 shows University of Wisconsin research silage density

results for haycrop and corn silages. Ask your Pioneer Sales Professional for information about using the Pioneer Forage Density Probe to make accurate determinations of silage density and to find out how effective packing was during the silo filling process.

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