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Poultry Housing Tips

Electronic Tachometers

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Though evaporative cooling pads and fogging nozzles are an important part of any tunnel ventilation system, it is important to keep in mind that it is in fact the fans that provide the majority of the cooling during hot weather. It is the air speed created by the tunnel fans that extracts heat from the birds, pulls trapped heat from between the birds, aids in litter drying, and last but not least, insures uniform air temperatures from end to end. Quite simply put, it is the air moving capacity of a house's tunnel fans not the evaporative cooling system, that primarily determines a producer's ability to cool his birds on a hot summer day.

Figure 1. Tunnel fan in need of maintenance.

To insure maximum bird cooling it is crucial that the fans in a tunnel-ventilated house move all the air they are designed to move. The most common reason for reduced fan performance is dust collecting on fan blades, orifices, screens, and shutters. The combination of these can reduce the air moving capacity of the typical fan by 25% or more. Though this may not seem like much, reducing air speed in a tunnel-ventilated house from 500 ft/min to 400 ft/min, a 20% decrease, will reduce the wind chill effect produced by the fans on an 85ºF day from approximately 11ºF to 7ºF. If the air speed decreases just a little further to 350 ft/min the wind chill effect drops to just 5ºF!

Though it is fairly easy to determine if a fan is dirty, a maintenance problem that often goes by unnoticed is reduced fan speed caused by worn belts. As a fan belt wears it will ride lower and lower in the fan pulleys (Figures 2 and 3). The lower a belt rides in the fan pulleys the slower the fan will spin. For the most part, the relationship between fan speed and the amount of air moved by the fan is linear. This means that just a 10% reduction in fan speed will reduce the output of the fan 10%. But, if the fan is working under a high static pressure due to dirty shutters or pads this can increase to 15% or more.

It is important to realize that a fan doesn’t have to ride very low in the pulleys to have a significant effect on fan speed. With some fans if the belts ride 1/8" too low in the pulleys fan speed will be reduced 10%! As a result it is important that producers keep a close eye on belt wear, especially during hot weather.

Figure 2. New fan belts

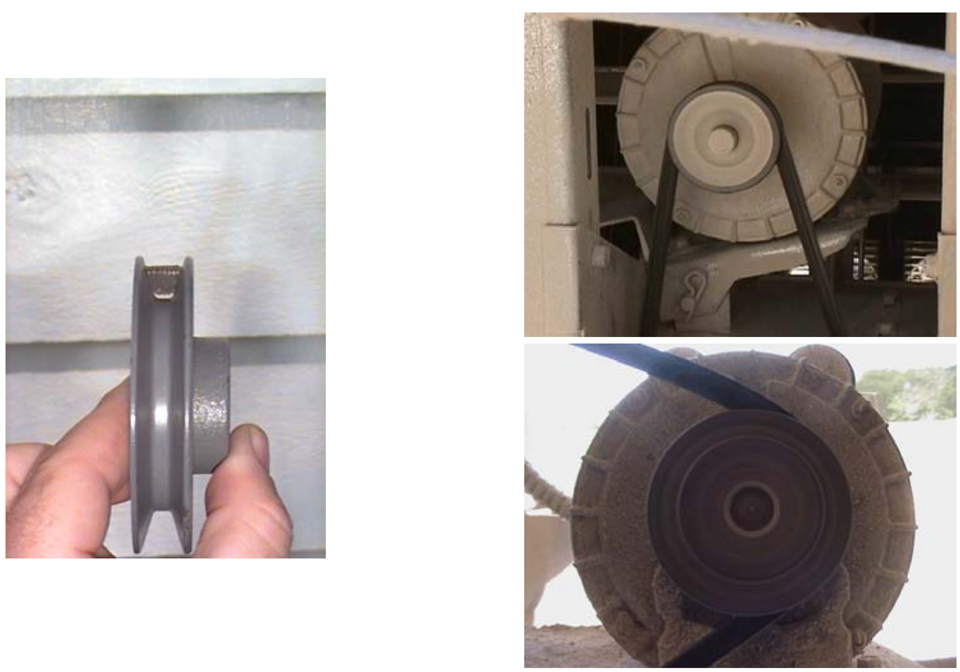

Figure 3. Worn fan belts

One easy way to check to see if a fan belt is worn is to simply examine how high the belt is riding in the motor pulley. As a general rule, the top of a fan belt should extend slightly past the top of the motor pulley. How low the belt can ride in the pulleys before it should be replaced varies from fan to fan, but for the most part, if the top of the belt is a 1/16" to 1/8" below the top of the motor pulley it should be replaced (Figures 2 and 3).

Figure 4. Electronic tachometer

A better way of determining if a fan belt should be replaced is to check fan speed with an electronic tachometer (Figure 4). With an electronic tachometer you simply stand outside the house and point the tachometer at the rotating fan blades (Figures 5 and 6). The tachometer puts out a beam of light which is reflected back to the unit when it hits a fan blade. The reflection of the beam back to the unit is counted and in approximately five seconds the unit will provide a reading of how many blades are moving past the unit each minute. Fan speed can be determined by simply dividing the blade count by the number of blades the fan has. The measured fan speed can then be compared to the proper fan speed which can be obtained by contacting the fan manufacturer or going to the BESS Labs fan test site (Figure 7 - www.bess.uiuc.edu).

For instance, from the BESS Labs web site it was determined the proper speed for the six-bladed 54" fans in Figures 5 and 6 is 350 rpm @0.10" pressure. The tachometer provided a reading of 2,104 blades per minute for the fan in Figure 5, which when divided by six indicated a fan speed of 350 rpm. For the fan in Figure 6, the tachometer indicated a reading of 1,587 blades per minute, which when divided by six, indicated a fan speed of 264 rpm, 25% too slow. As a general rule, when measured fan speed is slower than 5% of its rated speed, the belt should probably be replaced. After replacing the belt fan speed should be rechecked. If the fan speed is still too low the fan motor pulley may be worn out and need replacing.

Figure 5. 54" Six-bladed tunnel fan (proper speed)

Figure 6. Fan with worn belt.

ACME BDR48J-C

	Static Pressure (in. water)	Speed (rpm)	Airflow (cfm)	Efficiency (cfm/Watt
Test: 95289	0.00	473	23800	22.5
Fan description:	0.05	472	22700	20.6
48" belt drive, 1 hpA.O. Smith K56A40B83	0.10	471	21600	19.0
motor, steel slant housing, aluminum shutter,	0.15	470	20300	17.2
guard and discharge cone	0.20	470	18600	15.4
	0.25	469	16700	13.6
	0.30	468	14100	11.0

Figure 7. Example of fan test information depicting design fan

An electronic tachometer like the ones pictured cost a little under $200. Though this may seem expensive at first, it can save a significant amount of money over time, by not only pointing out which belts need to be replaced but also indicating which belts that might look worn are actually okay and do not need replacing.

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