A Field Topic

What We Have Learned From Metering Milk

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ABSTRACT

Finding differences between farm tank stick measurements and milk plant meters or scales caused Milk, Inc. to seek a new and faster way to locate inaccuracies. Many dollars had been spent on this kind of equipment without the desired results, because of improper installation, care, and operation. We realized that a meter needed special care by a trained person who did not have other responsibilities to divert his attention, so we developed the system explained in this article.

Milk, Inc. has been trying to keep up with calibrating and rechecking the calibration of its farm tanks since consolidation in 1970. We never seemed to catch up, or ever get where we could feel comfortable with the situation. We could get two to five setups in a day with two men, hauling our own water, using one of our 25-gallon prover pails — provided we got full cooperation from the hauler and the producers, and the tanks weren't too large. Too many times something happens to throw such plans off. In some areas, we were barely keeping the new tanks checked out all the way to the top.

Receiving rooms continued to report shortages on delivery trucks; not just from handlers, but from our own receiving stations. We followed up many of these complaints and found in most instances, whether the milk was measured or weighed, that the problems were usually with the equipment not being properly used, or the personnel either weren't qualified to do the job or didn't have time to do it right, or the hauler did not get the correct stick reading. Of course, we get very few complaints that loads are on the plus side.

IMPROVEMENT NEEDED

The General Manager of Milk, Inc. Mr. Gordon Riehl, directed us to develop a quicker way to check the accuracy of calibration. We wanted something portable that could be moved from place to place wherever it was needed — something that could tell us quickly whether or not our producers' cooling tanks were measuring correctly. If we could spot the ones that were not measuring correctly, we felt we could catch up.

Thanks to our portable meter setup, developed by Accurate Metering Systems, Inc., 1731 Carmen Drive, Elk Grove, Ill. 60007; under the direction of their President, Clarence R. Dreier. We have now checked the accuracy of 1,600 to 1,700 tanks and corrected about 200 of them.

Before getting the outfit going, we spent some time looking at other peoples' meters and how they were applied to the job of measuring milk. We went to Pennsylvania University to see Dr. Ed Glass, who has done a lot of work with meters, and is considered to be an authority on the subject. We found him to be very knowledgable on the operation and care of meters, and he was of considerable help to us. He thought our idea was good and encouraged us to follow through on it. We went along with their truck from Pennsylvania State University as it went to farms and picked up milk that was pumped through a meter located on the farm pickup tank. This worked well for one truck and one group of farms, but in our case we needed something that could be used to check many farm tanks. They have a "dog house" built on the rear of their truck to house the equipment. It costs a lot of money to build and to make it blend in with the balance of the tank, plus, we felt that not all haulers would adapt to looking after this kind of equipment. The other problem with putting meters on the farm pickup trucks is the cost. Haulers are now investing approximately $40,000 to $50,000 in a new truck, and we thought they would not look kindly toward spending another $12,000 to $13,000.

METERING VAN

We came up with a portable meter setup, installed in a van, where we can go along with any of our farm pickup trucks and check the accuracy of each farm tank at the level he is shipping that day. In this van we have the necessary equipment to do the job of checking one or more farm pickup loads every day.

We got our metering van on the road the last of May, 1976; but we spent June and July experimenting. We found one hauler that had a load every day of 12 to 14 producers, ran the route himself, and was willing to work with us day after day. We did both loads on this route six to eight times. As we learned to use the equipment right, the same farm tanks kept showing a plus or minus from the chart. We had Mr. Clarence Dreier with us a few days during this work, and we thought this was a good time to measure a load off that we had metered on. We had a load of about 3,000 gallons. It measured one gallon less going off all at one time than it did measuring on at fourteen stops.

One thing we did in this period was to add another switch on the pump on a long cord that we could feed with the hose through the hose chute, so we could stop and start the...
pump when milk got to the bottom of the tank. Flat bottom tanks are a problem. We found this switch helped; and also at the end, to unhook the hose at the farm tank and to hold it higher while running the pump to get the milk through. The system holds 6.9 gallons, so we must get the same amount out of the hose each time. This is blown into the tank truck at the last stop. We rechecked all the tanks on this particular route by prover pail, whether or not it showed by meter to be off from the calibration chart. The 25-gallon prover pail is one of many we have that is similar to the 5-gallon pail. We have them checked for accuracy at least once every year. We thought this was the best way to prove the accuracy of the meter setup. This meter cannot be changed by some manner of adjustment. The only way to change the amount per gallon reading is to change the gears.

COMPONENTS

Here are the different components necessary to make this equipment work: 24 ft or more of 1/8 inch Tygon hose, Jabsco milk pump, 3 H.P., 220-volt motor, air eliminator and screen with 1/8th inch holes, Sieman meter, air valves for blowing milk out of the system, and another for blowing milk from the hauler’s hose into his tank so it can be handled easier. An air compressor with a storage tank, an inplace cleaning tank, and lights to flood the inside of the van are also necessary.

The Jabsco pump we are using moves about 70 gallons per minute, which is faster than that which most haulers use on their equipment, so we do not slow up the haulers when we go along with them. From the pump, milk moves through the air eliminator, which by a float mechanism allows the air to go out the top through a 1/4 inch stainless steel pipe and the milk flows out through the bottom. We have used this equipment in some of the roughest, hilliest areas served by Milk, Inc. and didn’t have any problem with it not being level. One problem, a very small leak, developed where tanks had the butterfly or flapper valves. Since the pump creates a great amount of suction, a very small air leak between it and the volume of milk will cause thick, whipped cream-like foam that will go out through the milk flow outlet of the air eliminator and give a false reading. We thought for the few times this would happen, it wasn’t going to cause very much trouble; but one day after the operator became able to detect the difference in sound when the pump was pulling air, he discovered that it sealed the hole by running water on the valve. We then wondered if water might be drawn into the system, but by running cryoscope test, we found no detectable added water.

OPERATIONS

The screen between the air eliminator and meter has a very important function and should never be left out. We always find parts of filter equipment, brush bristles, and ice in it that would burst the piston if this wasn’t caught by the screen.

The meter head should be opened and inspected, at least after each day’s run. Any unusual wear or marks must be investigated. We have broken one piston, which the Accurate Metering people glued back together, machined and balanced, and it is back in use doing as good a job as before.

Keeping track of the amount metered each time is easy with the three-copy ticket from the meter that shows the gallons pumped through each time it is cranked back to 0-gallons. A record of the number of gallons passed through the meter is shown at all times on the face that is not unlike that of an automobile speedometer.

Inplace cleaning of this equipment has been very satisfactory. We have changed the containers for mixing the solution many times, and at the present are using a 10-gallon stainless steel can, which we set outside the van, and this keeps the splash or overflow outside.

FINDINGS

What we have learned since we really got into metering the milk from farm tanks into the delivery tank, is that most loads of milk have two or three pickups that are not in calibration.

We find about the same number measuring on the plus side as we do on the minus, which makes very little change in load shortages or pluses. A few loads have had enough corrections on the farm tanks to be of some importance.

Usually one of the first questions about this is — “What do you find that causes the farm bulk cooler to get out of calibration?”

Some of the reasons are as follows:

1. The ones that are just a few pounds off, such as 4 to 12 lb., we suspect were the result of a poor job of calibrating in the first place.
2. When bulk tanks went in 10 or 20 years ago, there were people doing the farm calibrating that were not properly taught or instructed to do the job right.
3. The measuring stick not having all the oil completely cleaned off, which caused a rainbow or creeping line, wasn’t always taken care of. Sometimes the wrong powder product was used on the stick for reading purposes.
4. The importance of the water being quiet and not making waves when being measured was not checked close enough.
5. Our measuring pails not being checked and sealed by the weights and measures people didn’t seem as important back a few years ago as it is now. This may have caused some to be incorrect.
6. As for the larger amounts, we have found when some tanks were originally calibrated, contents of a 5-gallon prover pail were either poured into the tank without being recorded or a 5-gallon amount was recorded and not poured in. We did find one tank where they shorted 5 gallons in the first half, and plused 5 gallons toward the top, without either being
recorded. We found one 500-gallon tank that the producer bought delivered, and he borrowed a can and did the calibration by 5 gallons without cleaning the measuring stick or waiting for the water to settle. Of course, most of his readings were wrong, plus, he missed one 5-gallon pail of water.

7. Broken floors in the milk house have contributed to some tanks being off. I believe that our greatest concern should be with the new 800- to 3,000-gallon tanks that are going in. We have found that many of the newer tanks are out of calibration from about 1/2 way up, and as yet, we do not have an answer as to why this is happening. We find this problem in all makes — not just one brand. We would definitely advise anyone planning to put portable metering equipment like this on the road, to install it in something with four-wheel drive, because to get it between the milk house and the tank truck, it sometimes has to be off the drive or at some awkward position. We would have the stainless steel platform that the equipment rests on made larger with a trough around the edge for easier cleaning and draining.

We have demonstrated this equipment to many interested persons since last August, and will be happy to do more; but for cost and availability, please contact Mr. Clarence Drier, President of Accurate Metering Systems, Inc. 1731 Carmen Drive Elk Grove, Ill. 60007.

One thing that we should make clear is that this equipment, so far as Milk, Inc. is concerned, is for one purpose only — and that is to locate problems. Correcting the problem is still done by prover pail. We will be busy everyday that weather allows, measuring milk from bulk coolers into the over the road tank.

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**Basic maintenance and acceptance tolerances for farm milk tanks (Copied from Handbook 44, Specifications, Tolerances, and other Technical Requirements for Commercial Weighing and Measuring Devices—1972 Replacement Sheet, Pg. 7)**

<table>
<thead>
<tr>
<th>Test draft</th>
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<td>(Gallons)</td>
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<td>250 or less</td>
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<td>2,501 to 5,000, incl.</td>
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<td>over 5,000</td>
<td>add 2 gallons per 2,500 gallons or fraction thereof.</td>
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