NGMA Helpful Hints

Insect Screening

What are the advantages of insect screening?
Properly installed insect screening restricts the entry of insects and pests and reduces exposure to pesticides.

What are the disadvantages of insect screening?
While manageable, the disadvantages of insect screening includes increased sizing and fastening problems, less ventilation, reduced access to the greenhouse, and added maintenance. In addition screens can keep insects in as well as out.

What are the negative effects screens have on airflow?
Screens with small holes are more effective in excluding pests but are more resistant to airflow. A screen with too much restriction of airflow can cause higher static pressure drops, inadequate air exchange, increased energy consumption by the fans, excessive wear on the fan motors, and higher greenhouse temperatures.

Can air-flow problems be avoided?
Yes, by correctly installing screens which have been properly chosen for new construction or retrofitted to existing greenhouses can exclude insects and pests while still allowing for adequate airflow.

How many screen varieties are there?
There are many different screens for reduction of almost any type of insect or pest. The challenge lies in matching the type of screen to the insect or pest you wish to restrict entry into the greenhouse.
• For crops that suffer from pests during a limited part of the growing season, lighter-duty, less expensive screens will work.
• For handling multiple pests at different points in the growing season (Ex. aphids-spring, thrips-summer, and whiteflies-fall) select a more restrictive screen.
• Use lighter screens for short-term interior zones and for periodic use when pests appear in large numbers.
• Use heavier more rigid screens for protection against sun, wind, rain hail, snow and wear and tear from equipment and workers brushing against it.

What about thrips, are they too small for screening?
Even though thrips are small enough to fit through most screens with good airflow, it has been shown in many cases that they can be dramatically reduced with the white screens designed for whiteflies. It is theorized that these screens are effective due to the white color of the screens and the thrips' inability to recognize the material as something to feed on.

What is the basic range of insect sizes?
Insects range in sizes from 215 micrometers (western flower thrips) which is barely visible to the naked eye, to 608 micrometers (Serpentine Leafminer) which is easily diverted by screens.

What are insect screens made of and how do they hold up?
The most common screen, often seen in homes, is made of stainless steel and brass. While being the longest lasting, it is the most expensive.

There are two types of polyethylene screens. One is monofilament, woven with solid strands similar in appearance to fishing line which is very rigid and strong. The other type of polyethylene is made of film that is punched full of “micro holes” and used as a crude, but low-priced insect barrier. Drawbacks include weak construction and low UV protection as well as very restricted airflow.

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A third type is polyethylene/acrylic. This material is made of many fibers “multi-filament” which causes resistance to smooth yarns sliding together and therefore maintains the integrity of the holes.

A fourth type is nylon. This type is good for shorter-term, low -cost and light-duty exclusion. Drawbacks include durability and is relatively more restrictive to air flow.

Does the manner in which it is constructed effect the screen?
There are three manners in which the screens are constructed.
• Weave- the most common, provides a trade off between hole size and air flow. Be sure to always check the tightness of the weave, and apply lateral tension to see if the holes distort.
• Knit- each thread is tied around the next creating a durable network resistant to tearing and raveling. Extra loops and knots may cause greater air restriction.
• Film- can be punched full of micro holes creating an insect barrier which is very restrictive to airflow and must be applied with the correct side out.

How can I test the static pressure on my greenhouse?
A manometer is used for determining static pressure drop. When testing the pressure the flexible tubes must be free of any drops of liquid, the tubes cannot be linked, the tube-to-manometer connections must be tight, and the manometer must be level for accurate readings. Static pressure is usually measured in inches of water.

What will happen if the static pressure is high?
When exhaust fans are running the air pressure in the greenhouse drops. If static pressure is too great, the fans will use excessive power and may overheat, causing the greenhouse to overheat during hot, bright, summer days. For more technical information please refer to the NGMA Cooling and Venting Standards.

What is considered to be adequate ventilation?
Willits (1993) recommends an air exchange of 11 to 17 cubic feet per minute per square foot. These flow rates are based on a study done using no alternate cooling devices, i.e. cooling pads, shade cloth, white wash, etc.

How can I maintain adequate ventilation while retrofitting?
The first step in retrofitting your greenhouse with insect screen is to check the current ventilation system. Measure the difference in static pressure in the structure with all the fans off and then with all the fans running. Use that pressure drop when consulting the manufacturer’s specification chart to estimate the total amount of air moving through the greenhouse. Interpolate between the 0.0”, 0.05” and 0.1” volumes given for the various fans and motors. (For example, 0.025”pressure drop is halfway between the 0” and 0.05”. Thus the volume of air moved would be halfway between the volumes given for 0”and 0.05”.) Than add up all the volumes of the fans together. By dividing this total volume by the number of square feet of the greenhouse, the quotient should equal an air exchange of 11 to 17 cubic feet per minute per square foot. Certainly if the volume of air exchange is below 8 cubic feet per minute, the structure is likely to overheat during hot, bright weather. If the total volume of air exchange is well above 17 cubic feet per minute per square foot, the selection of screening fabrics may be limited and transpiration and evaporation will be excessive.

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What if my greenhouse is naturally ventilated?

In a naturally ventilated greenhouse, the speed of the air is neither as rapid or as constant as that of greenhouses ventilated with fans. Therefore, there is no formula for determining how the greenhouse will function when screened. Naturally ventilated greenhouses can be successfully screened if the following guidelines are considered.

• When does the crop suffer from insect damage? Is it at a time when heat loads are critically high for the crop? You may consider not screening all vents and monitoring temperatures closely, and removing the screen when the threat of pest is past and the weather grows warmer.

• If the greenhouse is already at its upper limit for temperature you have three options. One, increase the open area of your vents or replace solid poly walls with walls made of insect screen and covered by roll-up poly film. If you are unsure of heat gain, experiment with one section at a time until you are comfortable with the application. Second, you could screen only the side that faces the wind, since most insects are carried by the wind this method has been shown to reduce insect populations. Three, consider the color of shade cloth used to shade the greenhouse. Black shade cloths, although they have a long UV life, tend to create excessive heat transfer radiating heat into the house. By using an aluminized shade cloth you can negate the additional heat gain associated with the insect screen.

Are there specific things I need to do to maintain insect screens?

Yes, the screens need to be cleaned or dirt and dust will alter the static pressure in the greenhouse. When designing an exclusion structure, it is important to have easy access to the inside of the screen so it can be easily cleaned. The grower should also install a manometer to monitor the static pressure in the greenhouse. Although you should check with the manufacturer for proper cleaning guidelines, the following suggestions may be used for most screens. Clean the screens from the inside out with a hose and nozzle pressure. Never use high-pressure cleaners or brushes as they will alter the hole size and make the screening useless. Screening should not be cleaned during ventilation, as the water can fill the openings and completely stop airflow. The best time to clean screens is in the evening when ventilation is usually over.

How do I attach insect screen to my greenhouse?

There are three options when fastening your screen: the Poly Fastener, the Spring Lock, or the Lath. Remember that keeping the screen snug and avoiding abrasion are your main goals when attaching the screen. Contact your NGMA greenhouse manufacturer for recommendations as they may have ready-made solutions available.

What kind of results should I expect when screening my greenhouse?

The average grower: The average grower, one that grows and sells to market or end users, usually wants good control of insects and will be content with a 70 to 90% decrease in pests. This grower can achieve this by screening the air inlet only. The primary propagator, and research facilities: This grower has a high demand from his customers to provide insect-free plants. Research greenhouses need full control of the environment. In these two instances the following things need to be screened: the air inlets, vents, and fans. In addition to screening the doors need to be air locked and all leaks of gaps in the house need to be sealed.

How advanced are screening applications?

The need for insect screens will continue to increase due to reduced availability of insecticides and the demand for high-quality insect-free plants. With this increase we will see more applications for insect screens.

For more information, please contact:
National Greenhouse Manufacturers Association
717-238-4530 or info@ngma.com