Handout 1: Fan Selection Method from BESS Lab Database

**Given:** A desired ventilation rate for a specific task. For example, 2,000 cubic feet per minute (cfm) at 0.10 inch static pressure (SP) is needed for 1,000 newly weaned pigs (12 lb/5 kg body weight).

**Required:** Find a 14” diameter propeller fan from the BESS database (bess.illinois.edu), which delivers no less than the desired airflow (2,000 cfm) at the specified building static pressure (0.1” SP). The fan must not have any sort of steel blades or housing because of concern for corrosion.

**Solution:**

1. Go to the BESS lab website.
2. Select “Performance Tests” from the tabs at the top of the page.
3. Select “Current Performance Tests” from the tab to get recent data.
4. Select “60 Hz (North America)” for a U.S. application.
5. Use the drop down tabs to select: All Manufacturers, and choose a 14” diameter, then press Submit.
6. Review the fans. For example, look at the Exacon 07479e (Model AF14LP) and note its Air Flow at 0.10 in SP is 2480 cfm. (see next page for the fan printout from BESS).
7. Click on the Test # for that model fan to open a fan test summary sheet. Review the fan specifications (see page 3). Note that it has a plastic housing and plastic shutters (not metal). It has a wire guard and a discharge cone. It has a 6-blade plastic propeller. It is providing 2,480 cfm at 0.10 in. H₂O static pressure, running 1554 rpm, using 230.4 volts, 1.35 Amps, and 306 Watts. The fan efficiency (VER, ventilation efficiency ratio) is 8.1 cfm/Watt.

Conclusion: this fan will fit the requirements. However, it does have a wire guard and it delivers a bit more flow than we wanted. It is also a relatively low fan efficiency (A VER less than 10 cfm/Watt for small fans, less than 18-20 cfm/Watt for larger fans, is not considered to be a high efficiency).

**Notes:**

1. Going back to the main search, keeping 14” fan diameter, reset to: All Manufacturers, Any Airflow, and specify a VER >= 10. The search finds no 14” fans with that high of efficiency.
2. Repeating the search once more, ask for All Manufacturers, 1,000 – 3,000 cfm Airflow, and specify a VER >= 10. Now you get many choices, as long as we can pick 16” or 20” fans.
Search Results

Power supply: 1 phase 230V, 60 Hz

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<th>Test #</th>
<th>Model</th>
<th>Size</th>
<th>Cone</th>
<th>Shutter</th>
<th>Air Flow (cfm)</th>
<th>VER (cfm/W)</th>
<th>Air Flow (cfm)</th>
<th>VER (cfm/W)</th>
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University of Illinois Department of Agricultural and Biological Engineering
Bioenvironmental and Structural Systems Lab
Final Report

Project Number: 07479e
Test Date: November 20, 2007

Fan:
Make- Exacon
Model- AF14LP
Blade dia.- 14.3"
Orifice dia.- 14.6"
Blade:
Number- 6
Shape- propeller
Material- plastic
Pitch- -
Clearance- 0.2"

Motor:
Make- FHP
Model- M099909
Hp- 1/4
RPM- 1625
Volts- 115/230
Amps- 2.6/1.3

Shutter:
Material- plastic
# Doors- 4
# Columns- 1
Door length- 15.1
Location- Intake

Guards:
Description- wire
Spacing- 2" concentric
Location- exhaust

Housing:
Material- plastic
Intake area- 14.4" x 14.4"
Discharge Cone:
Depth- 19.5"

Drive Sheaves:
Drive dia.- direct
Axle dia.- drive

Drive dia.:
Discharge- 0
Depth- 21" top

Notes: prototype discharge cone

Test Conditions:
T(wb): 64.5 Barometric pressure, recorded 29.28
T(db): 81 Barometric Pressure, corrected 29.14

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