TÜV CERT
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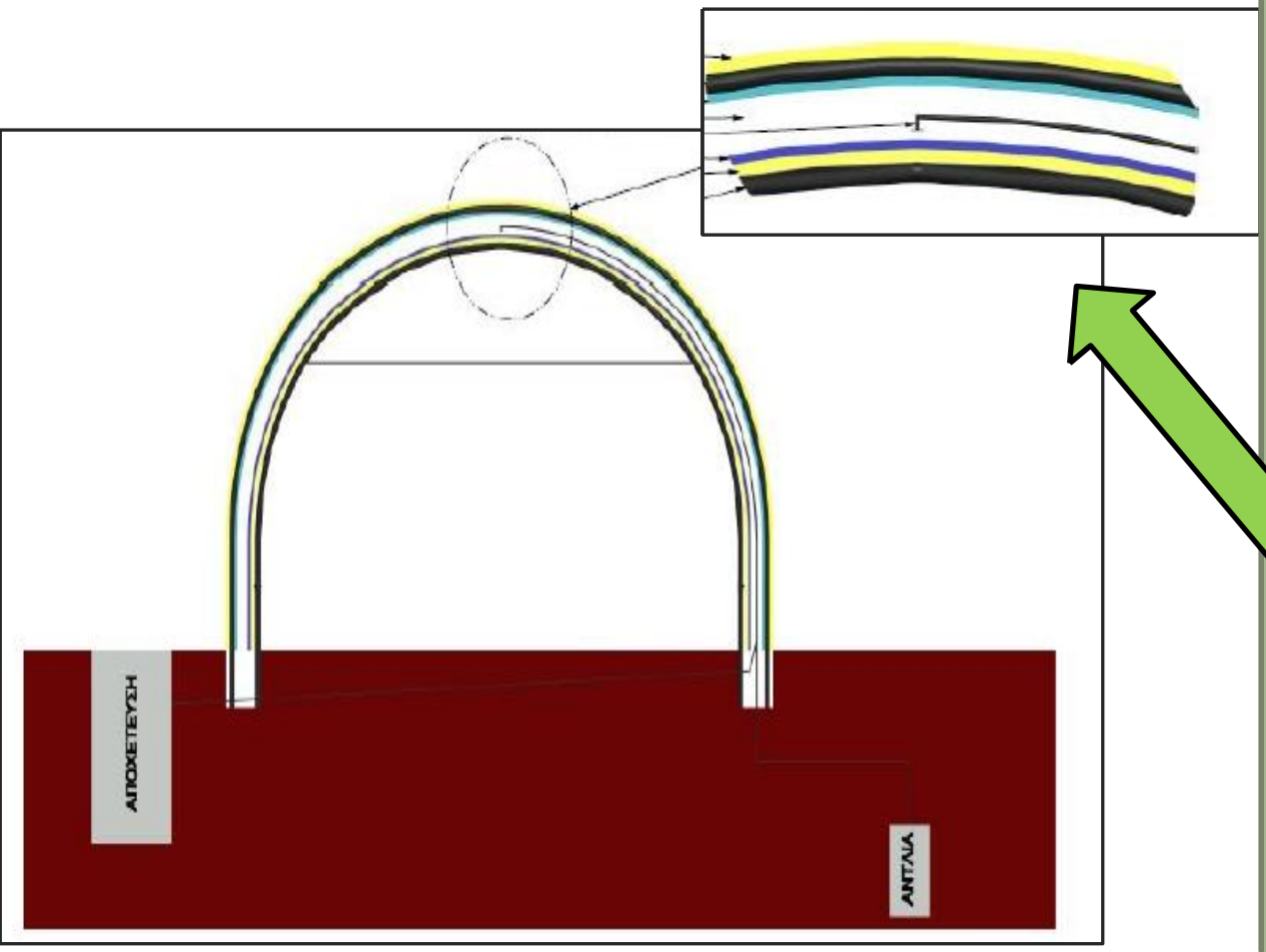
GEOTHERMAL GREENHOUSE



- Company involvement since 1981
- Water sprayed between the plastic covers
- Five insulation layers (Inner Cover, water film, air, Ice*, external plastic cover)

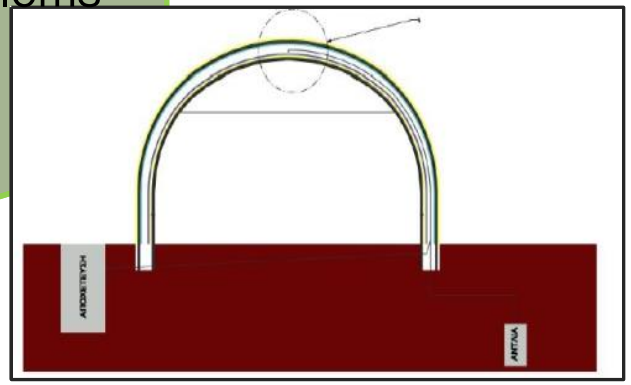
GEOTHERMAL GREENHOUSE

Advantages

- Improvised greenhouse insulation
- 7^0 C constant temperature inside the greenhouse

Disadvantages

- Additional construction frame demanded for holding the second plastic cover
- Increased shading conditions
- Humidity control problems
- Ventilation problems
- Higher cost



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- *The improvement of the plastic cover properties*
- *The high prices of fossil fuels*
- *The environmental problem*
- *The inflatable greenhouse technology*

Led to a new improvised version

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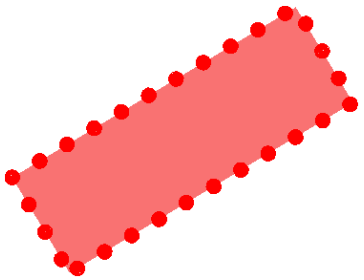

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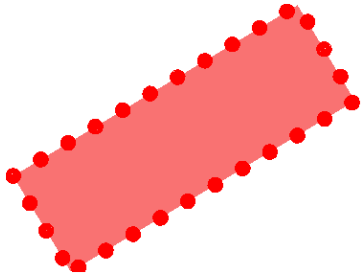
What's new?

1. *A moving window roof mechanism ensures the proper ventilation of the space (humidity control problem)*
2. *The absence of the additional frames- with the inflatable greenhouse technology introduced- limits the shading problems as well the investment cost (shading problem, high cost)*
3. *The blind mechanism allows the pressure control inside the greenhouse*
4. *New characteristics as the summer operation, the capability of high pressure conditions in the greenhouse and more are available*



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Roof window mechanism:

1. Moved by an electric motor
2. Materials used (steel, plexiglass)

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The bindings can be fully opened, partially opened or closed depending on the demanded internal conditions

The equipment supporting this mechanism is powered by an electric motor

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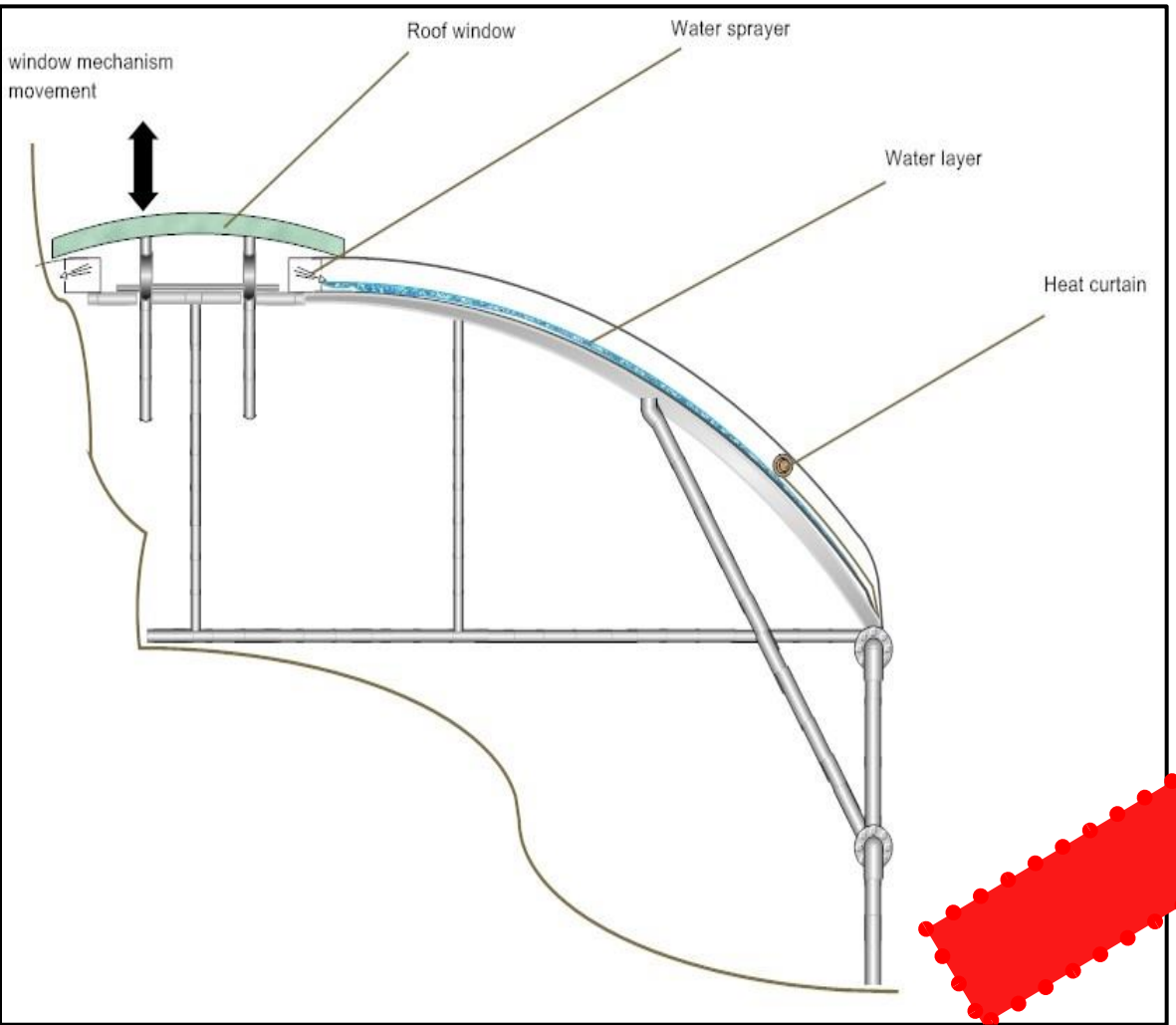
Winter night operation (phase 1)



- An air pump is inflating the gap between the two plastic covers
- In the absence of daylight the water sprayer starts spraying water between the gap created by the two plastic covers (Pressure 2,5 atm)
- The heat curtain is folded
- The roof window is closed

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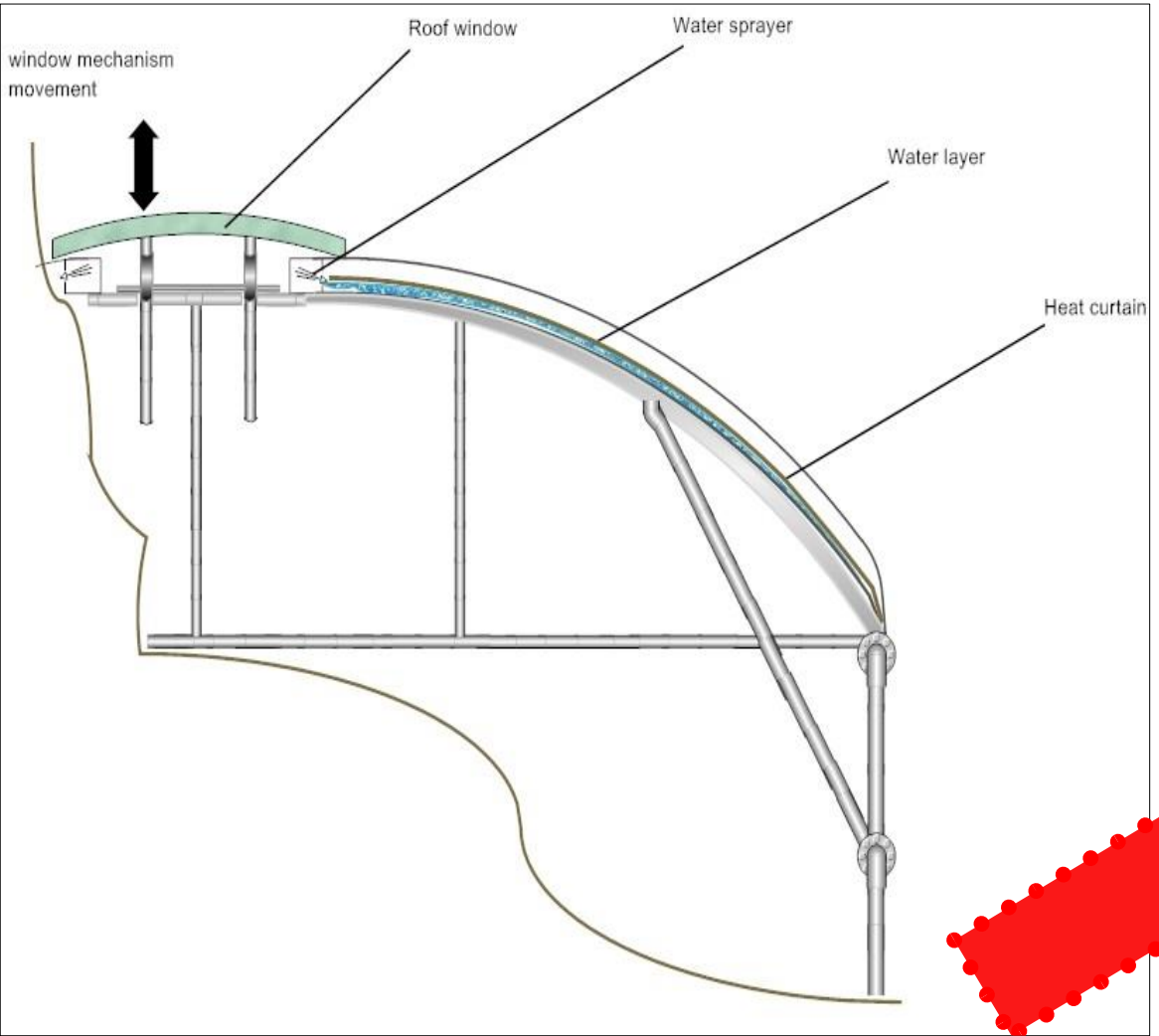
Winter night operation (phase 2)



•After 10 minutes of water sprayed, the heat curtain is spread over the water film (the adhesion forces lead to easy fitting)

•Five insulation layers are available:
1.Inner plastic cover
2.Water film layer
3.Heat curtain
4.Air
5.External plastic cover

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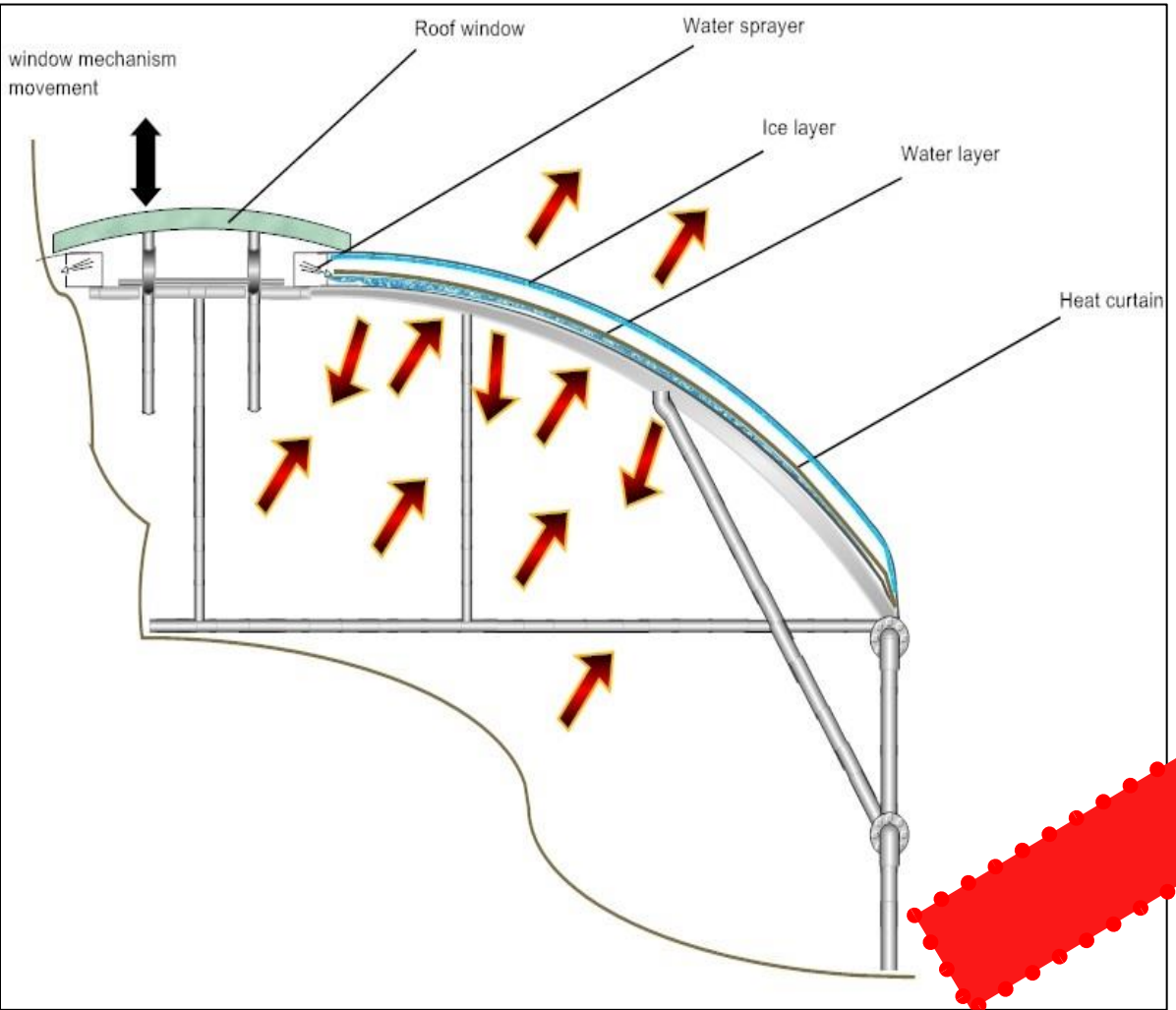
Winter night operation (phase 2)



- When the temperature is lower than 0°C a sixth layer of ice is created

- Six insulation layers are available:
  1. Inner plastic cover
  2. Water film layer
  3. Heat curtain
  4. Air
  5. Ice layer
  6. External plastic cover

- The insulation of the construction is significantly enchanced

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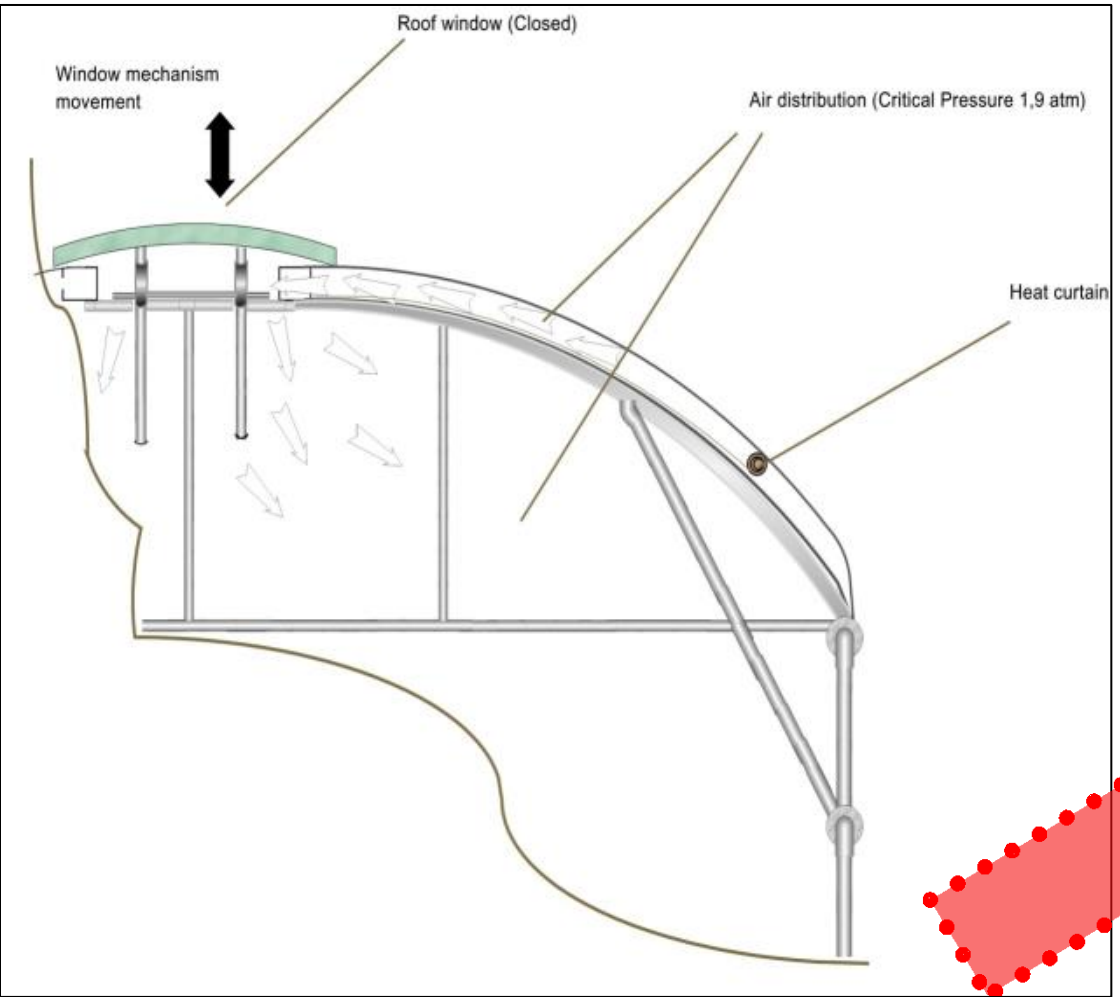
Winter day operation (phase 3)



- By the presence of daylight the heat curtain is folded
- The fans start operating
- The blinds connecting the space between the double layer areas are opening
- After the critical pressure is achieved the window starts moving to retain the optimum conditions within the structure

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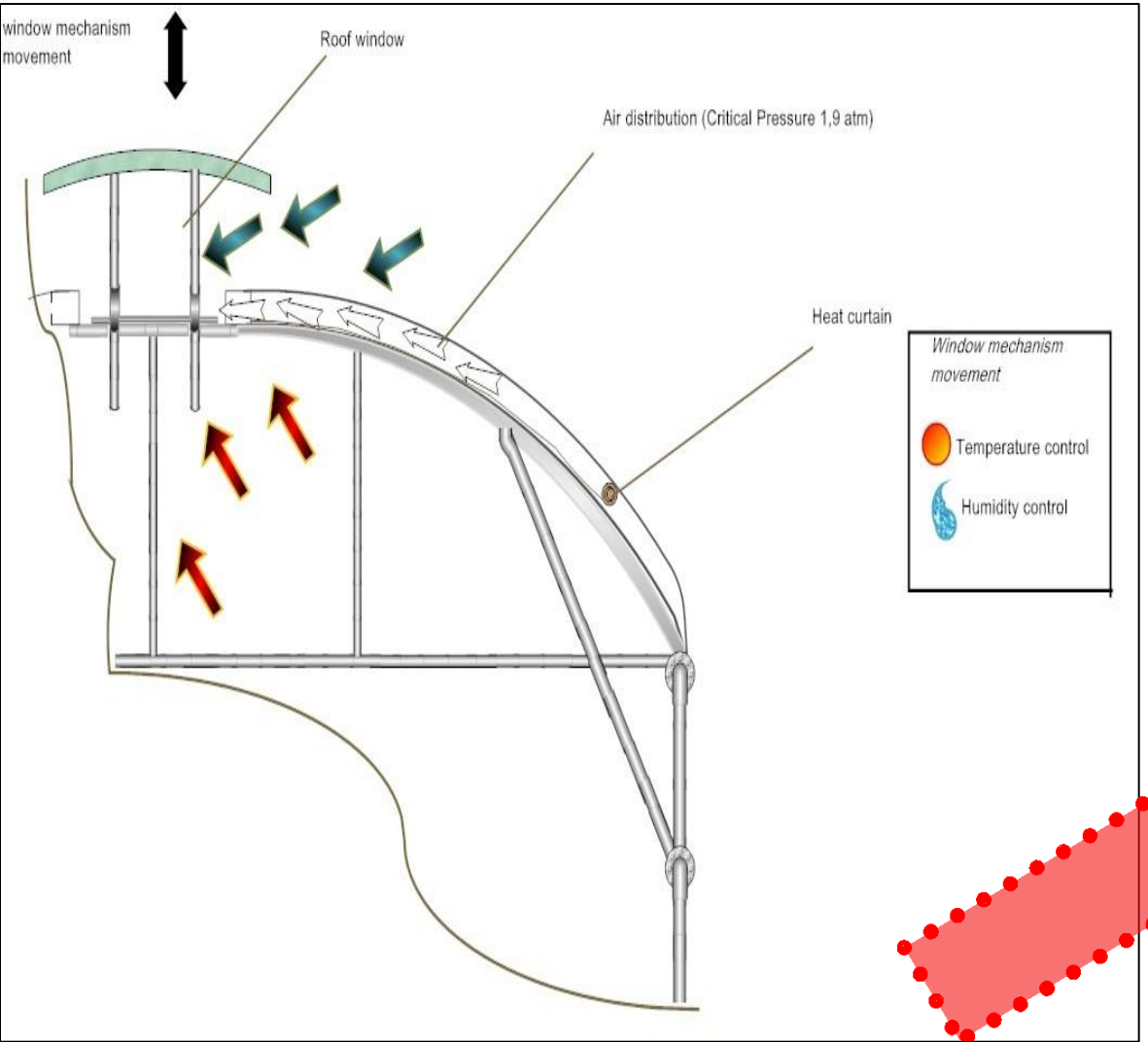
Winter day operation (phase 3)



•The combined operation of the air supply system- the moving roof window and occasionally the water sprayers can ensure the maintenance of the internal environmental conditions (humidity, dry bulb temperature)

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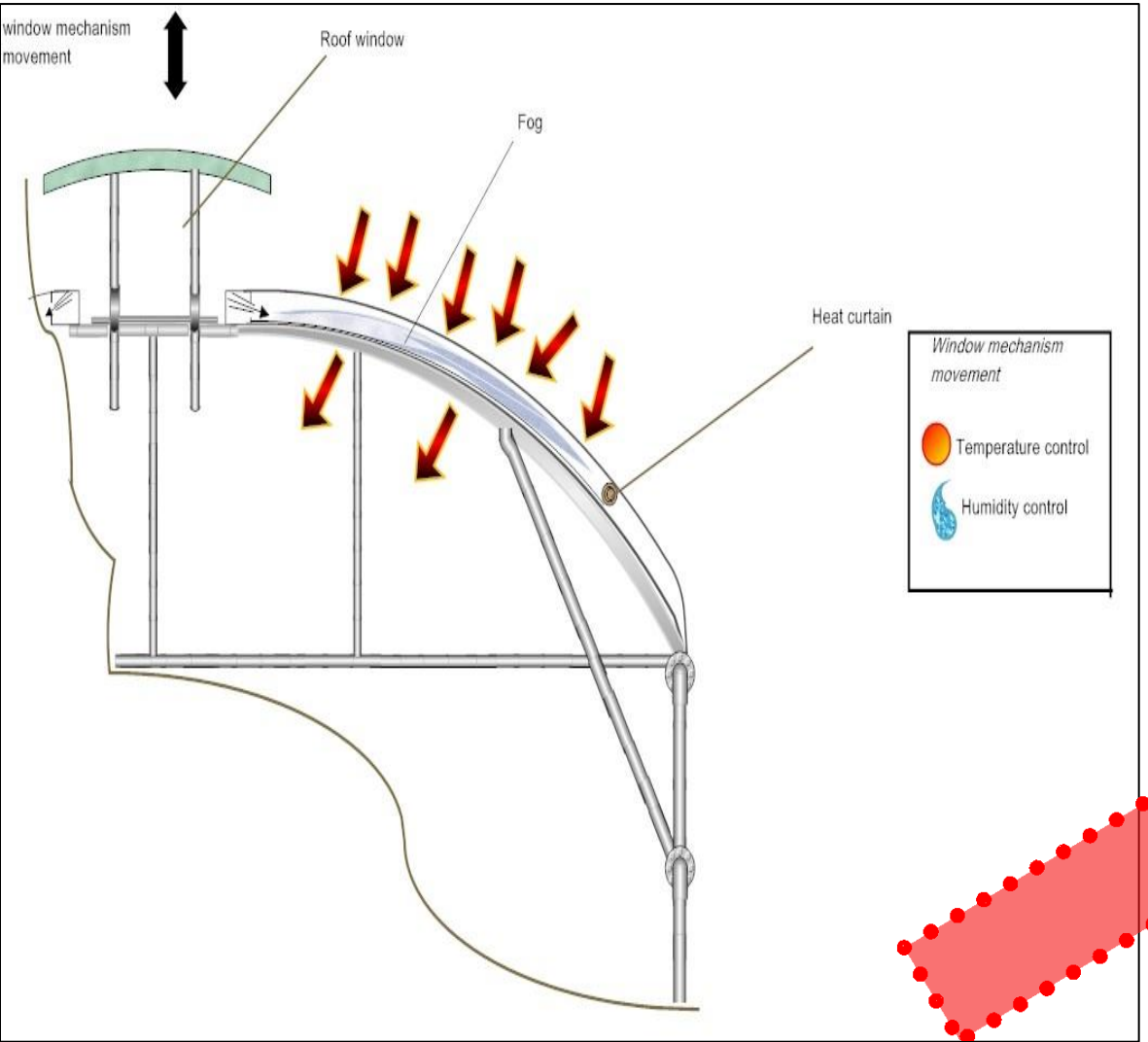
Summer operation (phase 1)



- During the day at summer periods the system can operate as an effective cooling system
- Fog sprayers are spraying with fog the gap between the plastic covers
- The fog operates as a barrier to the high intensity solar irradiation
- The fog phenomena preventing the rise of the temperature within the structure

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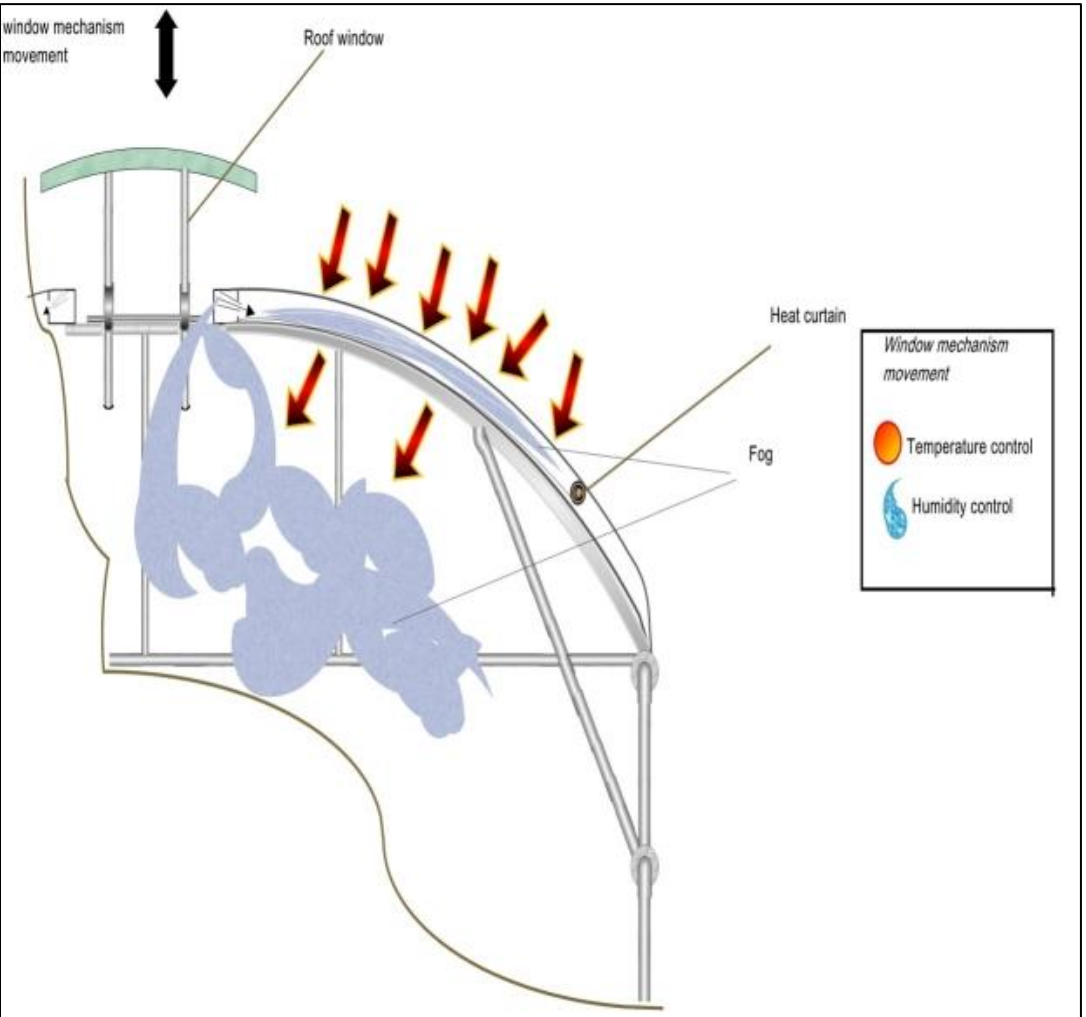
Summer operation (phase2)



- The bindings open so the fog can enter the structure
- Water absorbing heat from the environment to maintain the evaporation phenomena
- Balanced cooling of the internal environment is achieved, compared to greenhouse convectional cooling systems
- High values of air velocity are avoided

•Fog phenomena combined operation provides high cooling efficiency

Cooling phenomena during summer operation:

1. *Heat absorbed by the fog layer to evaporate*
2. *Heat absorbed heat by the fog from the internal greenhouse environment*
3. *The fog layer prevents the high solar irradiation enter the greenhouse*
4. *The moving window allows the exploitation of the external climatic conditions when it is necessary*

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Thank you for your attention!