Most of us are used to checking the fuel gauge on our car or truck. It tells us a lot about the way we are driving, problems with the vehicle, the fuel quality, and it tells us when we need to refuel. Just like a gas gauge, a flow meter on your water supply can tell you a lot about how you’re using, abusing or maybe losing water.

Very few farms have flow meters installed on water supply lines. Savvy managers monitor water usage to identify cost savings even where they aren’t paying for municipal water, which can be costly. Just like your fuel gauge, a water flow meter can help reduce the amount of water you use. What are some of the benefits of monitoring water usage:

- It can tell you when there is a problem such as a leak, a pump is failing, or a valve is left open.
- It can indicate if a drip irrigation line is becoming plugged.
- It can help you reduce your water use, thus reducing the size of an on-farm water treatment system.
- It can indicate if there are flock or herd health issues in not drinking enough water.

Changes in the flow rate can be early indicators of problems that could help save you a lot of money – if you have a flow meter to identify those potential issues. For example, if the water flow rate to a produce washer or other equipment is controlled manually, the amount of water being used daily or even with different operators on the same day can be inconsistent. A flow meter allows a consistent flow rate to be set.

The installation of a flow meter on the water supply line feeding a piece of equipment (e.g. a vegetable or fruit washer or a greenhouse planting line’s tray or planter watering station) will allow the flow rate to be adjusted based on the need. For example, vegetable washing equipment may need more or less water to effectively clean the produce depending on the amount of dirt on the product. Ideal set points for the flow could be established according to how dirty the product is. The settings could be marked on the side of the flow meter and/or posted on a sheet close to the washer so operators can adjust the flow to match the product being washed or watered.

There are all kinds of flow meters out there. This factsheet discusses a couple of low cost, easy to use meters that are suitable for most clean water applications. If the water has lots of particulates, you will need a system to remove the particulates such as a screen or filter before the water reaches the flow meter. Most flow meters don’t like dirt.
Choosing your flow meter

There is a wide variety of flow meters available, from paddle wheel to ultrasonic, from those that strap on the outside of a pipe to those that are located in the pipe, that allow you to measure water use. Flow measurement can be as simple as a spot measurement with a bucket and stop watch or as sophisticated as a long term data logging system with alarms to indicate that preset conditions are not being met. This discussion will cover only two types of flow meters that are most suited to farming applications, especially lower volume end uses.

A Simple, Inexpensive, Small Diameter Pipe Paddle Wheel Style Water Meter

This paddle wheel style meter is suited to smaller diameter pipes for pressures up to 80 psi. It can be threaded onto standard 3/4" faucet or hose fittings. It measures the volume in litres or U.S. gallons and can record cumulative usage over a longer duration.

The current-use reading can be zeroed at any time without deleting the cumulative total. Amounts are shown from one decimal place up to 999.9 on the digital display.

The unit automatically shuts off after being inactive for a pre-set amount of time to preserve battery life, resetting the current use reading only.

Figure 1: Examples of Simple, Small Diameter Pipe, Paddle Wheel Style Flow Meters

Approximate Cost (excluding connectors and shut-offs): $50.00 or less

Availability in many local retail hardware stores, including:

- Canadian Tire;
- Home Depot;
- Lee Valley
Essentially, a sight gauge or rotameter is a flow meter that measures the flow rate of liquids or gases. It consists of a tube and float. The float responds to flow rate changes by moving up or down in the tube.

The fluid flow raises the float in the tapered tube. The height of the float is directly proportional to the flow rate; in other words, the greater the flow, the higher the float is raised. The response is linear. The gauge must be mounted vertically because the float position is gravity dependent. It is simple to install and maintain. A variety of flow rate ranges are available.

When mounted in a visible location, the sight gauge also allows staff to check that the proper flow rate is being used at a single glance. To further enhance the ease of setting the flow rate, 2 shut-off valves can be installed before or after the sight gauge. One shut-off can control water flow (on/off); the second can control the flow rate and be left in the appropriate position.

If an automated valve (solenoid) is installed to turn the water supply on and off, a water hammer preventer should be installed to protect the sight gauge from potential damage.

The exciting news is that a sight gauge can help a producer achieve water use savings of between 10 to 50% or even more, simply by seeing what you are using.

Approximate Cost: $400 for a 1” female NPT (Polysulfone) or 1.5” female NPT (PVC) pipe diameter, 2 to 155 lpm (0.5 to 40 gpm). Price varies with flow rate.

Availability: many plumbing or agricultural suppliers including:

- McPhee Enterprises, 2740 Coventry Rd., Oakville ON, 905-829-2300: Blue-White Model #’s F-451 series (6-76 lpm, F-451002LHN, 1” pipe; or F-451002LHN-24, 1.5” pipe); http://blue-white.com/blue-white-products/f-451-polysulfone-molded-2/#tab-id-4
- Omega: FL-30000 series (20 - 150 lpm, FL-30001, 1” pipe); http://www.omega.ca/pptst_eng/FL30000.html
How do you figure out what the flow rate is if you don’t have a flow meter?

Picking a flow meter is sort of like asking the question, “which came first, the chicken or the egg?” How do you know what the flow rate is if you don’t have a flow meter? There are a couple of ways to find the answer.

If you want to put the flow meter on the water supply to the entire farm, a barn, room, or zone and the area has a dedicated pump, you can use the pump’s litres/minute or gallons/hour rating to select the appropriate flow meter size. If you want to know how much a piece of equipment uses and there isn’t a dedicated pump, you will want to take a timed sample of the water discharging from that equipment. All you need is something to collect the water in, a stop watch, and something to measure the collected water volume. To explain how to do this, a fruit or vegetable washer will be used as an example.

Where do you measure?

Ideally, you will want to measure the flow at the wash nozzles. If you cannot reach them safely, you can collect the discharge under the washer or at the discharge into the treatment system if you have one. Some of the water will stick to the fruit or vegetables being washed, but this is considered insignificant.

Collecting the Water

Sometimes you have to be creative to get the sample. It may be hard to get a bucket underneath to capture the flow. In spots with low clearance, you might want to use a tub with low sides or a shopping bag (without holes). Buckets, storage tubs, shopping bags (Figure 3), even rubber boots have all been used (Figure 4).

If you are measuring the nozzle flow rate, ideally you want to collect the water from all the nozzles. If you cannot reach all of them, collect the water from at least one nozzle. Multiply this flow rate by the number of nozzles on the washer. For example, if your washer has 6 nozzles and you can only capture the flow from 2 of them, multiply the flow by 3 to estimate the total flow rate for all 6 nozzles.

If you are going to measure the water running out from under the washer, use a big tub or several tubs that will capture all the discharge water. Unlike the nozzles or the discharge into the treatment system, the water does not run out evenly under the washer. If you only capture a portion of this discharge, you may under or overestimate the flow rate, so it is best to try to capture it all.
Time How Long You Collect the Sample

Once you have figured out how and where you are going to collect the water, get ready, set, put the container under the flow and start the timer. Depending on how much water is flowing and the size of the container, you might only collect for 10, 20 or 30 seconds. Use a number that is easy to multiply to give you one minute. It is ideal if you can collect for one minute though, but not always depending on how much and how quickly it is discharging.

Measure the Water Collected

Once you have got a good sample (it might take you a couple of times to perfect your technique), pour it into a container with a measuring scale on the side. You might want to use something with a scale in 100ml gradations. Take a couple of samples. The flow rates will vary.

Average flow rate: 2,593 ml (2.593 l) in 30 seconds for 2 nozzles.

\[
\frac{2,593 \text{ ml}}{2 \text{ nozzles}} = 1.296 \text{ l/nozzle (in 30 seconds)}
\]

\[
\frac{1.296 \text{ l}}{\text{ nozzle}} \times \frac{60 \text{ seconds}}{30 \text{ seconds}} = 2.593 \text{ lpm/nozzle}
\]

\[
\frac{2.593 \text{ lpm}}{\text{ nozzle}} \times 6 \text{ nozzles} = 15.6 \text{ lpm}
\]

Calculate Annual Water Use

\[
15.6 \text{ lpm} \times 60 \text{ minutes/hour} \times 9 \text{ hours/day} \times 40 \text{ days/year} = 336,053 \text{ litres/year} \quad (336 \text{ m}^3/\text{year})
\]
“Once we agree on the required flow rate, it’s easy to adjust to that flow and then simply observe the flow rate on the rotameter when you walk past it. Without being able to observe the flow, we were consistently using more water than we thought we needed to use. How much water is flowing into any machine is usually just guess work, but the rotameter takes the guess work out of water flow rates to any machine” says John, a vegetable grower and washer near Bradford Ontario. The installation of sight gauges reduced well water use by more than 60% on John’s vegetable washers.

Fresh water used in the vegetable rinsing process in particular was pretty significant. “We found out that we were using way more water than we had originally thought. It was much more than it needed to be,” says Adrian, maintenance manager at a Holland Marsh vegetable growing and packing farm. A water use assessment at this farm estimated sight gauges could reduce well water use by 20% and over 50% on the washers.

“Over the last few seasons, Kauzlaric Farms has been attempting to fine tune its drip irrigation and fertigation program for the Farm’s 18 zones of tender fruits and wine grapes. With a continual need to improve water use efficiency, Kauzlaric Farms was able to secure a water meter through a grant offered by Farm & Food Care. This meter will enhance the knowledge of the amount of water that is being used for each zone while reducing the current “guessing” method. In addition, the meter will provide valuable information for the fertigation program by allowing real-time readings to occur that will allow for the correct amount of fertilizer to be used per zone. The benefits of utilizing the meter are as follows: water use efficiency, reduction in environmental impact, improve health relative to tree and vine. Kauzlaric Farms appreciates Farm & Food Care for providing this grant opportunity which enabled the securing of the meter.”

Water management made easy

Knowing how much water you’re using doesn’t have to be rocket science. Simple, inexpensive, easy to get your hands on tools are available to help you figure out and probably reduce how much water you are using or losing. Even if you don’t have to purchase your water, there may still be a cost associated with it if you have to treat waste water or obtain a well water taking permit. Just pumping more water than you need is costing you money in unnecessary electricity costs and wear and tear on the pump.

Water use assessments conducted on farms as part of the Water Smart project funded by OMAFRA have found that virtually every farm can reduce the amount of water being used. Flow meters, installed as part of the project, are now helping many of those farms manage their water use simply by letting them see how much water they are using.

For more information, please contact Farm & Food Care Ontario.

For links to: Videos, fact sheets & Case Studies, and Links to Equipment Suppliers

Water Smart Website: www.FarmFoodCareON.org/water-smart-farm-projects/