Swath Width and Mower-Conditioners

Posted by:WCM-edit 5/12/2006 3:25:00 PM

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Swath width is one of the most important adjustments when mower-conditioning. Creating a wide swath with the mower conditioner will increase the potential for high quality forage feed through more rapid drying of the forage. All mower-conditioners on the North American market have an easy swath width adjustment. The more rapid drying shortens the time the forage is exposed to potential precipitation and reduces the losses due to respiration for the forage in the swath.

The primary force for drying in the field is the sun which provides the energy to dry the forage in the swath. Since the forage swath serves as a solar collector, more of the sunâ€™s energy is collected with a wider swath. Several studies have confirmed that wider swaths dry faster. Shinners, 2002, indicates the swath width is the most important factor affecting the drying rate. He estimates the drying time is reduced 25 to 40 percent by laying the crop in a swath 70 percent of the cut width as compared to a windrow 45 percent of the cut width for a given cut width.

Mower-conditioner design limits the maximum width for swath that a machine can produce. Schuler, 2006, reported the average maximum swath width for the mower-conditioners on the North American market is 61.4 percent of the cut width. The range is 27.8 to 87.3 percent, Table1 (Schuler, 2006). This was based on the maximum setting of the swath forming shields as reported by the manufacturers. Analyzing the data with respect to machine size, the maximum swath decreases four inches for every one foot increase in cut width. This supports the rule of thumb proposed by Shinners, 2002, the drying to bale moisture increases one hour for each 1.5 feet increase in the cut width for machines 9 feet and larger.

Table 1. Swath and conditioner width relative (percent) to the cutting width for mower-conditioners marketed by North American manufacturers (Schuler, 2006).

	Average	Minimum	Maximum
Swath Adjustment Maximum	61.4	27.8	87.3
Conditioner Width	65.4	29.4	99.7

Additional design limitations are created by the conditioning system width and the wheel spacing especially for the self-propelled machines. The average conditioning system width is 65.4 percent of the cut width and the range goes from 29.4 to 99.7 percent, Table 1. Some manufacturers use the same conditioning system for several machine models to control machine prices, which creates additional limitations on swath width.

When evaluating the self-propelled machines separately, the average maximum swath width is 48.3 percent of the cut width, having a range from 27.8 to 65.3 percent, Table 2. This is less than results for all machines. For the conditioning system, the average width is 52.8 percent of the cut width. Here the range is 29.4 to 73.3 percent. This table does not include self-propelled machine with multiple cutting-conditioning units.

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Table 2. Swath and conditioner width relative to the cutting width for self-propelled mower-conditioners marketed by North American manufacturers (Schuler, 2006)

	Average	Minimum	Maximum
Swath Adjustment			
Maximum	48.3	27.8	65.3
Conditioner Width	52.8	29.4	73.3
Wheel Spacing	57.7	43.7	76.2

On a self-propelled machine the swath is deposited between the drive wheels. The wheel spacing on the self-propelled machine appears to have a significant affect on the maximum swath wide. The wheel spacing was 57.7 percent of the cut width and its range was from 43.7 to 76.2 percent. All are greater than the conditioning system width.

With wide swaths two issues arise: potential for driving on the swath and an added field operation such as raking may be necessary. Wheel traffic on the swath should be avoided because it will result in slower drying and increase the potential for soil contamination. Wide swath may require additional raking to allow the harvesting equipment to pick up the swath with minimal loss. This additional field operation adds to the production costs.

If a mower conditioner can be easily modified to create a wider swath without conditioning, a solution for more rapid drying may exist for some mower conditioners having narrow swath widths. A custom operator in southwestern Wisconsin modified a machine having a swath width of about 30 percent by removing the two belt cross conveyors which normally deliver the crop to the conditioning rolls. The resultant swath width was about 90 percent of the cutting width, which will result in more rapid drying than the narrow conditioned swath of 30 percent.

This leads to a question as to what the necessary difference between conditioned and non-condition swath widths before not conditioning is advantageous. If the conditioner is properly adjusted, conditioning will lead to faster drying irregardless of the swath width when evaluating swaths of equal width, assuming the cutting width is the same. In the case above, 30 percent conditioned width versus 90 percent non-conditioned width; the conditioned swath will dry more slowly. The swath difference when conditioned and non-conditioned swaths dry at the same rate is also dependent on the crop type and yield and the resultant forage-hay silage or dry hay. More research is needed to provide the answer.

In closing, minimizing the time for the cut forage in the field should be the primary goal of a forage producer wanting to achieve the high quality forage. Creating wide swaths is an important step in achieving that goal. Swath width should be one of the criteria when selecting replacement machines in a forage harvesting system. Mower-conditioners available on the North American market have a wide range of maximum swath width capabilities ranging from 27.8 to 87.3 percent; numerous machines can produce wide conditioned swaths. Before abandoning the conditioner on the machine, the swath width must be much larger for the non-conditioned crop. How much larger is unknown at this time.

References:

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