



Enhancing biosecurity and welfare of pigs during transport



Bernardo Predicala, Ph.D,
Prairie Swine Centre



Alvin Alvarado, M.Sc.,
Prairie Swine Centre

Introduction

Airborne transmissible diseases have the potential to create significant economic losses due to lost productivity, added costs of medication and eradication measures, and even potentially market access.

A previous project examined the development of a new prototype trailer design aimed to protect the animals (such as high-value breeding stock) from airborne transmissible diseases during transport.

The design of the prototype trailer assembled in the previous project tried to integrate as many features as possible identified by stakeholders. This initial prototype was a first attempt at developing an entirely new platform for animal transport, however it still requires additional work before it can be widely adapted and commercialized. This subsequent work involved trailer improvements focused on better environmental control and data logging systems as well the addition or modification of necessary features such as drinkers, misters, and lighting in the animal compartment of the trailer.

What did we do?

The first phase of the project looked at implementing modifications to the existing prototype trailer in order to optimize biosecurity and welfare properties for swine transport. Recommendations from previous work was re-examined and a list was developed that included suggested modifications to the

prototype air-filtered trailer, and was supplemented by a search of information from various sources such as product brochures, feature articles, and promotional videos of various improved and modern livestock trailers. The search aimed to identify relevant, innovative and applicable features that can be part of the new trailer design. Further investigation also included the inspection of two existing state-of-the-art commercial pig trailers, manufactured in Europe, to gain first hand knowledge on available and promising new features.

Results and Discussion

Two aspects of trailer modification included: 1) modification of the instrumentation systems; and, 2) physical or structural modifications of the trailer. Table 1 presents a summary of modifications recommended for the prototype trailer.

Implications

A new and more versatile environmental control system was developed. The system has independent and separate controls for the top and bottom deck fans and will be governed by temperature, RH and CO₂ levels inside the trailer. The new system includes a more reliable data logging features that are capable of displaying data in real-time, allowing the driver to access to the data, or bypass the system, while in transit. After completion of trailer modification work, the new re-designed prototype will be subjected to further testing to evaluate its performance.

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Table 1. List of suggested modifications to the prototype trailer

Area of Modification	Description of Desired Modification / Reason for Modification
<i>I. Instrumentation — Environmental Control and Datalogging System</i>	
Ventilation system control	<ol style="list-style-type: none"> 1. Independent and separate control for the top and bottom deck fans. The system is governed by: <ol style="list-style-type: none"> i. Temperature – primary ii. RH and CO2 levels – could bypass temperature if RH and CO2 levels exceed a set threshold level while at minimum ventilation. 2. Ability to log temperature, RH and CO2 levels, as well as air flow inside the trailer at selected time intervals. Also, logging of ventilation flow rate (i.e., % fan capacity of each fan) for the duration of transport journey. 3. Real-time display and access to above data while in transit, and capability to be bypassed by the truck driver if the need arises. 4. In-cabin controls and alarms.
Misting system	Ability to activate manually or automatically if certain temperature level is reached inside the trailer.
Area of Modification	Description of Desired Modification / Reason for Modification
<i>I. Instrumentation – Environmental Control and Datalogging System</i>	
Monitoring and data logging of the above parameters	<ol style="list-style-type: none"> 1. Upgrade/replacement of sensors and stand-alone data loggers shall be wired for permanent installation in the trailer, such that sensors (and its housing) can withstand washing and disinfection (including baking), or sensors can be easily removed/detached prior to washing and can be re-installed without technical complications. 2. Parameters to be monitored and logged: <ol style="list-style-type: none"> i. temperature ii. RH iii. CO2 level iv. air speed/air flow v. trailer surface temperature – this parameter should be monitored real-time during baking to confirm when desired temperature of key surfaces is attained to achieve proper disinfection vi. GPS location monitoring
<i>II. Physical / Structural Modifications</i>	
Hydration control system	<ol style="list-style-type: none"> 1. Water tank/s, water heater and water distribution system, with appropriate controller to activate the water tank heater at pre-set ambient temperature (i.e., European trailers have -10°C threshold, below which the water system is not used). 2. Design safety for water distribution (e.g., avoid protrusions or pinch points) shall be considered.
Lighting	<ol style="list-style-type: none"> 1. Interior lights will be permanently installed following welfare criteria on lighting, with manual or automatic control switches. 2. Installation of lights on rear exterior of animal compartment that can be activated together with hydraulic ramp control, for use during loading/unloading before dawn or after dusk.
Portable heater at front compartment	Heater/s shall be installed at the front compartment. This requires appropriate positioning and ducting to uniformly distribute the supplemental heat within the compartment, and then into both decks.
Area of Modification	Description of Desired Modification / Reason for Modification
<i>II. Physical / Structural Modifications</i>	
Access for inspection	This is required by regulation, especially at border crossing. This can be achieved by installing air-tight-hatches along the side walls, which can be opened to carry out the inspection without compromising the biosecurity of the animals (i.e., prevent entry of unfiltered air into the compartment).
Wireless remote control of the hydraulic lift	The current wired controller for the operation of the hydraulic lift is quite inconvenient to use; a wireless option should be investigated.
Man-door or side access ladder	In conjunction with the inspection hatch, this is needed in emergency situations when the hydraulic lift failed to operate.
Emergency unloading door for animals	In conjunction with the inspection hatch, this is needed in emergency situations when the hydraulic lift failed to operate.
Emergency plan in case of ventilation system failure/malfunction	Also in conjunction with inspection hatch/unloading door, alternate openings for natural ventilation of the animal compartment should be installed in case of prolonged shutdown of the main ventilation system.
Water-proofing of sensor/data loggers housing	Appropriate protective housing for electronic components should be installed. Alternatively, the sensors should be easily detachable prior to trailer washing and disinfection.
Generator exhaust pipe	Current exhaust pipe on the side of the trailer may allow the exhaust fumes to enter the air inlet of the front compartment. The exhaust pipe needs to be extended to vent the fumes at the top of the trailer.
Hydraulic lift side panels	For animal and handler safety, options should be explored to increase the height of the side panels by adding detachable extension panels, without hindering the opening and closing of the hydraulic lift gate.

