



Running on efficiency

By DANA PETERSEN

IN the wake of the recent egg recall, management and maintenance in poultry production facilities are key issues. Proper ventilation is an important consideration for the health of employees and poultry alike. Selecting energy-efficient fans can help minimize production costs, and performing routine maintenance on new and existing fans ensures consistent air quality and efficient fan performance.

Fans are an important component of mechanically ventilated poultry facilities. Inefficient or mismanaged fans may allow air quality to diminish, causing undue stress on birds, says Jay Harmon, ISU professor in ag and biosystems engineering. Stressed birds are more susceptible to disease and have less-than-optimal growth and feed conversion. "Fans serve as the engine of the ventilation system," says Harmon. "They are the driving force behind the exchange of air that is necessary to create a healthy environment for poultry and associated farmworkers."

Inefficient fans can add to production cost in two ways, says Harmon. The most obvious is wasted energy that is expended by an inefficient fan. Other costs include poor air quality throughout the building due to under-ventilation or

wasted heat due to over-ventilation. In general, small fans are less efficient than larger fans. Fan efficiency is measured based on the amount of air delivery that a fan will provide per unit of electric power used, given in cubic feet per minute per watt (cfm/W). Efficiencies range from about 5 to 25 cfm/W.

Factors affect performance

The configuration in which a fan is installed and the manner in which it is maintained greatly affect its performance, says Harmon. Guards generally decrease the fan performance less than 5% and should always be left in place because they protect workers from the fan and the fan from obstructions.

Shutters reduce fan performance from 10% to 25% but are necessary for periods when the fan is not operating. Dirty shutters and blades can reduce air delivery by as much as 40%. Regular cleaning and maintenance keep shutters operating at their manufactured level of efficiency. Well-maintained discharge cones increase fan efficiency by 15% or more.

If belt-driven fans are used, check belt tension regularly. Loose belts will cause the fan to be less efficient and effective, perhaps by as much as 50%. An over-tight belt will cause undue wear on bearings. Fan ratings are based on a fan that is in new condition and should include all accessories that will be used in your application.

According to Harmon, a common mistake is to select fans based on fan diameter. Never assume that two fans of equal size will perform the same, since different motors, curvature of blades and other attributes greatly influence the performance. For instance, it has been found through testing of several 50-inch fans that the air delivery (at 0.10 inches of water) ranged from 18,000 to 28,600 cfm, and the efficiency ranged from 14.3 to 24.5 cfm/W.

Fans should be rated by an independent lab to show air delivery and efficiency as a function of static pressure. This information is typically presented using either a graph or table. Accessories on the fan such as guards, shutters and discharge cones impact performance and should be noted when examining test data. Test results are available from the Bioenvironmental and Structural Systems lab at the University of Illinois (www.bess.uiuc.edu).

Fan selection criteria

Mechanical ventilation systems are generally composed of multiple fans that are staged to turn on as temperature rises. In some systems this begins with small fans, and larger fans are added to increase the air delivery. Fans should be selected based on air delivery and efficiency ratings at 0.10 inches of water.

RIGHT CHOICE: Energy-efficient fans that move enough air are essential for proper ventilation of livestock facilities.

The table accompanying this article shows median and upper-quartile test results for efficiency ratings by fan size. Harmon recommends selecting fans from the upper quartile of rated fan efficiencies. As an additional incentive, many utility companies provide rebates for fans that meet specific efficiency ratings. Check with your local electric utility before purchasing fans.

Petersen is with the Farm Energy Conservation and Efficiency Initiative, sponsored by the Iowa Energy Center.

Checklist for fan

IMPROPER fan maintenance can negate energy savings from proper fan selection. Simple routine maintenance steps include:

- regular cleaning and maintenance of fan blades and shutters
- maintain discharge cones
- check belt tension regularly
- check with utility provider for rebates when replacing or upgrading fans

Fan test results for efficiency

Diameter of fan	Efficiency rating	
	Median rating cfm/W	Top ¼ rating cfm/W
Inches		
<16	7.9	8.7
16 to 20	10.3	11.2
22 to 35	13.0	14.6
36 to 46	15.9	17.2
48 to 56	18.9	20.4
>56	20.1	21.5

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