Minimizing milk losses is essential to the economic well being of the dairy industry. Producers, plants and haulers are all faced with tight margins and the goal of everyone involved in the dairy industry should be that bulk milk is accurately accounted for from the farm to the plant. While zero loss or shrinkage may be an optimistic goal, it is not likely to be achieved under real world conditions. Inevitably, some loss of milk will occur during normal handling. The composition of milk (fat, protein, other solids) makes it a fluid with a tendency to cling to surfaces. The more pumping, piping and equipment surface involved, the greater the anticipated loss or shrinkage.

Unfortunately, milk haulers are caught in the middle. They are charged to accurately measure and weigh milk on the farm to ensure producers are paid for each and every pound of milk produced. At the same time, they are expected to deliver and transfer the same quantity of milk to the silo in the plant’s receiving bay. While most reasonable people will recognize that zero shrinkage is not likely to be attained, losses associated with bulk milk transportation should be kept to a minimum.

To ensure accurate marketing of bulk milk and to minimize shrinkage, let’s focus on three areas:

- The dairy farm,
- Hauling procedures and
- Plant measuring activities.

**Dairy farm**

Some larger and more recently constructed dairy farms utilize direct-load milking systems and, in some cases, vertical silos. These farms often utilize metering devices and/or truck scales for obtaining milk weights. However, the majority of Kentucky farms continue to use bulk milk tanks with gauges and this will be our area of focus. When we consider the bulk milk tank for measurement purposes, we are actually taking into account the tank itself and all of its required accessories such as leveling indicators, the measuring gauge (stick or tube) and the accompanying conversion chart. Tanks, gauge rods and charts will be identified with a serial number. The serial number of each accessory should correspond to the tank. Tanks are required to be accurately calibrated upon installation. When accurately calibrated, the tank functions appropriately with these accessories to allow the user to obtain an accurate weight for milk stored within the tank.
Unfortunately, over time a number of factors may detrimentally impact the tank and accessories. The milkhouse floor may shift due to heaving or other factors, structural weaknesses may change the physical condition of the tank, tank legs may become weak or the tank may have been moved by the producer. Any of these factors may result in an unlevel tank. Additionally, gauge sticks may become bent or twisted, site tubes and gauges may become damaged and charts may become worn, faded and difficult to read.

Because of these factors, it is recommended that farm tank calibrations be examined periodically (at least every five years) or when a noticeable change has occurred with the tank and/or accessories. Tank calibrations are often conducted by the Kentucky Department of Agriculture (KDA), the United States Department of Agriculture Milk Market Administrator and by some milk marketing agencies. Each of these groups follows official protocols for tank calibrations and can legitimately calibrate farm tanks. However, we should recognize that official oversight of all measuring devices in Kentucky, including milk tanks, rests with the KDA.

Having a bulk milk tank evaluated for an accurate calibration is the appropriate means for ensuring:
1) The producer is paid accurately for milk shipped,
2) The hauler can accurately perform measuring and weighing procedures on the farm and
3) The plant is accurately invoiced for milk delivered to the plant.

Hauling Procedures

In addition to the actual loading of milk, haulers perform several critical functions while on the dairy farm including sampling, measuring and weighing and record keeping. All of these activities are equally important and all are performed in a very short time. Rushing through any of these activities will eventually result in problems. It is important
for haulers to make sure the appropriate amount of time is taken to perform each activity.

In relation to shrinkage, the primary concerns are milk measuring, weighing and loading activities. Most haulers are well aware of farm issues that may contribute to shrinkage but occasionally a quick review of these and other items is appropriate.

**Lighting**

A well-lit milkhouse is essential to properly evaluate the milk and obtain an accurate gauge reading. With more haulers collecting milk at night, lighting has become even more important. If proper lighting is an issue on a farm, visit with the producer about your concerns. Most producers will be willing to correct this type of issue in their milkhouse.

**Condition of the tank and accessories**

The critical importance of a properly calibrated tank has been outlined above. If a tank or a conversion chart is cause for a concern, haulers should request to have these items examined. Producers should rest assured that these types of requests do not suggest any impropriety on their part. Having a tank calibrated or a new chart printed for a tank simply ensures that a producer is more likely to be accurately compensated for the milk produced and shipped from the farm.

**Measuring and weighing**

Appropriate time should be taken for each of these steps:

- Measure milk with the agitator off and the milk absolutely motionless.
- Do not measure through foam.
- Read a clean, dry stick gauge at eye level until two readings agree.
- For tanks with tube gauges, the tube should be clean. Be sure to open the tube valve slowly to minimize foam and obtain the measurement by reading the bottom of the meniscus.
- Carefully convert the measurement using the tank conversion chart.
- Immediately record the measurement and weight on the milk ticket and milkhouse record.

**Milk transfer**

The final step of the farm milk pickup process is to transfer the milk from the farm tank to the truck. At the last farm on the route, haulers should be certain that the truck tank can hold all of the milk contained within the farm tank. This sounds simple enough, but overfilling truck tanks occurs more often than it should. Anytime a truck tank is overfilled, shrinkage for that load is certain.
Always examine the farm tank after milk has been pumped onto the truck. Any milk remaining in the tank is a potential shrinkage problem. Remember, never chase milk out of the tank with water. However, be sure to note when milk consistently remains in a tank. This is a sign that the tank is not level and may need to be adjusted and recalibrated.

Also examine for ice. Ice in a tank has been weighed but not pumped onto the truck and can contribute to shrinkage. Ice in the farm tank is most often attributed to a malfunctioning tank cooler and milk quality problems regularly accompany ice build ups in farm tanks. Be sure to notify the producer and field representative when ice is observed.

**Plant measuring activities**

When a load of milk arrives at the plant, it will most often be weighed and/or measured using either a metering device or a truck scale. Regardless of which method is used, the measuring device must be accurately calibrated, well-maintained and properly operated by plant employees.

*Metering systems*

The use of milk meters in plant receiving bays requires two areas of focus: sanitation and accurate measurement of milk. Meters are typically cleaned by clean-in-place systems (CIP) utilized in the receiving area. Equipment installers, including both the metering equipment and CIP equipment representatives should have a thorough understanding of how these devices interact. A change or adjustment in one area should not be made without giving consideration to how the entire receiving bay system (metering and CIP) will be impacted. Additionally, meters should be equipped with an effective vapor or air elimination system to prevent air from passing through the meter as appropriate.

Procedures for meter operation should be developed for each receiving area with consultation from the installer. These procedures should be readily available for all meter operators. Posting these procedures is recommended. Meter operators are responsible for the equipment and its proper operation on the plant’s side of the truck valve. Basics of proper meter operation include ensuring:

- The meter’s indicator or register has been zeroed prior to connecting the truck hose.
- When applicable, the plant’s receiving system is adequately “primed” prior to unloading milk (some systems may require draining an air eliminator after each load too).
- A proper hose connection and that the truck valve is opened to begin the unloading procedure.
- The truck tank is completely unloaded and empty prior to printing a meter ticket and unhooking the truck hose.
• Meter malfunctions and maintenance needs are promptly reported and addressed.

_Truck scales_

Truck scales are arguably the most common means of transported milk measurement at plants. Truck scales should be appropriately sized for their intended use and must be long and wide enough to hold the largest vehicle to be weighed. As with meters, proper scale operation is critical. Many modern truck scale systems utilize indicating devices that make use of stabilization programs. This means the scale operator cannot obtain a weight until the scale reading has “stabilized” within a certain range. Operators who use scales without stabilization programs must be extremely patient to ensure truck weights have stabilized prior to obtaining a weight. Finally, the actual scale should be visible from the location of the weight indicating device. This can be accomplished by having the indicating device installed within direct sight of the scale platforms or by using other means such as large mirrors or cameras. This will help to ensure the proper tare (empty) truck weight is associated with the loaded truck weight.

Scale operators should be aware of the many factors that can influence scale readings such as wind, moisture, debris, snow/ice, personal belongings, people (most commonly the truck driver) and “load slap”. “Load slap” is the sloshing of liquid within the tanker and can test the patience of any scale operator. Due to a number of factors, milk trucks will not be completely full, which increases the tendency for “load slap”. In most cases this condition will lengthen the amount of time required for stabilization of the scale. Even though it may be tempting to rush this process, scale operators must be patient and not obtain a truck weight until the load has completely stabilized. Additionally, scale operators should be very observant and note any unusual conditions during operation times. Particularly in the winter, snow/ice and wind can contribute to erroneous truck scale weights.

_Preventative maintenance and inspection_

Whether using a meter or a scale in plant receiving operations, preventative maintenance is essential to ensure accurate and consistent equipment performance. Equipment manufacturer recommendations regarding maintenance should be followed. Additionally, prompt investigations and corrective action should occur when meter and scale operators notice changes in equipment. Maintenance programs and repairs
performed on meters and scales should also be well documented and these records should be kept on file for future reference. Finally, it is appropriate to note that just as the farm bulk tank is subject to evaluation by an authorized official because it is used for commerce, any meter or truck scale used for commercial transactions is also subject to periodic evaluation by the KDA.

**Tying all this information together**

If we lived in a perfect world where all farm tanks were calibrated accurately, all haulers flawlessly performed proper procedures and all plant measuring devices were properly operating, some milk losses would occur during normal milk transportation processes. The key to reducing milk losses is for the dairy community to work together in an effort to keep shrinkage to a reasonable minimum. Accomplishing this goal takes a continuous commitment from each of us to narrow down potential sources of shrinkage and then to follow through with corrective action.

The common theme throughout this article is accuracy. If you would like to have a farm tank calibrated, a conversion chart reproduced or a meter or scale evaluated for accuracy, go to [www.rs.uky.edu](http://www.rs.uky.edu) or contact our office for more information.

Chris Thompson, Coordinator
Milk Program

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