



  
agculture  
by AGC

Challenge and progress in solar  
mirrors and glass for greenhouses



# CHALLENGE OF COLD SEASONS/CLIMATE!



## Outside

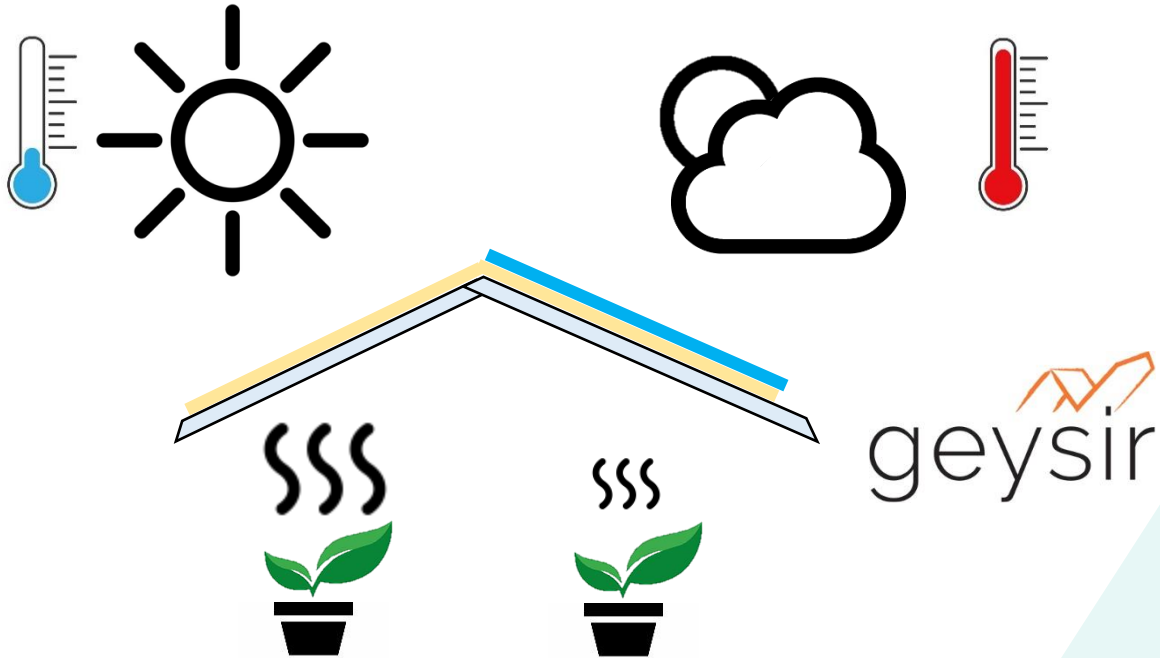
AR
Low E
CLEAR
AR

## Inside



RETAINS ENERGY WITHOUT LOSING LIGHT IN GREENHOUSE





## Competitive Advantage

- ✓ Direct saving by Low E
- ✓ Less condensation on glass & crops

- ✓ PAR Transmission  $91.0\% \pm 1.0\%$
- ✓ Hemispherical Transmission  $84.0\% \pm 1.0\%$
- ✓ Can be combined with Hortiscatter
- ✓ Save 22.2% gas-based energy consumption\*

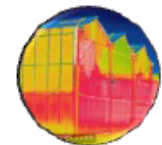
\* [https://www.kasalsenergiebron.nl/content/research/WPR-1040\\_Eindrapport\\_Zonder\\_emissie\\_naar\\_hoge\\_transmissie.pdf](https://www.kasalsenergiebron.nl/content/research/WPR-1040_Eindrapport_Zonder_emissie_naar_hoge_transmissie.pdf)

## Het glas

- Glas met een lage emissie coating voor laag energieverbruik
  - Low-e glas: 83.7% hemisferische transmissie
  - Referentie glas: 84.0% hemisferische transmissie
- Proef: 2 kasafdelingen 144 m<sup>2</sup>, tomaatenteelt, onbelicht, 27 December geplant, ras Marinice
- Voorstudie\* heeft laten zien dat ook combinatie met AR coating voor een (nog) hogere transmissie mogelijk is in de toekomst (86.0-88.6% bij een emissiviteit van 16-31% op commerciële schaal)
- Dit zorgt volgens modelberekeningen voor een energiebesparing van 17-22%



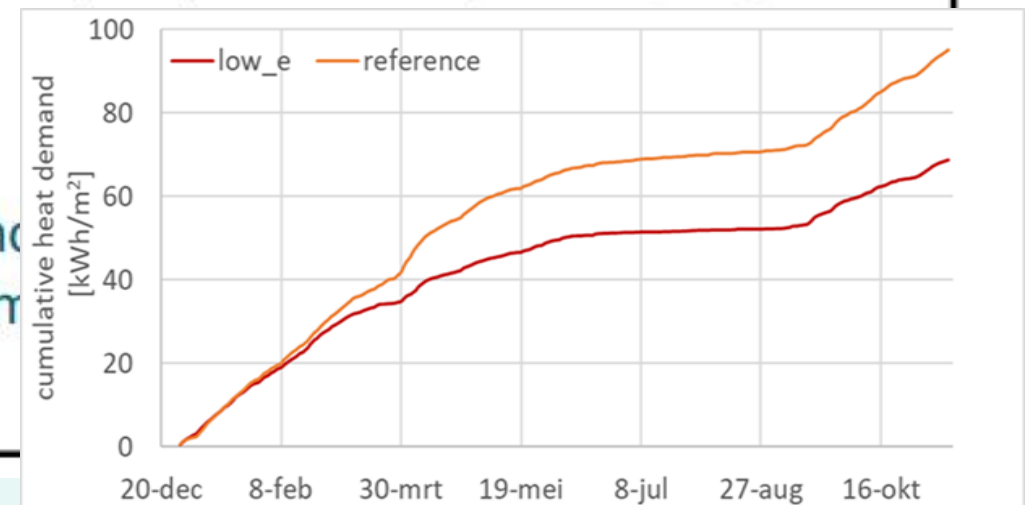
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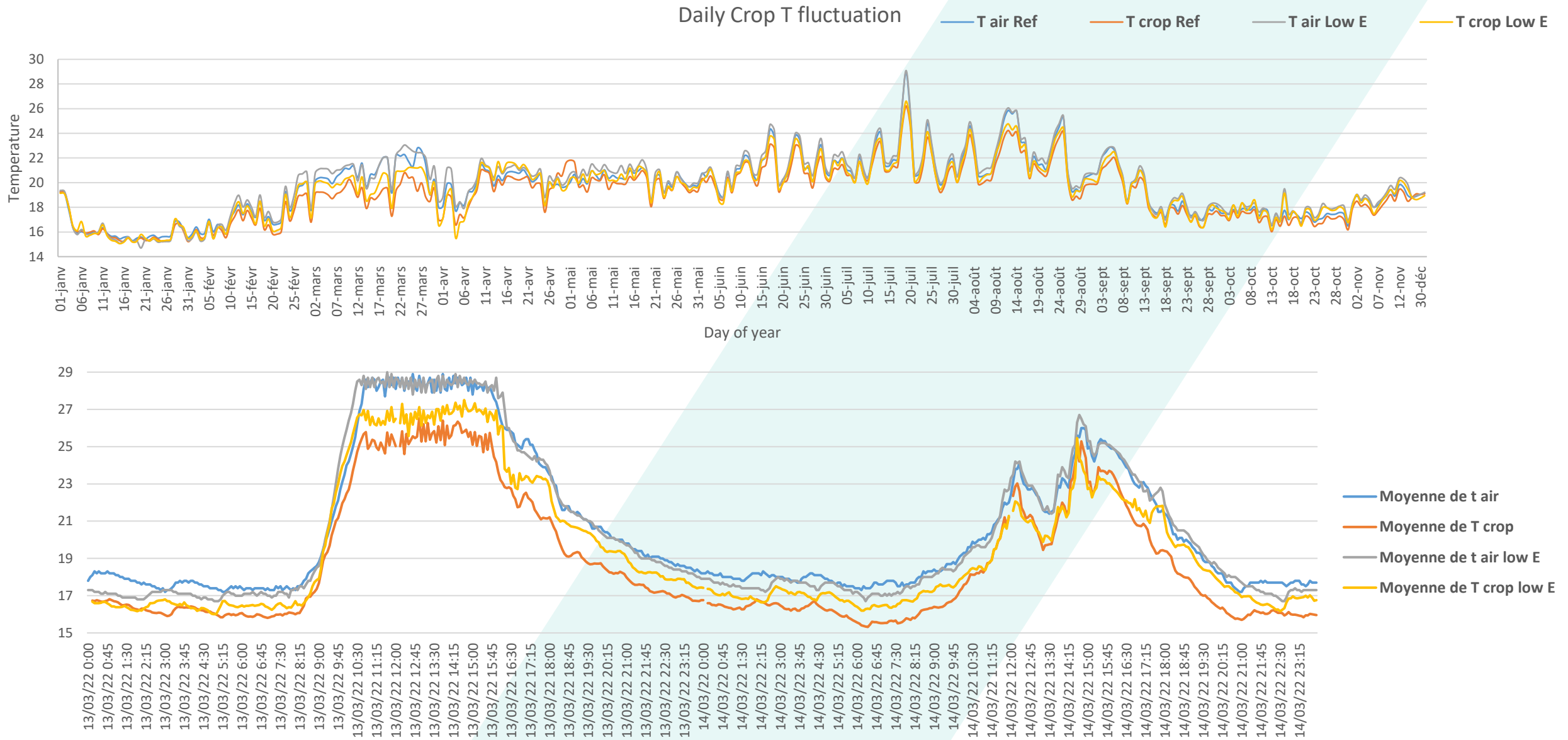


## Energiebesparing met (enkel) low- $\epsilon$ glas

- Resultaten t/m week 43:
- Oogst: low- $\epsilon$  59,1 kg/m<sup>2</sup>, referentie 59,9 kg/m<sup>2</sup> **gelijk**
- Cumulatieve **warmtevraag** kas: low- $\epsilon$  69,0 kWh/m<sup>2</sup> (7,7 m<sup>3</sup> gaseq.), referentie 80,7 kWh/m<sup>2</sup> (10,6 m<sup>3</sup> gaseq.)
- Cumulatieve **elektriciteitsvraag** warmtepomp: low- $\epsilon$  37,3 kWh/m<sup>2</sup>, referentie 42,5 kWh/m<sup>2</sup>
- → **totaal >15% energiebesparing**
- Echter...er waren wat warmteoverschotten  
veel elektriciteitsverbruik warmtepomp

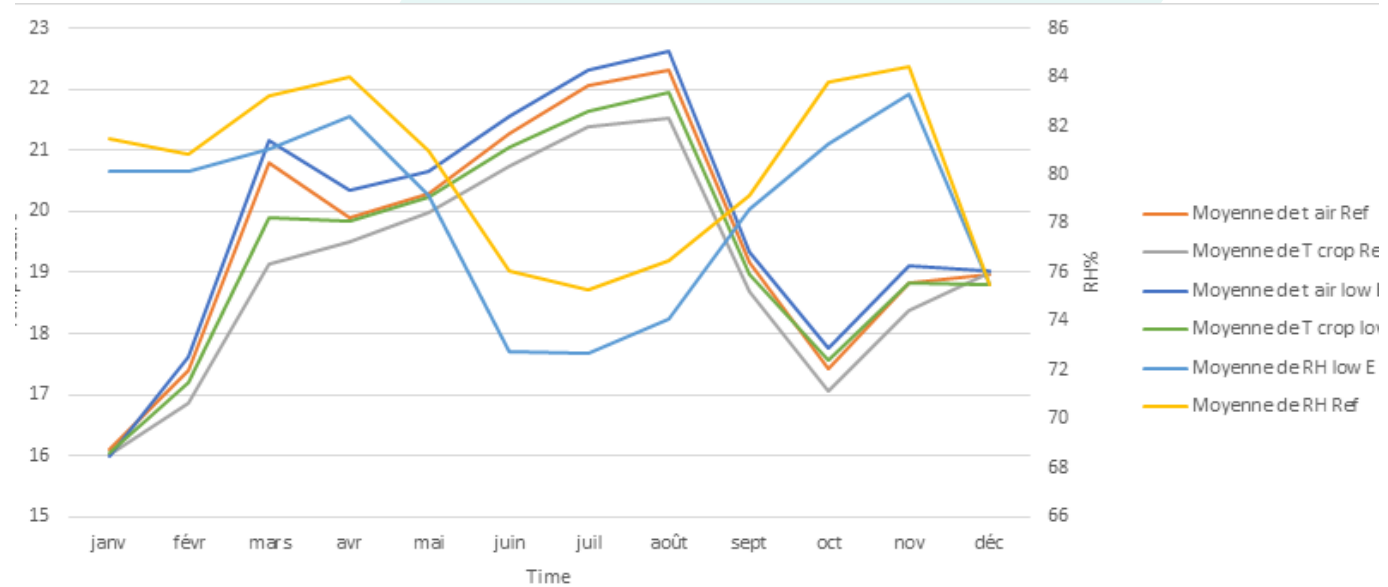
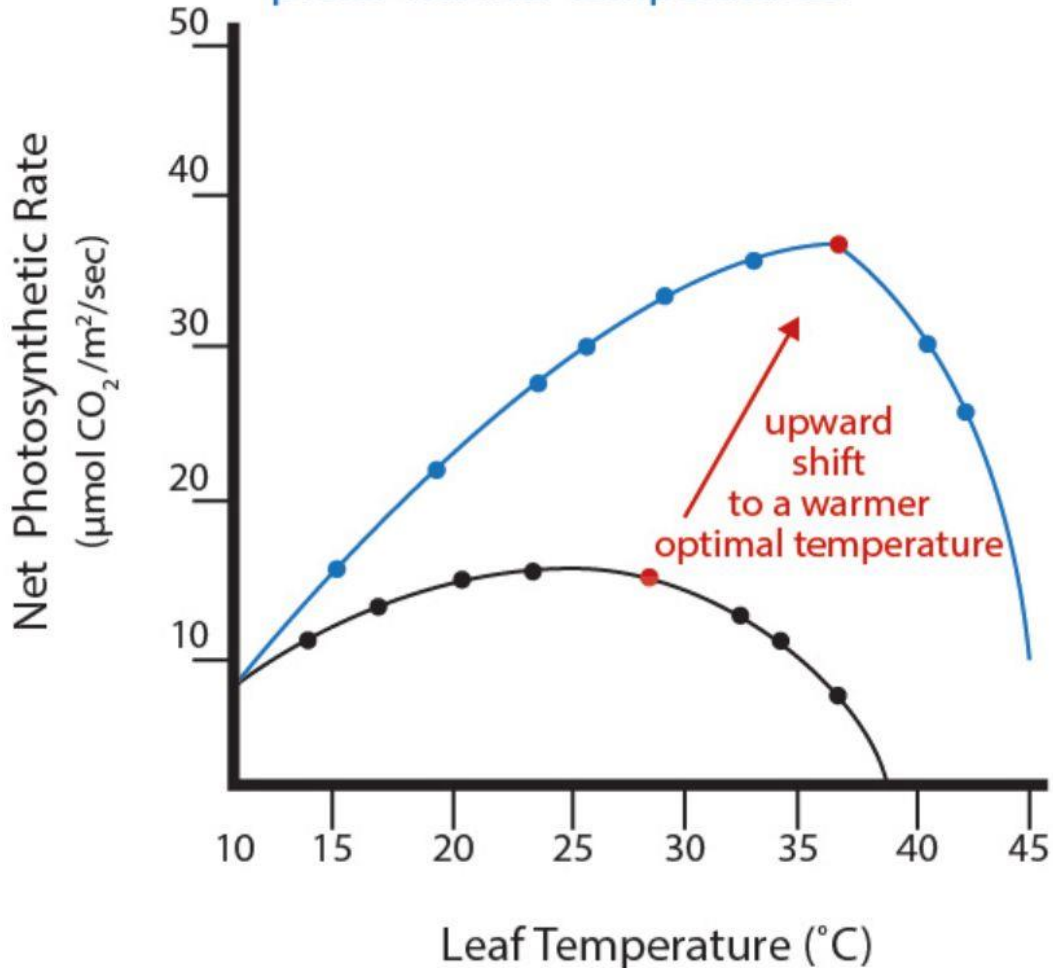


# GEYSIR, CROP TEMPERATURE



# GEYSIR, PROFITABILITY + SUSTAINABILITY

Plants growing in CO<sub>2</sub>-enriched air prefer warmer temperatures.



**With Geysir**  
Air Temperature Higher  
Leaf Temperature Higher

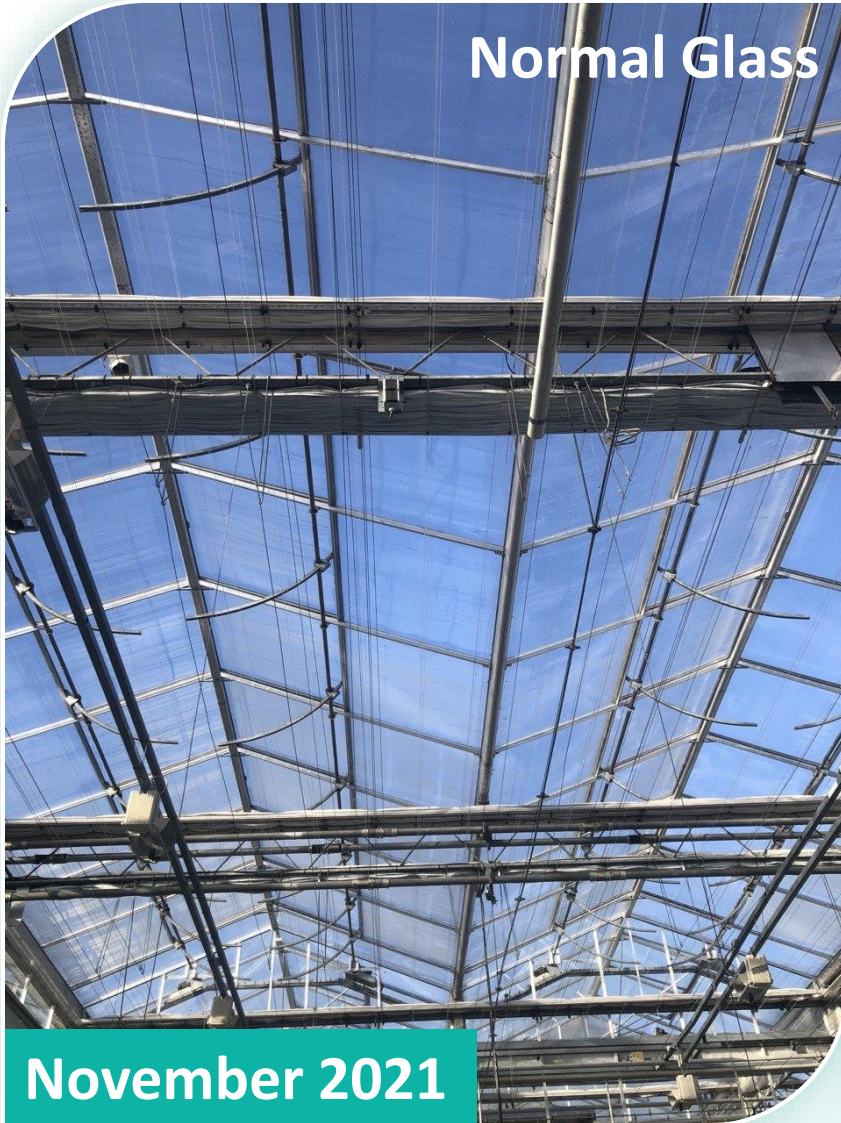
If Enriched by CO<sub>2</sub> →

**Photosynthesis will have an Upward Shift to a Warmer Optimal Temperature without Photorespiration**



# GEYSIR, COLD & SUNNY DAY

Normal Glass



November 2021

Geysir Glass



November 2021



WAGENINGEN  
UNIVERSITY & RESEARCH

geysir

Research Facility Bleiswijk

550 m<sup>2</sup> of Geysir Clear 2xAR

Energy saving performance  
in experimental trial

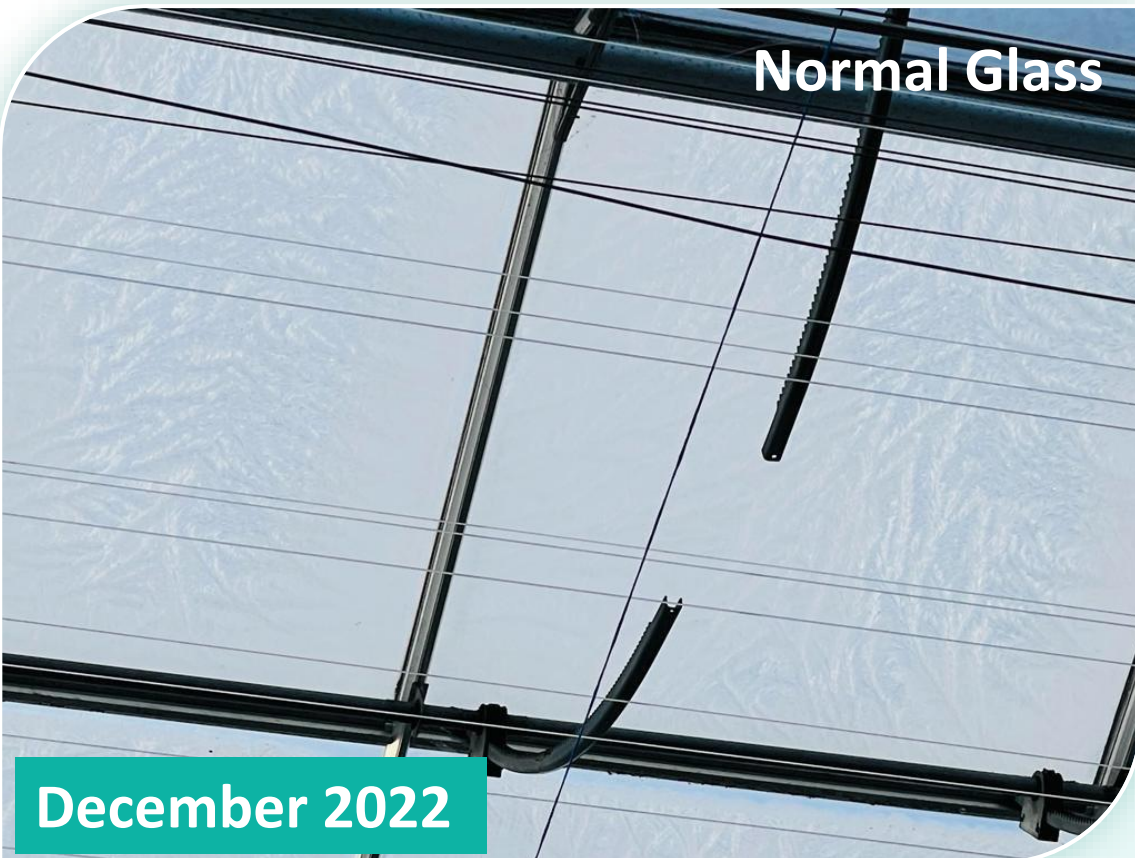


# GEYSIR, NON-FROZEN GLASS COLD & CLEAR SKY



WAGENINGEN  
UNIVERSITY & RESEARCH

geysir



December 2022



December 2022

10:10 5G

Bleiswijk

Huidig 10:00 Zonnig, Nevel

Voelt als -5°C  
Dauwpunt -5°C  
Rel. vocht. 100%  
Luchtdruk 1011,2hPa

-5°C 0,0 mm u 4 km/u Stoten 6 km/u

Sensor Luchtdruk: 1012hPa

07:00	13:00	19:00	01:00
0,0mm	0°C	0,0mm	-2°C
di 13-12	0°C 1°C	* 5,3h 0% 0,0mm	11 km/u
wo 14-12	-4°C 2°C	* 6,4h 10% 0,0mm	7 km/u
do 15-12	-3°C 7°C	* 5,3h 10% <0,1mm	13 km/u
vr 16-12	-2°C 6°C	* 6h 10% <0,1mm	7 km/u
za	-2°C	* 3,9h 10%	15 km/u

Weer Favorieten Kaarten Rad/Sat Meer



# GEYSIR, NO CONDENSATION, COLD & CLOUDY SKY



geysir



geysir

geysir

Standard glass

geysir





# GEYSIR, FIFTH PILLAR OF PERFORMANCE

Product	Patterned Glass	Acid-etched	Geysir
Hemispherical Transmission	++	++	+
Hortiscatter	+	+	++
Hydrophilicity	-	++	++
Durability	+	-	++
Energy Saving	-	-	++

Competitive Advantage



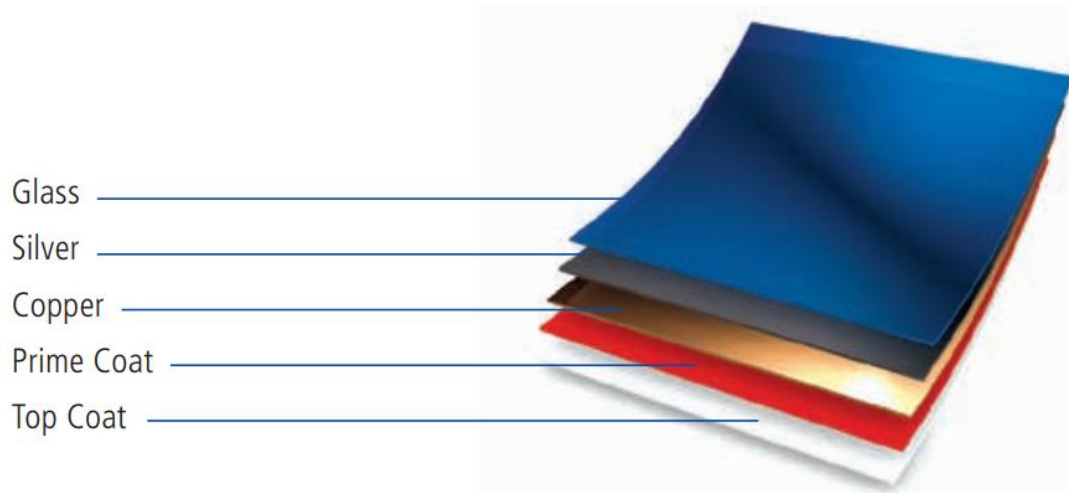
## Glass made for the sun

Industrial solar glass production in Europe

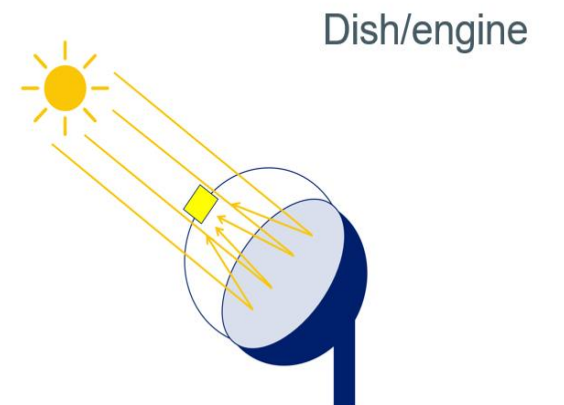
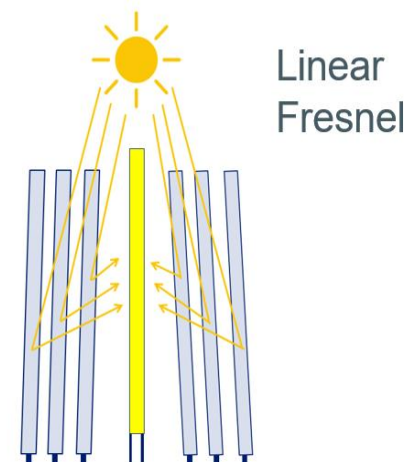
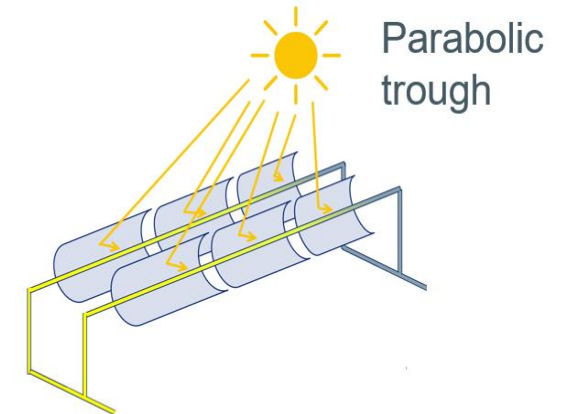
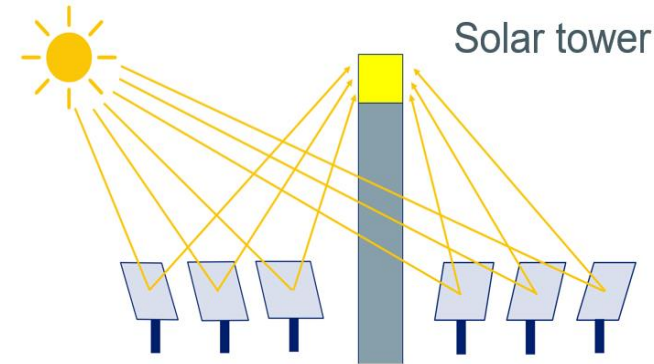


# AGC Sunmax Premium Reflect

- AGC is a leading manufacturer of flat solar mirrors with proven expertise
- SunMax Premium Reflect is designed to provide customers with the highest possible reflectivity and the required durability thanks to their composition: extra clear low-iron float glass, silver, copper, 2 paint layers



- **Sunmax Premium Reflect thick**
  - Up to 94,4% energetic reflectivity average (ASTM G173)
  - Available in 3mm and 4mm
  - For solar tower and linear Fresnel reflectors
- **Sunmax Premium Reflect thin**
  - Up to 95,5% energetic reflectivity average (ASTM G173)
  - Available in 1mm and 2mm
  - Suitable for lamination
  - For solar tower, parabolic trough, dish/engine





✔ Your Feedback is Highly Appreciated

