Silo Filling With Five Horse Power Electric Power
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SILO FILLING WITH FIVE HORSE POWER ELECTRIC MOTOR

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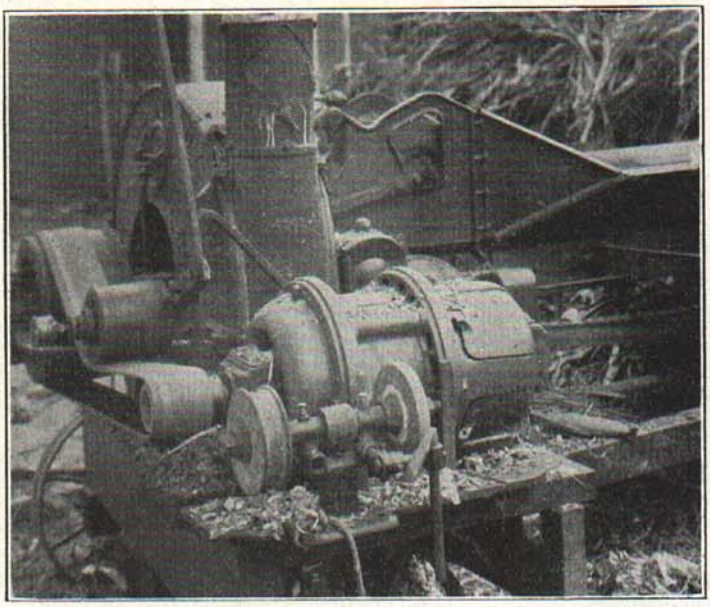
Silo filling is generally considered one of the big power jobs on the farm, but, in reality, it is not. Most ensilage cutters are operated at too high a speed and with too large a power unit. This method of operation requires a large crew of helpers and results in too great an



Five H. P. Electric Motor mounted on frame of cutter. Pulleys two feet apart at centers. Idler used on belt to give proper tension. Too tight a belt ruins the bearings of machinery.

expense. Reduced speed increases the efficiency of the cutter and permits the use of smaller power equipment. This is of special importance where electric energy is used for power, because it is the use of the small power unit that makes electricity so economical and practical for farm operation.

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For two seasons, the farmers on the Michigan Experimental Electric Line between Mason and Dansville have successfully filled silos with a five horse power electric motor. Similar reports have been received from other farmers in Michigan and from the agricultural colleges in other States.

In filling silos with a five horse power motor, it is necessary that the working parts of the equipment be designed and adjusted to cut and elevate ensilage so that power is not wasted in merely running machinery. This does not mean that a special make of ensilage cutter must be purchased for a five horse power motor. It is true that some of the older models will not elevate at low speed and that a five horse power motor cannot pull them at high speeds, but there are a number of cutters now on the market as well as a great number already in use on farms which will operate satisfactorily with a five horse power motor when due consideration is given to the following recommendations:

CUTTER

Type of cutter: Flywheel—two or three knives.

Size: 12-16 inches.

Fan Wings: Good design for elevation, must fit close to the housing not over ⅛ inch clearance at tips, reasonably close at sides.

Cutter Speed: Very Important. Cutter must be run at low speed. (Refer to table of cutter speeds.)

Knives: Must be kept sharp. Maintain original bevel. Adjust knives as closely to shear bar as is possible without their striking when running.

Ledger Plate: Replace if badly worn.

Pipe: Should be kept reasonably straight and in close alignment with the cutter.

POWER

Motor: Five horse power, single phase, 1800 r. p. m., 220 volts.

Switch: Magnetic type, thermal overload relay.

Feed Wires to Motor: No. 6 or heavier according to distance from distribution.

Motor Pulley: Fibre, 4½—6 inches diameter, 6½ inch face.

Cutter Pulley: 18-24 inches diameter.

(Refer to table for proper cutter speed.)

Calculate the exact diameter of cutter pulley as follows:

$$\text{Cutter pulley diameter} = \frac{\text{Motor Pulley diameter x motor speed (R.P.M)}}{\text{Cutter Speed (R.P.M.)}}$$

Belt: 6 inch 4 ply rubber or stitched canvas.

OPERATION

The motor may be mounted on the frame of the cutter and a short belt with belt tightener used. With this assembly, the pulleys are always in line and no anchoring of equipment is necessary. See Illustration.

When the motor is not mounted on the frame, a distance of 15 to 25

feet between pulleys is recommended. This assembly requires anchoring of the motor truck. This can generally be done by driving a stake in front of the truck wheel directly beneath the motor pulley.

Length of Cut: 3/8 or 1/2 inch. Shorter cuts, as 1/4 inch are harder to elevate, increase the current consumption per ton and reduce the tonnage per hour.

Feeding: Adjust corn binder to cut medium size bundles. Medium size bundles can be fed without cutting the band and can be lapped about one-quarter. Feed steadily. If care is taken to throw the bundles straight on the feed table from the wagon, a man will not be required at the cutter for feeding.

Size of Crew: The maximum size crew that can be used to advantage depends largely upon the length of haul.

Satisfactory operations have been conducted with a crew of only two men. Two wagons were used in hauling, each teamster helping the other load and unload. Nobody worked in the silo, an open head distributor was used. After the silo was filled, a few minutes each day was spent in leveling and tramping the top layer until it was sealed. The ensilage kept in fine shape.

Table No. 1—Ensilage cutter speeds for 5 horse power electric motor.

Diameter of cutter fan	Heights of silo								
	25 ft.	30 ft.	35 ft.	40 ft.	45 ft.	50 ft.	55 ft.	60 ft.	75 ft.
	Revolutions per minute of cutter fan								
36 inches	415	440	480	510	540	575	600	625	695
38 inches	390	415	450	480	510	545	570	595	660
40 inches	370	395	430	460	485	515	540	565	625
42 inches	355	380	410	435	465	490	515	535	595
44 inches	340	360	390	415	440	470	490	510	570
46 inches	325	345	375	400	425	450	470	490	545
48 inches	310	330	360	380	405	430	450	470	520

Note:—These speeds are based upon carefully conducted tests with a reasonable allowance to insure uninterrupted elevation. Good cutters will operate at these speeds.

Table No. 2—Results on Mason-Dansville line with 5 H. P. motor.

Factors considered	Silo			
	No. 1	No. 2	No. 3	No. 4
Height of silo	32	37	40	28
Diameter of silo	10	10	12	10
Number of men in crew	6	2	7	6
Number of men in silo	0	0	0	0
Distance of haul in rods	20	100	100	80
Tons ensilage cut	40	53	65	30
Total filling time in hours	8	18	15	3¾
Running hours of machine	6	7½	12	3¾
Average tons per hour	6⅔	7.7	5.4	8
K. W. hours used	41	66	53	18
K. W. hours per ton	1	1¼*	.81	.6
Energy cost (3c per K. W. H.)	$1 23	$1 98	$1 59	$0 54

*Low voltage of 180.
Speed of cutter 490-520 R. P. M.

Tramping ensilage is unnecessary; where corn is dry, water should be added to give weight and moisture for proper settling. If it is desired to distribute the silage, a man stationed at the top of the silo can handle a section or two of the distributor.

Filling silos in this manner materially reduces the crew, which means fewer days away from the farm during the busy season. The smaller crew is easier and cheaper to board. This saving in cost alone would generally pay for the current used in filling. Slower filling means more ensilage in the silo.

The ensilage cutter can successfully be used for other purposes than filling silos. It is easily converted into a good blower type grain elevator by simply removing the knives and installing a hopper on the side of the drum along side of the feed table so that the grain is fed through the opening which is provided for removing the knives. With this assembly, the speed should be regulated so that grain is not cracked or oats clipped. Grain can be handled directly from the threshing machine with this outfit and conveyed into storage bins through the pipe line without a man at the bagger or men carrying grain.

Table No. 3 is the record of operation on two of the farms on the Mason-Dansville Line.

Table No. 3—Kind of grain—oats.

	Farm No. 1	Farm No. 2
Number of bushels	1,705	792
Time hours	13	7
Total height, feet	7	12
Horizontal distance, feet	38	93
Kilowatt hours	47	27
Energy cost (3c per K. W. H.)	$1.41	$0.81
Crew reduced	4	6
Resultant saving	$21.20	$18.09

Some farmers use the cutter and electric motor to cut their corn fodder for feed and bedding. Sweet clover hay and the first cutting of alfalfa are more readily consumed by the cattle if put through the ensilage cutter before feeding.

The ensilage cutter operated by a five horse power motor is ideal for all these jobs and provides the farmer opportunity of receiving greater use from silo filling equipment than merely filling silos.

The five horse power electric motor, in addition to uses that have been mentioned, is an ideal power unit to run the buzz saw, the feed grinder and other equipment.

Note: Acknowledgment is made to Professor F. W. Duffee, University of Wisconsin for the material in Table No. 1 and many of the recommendations given for ensilage cutters and operation of cutters.