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Update on thermal assisted drying and decontamination (TADD) systems

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Research has shown the importance of drying in the prevention of porcine respiratory and reproductive syndrome virus (PRRSv) transmission from contaminated livestock trailers. Dr. Dee's initial research (2003) with scale models provided us with the first indication that natural drying would eliminate the virus. In further research (2004) utilizing full sized trailers and an 800,000 BTU MAC heater, he demonstrated that the virus could be eliminated in 20 to 30 minutes at 71° C (160° F). With this knowledge the US pork industry has continued to develop and apply equipment to heat and dry trailers in a more efficient manner.

PIC's original 2 million (M) BTU grain drying units are still being used in the KY system. Due to concerns about toxic fumes and noise, these drying units need to be installed in dedicated drying bays or outdoors in nonresidential areas. For more efficient energy use MAC Heater, Glenburn, ND has supplied 1.2 M BTU indirect fired heaters. These units have been installed in the PIC Ft. Dodge, IA transportation center as well as in a pork production system in Iowa. With the indirect fired unit all burnt gases are exhausted outside the building. After this unit was placed into service in the truck wash environment we quickly learned it needed higher temperature electronic thermostats and a different pulley to increase the cubic feet per minute (cfm) output. Along those lines we also had to change the cycling of the unit to narrow the temperature range from high to low to keep the output at a more consistent temperature. This particular unit will also allow recycling of heated air to conserve fuel.

As awareness to the advantages of drying has increased, other suppliers to the pork industry have developed new systems. Automated Production Systems (GSI) of Assumption, IL has developed two systems for drying. Their high volume drying system, "Bio-Dri", utilizes two 10 hp. centrifugal fan grain drying units to heat a stand alone drying bay. This system allows the recycling of heated air to increase fuel efficiency and has automated controllers to monitor the system. Individual trailer identification, day and time can be inputted into the controller for recording of the data. At the end of the drying cycle fresh air is used to flush the bay before a driver enters. Safety features are in place to shut the system down if anyone enters during the drying cycle. Drying times with this system are dependent on the ambient temperature and humidity but have been running approximately 20 minutes per trailer this summer. The temperature sensors on the trailers are set at 60° C (140° F). Fuel costs will be approximately $10/trailer in the winter and $5/trailer in the summer. AP Systems estimate the turn key cost for building and equipment for this system to be in the range of $90,000 to $120,000.

Another drying system more suited for lower volume usage at a reduced cost is called "Eco-Dri". This system utilizes two 50 foot long radiant heaters at 150,000 BTU/unit plus 4 strategically placed box fans to circulate the air. Two stacked 36 inch fans blow in the left rear door of the trailer and the other two fans are placed to blow into the front corners of the trailer. This system has a power inlet shutter and exhaust fan that operates during the drying process. The controller for this system uses a manual timer. The Eco-Dri system should be able to reach temperatures of 38 to 43° C (100 – 110° F). I would estimate it will take 60 to 90 minutes to dry a trailer with this system in the winter.

Dr. Butch Baker at the North Carolina State University has been working with a different system that has focused more on heating the trailers to 71° C (160° F) for 10 minutes to eliminate the PRRSv instead of focusing on drying per se. Dr. Dee has assisted Dr. Baker in evaluating this system and was able to show the PRRSv was not viable following the treatment. This unit has an automated controller that is able to input the trailer ID, day, time, and temperatures. It uses 8 infra-red sensors to monitor the process. Temp-Air from Minneapolis, MN is the supplier of this equipment.

From an economic point of view all of our focus to this point with temperature or drying has been on eliminating PRRSv. We plan to conduct trials with Dr. Dee in 2005 to also look at bacterial pathogens and the effects of heat or drying on them. Personal communication with Dr. Dee last year indicated that drying killed Escherichia coli however the bacteria was able to survive in the presence of moisture when just heat was applied without complete drying. Additional information will be available from trials in 2005 evaluating contamination from E. coli as well as results from a trial conducted with Dr. Sandy Amass at

Purdue evaluating environmental contamination following TADD treatment.

In conclusion, the original research has shown the importance of drying as a component of biosecurity for the pig industry. During the last 18 months there have been several producers in the US that have considered the implementation of TADD systems. Some of these systems are operational and proving to be a cost-effective tool for producers to improve biosecurity. Several suppliers have models that are suitable for these purposes. We feel that this is an important method to improve biosecurity in transport.

References

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