GROWERTALKS

Features

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Keep Your Greenhouse Young

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When looking for tips or tricks to extend the life of your greenhouse, my first tip is … there aren't any tricks. Extending the life of your greenhouse will be a function of how your greenhouse was manufactured and what maintenance is done to preserve what you originally purchased. When you purchase a greenhouse, the life of that structure can be directly correlated to the strength of the steel, the corrosion protection on the steel and the design. These variables are what will keep your structure standing after 40 years while enduring 12 in. of snow and 100 mph winds.

Your visual inspections, identified actions and maintenance schedule will keep your greenhouse operating properly during the growing season, while minimizing the impact of problems that arise. Your greenhouse is continually attacked by wind, humidity, UV light and temperature fluctuation and, therefore, without a good preventive maintenance program, you can fall victim to crop loss or structure failure.

What's it made of?

When choosing the strength of materials for your greenhouse, the grade of steel, cross section and thickness (gauge) are the variables that make up the strength. Although aluminum is used in greenhouses, steel is almost always the material of choice for the structural components of a commercial greenhouse due to strength.

Not all grades of steel are equal. The steel or rolling mill can have quality problems where they don't meet the original desired specification. When this happens, they don't scrap the steel; it's often sold on the "secondary market." To ensure you're getting a quality steel, you can request vendor certifications and ASTM specification of the steel used by your manufacturer. Greenhouse structures are normally built with ASTM 500 materials or stronger.

The application strength of your steel greenhouse is also predicated on the cross section of the product. Tubing made with a box profile is always stronger than the equivalent amount of material made in a round or oval cross section. Square profiles also provide equivalent strength in both of their directions and aren't susceptible to having a weaker direction, like rectangular profiles. Round profiles in greenhouses are often used because of the cost and ease of forming, but if you're looking for strength, you really do get what you pay for.

Is your greenhouse protected?

When discussing corrosion protection in greenhouses, aluminum is king and is the best product for exposed areas, such as glazing. The aluminum oxide layer forms a protective coating that prevents additional oxidation beneath this layer. Steel, on the other hand—which is predominantly iron—is highly corrosive in a wet environment, thus resulting in the brownish orange oxide known as rust. To prevent steel from rusting, it's often coated with a sacrificial anode such as zinc, aluminum or magnesium. Zinc is often the product of choice used for galvanization of greenhouse steel.

Almost all of the steel used in greenhouse structures is pre-galvanized, metallurgically bonded at the steel mill. A pre-galvanized product is one of the best and most cost-effective ways to prevent your structure from rusting. However, it does have a few limitations. First, the inside of a pre-galvanized tube doesn't have the same protection as the outside, so in very high humidity, you may be susceptible to internal rusting. Second, when tube steel is welded together or when greenhouse members are welded, the pre-galvanized coating is destroyed due to the high heat. Finally, if you ever fabricate a pre-galvanized product by drilling or cutting, you're cutting through this protective layer exposing the steel surface.

After understanding the weakness of pre-galvanized products, you can now see the correlation to the three most common areas of rust in a greenhouse, which will be your pins or posts that are buried in the ground or concrete, the bottom of the rain gutter and, typically, at the welds. When your post or pins are placed in the ground, they're constantly exposed to a high-moisture environment. Likewise, your rain gutters often have low spots inherent with the overlapping design, which allows water to remain in the bottom of the gutter well after the storm. Also, welds at the baseplate or trusses that destroy the original pre-galvanized layer need additional protection.

Preventing rust

There are many ways to prevent these exposed areas from rusting or continuing to rust by painting or thermal spraying, which is adequate but not as good as the originally metallurgical pre-galvanized zinc layer from the steel mill. The best solution for long-time corrosion resistance is a better coating. We discussed earlier that zinc is a sacrificial anode, which means the zinc is consumed as it's exposed to corrosive environments.

The best solution to prevent long-term corrosion of posts/pins, gutters and welded trusses is to hot dip galvanize these products. Hot dip galvanizing provides a sacrificial zinc anode that's four times thicker than pre-galvanized layers. Additionally, it's acid etched, then submerged into a molten bath of zinc, allowing the zinc to diffuse into the steel surface and causing a metallurgical bond on the inside and outside of any steel tube. The last benefit of hot dip galvanized products is that it can be done after fabrication or welding, thus enabling 100% of the surface to be coated with zinc.

The design

A well-designed greenhouse can be more important than the materials used. Structures are designed from the bottom up, so your posts and pins need to be sized to support the whole structure. In a greenhouse, the center of the gutter and any truss or bow not connected directly to the steel post are the weakest points of any design. Gutters need to be supported at the midpoint and intermediate bows need to be webbed or trussed to pass any IBC loading requirements over 15 lbs. of snow. Additionally, cast aluminum pieces often are used for complex designs, but should only be used in compressive load designs. If a cast iron or aluminum piece is

used in tension, you'll be susceptible to cracking due to the inherent porosity and weak points in a casting.

Maintaining your structure

When it comes to greenhouse maintenance, it's not about what we don't know, but more about what we don't do. Cleaning, visual inspection and audio inspection of your greenhouse are the best ways to make you aware of any problem you have or could potentially have in the future. Beginning with the glazing, you should keep this clean with a low-pressure water spray. Glass may require trisodium phosphate solution while acrylic/polycarbonate should only use a mild soap. Harsh chemicals or detergents can cause etching or could contain solvents that attack your petroleum-based products.

Twice a year, you should walk your gutter to replace or tighten missing screws, bolts or clips. Also look for any holes, tears or gaps in the glazing and repair accordingly. Every month all inflation fans, exhaust fans and HAF should have the guards and intake screens cleaned and free from any impediments. Clean the blades from build- up and lubricate accordingly. Tighten drive belts if applicable.

Pay special attention to any of your operable vents and curtain systems. Since your vent is always operating and is under a lot of vibration due to the wind loads, make sure your hinge point is operating freely and all your bracing is secure. Inspect the gear motors for leakage or wear, verify the positioning of the limit switches and rack stops, and secure set screws and check the alignment of your racks and drives. Motor failure is often a symptom of limit switch position and alignment issues. Check for worn retention lines and fabric in your curtain, and replace and repair as needed. As with the rest of your greenhouse equipment, the OEM should be able to provide you with an equipment maintenance plan.

After establishing your greenhouse and greenhouse systems inspection checklist with frequency of execution, verification of completion and corrective actions, it's time develop a preventative program with failure analysis. In the automotive world, this is referred to as the 8D and FMEA processes. 8D is a problem-solving process where
you put corrective actions in place to solve the root cause and not the symptom. Previously, we identified that a drive motor failure could potentially be a symptom of limit settings or misalignment, which puts an excessive load on the motor. The 8D takes you through the process to identify those root causes.

The failure mode analysis identifies all the potential failures that could occur, what their probability is of occurring and the cost impact on your business if that failure does occur. By analyzing your potential failures and the relative impact, it provides clarity that will help you prioritize what you should work on, what replacement parts you should have and how much money you should dedicate to the repairs. **GT**

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