Outdoor Weather Characterization for a Swine Transport Assessment

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Background

➢Animal transportation is important to maintain because of two distinct reasons:

1. For the benefit and the safety of the animals and the people involved. With more science based management information,

- The spread of animal carried diseases decreases.
- Animals experience less stress, increasing their chances of surviving the trip.
- Producers don't lose their investments.
- Consumers have cheaper prices and greater availability on animals and animal products.

2. For the humane treatment of animals.

- Animal welfare is defined as, "the ability of an individual to cope with its environment. [1] " Any slow of coping ability or inability to cope is an indication of poor welfare[1].
- During animal transportation, animals can be subjected to stress, exhaustion, starvation, heat stroke, frost bite, ect.
- In a study conducted by P. J. Bryer et al., pigs were transported for 6, 12, 18, 24, and 30 hours[2]. In all trips, stress, muscle breakdown and dehydration were shown[2].
- This severely damages the animal's well-being and the product.

➢Pork is the most widely consumed meat in the world,"[3].

➢No laws or regulations that state when and how pigs can be transported.

➢The National Pork Board recognizes that problems continue to occur during transport and supports research to correct the issue.

➢Problems that can occur during transportation are:

1. 'Down' : a pig that has arrived exhausted and unable to stand[4].

Figure 1.0 Example of 'down' pig. http://www.chinadialogue.net/article/show/single/en/5820-Shanghai-s-dead-pig-story-stretches-back-upstream

2. 'Dead in pen' : a pig that has arrived in good condition but stress and fatigue caused it to die in its destination pen[4].

Figure 2.0 Example of 'dead in pen' pig. http://www.flickr.com/photos/75028589@N00/3172242530/

3. 'Dead on arrival' : a pig that was found dead when the trailer arrived at its destination[4].

Figure 3.0 Example of 'dead o arrival' pig. http://ppd.soup.io/tag/India

➢Although the occurrence rate of these problem pigs is small, these kinds of pigs can not be used. Therefore, these pigs, "cost the US pork industry **$50 - $100 million annually,"[4].**

➢Therefore, research and science based management information of this industry has the potential to save the US millions of dollars and can then be applied to other countries and other livestock species.

Objective

Do external trailer conditions during pig road transportation correlate ASHRAE annual records?

Methods

Overall:

➢My study was a part of a larger pig transportation project.

➢~50 pig transportation trips each lasting 2-6 hours.

➢Boarding, bedding and misting were incorporated.

➢The internal environment (6 different sections), the external environment, and pig skin temperature were monitored.

➢GPS locations were obtained every min of every trip.

My Contribution:

➢Analysis and generation of a GPS based weather data sets with frequency distributions.

1. Each trip was plotted in Google Earth, using online programs Multiplottr.com and OnlineCustomMaps.com.

Figure 4.0 Example of a single plotted trip with trip GPS locations only.

2. Weather station locations were gathered from the online National Climatic Data Center (Department of the National Oceanic and Atmospheric Administration) and plotted.

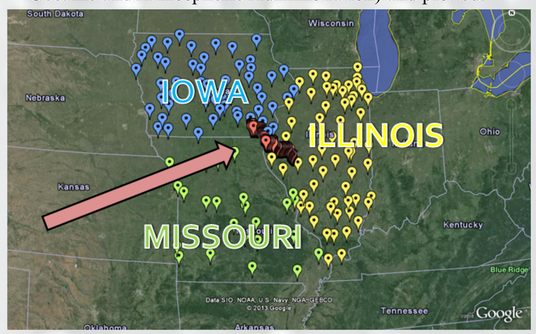

Figure 5.0 Example of a single plotted trip with trip GPS locations and weather station GPS locations.

3. Nearest stations to the trip were identified. Then distinguished which GPS locations belonged to which weather stations, based on latitude and longitude, using Movable Type Scripts and the following equation:

$$(2 * ATAN2\left(\sqrt{\left(\sin\left(\frac{|Lat1 - Lat2| * \Pi}{180}\right)\right)^2 + \cos\left(\frac{Lat2 * \Pi}{180}\right) * \cos\left(\frac{Lat1 * \Pi}{180}\right) * \sin\left(\frac{|Long1 - Long2| * \Pi}{180}\right)^2}, \sqrt{\sin\left(\frac{|Lat1 - Lat2| * \Pi}{180}\right)^2 + \cos\left(\frac{Lat2 * \Pi}{180}\right) * \cos\left(\frac{Lat1 * \Pi}{180}\right) * \sin\left(\frac{|Long1 - Long2| * \Pi}{180}\right)^2}\right) * 6371km$$

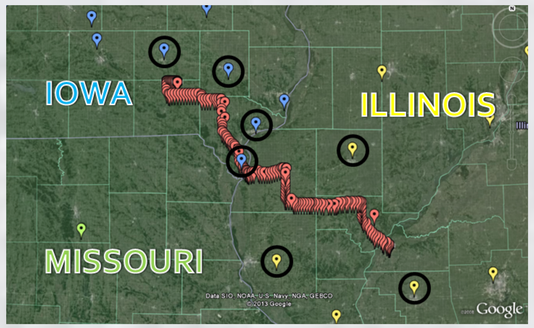

Figure 6.0 Example of a single plotted trip with identified local weather stations.

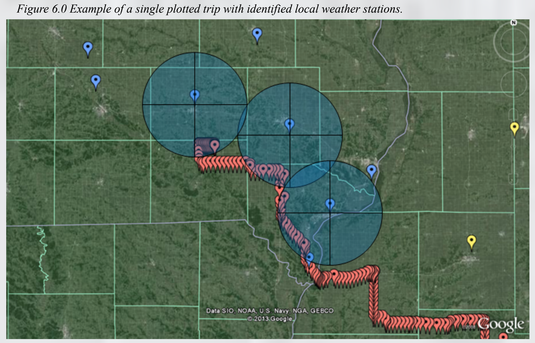

Figure 7.0 Example of a single plotted trip with localized local weather stations.

4. Time and date specific weather data (dry bulb temperature, wet bulb temperature, dew point temperature, humidity, wind speed, and standard pressure) was gathered for each GPS location, according to the history of each weather station.

5. Each set was compared to ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) records to determine if results resembled normal annual conditions.

Results

➢ Results are still in analysis. The following graph is a sample of the current progression of results:

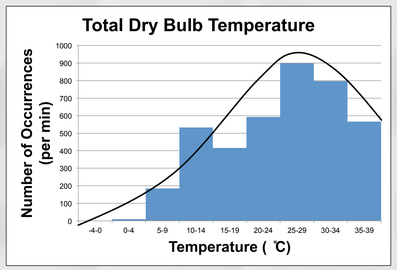

Figure 8.0 Sample frequency distribution of total dry bulb temperature which currently demonstrates a skewed frequency distribution. Further analysis is required to determine if results resemble annual ASHRAE conditions.

Results (Continued)

➢ Should my results support that the external trailer conditions correlate to ASHRAE annual records, this means that the gathered data is applicable to the area in which it was gathered and others.

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