**Problem Statement**

Sows are very sensitive to changes in their environment. These changes can lead to increased respiration rate and decreased food intake, milk production, and reproductive performance in sows. All these factors have negative impacts on the pork producers' capability to maximize sow productivity. Thermal discomfort is one of the main problems affecting sow performance. Major pork producing areas experience temperature ranges above the optimum room temperature range. By controlling the temperature of the sow to reduce/eliminate heat stress, a producer can increase both the sow and litter productivity and health. Designing a portable cooling pad that can easily be installed in and removed from a current farrowing crate eliminates the problem of remodeling current hog producing facilities. With a large number of sow farms reporting a decline in fertility during the hot summer months, a cooling system is needed to control the sows' core body temperature.

**Overall Design Goal**

- Design and build a cooling pad durable enough to withstand the daily use of a 600 lb sow in a farrowing crate.
- Have adequate heat transfer of material within the pad for conductive cooling of animal.
- Thermocouple connections throughout pad for future testing and research.

**Environmental Impacts of Floor Cooling on Sows**

Studies have shown positive effects of floor cooling under lactating sows productive and reproductive performance and litter performance.

- Reduced heat stress of animal
- Greater feed intake of sow
- Increased milk production of sow
- Greater piglet and litter weight
- Increased time sow stayed nursing, indicating greater animal comfort

**Alternative Building Designs**

Three solutions of how to connect Thinfin C plates to aluminum transfer plate were discussed and tested.

- Weld
- Adhesive
- Fasteners

Fastening was determined the best method for prototype cooling pad to allow for changes if needed.

**Future Research**

Dr. Allen Schinckel is leading a research project that promotes sow welfare and productivity. Recently receiving an AgSEED grant, the sow cooling pad is designed to be capable of testing many issues of heat stress of lactating sows needed for this research project. Future testing of the design is to begin this summer.

**Future Research Includes:**

- Maintain temperature uniformity
- Expand range of thermal capacitance
- Minimize overall energy loss from device
- Confirm effective environmental skin temperature of sow

**Cost Analysis**

<table>
<thead>
<tr>
<th>Material</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Aluminum Diamond Tread Plate</td>
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</tr>
<tr>
<td>1/2&quot; Copper Pipe</td>
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<tr>
<td>Copper Fittings</td>
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<tr>
<td>Thinfin C Heat Transfer Plates</td>
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<tr>
<td>HDPE Plastic</td>
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<td>Fasteners</td>
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<tr>
<td>Lord 412 Adhesive</td>
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<tr>
<td>Aluminum Spacers</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$279.00</strong></td>
</tr>
</tbody>
</table>

**Figure 1 - Seconds for Top Plate to Reach 65°F**

- Water Temperature: 58°F
- Plate Temperature: 72°F
- 245° Glue
- 378° Bolts
- 690° Weld

**Figure 2: Exploded Final Design**

**Figure 3: Final Prototype**