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Poultry Housing Tips

Air Velocity Along the Length of Tunnel-Ventilated Houses

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The air speed in a tunnel-ventilated house is determined simply by dividing a house's tunnel fan capacity by the cross-sectional area of the house:

$$\text{Air speed} = \frac{\text{Tunnel fan capacity (cubic feet per min)}}{\text{Cross-sectional area (square feet)}}$$

To increase air speed, either tunnel fan capacity needs to be increased or the house's cross-sectional area decreased. Air speed is decreased by either decreasing the house's tunnel fan capacity or increasing the house's cross-sectional area.

It is a common misconception that speed of the air moving down a tunnel house will sometimes decrease as it moves from the pads to the tunnel fans. The truth, it is essentially impossible for this to happen. Assuming that the ceiling height doesn't increase between the pads and the fans, the only way for air speed to decrease is for air to leave the house, which can't happen in a negative pressure house unless side wall exhaust fans are operating. Interestingly, it is possible for air speed to increase as it moves from the pads to the fans. If a house is very loose, the amount of air flowing down the house will increase as it moves from the pads to the fans. As the amount of air flowing in the house increases, the speed of the air moving down the house will increase. It is important to note that a house would have to be **extremely** loose to be able to show significant change in air speed along the length of a house.

A study was conducted to explore how air speed and air speed uniformity varied between the pads and the fans in a 50' X 500' broiler house (Figures 1 - 8). Though there were variations in air speed within each profile of between 100 and 150 ft/min, the average air velocity for each profile varied less than 25 ft/min from the house's average air speed of 730 ft/min (Figure 9).

780	821	773	844	778
773	828	770	832	771
796	812	782	839	802

Figure 1. Air velocity profile 16' past end of pads

763	725	787	791	819
756	780	758	794	806
706	724	765	700	755

Figure 2. Air velocity profile 66' past end of pads

761	699	763	777	802
770	776	788	770	797
703	708	786	653	758

Figure 3. Air velocity profile 116' past end of pads

763	707	681	797	802
831	781	817	797	809
791	729	814	724	800

Figure 4. Air velocity profile 166' past end of pads

759	675	436	811	794
839	804	773	826	811
771	758	881	787	809

Figure 5. Air velocity profile 216' past end of pads

696	756	764	765	732
766	775	760	793	758
714	731	801	721	778

Figure 6. Air velocity profile 266' past end of pads

681	740	808	790	719
670	786	817	793	751
645	704	804	689	743

Figure 7. Air velocity profile 316' past end of pads

715	732	826	807	770
711	829	860	809	789
654	715	796	681	738

Figure 8. Air velocity profile 366' past end of pads

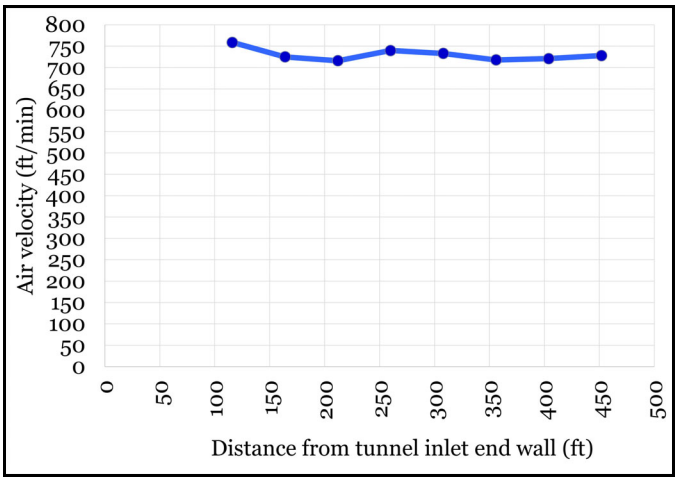

Figure 9. Average air velocity vs. Distance from pad end wall (50' X 500' broiler house)

There are two areas of a house where the air velocity will increase/decrease from the calculated average: that's near the pad and tunnel fan ends of a house. As we move from the pad end wall to the tunnel fan end of the pad system opening, fresh air is continually being added to the cross-section of the house and as a result air speed will increase (Figure 10). At the tunnel fan end of the house air is being continually being removed from the house as we move past each side wall tunnel fan which results in a decrease in air speed as we approach the end wall (Figure 11). The greater a house's air speed, the longer the pad system and the greater the number of tunnel fans a house will have. Both will result in the large reductions in air speed as you move closer to the end walls (Figure 12). Though tunnel doors can help to increase air

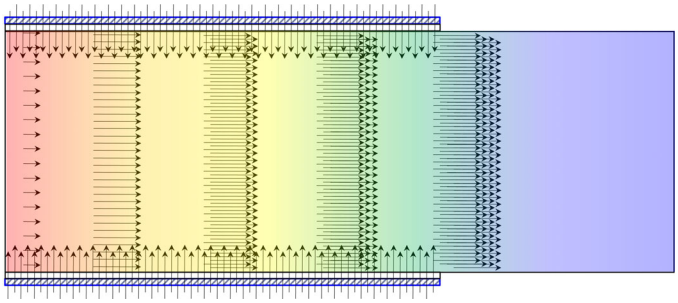

Figure 10. Tunnel pad end of tunnel-ventilated house

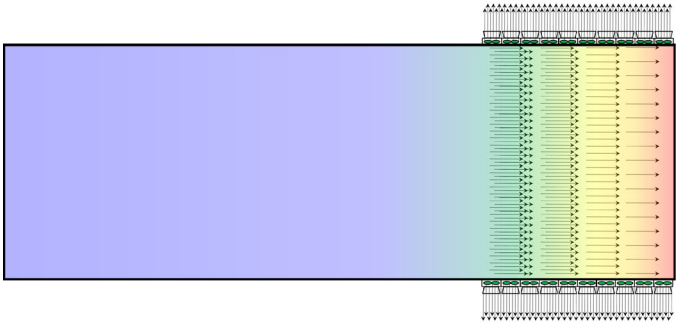

Figure 11. Tunnel fan end of tunnel-ventilated house

movement in the vicinity of the pads, they cannot totally compensate for the fact that there is relatively little air moving down the house near the pad end wall. This results in relatively low air velocities near the pad end wall.

10'	32'	54'	76'	98'
131	298	383	542	752
284	374	439	578	681
218	276	344	460	563
218	276	344	460	563
284	374	439	578	681
131	298	383	542	752
10'	32'	54'	76'	98'

Figure 12. Air velocity in pad area of 66' X 600' house with two 100' long evaporative cooling pad systems.

It is important to note that though the average air velocity will not decrease between the pads and the fans, the air velocity at any given location within a cross-section can increase, decrease, or vary as you move from the pads to the fans. For instance, air velocity towards the center of a house at the end of the pads will often be higher than it is near the side walls. As the air moves towards the fans, the air will tend to spread out, resulting in a decrease in air speed near the center of the house and an increase in air speed near the side walls.

Heaters, chick feeders hung on the side wall, rolled-up half house curtains, migration fences, feed hoppers, and circulation fans will also cause variations in air speed within each cross-section of a house. Since the location and positioning of these obstacles vary along the length of a house, it is only logical that air speed distribution from wall to wall and ceiling to floor would vary to some extent along the length of a house.

Since the average air speed remains constant between the pads and the fans, it can be determined at about any location. What is more important than location is the number of measurements taken within a given cross-section. The greater the number of measurements, the more accurately a house's average air velocity can be determined.

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