PAMI GLEANINGS

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MEASURING COMBINE CAPACITY

This article desribes how PAMI measures combine capacity. Determining the size or capacity of a combine is one of the more important parts of field testing a combine. It is also the most complex.

What is combine capacity? It is the maximum rate at which a properly adjusted combine can harvest a crop while maintaining an acceptable loss level. Capacity is affected by many factors such as grain and straw yield, crop type and variety, windrow size and shape, moisture content and even local climatic conditions. PAMI has chosen a 3% total grain loss as an acceptable level for rating combines. For example, this represents a 60 kg/ha loss on 2 t/ha crop or a 1 bu/ac loss on a 35 bu/ac crop.

Specialized equipment and techniques are needed to determine combine capacity. Grain flow, straw flow and losses have to be measured while operating over a wide range of feedrates in a variety of crop conditions. Samples of straw, chaff and grain are collected simultaneously.

Grain samples are collected with a diverter and weigh hopper installed in the grain tank as shown in FIGURE 2. Chaff and shoe losses are collected in a bag suspended from a swing frame behind the shoe as shown in FIGURE 3. Straw and separator losses are collected with the reversible cross-conveyor bagging system shown in FIGURE 4. The three collection devices are synchronized with a simple control system. The combine is operated at a fixed speed until it is uniformly loaded. The sample collecting equipment is then triggered to collect samples of straw, grain and chaff. Counters which measure the collection time and distance travelled are also started. When sampling is completed, straw, chaff and grain samples are weighed and stored for later processing. Seven to ten such collections, each at a different feedrate, are required to obtain enough information to determine capacity in one crop condition.

FIGURE 1. Determining Combine Capacity.

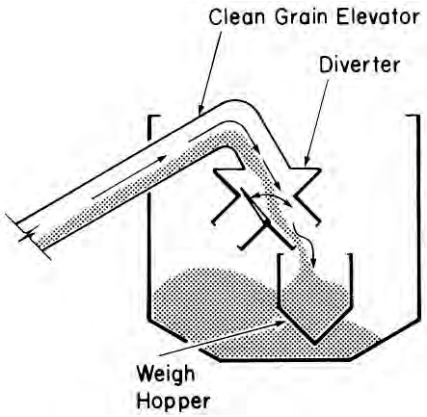

FIGURE 2. Grain Sampling Equipment.

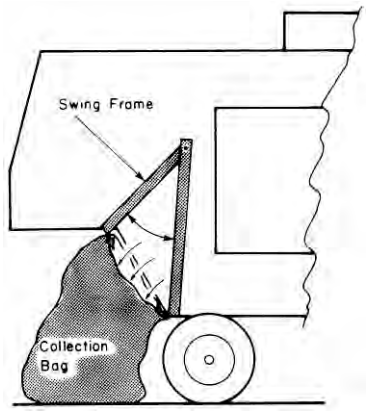

FIGURE 3. Chaff Sampling Equipment.

A straw and chaff samples in each collection bag are processed to determine the amount of grain in each sample. This is done with the batch processor shown in FIGURE 6, which determines the quantity of both threshed and unthreshed grain in each. Free grain in the straw sample is reported as separator or walker loss, while free grain in the chaff sample is reported as shoe loss. Unthreshed grain in either the chaff or straw is reported as cylinder loss. The three loss samples from the separator, cylinder and shoe are then cleaned on a fanning mill and weighed for final analysis.

The loss and feedrate data for a set of runs in one crop condition are then analyzed using a special computer program. The computer program calculates loss levels and feedrates, and prepares actual loss curves such as the one shown in FIGURE 7. During a PAMI combine evaluation, loss and feedrate information for a specific machine is determined in several crop types and conditions. From these loss curves, it is then possible to determine the capacity of the combine.

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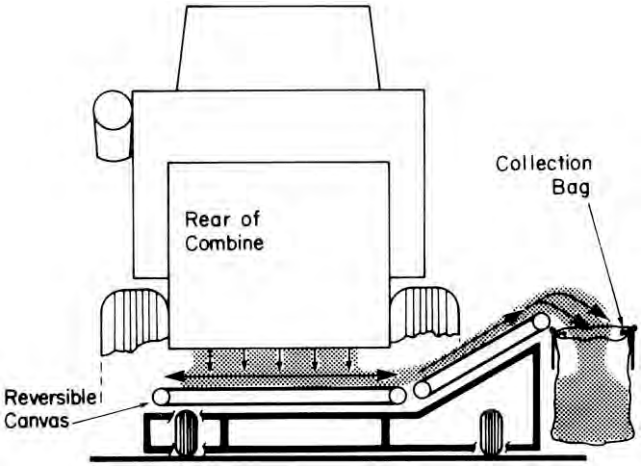

FIGURE 4. Straw Sampling Equipment.

FIGURE 6. The Batch Processor.

FIGURE 5. A Test in Progress.

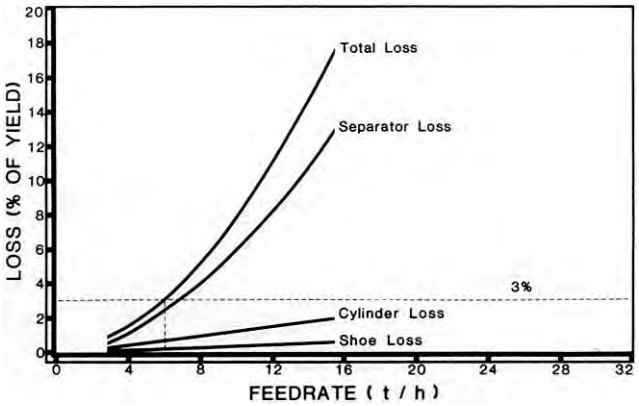

FIGURE 7. Typical Loss Curve for One Crop

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