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Poultry Housing Tips

The Best Performing Tunnel Fans - 2005

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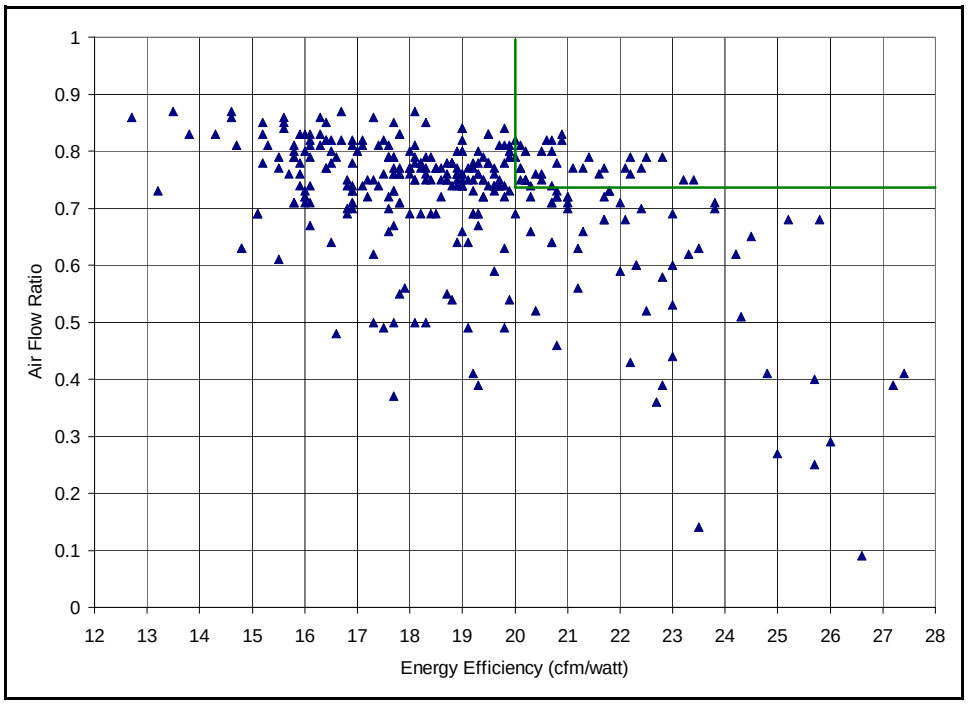

Figure 1. Energy Efficiency Vs. Air Flow Ratio for all Fans 48" or Larger

Selecting the right fan when building a new house or retrofitting an older one for tunnel ventilation is one of the most important tasks a producer has. A house's fans are essentially the engine of the ventilation system and as a result have a significant effect on a producer's ability to keep their birds cool and energy costs to a minimum during hot weather.

There are three performance factors producers should pay close attention to when purchasing fans: the amount of air delivered at a static pressure of 0.10", energy efficiency rating, and air flow ratio ((*Poultry Housing Tips. Exhaust Fan Performance Factors. March 1999*). When determining the number of fans a house should have producers need to look at how much air it moves @0.10" static pressure because that is the typical static pressure the fans will be operating at or near when in operation. Determining the number of fans a house should have by a fan's air moving capacity at 0.05" or even worse 0.00" can lead to a house being significantly under-ventilated during hot weather.

A fan's energy efficiency rating is similar to a car's mileage rating. Instead of speaking in terms of miles per gallon when comparing fans we look at how many cubic feet per minute the fan can move with a single watt of power (cfm/watt). As with a car's mileage rating, the higher the cfm/watt the more energy efficient the fan. A two cfm/watt

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difference between two fans typically results in approximately a 10% difference in electricity usage. In general, energy efficiency ratings vary from around 15 cfm/watt to nearly 30 cfm/watt. As with the case of a fan's air moving capacity, comparing a fan's energy efficiency rating should be done at a static pressure of 0.10"

A fan's air flow ratio is another important factor to consider when purchasing a fan. A fan's air flow ratio is an indicator of how well the fan will hold up as static pressure increases due to factors such as dirty shutters, pads, baffle curtains, or tunnel curtains not fully opening. A fan's air flow ratio is determined by dividing the amount of air it moves at 0.20" pressure by the amount of air it moves at a static pressure of 0.05". Air flow ratios typically vary from 0.50 to 0.85. The higher the ratio, the less the fan is affected by high static pressures, and the more desirable the fan. To put this into perspective the air moving capacity of a fan with an air flow ratio of 0.50 will decrease as much as 50% in a worse case scenario in which the static pressure was very high (0.20") due to dirty pads and fan shutters whereas a fan with an air flow ratio of 0.85 would only decrease 15%.

Most manufacturers send their fans to the BESS Laboratory at the University of Illinois for performance testing. Fans are tested with shutters and guards in place to determine their air moving capacity and energy efficiency ratings at static pressures ranging from 0.00" to 0.20". Producers can either purchase a test booklet or visit their web site (www.bess.uiuc.edu) to obtain copies of performance test results.

Over the years the BESS Laboratory has tested hundreds of 48" - 54" diameter fans that could be used in a tunnel-ventilated house which can make it rather difficult in searching out the best tunnel fan to purchase. The search can be significantly easier if we first set some rather high limits as to what is acceptable from a performance stand point. With ever increasing electricity rates we want to make sure that we have a fan that is very energy efficient. Specifically, it should have a minimum energy efficiency rating of 20 cfm/watt @0.10" static pressure. Next we want to make sure it is among the best when it comes to continuing to move the air we need as static pressure increases, specifically it should have an air flow ratio of at least 0.73.

Figure 1 is a graph of energy efficiency rating versus air flow ratio for all fans in the 2005 BESS Laboratory test booklet that are 48" or larger in diameter (each diamond is a specific fan). The worst performing fans tend to be in the lower left hand corner with a low energy efficiency rating as well as a low air flow ratio. The best fans from a performance stand point are those in the upper right corner of the graph that have both a high energy efficiency rating and a high air flow ratio (green rectangle). If we limit our fan section to those that meet the aforementioned performance criteria we can focus our efforts on the top 10% of the fans tested (Figure 2, Table 1). Though all these fans are exceptional, the best of the best would again tend to be those in the upper right hand corner (Figure 2).

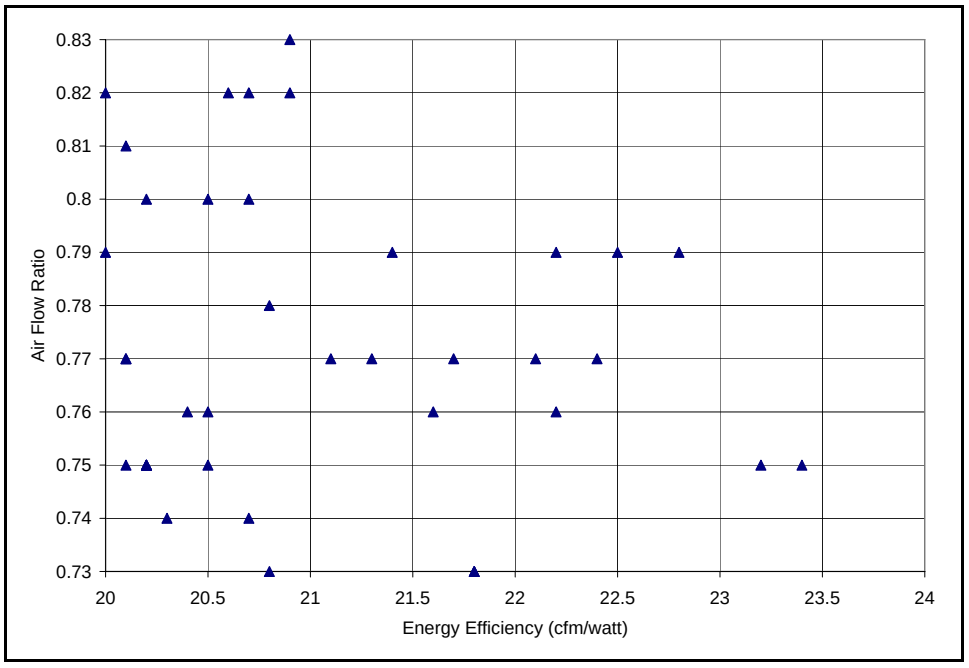

Figure 2. The Best Performing Tunnel Fans 2005 (Energy Efficiency Vs. Air Flow Ratio)

Bess Test #	Fan	Cone	Shutter Type	Cfm 0.05"	EER 0.05"	Cfm 0.10"	EER 0.10"	AFR	Size
04337	Chore-Time 49451-23	Y	B	20,100	26.8	18,700	23.4	0.75	48
04325	Chore-Time 49515-23	Y	B	20,000	26.5	18,600	23.2	0.75	48
98179	Acme BDR54J-C	Y	A	25,500	25.5	24,100	22.8	0.79	54
02207	Acme BDRV54J2-C2	Y	A	27,400	25.5	25,800	22.5	0.79	54
02210	Acme BDRV54J-C2	Y	A	26,100	25.8	24,400	22.4	0.77	54
02217	Acme BDRV54J2-C3	Y	A	27,100	25.2	25,400	22.2	0.79	54
02214	Acme BDRV54J-C3	Y	A	25,900	25.3	24,200	22.2	0.76	54
98181	Acme BDR54J-C	Y	A	25,200	25.1	23,600	22.1	0.77	54
04322	Chore-Time 48318-235	Y	P	19,400	25.1	18,000	21.8	0.73	48
04322p	Pro Terra A48318-235	Y	P	19,400	25.1	18,000	21.8	0.73	48
01216	American Coolair MNBRC52L	Y	A	25,900	24.6	24,300	21.7	0.77	52
04336	Chore-Time 49451-22	Y	B	21,200	24.8	19,700	21.6	0.76	48
00245	Acme BDR54J-C	Y	A	26,100	24.2	24,500	21.4	0.79	54
04326	Chore-Time 49515-22	Y	B	21,100	24.4	19,600	21.3	0.77	48
02209	Acme BDRV54J1-C2	Y	A	27,100	24	25,500	21.1	0.77	54
98142	Acme DDPS48J1-C	Y	A	21,400	23.2	20,300	20.9	0.83	48
98178	Acme BDR54J1-C	Y	A	27,700	23.5	26,300	20.9	0.82	54
04343	Hired Hand 6603-0606	Y	A	27,000	23.3	25,300	20.8	0.78	50
04334	Chore-Time 49740-22	Y	B	27,000	23.5	24,900	20.8	0.73	52
02460	Hired Hand 6603-7401	Y	R	27,900	23.2	26,400	20.7	0.82	52
01093	American Coolair FGBRE52M	Y	A	28,000	23.3	26,400	20.7	0.8	52
02215	Acme BDRV54J1-C3	Y	A	27,000	23.8	25,000	20.7	0.74	54
98175	Acme DDPS50J1-CR	Y	R	24,900	22.8	23,700	20.6	0.82	50
98162	Acme DDPS50J-C	Y	A	23,900	22.9	22,700	20.5	0.8	52
02409	BSM Agri 719-150831-1	Y	P	23,600	22.9	22,100	20.5	0.76	50
00066	Canarm FGI50W27H61	Y	P	24,100	23.5	22,400	20.5	0.75	50
02228	Raydot/Valair PM50W340M_A (C or N)	Y	A	25,400	22.8	23,800	20.4	0.76	50
04354	Hired Hand 6603-7021	Y	A	23,400	23	21,500	20.3	0.74	48
98185	Acme BDR54J-A	N	A	23,400	22.1	22,100	20.2	0.8	54
04321	Chore-Time 48318-225	Y	P	20,700	23.2	19,200	20.2	0.75	48
04321p	Pro Terra A48318-225	Y	P	20,700	23.2	19,200	20.2	0.75	48
01232	American Coolair MNEFC52M	Y	A	27,000	21.6	25,500	20.2	0.75	52
01209	American Coolair MNBRC52M	Y	A	27,600	22.5	26,000	20.1	0.81	52
99075	Pruden Ventilation FG48-C	Y	A	20,700	22.8	19,300	20.1	0.77	48
99075	Pruden Ventilation FG48-C	Y	A	20,700	22.8	19,300	20.1	0.77	48
03148	Aerotech WF501T1CP	Y	P	23,900	22.5	22,400	20.1	0.75	50
02461	Hired Hand 6603-7401	Y	A	27,400	22.2	25,900	20	0.82	52
00252	Acme DDPS50J-C	Y	A	23,800	22	22,600	20	0.79	50

Table 1. Listing of Best Performing Tunnel Fans 2005* (48" or larger)
(Shutter Type: A= aluminum, B= butterfly, P= plastic, R= roll seal)
*There may be other fans that meet the performance criteria of 20 cfm/watt @ 0.10 and an air flow ratio of 0.73 that were tested since the publishing of the 2005 test booklet)

As you might suspect performance tests do not tell the entire story. There are other factors to consider when purchasing a fan such as quality of construction, local dealer reputation, warrantee and type of shutter (some types significantly reduce cleaning requirements). The fact is that if you select a fan that has an energy efficiency rating of at least 20 cfm/watt (@ 0.10") and an air flow ratio of at least 0.73 you have a fan that is in the upper 10% of all those tested by the BESS Laboratory.

There is of course the issue of fan price. Though too many times it is on the top of producers list the fact of the matter is that the tunnel fan will use as much electricity in the first two to three years of operation as it did to purchase it. So if you want to have maximum efficiency when it comes to overall ventilation system performance, price may need to be moved more towards the bottom of the list of factors to consider when purchasing fans.

One final point. When you find a fan you want to purchase make sure you print a complete copy of the BESS laboratory fan test which provides important information on the specific fan tested (motor model number, shutter type, pulley sizes, etc). Provide a copy of the fan test to the person/company you plan to purchase the fan from and let them know you want that specific fan.

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