

COVERED CROPPING SECTOR

Reducing Energy Emissions: What's right for your greenhouse?

DOUBLE-PANE

THERMAL SCREENS

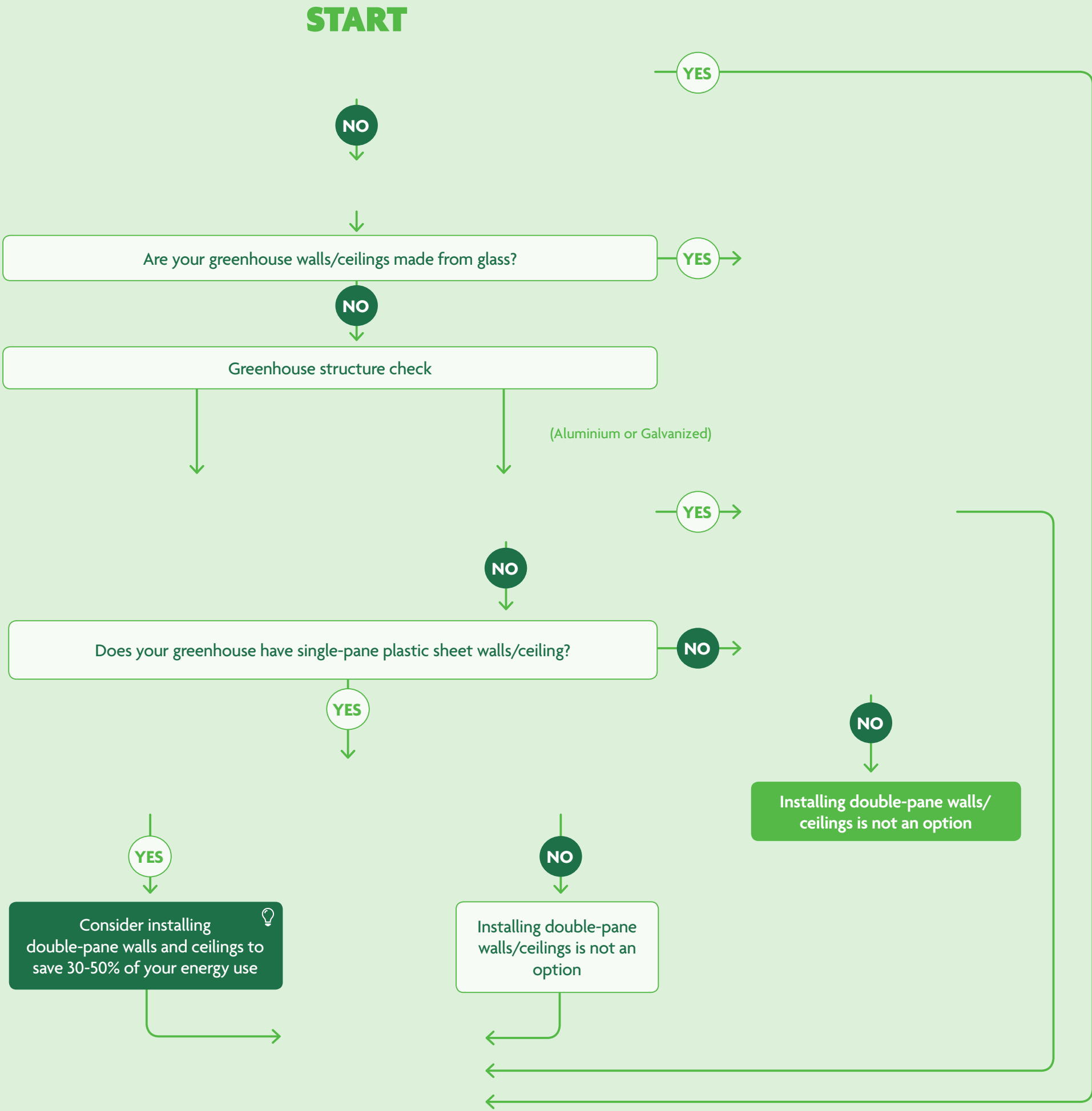
DEHUMIDIFICATION

Produced for TomatoesNZ, Vegetables NZ and EECA by Worley





Is using double-panes right for your greenhouse?



ADDITIONAL INFORMATION

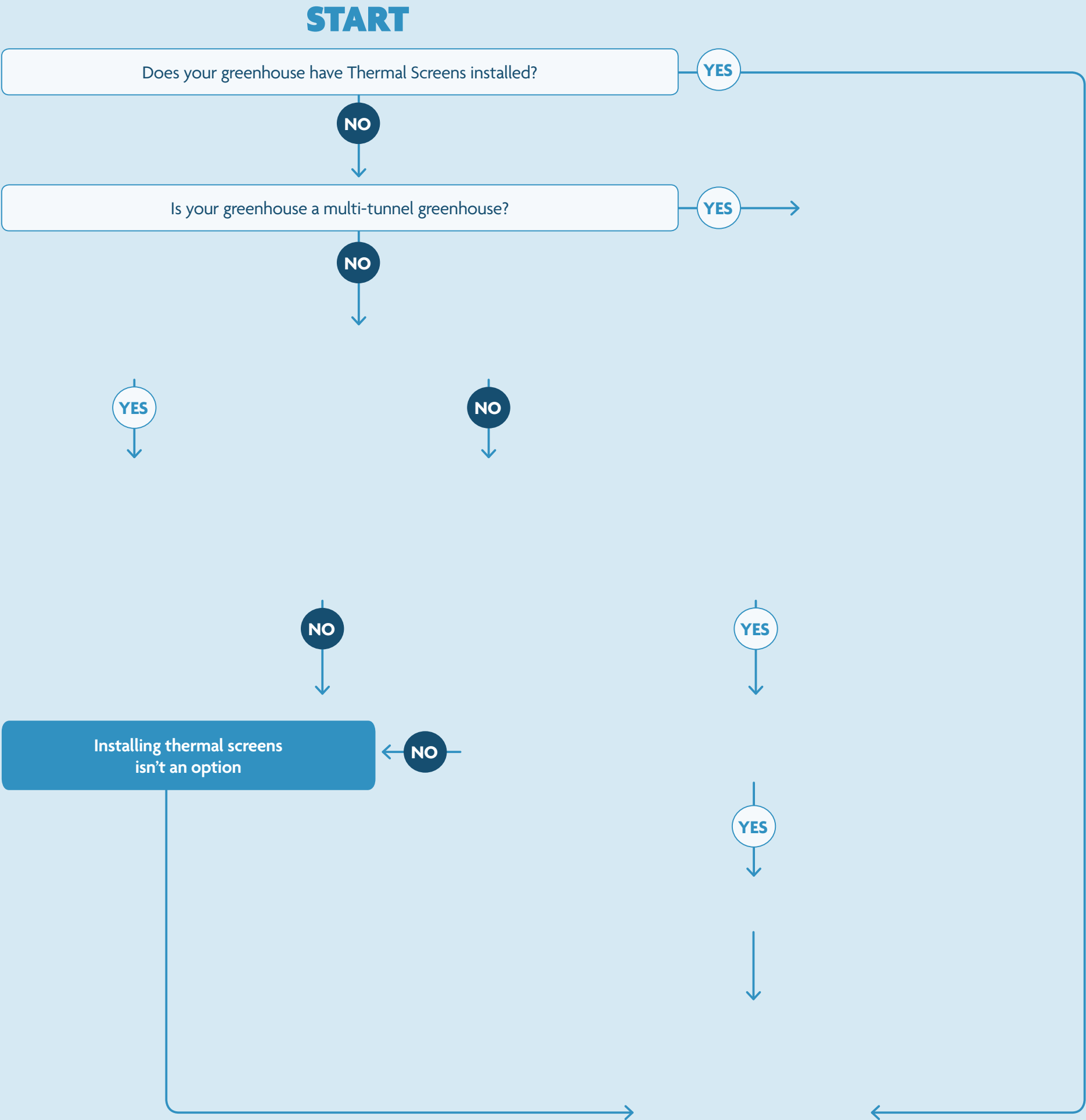
- Usually use 180µm for the inside layer, 215µm, for the outside layer - stronger outside as in direct contact with sun, rain, wind, and other weather elements - thinner plastic, better light transmission. People are looking more often now at using 200µm for the inside layer if they can get away with the reduction in light transmission as it will last much longer.
- According to suppliers a rule of thumb for energy reduction is 30% improvement from single skin to double skin, and a 50% improvement from glass to twin-skin.
- The amount of energy savings from single-skin to twin-skin depends a lot on the environment where you grow. Wet, windy conditions greatly increase the savings obtained by twin-skin as compared to single-skin. If the area is quite dry then savings obtained are lower.
- Single skin has a light transmission of 96% which will fall to 90% after a year. Double skin has a light transmission of 80% which if not kept clean will fall somewhere between 70-80%.
- Air gap between layers of 20-30mm provides insulation, (needs pump to keep it from becoming loose). After 3 years the gap will shrink to lose 25% insulation; need to adjust the air pumps at this time to increase pressure to keep them from coming loose.
- Plastic sheets will require replacing every 8-10 years due to decreased light transmission.
- Plastic sheets will come with a 3–5-year warranty when purchased. The higher the shade rating on the plastic sheets, the lower the warranty (reducing to 3 years).
- Plastic sheets require regular cleaning to maintain light transmission (hand wash or water jet).
- Installation can generally be done while greenhouse is still operational without removing things other than heating pipes on the walls.

Case Study	Type of Houses	Energy savings	Comments
Cucumber grower, Christchurch	1 x 2000m² twin-skin; 1 x 2000m² glass	When glass and twin-skin are compared, twin-skin shows 13% less energy demand for the same size greenhouse (Note in this example that the glasshouse has thermal screens; adjusting for screens shows twin-skin using 25% less heat).	Twin-skin greenhouse uses hot air blowers; Glasshouse uses radiative pipework for heating.
Redpath NZ, Greenhouse supplier	Growers moving to energy intensity crops are occasionally shifting from single to twin skin/double pane	Redpath report 30% energy savings moving from single to twin-skin, and 50% savings moving from glass to twin-skin	Main consideration for twin-skin will be the frame design; typically this is not a major issue.

[*https://www.eeca.govt.nz/co-funding-and-support/products/covered-cropping-decarbonisation-pathway/tools-and-resources/](https://www.eeca.govt.nz/co-funding-and-support/products/covered-cropping-decarbonisation-pathway/tools-and-resources/)



Are Thermal Screens right for your greenhouse?

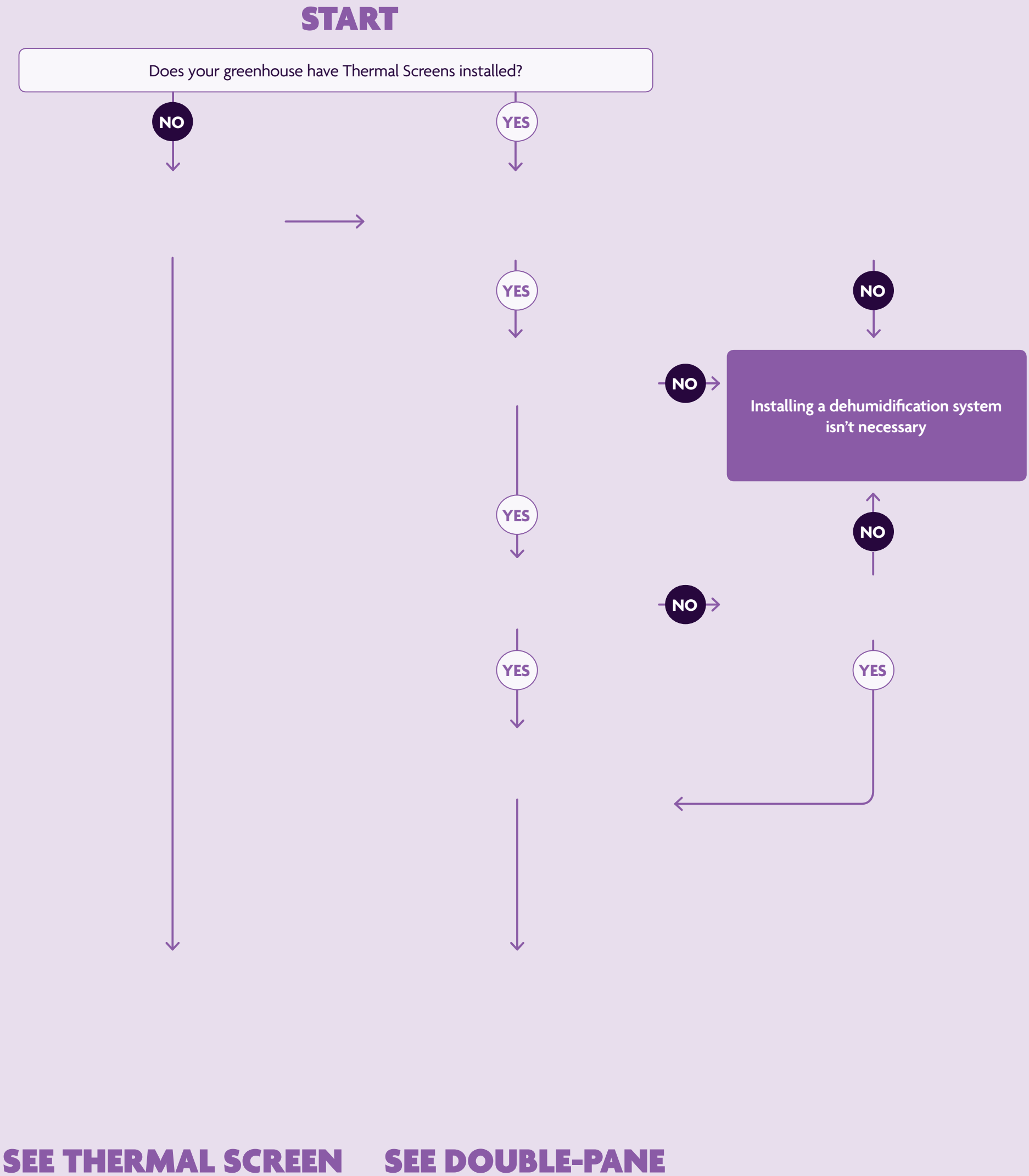


ADDITIONAL INFORMATION

- Energy savings depend on the type of screen – a supplier stated screen material energy saving may be 40-70%. Likely overall savings of 25-35% of the total annual heat energy input.
- Depending on the material selected, screens can also be used for shading.
- Co-benefits - can grow more resilient, stronger crop; less problems with rot and mould; increased growing season; stops condensation drips falling from the roof onto the plants.
- Important to get good advice on correct usage of screens. If screens are purchased through Ludvig Svensson free consulting advice can be obtained around how to maximise screen effectiveness.
- Thermal screens shouldn't cause a humidity issue if they are operated correctly.
- Different screen materials can be recommended based on the purpose and crop.
- Screens will require replacement every 10-12 years, though after 8 years reduced benefit is seen from screens because they will get dirty which limits their effectiveness.
- Obstructions (lights, fans, heating pipes) can make installation more difficult but can usually be worked around.
- Luxous type of screens are the type that are most often used for energy intensive crops as they maximise energy reduction and light transmission.
- Vege Fresh Growers talk about their experience of installing thermal screens: <https://youtu.be/5N4ueYJ8UGk?si=03wHHvFcU8OOLtag>

Site	Estimated Energy Savings	Location	Comments
Tomato & vegetable grower	12.5%	Tasman	Climate control adjustments required to manage screens effectively. If retrofitting, it's helpful to have no crops planted. Utilise supplier advice when choosing best type for your house and crop.
Tomato grower	25%	Christchurch	~2.5-3 year return on investment
Capsicum grower	35+%	Auckland	
Tomato grower	29%	Auckland	Noted difficulties with accurate screen control
Nursery	20%	Auckland	1ha
Capsicum grower	30%	Auckland	5ha

Is Dehumidification an option for your greenhouse?



ADDITIONAL INFORMATION

- Units can be ground mounted or suspended (depending on strength of greenhouse, space availability, irrigation by flooding, sufficient head height/truss height. Suspension can be more efficient as heat and humidity rise, exit water can be gravity run).
- Energy savings can be 30-50% of the total annual heat energy input.
- May need multiple units per greenhouse - number will depend on size, no. of plants, irrigation schedule, crop type, outdoor temps.
- Good air circulation is required - some units circulate the air themselves, others need external fans.
- Water removed from atmosphere can be re-used in irrigation (after filtration).
- Can result in an increase in production of 15-25%
- Other co-benefits include reduced diseases. Longer growing season.
- Different sized units can be specified depending on the requirements (26 - 1,100 L/day)
- Dehumidification generally runs at night when temperature drops and transpiration increases - can use cheaper power if on TOU meter
- Available electrical capacity: need approximately 6-10kW per 1,000m² (depends on required humidity levels, crops etc.).
- View a case study on use of dehumidifying units at Southern Belle greenhouses: <https://youtu.be/gZznlrpqSIE?si=zFLYHJp9lxZIHPXo>

SOUTHERN BELLE

Savings	Thermal fuel use: 25% reduction
	Production Increase: 15% increase as a result of fungal disease reduction and CO ₂ retention
	Payback: 3-4 years
Number of units	2 DG-12 Standard units, each requiring 10kW of electricity (DryGair)
Capex	\$120,000 for the entire installation (2018)
Greenhouse size	3000m ² twin-skin plastic house
Comments	Most difficult part of installation was connecting the system to the climate control system. Southern belle are located in Matamata