**Sow Cooling Pad**

**Background**
- In 2015, a Senior Design team developed a sow cooling pad for use in farrowing facilities that would lower thermal discomfort in the sow crate to increase productivity.

**Problem Statement**
- Cooler used water from the farm, dumped exhaust water into the manure pit
- Wasteful/not realistic for large scale operations.

**Criteria**
- Close the system to improve efficiency in consumption, waste and operation management.
- Multiple Solutions for a closed system to cool and recirculate water
- Show cost analysis/decision matrix for solutions

<table>
<thead>
<tr>
<th>Solution</th>
<th>Vertical Geothermal</th>
<th>Geothermal Horizontal</th>
<th>Legacy Chiller</th>
<th>Peltier Chips</th>
<th>Piping PVC</th>
<th>Piping Sch 40 Blk</th>
<th>Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barn Cost Equipment</td>
<td>$25,000.00</td>
<td>$25,000.00</td>
<td>$65,900.00</td>
<td>$13,296.61</td>
<td>$25,679.61</td>
<td>$9,478.82</td>
<td>$22,371.62</td>
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<tr>
<td>Install Generators &amp; Loops</td>
<td>$15,000.00</td>
<td>$15,000.00</td>
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<tr>
<td>Install Loop</td>
<td>$2800/ton</td>
<td>$1300/ton</td>
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<tr>
<td>Install Pumps</td>
<td>$106,400.00</td>
<td>$49,400.00</td>
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<tr>
<td>Install Insulation</td>
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<tr>
<td>300 gl Recirc Tank</td>
<td>$304.00</td>
<td>$304.00</td>
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<tr>
<td>Total Cost</td>
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<td>$98,953.00</td>
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<td>$33,383.49</td>
<td>$19,406.35</td>
<td>$36,166.99</td>
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</tbody>
</table>

**Economic Analysis**

**Barn Layout**
- 9,300 sow operation
- 240 crates/barn
- 60 crates/room
- 4 rooms/barn

**Geothermal Systems**
- 28 & 10 ton generators combined
- 42,000’ of loop required
- 300 gallon recirculation tank

**Maximum Water Flow**
- 144 gpm at full capacity
- 72 gpm average
- Two 89 gpm pumps to compensate

**Sow Heating Units Created**
- 460,000 btu/hr at max capacity
- 230,000 btu/hr average

**Sustainability**
- Cooling pad Lifespan of 15 years
- Geothermal Generators 25-30 years
- Legacy Chiller 20-25 years
- Pit Piping lifespan 50+ years
- Peltier Chip lifespan 1 year
- 89 gpm pumps 10 years

**Impact**
- Gain of 2.5 pigs/pen/year climate dependent
- Gain of $150-175/crate/year
- Improved estrus cycles
- Improved Daily Feed Intake (DFI)
- Improved Weaning Weight
- Improved sow health
- Lower gilt herd sizes

**Breakdown**
- Vertical – $33.12/crate/year
- Horizontal - $23.62/crate/year
- Legacy Chiller - $20.62/crate/year
- Pit Cooled – $2.31/crate/year
- Peltier Chip – $72.02/crate/year

**Acknowledgements:**
- Tyler Field – PhD Candidate ABE
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