

Joint Project:

Energy savings of 50% in horticulture under glass by application of new glass foil combination, pilot application in the horticultural plant business, determination of energy savings and beneficial effects on the cultivation of plants

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Subproject "System test and coordination"
Forschungszentrum Jülich GmbH, ICG-III
Dr. Hans-G. Bertram, Gerhard Reisinger

Subproject "Industrial development"
CentroSolar Glas GmbH & Co KG, Fürth
Dr. Thomas Hofmann

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SUMMARY

The beneficial effect of a new developed glass/foil glazing system for horticultural applications was investigated in a commercial greenhouse. It was shown that 50% energy savings and an improved plant yield and quality could be achieved.

AIM OF THE RESEARCH IN THE FRAMEWORK

An area of 5,000 hectares under glass in Germany and about 90,000 hectares in total in the EU make sure the high potential of savings in heating energy in horticulture. The new covering system is to minimise the heat losses by one half.

A new covering system for green houses, which combines a higher transparency with the halved heat transfer, fulfils this requirement. Additionally to the saving of heating energy, the higher and spectrally more advantageously distributed daylight corresponds to a better plant development.

Apart from the principal purpose of the research programme for the climate protection of the BMBF limiting the emission of the greenhouse gas CO₂ (part A), the following aspects are also to be considered at the planned project

- Diffusion of technologies beyond industry borders
The improved covering for greenhouses are favourably applicable also in the architectural area for all other kinds of transparent cover surfaces.
- Visionary concepts, long-term effects
The respective specific advantages of glass and foil are united to a synergetic component, which deduces thereby new characteristics beyond the sum of the component characteristics. During the typical life time of decades for greenhouses and building facades, we must expect sustainable energy saving.
- Application orientated projects: implementation in the near future
In a practical application case the new system is come as pilot scheme into operation just in the beginning of the project and then further developed can be made gradually with feedback to the experiences during the practical operation.
- Starting support for self runners
The project is equipped with a fast practical start and a systematic scientifically accompanied evaluation phase. The evaluation of the measuring data for heating energy consumption will provide relatively fast for further comparable constructional measures.

RESULTS

A new glazing system was developed by combining the materials glass and foil giving a glass based foil cushion glazing system. This system of high transparent ETFE foil with low-iron, antireflective coated solar glass was presented as a prototype from the Research Center Juelich and the companies Centrosolar Glas and Siedenburger Gewächshausbau at the international plant fair (IPM 2005 and 2006). It offers for the first time in horticulture the possibility to increase the transparency of the cover and to simultaneously reduce the heat transfer by up to 50 %. Both materials are highly UVB transmissive, which is favourable for the quality and the hardening of ornamental plants. In addition, the thermal insulation of the

glass/foil combination is switchable by taking out the air from the cushions and therefore offers the possibility to get the roof area free from frost or snow by heating. This is not possible for conventional insulating covers often leading to light loss thus to a lower production yield.

First results were obtained by a prototype system at the Research Center Juelich. As a first commercial project at Cramer company in Bad Salzuflen a greenhouse of approx. 1,000 m² area for cultivation of ornamental plants was completely equipped with the glass/foil combination.

According to simulation calculations and first measurements the amount of saving in heat energy is approximately 50%. To determine the latent energy flow caused by condensation of humidity at the greenhouse cover, hot box equipment is actually prepared for systematic measurements of several roof elements.

It could be shown that the plants developed faster due to the beneficial light conditions resulting in a reduced cultivation time which gives significant economic advantages by a improved use of the production area. Additionally, the increased amount of UVB radiation leads to a stronger plant constitution and to a more intensive colour development.

As a first result it can be summarised, that the amortisation of the technical costs are not yet to be financed by the energy savings alone at present, but the additional benefit by the better plant development will lead to a high acceptance of these energy saving measures.