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### **First Closed Loop Manure Recovery System FAST, COMPLETE and SUPPORTED**

Good morning everyone. My name is Victor Van Slyke and ATD Waste Systems is a private company incorporated in British Columbia in 1993. We started ATD to look for a vegetable waste/landfill solution but when we were told that the hog industry had a much more pressing problem we adapted our expertise to this new challenge. Suffice it to say it has been a long and fascinating learning experience.

ATD has created a hog manure recovery system that eliminates environmental concerns and resolves nutrient balance problems to finally allow the hog industry to move forward to a sustainable and environmentally acceptable future. It presents new options to operators and the packing industry to organize and relocate for greater profits by eliminating lagoons, reducing transportation costs and collecting more nutrients without environmental degradation. This new model will be the 'gold standard' of the future.

The system makes a dry fertilizer, clean water and it works because it separates liquids and solids, taking them both straight from the barn. We capture 100% of the solids. What we don't use for fuel is in an 88.5% dry matter fertilizer pellet. We capture 99.9% of the phosphorus in the liquid stream and 100% of phosphorus in the solids stream. We capture 100% of the nitrogen in the solids stream and 99.98% of the nitrogen in the liquid stream. We will eliminate the lagoon, long term storage and slurry disposal while reducing water consumption by over 50%. We will reduce odours and greenhouse gases significantly. When processing 163 cubic metres of manure a day (about 2,000 sow farrow to finish or 20,000 feeder places) we project the return of investment in less than 4 years using Spring 2008 fertilizer prices when with the pellet supplemented to provide an N:P ratio of 2:1 for corn.

We have obtained three patents and have been assisted along the way by the University of British Columbia, Chemical Engineering Dept., Hipp-Anvil Engineering Ltd. of Vancouver, the North Carolina State University and members of their staffs.

Here are the targets we set for the system.

First, we recognized that we had to develop an environmentally sustainable and economically viable system. The environmental issues were simply solved by not discharging to the environment. The drive to economic viability was more troublesome. While odour reduction was often presented as a large problem we found that its elimination, by itself, would not provide the returns we needed. So, we developed an integrated approach that, while more costly, provided the investment returns that make it viable. We also identified benefits that will depend on an individual operator's implementation to make that calculation even more attractive.

Secondly, we wanted to install the system on any farm, in any climate and it had to be easy for an operator to use. That meant finding processes and equipment used in other industries so we could utilize their

experience to make things easy to operate. We tied them together in an operating system that can prompt an operator and be remotely monitored by ATD to keep it running efficiently. We had to buy what we needed off the shelf from suppliers that could support us anywhere in the world and make things easy to repair. That's where we found that old technology can be applied to new problems. It seems to be true that there is nothing really new in the world. They are just being rediscovered. Lastly, because of the weather and a host of other reasons, we wanted to avoid anaerobic treatment. Well, we did that.

In terms of viability, we had to get an idea of your current costs so that a comparison to our system could be made. There were some surprises along the way, e.g., nitrogen losses in long term storage were one, water consumption was another and now new phosphorus rules and expansion are creating nutrient imbalance challenges for some.

We recognized that each operation would be unique and because of that we developed a spreadsheet that reflects the engineering characteristics of our system and its costs. This allows us to customize a solution with your own information and get an estimate of the potential costs and benefits before any commitments are made. I will give you some ballpark figures as to costs later and explain how it works as we go along.

It would be nice to think we could just compare the two costs, yours and ours, and make a decision. But in putting a total solution together we found that such a comparison was going to be difficult. We had created a major new approach with benefits that could only be valued by the operator.

So, while the some items are largely dependent on the individual operation I would ask for the moment that you accept that:

- You won't need manure storage facilities.
- You won't be disposing of manure slurry.
- You will use less water.
- You will produce fewer odours and improve air quality.
- You will do it on the land you have - Even expand on it!
- You will capture more nutrients.
- You will reduce greenhouse gases.
- You will be supported by ATD - long term.

Now, with all that in mind, I would ask that you try to put a value on these other benefits.

**Substantially reduced odours!** How do we do it? There are two major components in the odours people complain about, ammonia and the by-products of anaerobic activity. The ATD solution is to stop odour production before it begins.

Ammonia is caused by enzymes produced by bacteria in faeces attacking urea in the urine. By using conveyors at rest we separate the faeces and their bacteria from the urine in the barn and move the urine out immediately. This allows the faeces to dry aerobically until the end of the day when the conveyor belt is scraped clean, drastically reducing ammonia production and preserving urea. All manure is treated within 24 hours.

Low ammonia means:

- Improved health for the animals and staff (and possibly neighbours).
- Lower vet bills.
- Lung lesions reduced or eliminated.
- Better feed conversion and earlier to market - some say as much as three days.

The other major components of the odour are produced by anaerobic activity. Prompt removal and treatment just doesn't allow that to happen. There will be no hydrogen sulfide safety concerns.

We aren't perfect! Barn smells will continue to come from evaporation on the floor, the animals themselves and we still discharge to the air. Our burner has been designed for biomass fuels (we use faeces) with discharge levels well below current regulatory requirements. We also discharge moist air from the dryer which is directed to our only biological treatment facility - an all-weather biofilter.

**Water consumption cut in half!** Liquids are treated by membrane filtration, heat, pH shock and UV radiation to ensure pathogen-free water for reuse. Your feed and wash down water volume will be cut in half to reduce costs as water becomes more expensive and in some cases, in short supply. The system can be configured to handle irrigation with reduced suspended solids.

**Reduce transportation costs!** New operations will no longer need disposal acreage or liquid manure storage facilities. Employ that capital to capturing nutrients in pellets and increasing populations. As a neighbour who doesn't stink, doesn't discharge to the land or water and conserves water, you can relocate close to a feed mill or packing house and reduce transportation costs as well as obtain access to a new labour pool. **A major item.**

**Computer-assisted Operation!** The system components are tied into a system that ATD can monitor remotely should it be required. System prompts help the operators respond to any action that may be called for.

**Nutrients in balance!** Pellets will carry the analysis provided by the herd, but can be supplemented as required. They are sterilized by the heat of the dryer and will be weed free. **Hog density can be increased on the same acreage while maintaining a nutrient balance by selling surplus pellets.**

**More acreage can be farmed!** As up to three times more nutrients are captured, you will be able to fertilize more acres from your existing herd.

**Better crop fertilization!** Nutrients can be applied more accurately and conveniently with pellets having a consistent analysis and a high organic content.

**More heat!** Hot water heating is available for barns or residential use as a by-product of drying.

**A new Brand is created!** Environmentally sound management and healthier animals should receive market endorsement and a better return. This is the differentiation exporters are looking for as part of their "Canadian" Brand .

**Easier to find staff!** New recovery techniques, better air and cleaner surroundings will encourage farm employment.

**New market for biomass fuel!** There may be other biomass fuels available that are under utilized, e.g., flax and hemp straw.

**New sources of revenue!** Greenhouse gas reduction credits and fertilizer sales provide stable cash flow that is not affected by the cyclical hog market - providing some shelter from market swings. Money used for current manure recovery can be redirected. Litigation may be avoided.

**Dietary changes can be refocused!** With odours and manure nutrients under control, dietary changes can be directed to the production of meat, rather than environmental impact.

**Appreciation in land values!** With the odours associated with manure storage facilities and their management eliminated and barn odours reduced, the negative impact of those elements can be reversed.

**Regulatory permitting process is simplified!**

Reduced odours and water consumption coupled with the elimination of potential threats to the environment by manure storage facilities and land disposal will help the permitting process proceed. A strong presentation at public hearings will now provide a positive opportunity to reinforce your commitment to the environment and stewardship of the land.

**Our Targets In Summary:**

**No discharge to the environment.** As there is no manure storage facility nor land disposal, we have eliminated them as sources of potential trouble while reducing greenhouse gases by more than 65%. With anaerobic activity eliminated then so are greenhouse gases - no matter how they are going to be measured. All water is now either part of the pellet or water vapor exhausted to the biofilter while the rest is cleaned for recycling to the barns. All solids and materials used in the process find their way into the pellet, including the ash from the burner.

**No new technology.** All we have done is integrate existing technology into a complete solution.

**Economic viability.** You will be eliminating a manure handling cost center in favour of an investment in a new fertilizer manufacturing business. By creating new revenue streams from fertilizer and greenhouse gas remission credits this vertical integration and diversification places a safety net under hog market prices.

Capital budget estimates for a 10,000 place grow to finish facility in Canada are in the area of C\$5 million with payback in less than 6 years. A 20,000 place finisher in Canada comes to about C\$7.5 million with payback in about 4 years, including interest costs. This capital outlay sounds like a lot but remember there are four sources of revenue.

1. Sale of surplus fertilizer.
2. Sale of greenhouse gas offset credits
3. Recovery of current manure management costs.
4. Avoidance of future manure management costs.
5. Additional benefits mentioned earlier incorporated in your operation

**These five cash flows will turn a manure management cost center into a profit center.**

**The Process:**

Starting with the conveyors in the barn - the unique shape and slope of the conveyor at rest allows the urine to drain immediately into the pipeline that will take it to the treatment building where after some pre-treatment it will be passed through the membrane filter. If necessary the filtrate will then go to an ammonia extraction process which uses heat and pH to remove the ammonia and convert it to ammonium sulphate which will eventually be added back to the solids prior to drying. The liquid is then passed through the Ultra Violet radiation process, pH adjusted and cooled before being returned to the barns where it will be mixed 50/50 with your normal supply. The pH adjustment is done with lime which eventually finds its way into the pellet along with some sulfuric acid which brings the pH back down to the normal range. The system can be adapted for scraped gutter systems in the case of retrofits.

Now let's follow the faeces path - Having allowed the faeces to remain exposed to air circulation for up to 24 hours, the conveyor is rotated and scraped. This will take about 5 minutes or so each day. The faeces are dropped into a bin which is transferred to the treatment building and fed into the dryer to produce fuel for the following day. As soon as that is done the membrane concentrate, lime sludge, burner ash and ammonium sulphate along with any supplements are added to it and the mixture is then dried and pelleted. The pellets are then moved into bulk storage. We expect a 10,000 head operation to produce about 3,700 tonnes of pellets supplemented to a 2:1 NP ratio for corn per year. Fertilizer analysis will be about 10.6 - 5.3 - 2.5 with Sulfur at 2.2, Calcium at 2.8 and Magnesium at 0.8 that should sell for about \$460/tonne based on equivalent chemical prices.

Bulk chemicals are lime and sulfuric acid which are consumed and find their way into the pellet. We took measurements of the nitrogen available on manure discharged fresh from a barn and compared it to the nitrogen left when the storage facility was pumped and distributed. That is where we found a substantial loss of nitrogen, close to 75%, which confirmed other studies.

We can reduce your water consumption by more than 50% and pumping costs are reduced accordingly. As you can see there will be no further need for flushing.

Ammonia in the barn will be substantially reduced and what little anaerobic activity occurs is internal to the faeces itself. The dryer uses biomass - the faeces or some alternate that might be available, and while generating carbon dioxide it does not count against us in determining CO2 reduction. Within the next few months we may finally have some idea as to the remission credits that may be available and the extent that a fair market price may be obtained for them.

### **In Conclusion:**

In conclusion, some of you may have found our website and will already be aware that we are searching for a demonstration site. Hopefully, it will be an operator who has 4,000 to 10,000 head in a reasonably small area who wants to expand and needs a solution to his problems. In Canada we propose, to build the treatment facility at no cost to the operator, but with his promise to buy it at a discount if we pass agreed milestones. As attractive as that may sound we have no applicants at this time. The reason is simply 'risk avoidance'. Operator's will not take on significant debt - no matter what the pay back is, until the concept is proven. No one wants to be first. But as in Europe, the agricultural industry cannot afford to increase costs when they cannot be passed on to the consumer. I think at this time the public wants to see action and is willing to pay for it.

The answer is to use the approach that worked for Denmark in their adoption of biogas plants. Let me quote from a presentation by Bruno S. Nielsen at the 2007 Banff Pork Seminar and reported in their Proceedings, pages 237-243. "From the outset the plants had to be commercially viable. Their economy was based on energy sales. Through the 1980's and 1990's the development was promoted through a close public-private co-operation. This included public funding for research, development and up to 40% investment grant in full-scale demonstration plants. The subsidy for investment in biogas plants was gradually reduced from 40% to 20% and has been reduced to zero by the government."

This is how new technology can be jump-started in our industry - a one-time reduction in capital cost that allows an operator to choose the technology that works best for him while providing the public with measurable and immediate results in terms of reduced environmental risk and impact, conservation of resources and an expanding agriculture sector economy.

I want to thank you for your attention and will take any questions in the time remaining.