NGMA Helpful Hints

Internal & External Greenhouse Curtain Systems

What are greenhouse curtains?

Greenhouse curtain systems are called shades, screens, and even blankets. No matter what they are called, they consist of moveable panels of fabric or plastic film used to cover and uncover the space enclosed in a greenhouse. Curtains may cover an area as small as a single bench or as large as an acre. Small systems are often moved by hand and large systems commonly by motor drive. Internal shade systems mount to the greenhouse structure below the rigid or film covering of the house. They are used for heat retention, shade (and the cooling effect of shade), and day length control or blackouts when the covering transmits lower than 1% of the incident light.

How do the curtains provide heat retention?

Any interior curtain system can be used for heat retention at night when the heating demand is greatest. Blackout systems can serve this purpose, even when day-length control is not a consideration. The amount of heat retained and fuel saved varies according to the type of material in the curtain. Curtain systems can save energy in three ways; they trap an insulating layer of air, reduce the volume that must be heated, and when they contain aluminum strips reflect heat back into the house. A curtain system used for heat retention traps cold air between the fabric and the roof. This cold air falls into the space below when the curtain reopens in the morning. To avoid stressing the crop, it is important to uncover the curtain gradually to allow this cold air to mix with the warm air below. Alternatively, if the crop can tolerate the shade, the curtain can be left uncovered until sunlight warms the air above the system.

How do the curtains provide shade and cooling?

Interior curtain systems are widely used to reduce indoor light intensity and help control temperature during the day. Curtain systems also eliminate the recurring cost of materials and labor to apply shading paint. Most curtain systems now use fabric made of alternating strips of clear and aluminized polyester. The aluminized strips reflect light out through the roof of the greenhouse. This reduces the cooling load under the shade significantly.

How can I attach the curtains to my greenhouse?

The fabric panels in a curtain system can be driven gutter-to-gutter across the width of the greenhouse or from truss-to-truss down its length. In a gutter-to-gutter system each panel of curtain material is essentially the size of the floor of one gutter-connected house. In a truss-to-truss system the panels are wide enough to span the distance between one truss and the next. In either configuration, each panel of curtain material has a stationary edge and a moving edge. The drive system moves the lead edge back and forth to uncover and cover the curtain while the stationary edge holds each panel in place.

How does the gutter-to-gutter system work?

The curtain panels are pulled flat across the width of the greenhouse at gutter height. This configuration minimizes the volume of greenhouse air below the curtain that must be heated. These systems require less installation labor than a typical truss-to-truss system. However, gutter systems are not ideal for every greenhouse. If unit heaters or circulation fans are mounted above gutter level, the curtain will block them from heating or circulating the air under the system where the crop is. Though the volume of greenhouse space that is heated is reduced the amount of cold air is maximized. This makes it harder to mix and reheat the air above the system when it uncovers in the morning. Retrofitting can also be a problem if the gas lines, electrical conduits, and heating pipes are mounted at gutter level. Because the curtain panels are as wide as the greenhouse when the curtain is uncovered, the curtain material forms a large bundle under each gutter. This bundle can be a source of unwanted shade.

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How does the truss-to-truss system work?
With a truss-to-truss system, the panels of curtain material move across the distance between one truss and the next. This distance leads to more compact bundles of fabric when the system is uncovered. There are three ways to configure the truss-to- truss system. First it can be flat at gutter height, minimizing heated area and making installation easy. Second it can be slope-flatslope, where the profile of the curtain follows each slope of the roof part way up the truss with a flat section joining the two sloped segments. The benefit of the slopeflat- slope curtain system is it can be installed over equipment and mounted above the gutter. The third type is slopeslope where the profile of the system parallels a line drawn from the gutter to the peak of the truss. This configuration minimizes the amount of cold air trapped above the curtain and maximizes clearance from equipment mounted above gutter height.

How does the drive mechanism work and are there different methods?
Drive mechanisms use an electric motor and gearbox to extend and retract the panels of curtain material in a system. They solve the problem of translating the rotary motion of the motor and gearbox into the linear motion needed to move the curtain panels. There are three basic methods. The push pull drive can be used to move truss-totruss systems only. Both the cable/drum, and the chain and cable drives can be used for both gutter-to-gutter and truss-to-truss.

What is a support system?
Curtain systems support the panels of curtain material on wires or nylon monofilament lines parallel to the direction of the movement of the curtain. These lines are uniformly spaced across the greenhouse at distances of eighteen inches to four feet on center, depending on the design of the system. Two support systems are commonly used. In a lay flat system, the curtain panels lie on top of the support lines. In a suspended system, the panels hang from the support lines on plastic hooks. Curtain panels can lie on top of the support lines if monofilament or smooth stainless steel wires are and fabrics where the clear strips are omitted, leaving gaps for air circulation.

What type of material are blackout curtains made of?
Black-out curtains include polyethylene film, knitted polyester, and composite fabrics where all the strips are either aluminized or opaque. Most black-out materials attempt to reduce heat buildup when the curtain system is covered for day-length control in summer. Knitted polyester is available with an aluminum reflective coating bonded to one surface. Polyethylene film is by far the least expensive black-out material, but it is impermeable to water and water vapor. If the greenhouse leaks when it rains, water can build up in pockets of the film, and the weight can damage the support system of the curtain. Polyester knits and composite fabrics are porous and allow water and water vapor to pass through. This reduces the chance of water-weight related damage to the system knit and also offers a longer service life than does film.

What are sidewall curtain systems?
Sidewall curtain systems are used to form interior partitions, to cover walls in blackout systems, to shade south facing walls and to cover and uncover sidewall vent openings in place of glazed vents or louvers.

What types of exterior curtain systems are available?
There are three types of exterior curtain systems available. A motor and gear driven shade system can be mounted above the greenhouse roof to reduce the amount of heat and light that enters the structure. A dark colored or aluminized mesh can be stretched over the greenhouse roof and left in place for the duration of the high-light season. The curtain system can serve as the greenhouse roof, uncovering for maximum light and ventilation, and covering for weather protection.

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What type of material is the shade and retention curtains made of?

Covering materials for shade and heat retention include knitted white polyester, non-woven bonded white polyester fiber, and composite fabrics manufactured specifically for use in greenhouse curtain systems. The white polyester fabrics offer excellent durability. White polyester has largely been superceded by composite fabrics made of alternating strips of clear and aluminized polyester or acrylic held together with a finely woven mesh of threads. These panels outperform white polyester because their aluminized strips reflect infrared light out of the greenhouse during the day and back into it at night. The composite fabrics include; chemical stabilization against breakdown by UV light, flame resistant fabrics to meet building code requirements, and fabrics where the clear strips are omitted, leaving gaps for air circulation.

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