BASIC VENTILATION CALCULATIONS FOR PS AND BROILER HOUSES

Before any construction starts on new housing all calculations of ventilation need to be hammered out and be very clear so that all aspects are in balance. Fan capacity is based on housing volume and airspeed required, inlet opening is based on number of fans running, pad area is based on fan capacity. In dark out rearing houses the light trap surface area is based on fan capacity and the negative pressure. All these ventilation aspects are related to each other and need to be in balance for the system to work properly. This is what you should know.

RULES TO KNOW:

How to calculate airspeed through the house (rearing + production houses)?

Calculate the cross section of the house to know if it is based on installed fan capacity. (Cross section x 475 fpm = total fan capacity). Examples: 7 fans x 20,000 cfm at 0.15 negative pressure with cross section of 40x7 feet = 280 f^2 · 140,000 ÷ 280 f^2=500 fpm. This is the maximum airspeed permitted for production. For rearing houses 400 fpm is a normal recommendation.

Size the inlet light trap area based on the fan capacity (rearing houses).

Inlet area should have 1 $inch^2$ of light trap area for every 5 cfms of fan capacity. Take fan capacity ÷ 5 cfms = $inch^2$ of light trap area. Light traps are normally 54" (1.37 m) or 64" (1.62 m) in height. Example: 7 fans x 20,000 cfm at 0.15 neg. pressure = 140,000 ÷ 5 cfms = 28,000 $inch^2$ ÷ 144 = 194 f^2 light trap area ÷ 2 sides of the house = 97 f^2 light trap area on each side of the house. With height of light trap at 64" or 5.3 feet (1.62 m) the house needs an inlet length of 18.3 feet (5.6 m) on each side of the house.

Size the fan light trap area based on the fan capacity (rearing house).

Fan area should have 1 $inch^2$of light trap for every 4 cfms of fan capacity. Take fan capacity ÷ 4 cfms = $inch^2$ of light trap area. Example: 7 fans x 20,000 cfm at 0.15 neg. pressure = 140,000 ÷ 4 cfms = 35,000 $inch^2$ ÷ 144 = 243 f^2 light trap area in front of the fans with a 3.3 feet (1 m) distance between them. Height of light trap in a 40 feet wide house is 243 ÷ 40 = 6.08 feet (1.85 m).

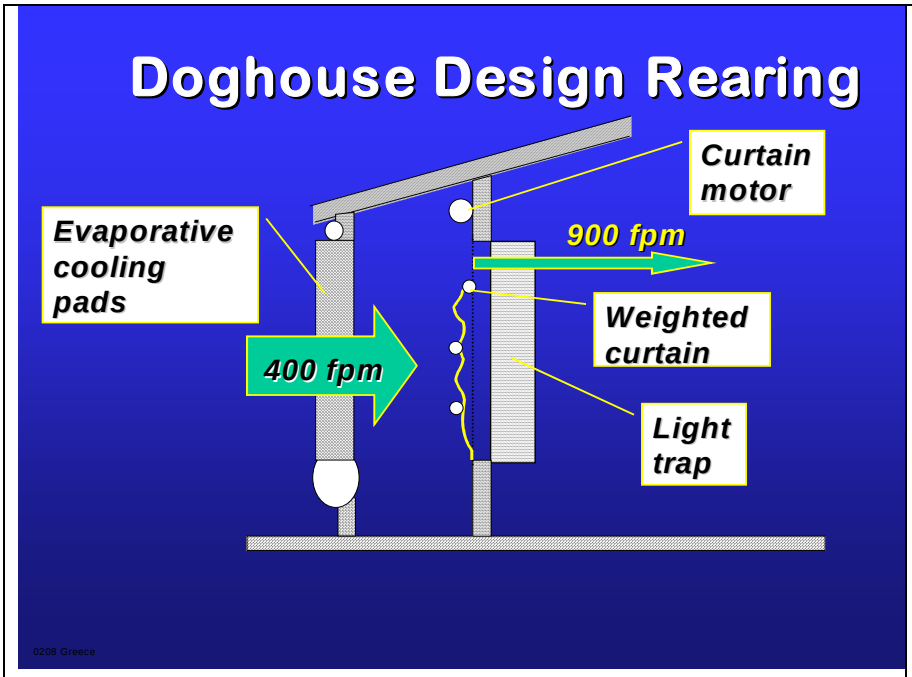
Size mini curtain opening based on number of fans running (rearing + production house).

Must maintain 900 feet / minute airspeed at curtain entrance with 12 meter or 40 feet wide house. (Total fan capacity ÷ 5 ÷ 144 ÷ 2.5 ÷ 2 = length on each side of the house of curtain). (Ideal is 2.5 f = 76 cm maximum opening).
Example: 140,000÷5÷144÷2.5÷2 =39 feet.
With 5 fans=100,000÷5÷144÷39÷2=1.78 f=54 cm
With 3 fans =60,000÷5÷144÷39÷2=1.07 f=33 cm
An automatic pressure regulator should control the mini curtain opening preferably.

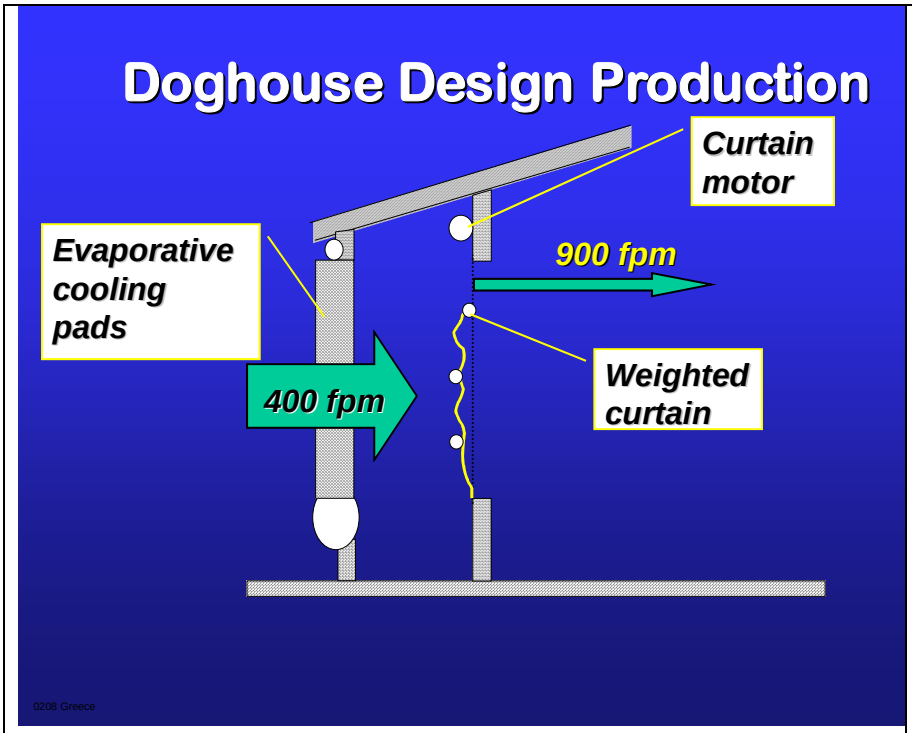
Size the pad area based on the fan capacity.

Take fan capacity ÷ 400 feet / minute / square foot = f^2 pad of 6" thick.
Pads are normally 5 feet in height. Example: 7 fans x 20,000 cfm at 0.10 neg. pressure = 140,000 ÷ 400 = 350 f^2 pad area. 350 f^2 ÷ 5 feet ÷ 2 sides of the house = 35 feet long pads needed on each side of the house.

Construction of the dog-house design for rearing and production.



In rearing normally no evaporative pads are required. If this is the case, install the light trap where the evaporative pads are normally installed in order to have 100% efficiency of the light traps. The distance between the pads or light traps and the inlet curtain is around 100 cm (3.3 feet).



In production it is very important that the incoming air passes the curtain with enough airspeed (900 fpm = 4.5 m/s) with a house that is 40 feet =12 m wide. This is to overcome the distance to get to the middle of the house behind the pads. Uniform air distribution is thus obtained through the whole length of the house.