Ventilation Basics

by Bob Taylor, Chief Chemist of Flairform

Artificial lighting and plant transpiration generates heat and humidity that can produce poor growing conditions. Ventilation equipment must be capable of removing this excess heat and humidity.

Equipment Overview

Exhaust fan: Generally speaking, the exhaust fan (figure one) should be capable of removing or exchanging the volume of air in the room within five minutes. Consult your fan manufacturer or grow shop for the best fan size and type. You will need to account for room size; configuration of ducting (diameter, length and junctions/bends); inlet/outlet filters; the maximum temperature of incoming air; and the total wattage of all electrical devices in the grow room. To prevent condensation from pooling in the fan, mount it vertically in the ceiling as opposed to high on a wall.

Inlet fan: Pushing air into the room (figure one) helps maximize the effectiveness and lifespan of the exhaust fan. To ensure the exhaust fan is not restricted, use an inlet fan of equivalent airflow capacity.

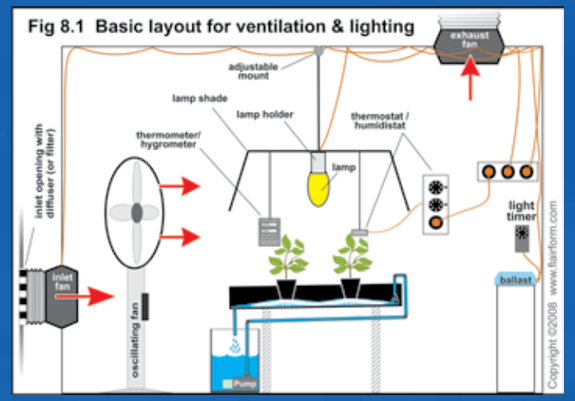

Figure 1. Basic layout for ventilation and lighting.

Tips for best airflow

1) Where air is being moved through ducting, centrifugal/radial (or mixed inline) fans are the most efficient (figure two).
2) Where air enters the fan unit/ducting, ensure it is mounted flush with a solid and sealed surface of diameter at least double the diameter of the inlet itself (figure one). A flange may be needed to achieve this.
3) Keep objects at least one meter away from the inlet.
4) Position a diffuser screen on the opening. A filter (preferably activated carbon) will help act as a barrier to spores and pests.

Ducting: For maximum fan efficiency keep ducting as short and straight as possible. Where junctions are needed, employ 'Y' junctions instead of 'Ts.' If the diameter of ducting needs to changed en-route, ensure this change is gradual (e.g. 10 degrees).

Oscillating fan: Usually operates 24 hours a day to ensure air is always distributed evenly (but gently) through the room (figure one). This eliminates hot spots (zones prone to CO_2 depletion or excessive humidity and temperature that are most likely to occur nearest lights and dense foliage).

Relative location of inlet, exhaust and oscillating fans: As a general rule, try to keep the air moving in one direction; this creates and maintains air momentum. The ideal configuration depends on many factors including room size and shape, and the relative placement of equipment/plants within the room. As a general rule, locate the inlet and exhaust at opposite ends of the room, with an oscillating fan maintaining the airflow direction provided by the inlet (figure one). For wider rooms especially, employ multiple inlets and exhausts and space them evenly across the room's width. This will help ensure all air is replaced. To verify the system is working throughout the room, routinely check temperature and humidity at various points.

Figure 2. For moving air through ducting, the centrifugal/inline fan is the most efficient.

I strongly suggest speaking to your local grow shop when designing your ventilation system. A system which is perfect for one particular climate may be useless in another.

Thermometers and hygrometers: These devices provide minimum/maximum data and will inform of the worst case scenario (figure one). Position the probe in that place of highest temperature/humidity (typically directly beneath the lights and amongst the foliage). However, for accuracy, shield the probe (or sensor) from direct heat and light.

Grow room dimensions: The more plants there are in a given area, the quicker temperature and humidity will rise to extremes. Therefore, aim to minimize the number of plants. If this is not feasible then ventilation rates must be increased.

Figure 3. The heat generated by HID lamps is the biggest problem facing indoor growers, especially in summer. An effective way of removing this heat is by directly 'ducting' heat away through air cooled shades. These simplify ventilation requirements by minimizing hot spots and enable lights to be positioned closer to foliage.

Switching fans on and off

Automated method: Thermostats and humidistats are useful for activating the inlet and exhaust fans (figure one). Position the thermostat's sensor at the hottest point in the foliage, and the humidistat's sensor at the most humid point (determined using a thermometer and hygrometer). For day time (lights on) they should be set to activate the fans when either the temperature exceeds 27°C or the humidity exceeds 70 per cent RH. At night time, the temperature should be allowed to drop to 20°C. To achieve this, you will need a controller that allows separate settings for both day and night. Or, you will need a separate, dedicated set of fans for both day and night. An axial fan in the ceiling (controlled with or without a timer) may be sufficient to produce the correct night time conditions.

Manual method: In extremely hot or humid climates it is usually necessary to have fans running constantly so the absence of control gear (thermostats, etc.) is of little concern. The temperature and humidity targets mentioned above still apply. A modest degree of control can be gained using a timer, a surprisingly effective aid, especially if the weather is consistent or predictable.

Temperature still too high?

Consider the following options:
1) Shift the lights-on period tonight.
2) Air-condition the incoming air.
3) Reduce the amount of lighting.
4) Employ air-cooled light/shades (figure three).

Temperature too low?

Low temperatures will cause humidity (RH) to increase. For example, the RH of a body of air will increase from 55 per cent to 100 per cent if its temperature drops from 25°C to 15°C. Therefore, consider pre-heating incoming air. If air is coming directly from outside, bring it from another room where it has been able to warm up first. If incoming air is not heated you may be restricted as to how frequently fans are operated, especially at night when lights off.

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