

# Increasing Drinking Water Use Efficiency in a Commercial Alberta Pork Production Facility

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## ■ Introduction

I am a southern Alberta pork producer. I conducted a practical and economical comparison of water drinkers on a commercial hog facility. This demonstrated that farmers can make significant water savings. Over the course of the one year trial, from August 2004 to July 2005, the ball-bite drinker sections of the barn used 35 per cent less water than the standard drinker sections, as measured by the farm's water monitoring system. These water savings had no detrimental effects on the animals or facility management. Instead, the significant decrease in water usage led to many secondary benefits.

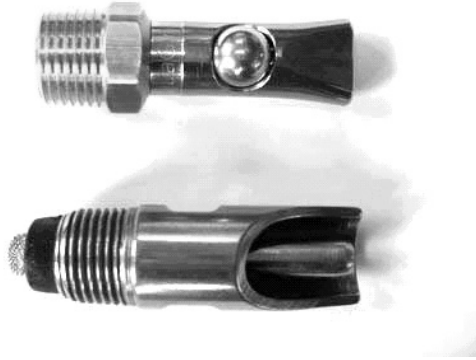
## ■ Detail Project Description

In 2003, the idea of this water drinker project was prompted by results of a Prairie Swine Centre research project. By replacing standard bite water drinkers with ball-bite water drinkers, the research documented a 35 per cent decrease in total water usage, with select water control measures in place.

Questioning the practicality of the results, I put it to the test on a commercial operation to confirm findings of the previous research and to determine if they were consistent over an extended period of time, including seasonal and weather variations. In addition to measuring water consumption and wastage, additional steps were taken to record the effects of the two types of water drinkers on behaviour, performance, manure management, barn management, economics and greenhouse gas mitigation.

Barn water flow rate controlling and monitoring equipment was installed into a commercial 3000 head facility in High River, Alberta. Ball-bite water drinkers were installed in one half of the facility. The second half of the facility had brand new standard bite drinkers installed. (**Figure 1**)

**Figure 1. Ball-bite drinker (top) vs. Standard drinker (bottom)**



The idea was that ball-bite water drinkers would reduce water usage because the pig must have the whole valve in its mouth and then bite down to release water (**Figure 2**). In contrast, a pig can easily release water from a standard drinker by simply nudging the drinker, thereby wasting water and increasing manure volume (**Figure 3**).

Two water-flow monitors were also installed, one to handle the ball-bite rooms and one for the standard bite drinker rooms. A data logging system was incorporated into the flow control unit which determined and provided regular reports on the water being used in the facility. This led to the set up of a three-tiered water monitoring system: a water meter measuring the amount of water entering and exiting the building, while a water device measured the amount of water the animals consumed, plus a daily record keeping system.

Trials ran for the full year and detailed daily data collection was documented. In that period of time, 6 groups of 500 grower pigs arrived every 8 weeks. Within the production cycle, pigs entered this 8 week period weighing about 25 kilograms and left the facility at about 60 kilograms.

The grower pigs all came from the same supplier who reared his animals in a non-nipple drinker nursery. Therefore, the pigs had no previous experience with getting water from a nipple drinker, either ball-bite or standard drinker, and therefore would show no preference.

**Figure 2. Pig drinking using ball-bite drinker**



**Figure 3. Pig drinking using standard drinker**



As many variables as possible were controlled or accounted for. The trial barn was filled with same sexed pigs with approximately 30 pigs per pen. The barn was divided east and west to equalize temperature or ventilation

differences. A 12 month trial accounted for seasonal and weather variation. Both pig groups had the same feeding regimen.

Animal performance was determined by monitoring the pigs' exit weight. There was a noticeable reduction in the volume of manure produced between the groups. The manure nutrient composition was the same with both drinker systems; however, a more concentrated manure (less total water) reduces the manure application rate and cost per hectare to apply these nutrients. Also, concentrated manure should reduce nitrous oxide production by lowering the level of soil saturation following application. And finally, a more concentrated manure allows it to be moved further down the road to fields where it may not have previously been economical to haul a more dilute manure product. Hauling manure a farther distance creates the opportunity to spread manure over a larger land base. This can reduce the risk of over-applying nitrogen. Over application of nitrogen can result in greater greenhouse gas (nitrous oxide) production.

A more concentrated manure decrease nitrous oxide production, when applied to crop land, because less anaerobicity will be induced during application.

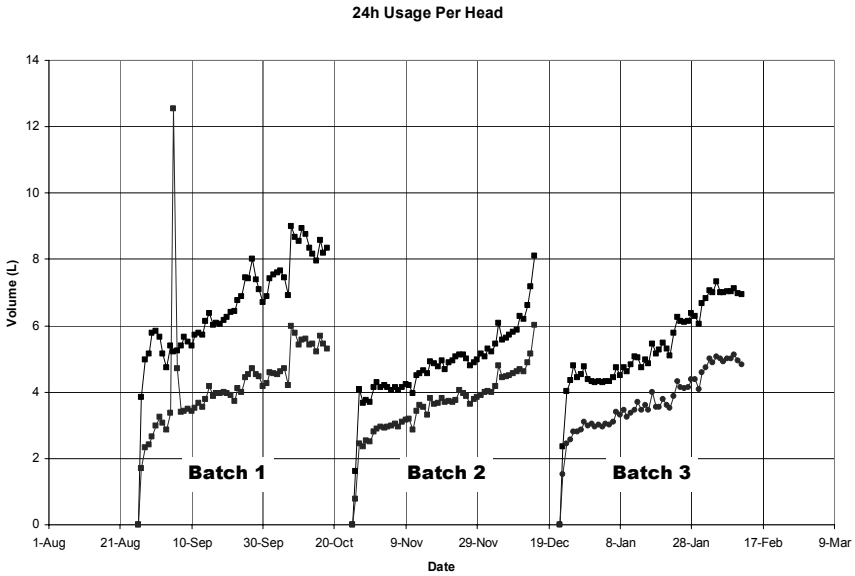
Regular bite drinkers cost \$6.90 each and Aqua Globe Ball-bite drinkers cost \$12.60.

## ■ **Tangible Environmental Benefits or Results:**

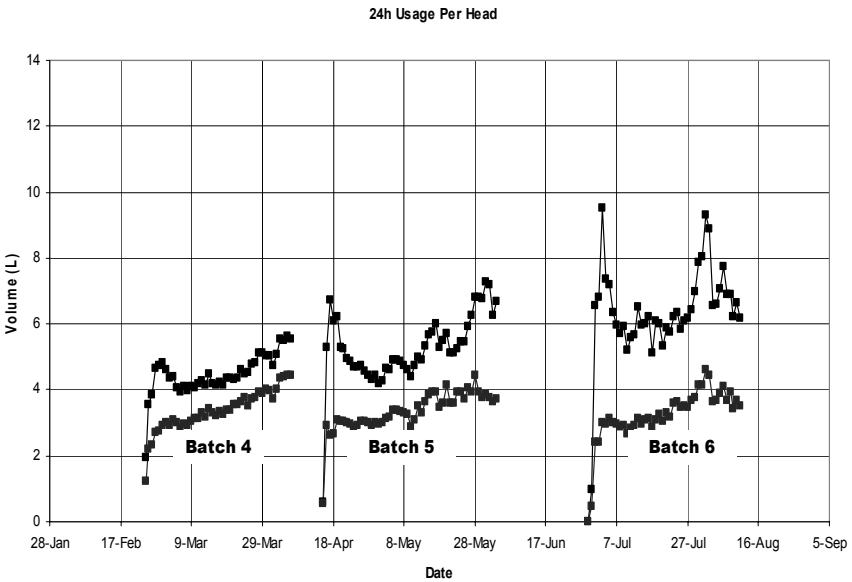
Over the course of one year the ball-bite group used 35 per cent less water than the control group. Even with daily variation on water usage, water wastage was consistently lower with the ball-bite drinkers throughout the year as seen in **Figures 4, 5 and 6**.

A decrease in water usage leads to many secondary benefits. Electrical savings occurred from not having to pump the extra 35 per cent of water (in this case 133,149 litres).

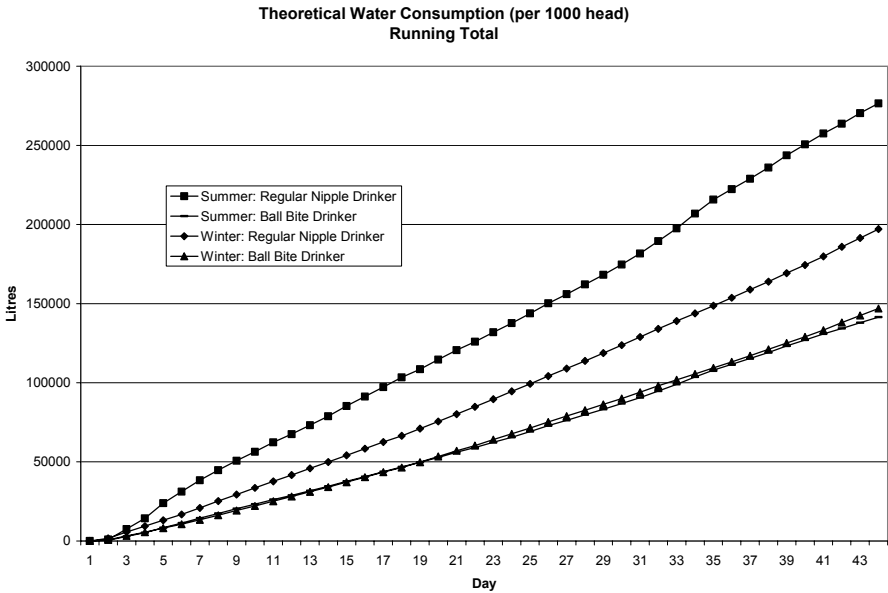
Less water means less manure. Manure can be spread on the land less often – saving money, time and odour issues with the neighbours (because of fewer applications). Solids build-up causes great problems when removing manure from a facility to apply to the land. However, having less water did not complicate the process of removing manure from the barns assuaging concerns of solid build-up.



**Figure 4. Batch 1 to 3: Water usage variation between groups (top line is standard drinker, bottom line is ball-bite drinker)**



**Figure 5. Batch 4 to 6: Water usage variation between groups (top line is standard drinker, bottom line is ball-bite drinker)**



**Figure 6. Variation in Water Consumption**

Reducing the manure volume and total water used in a commercial hog rearing facility results in reductions in greenhouse gas emissions mainly due to less petroleum and electrical energy consumed in handling the manure liquid. Decreasing the amount of energy required to deliver water to the barn and to distribute it throughout the facility will decrease the total water system energy load. During manure pump-out and field application, a decrease in fossil fuel use to operate machinery will also be realized. This may prove to decrease the costs of applying the liquid as less total volume of manure will be handled. Efficient water use allows producers to achieve efficiency gains with minimal capital cost. (further research is being conducted by the George Morris Centre – see below)

Reducing the quantity of water used in commercial pig facilities will prolong the life of useful ground water resources, thus prolonging the useful life of groundwater wells on the property. Producers using dugouts for water storage will decrease the requirements for sourcing water to fill these dugouts throughout the year.

It is important to note that there was no difference in growth of the pigs between the groups of pigs even though water usage was on average 35 per cent less in the ball-bite drinker group.

## ■ Intangible Benefits or Results

Monitoring water usage is a diagnostic tool for efficient barn management. Consumption numbers can alert the producer to problems such as poor ventilation, feed issues, or health concerns of the pigs.

Appropriate methods for changing over water nipples came from watching animals react to the change in drinker. After the official trial, I converted one pen to half of each drinker type. A higher degree of aggression was observed amongst the pigs because the dominant pigs would protect one drinker. It is recommended that all drinkers in a pen be converted at the same time to prevent fighting; an important animal welfare issue.

This technology is applicable to all types of swine operations including all sizes of piglets and sows. The research may be expended to include a finisher facility. The pigs in the grower weight range that were in the ball-bite group were using as little as three litres per head per day compared to eight or more litres in the other group. The savings may be even more as the animals put on weight, leading to greater savings in the finisher barn where animals go from 60 kilograms to approximately 115 kilograms. However, the financial results would vary for farrow-to-finish operations because each individual sow would require a ball-bite drinker.

## ■ Innovation “Going the Extra Mile”

This project has spawned a complementary study by the George Morris Centre, Guelph, Ontario, to examine the economic benefits on a farm wide basis. The George Morris Centre is an independent think-tank, the centre provides industry decision makers with critical information and analysis on issues affecting the Canadian agri-food sector.

This project was a way to collect and analyze farm level data from a typical swine farm to determine the economic benefits and costs of water flow control systems. The project compares farm profitability and cash flow with and without the imposition of the GHG mitigating best management practice to determine the economic rationale for producer adoption.

This project suggested that replacing the standard drinkers with ball-bite drinkers resulted in a payback period of approximately 3.5 months and an increase in annual net income of \$1,584 on a \$463 investment. The analysis was based on an operation with 500 pigs per cycle and one nipple drinker for every 15 pigs.

The George Morris Centre analysis provides further evidence, illustrated in this simple example, of the benefits of ball-bit drinkers to the farm business:

*Buy 6 to 8 pigs less in your next batch, invest the \$500 to install ball-bite drinkers for 500 pigs, and more than triple your money in less than a year. It's highly unlikely that the 6 to 8 pigs would triple your money. Moreover, the annual profit on the ball-bite drinkers will carry on for years without further investment – a passive investment that keeps on earning for you.*

Overall, the strength of this technology lies in the fact that it is simple, environmentally friendly and profitable.

## ■ Additional Contacts

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