

Quality and energy savings under F-clean roof

Georg Welzel has been growing pot- and bedding plants since 1993. Last year he built a new 1ha greenhouse to utilise the excess heat produced by his biomass installation, which, since 2005, provides the nursery with electricity and warm water. The German grower chose a double layer of F-clean plastic film to cover the new greenhouse and his initial experience is very positive.

By Florentine Jagers op Akkerhuis

Welzel's new greenhouse with its F-clean covered roof which opens from the gutters to allow ventilation.

In the small, picturesque village of KerkenRahm, close to the German flower auction Landgart in Straelen, is the nursery of Georg Welzel, an innovative grower of pot- and bedding plants. He uses biomass to heat his greenhouses

and in 2006 he built a modern greenhouse with a F-clean roof. The roof is one of the first in Europe to be built with this double layer of film, a product which is much more common in Japan. Having grown plants in the greenhouse for several months Georg Welzel is enthusiastic. The greenhouse climate is perfect, the energy savings are as expected and the quality of his plants is better than in the conventional greenhouses.

Heat surplus

Georg Welzel runs the company with his wife Silvia Welzel. They took over the company in 1993 from Georg's parents Hubert and they have two locations: 2 hectare in KerkenRahm and another 3 hectare in the Netherlands. Welzel is an idealist and an entrepreneur. He aims to use only durable energy and he knows how to take advan-

tage of the financial possibilities created by "Green State Aid" in Germany. In 2003, together with two farming neighbours he started the company 'Biogas Rahm GbR'. This biogas installation generates 626 KWatts; providing electricity and warm water from biomass, which in 2006 saved the nursery 30,000l fuel oil. In addition, the grower has a bio-oil installation which runs on palm oil and provides nearly 1,000 KWatt.

Heat production has been very efficient, so much so there was a surplus of heat for the existing greenhouses. That was when Welzel started to consider an expansion. However, a new greenhouse had to fulfill two important conditions: it should be energy neutral and the growing circumstances should be as close as possible to outside conditions. This brought him in contact with the F-clean covering, an ultra



Georg Welzel, entrepreneur and grower of pot and bedding plants.

thin poly film, which is used in greenhouses in Japan. Together with Ron van der Pluym, who represents the Japanese company Asahi in Europe, and with brothers Ben, Kees and Lucien van der Heiden of the Dutch company VDH-Poly-Greenhouses, he developed a new greenhouse which became operational in the summer of 2006.

New roof type

For an unobservant visitor the new greenhouse just looks like a normal glass greenhouse. The 9,800 m² greenhouse is not a tunnel, like most poly-greenhouses, but it has a ridged roof. The five meter high walls are partially build of two-layered 16 mm acrylic sheets. The 12.80 meter wide roof is very bright and made of a double layer of F-clean, the outside is bright F-clean and the inner side is diffuse F-clean.

F-clean is a so called ethylene-tetra fluor ethylene (ETFE) and cannot be compared with standard film like polyethylene (PE). The material has a very high UV light transmission, which encourages early blooming and more colourful plants. The film is durable and is chemically treated to make it self-cleaning. The life expectancy is at least ten years, but in Japan there are already F-clean greenhouses which are 17 years old.

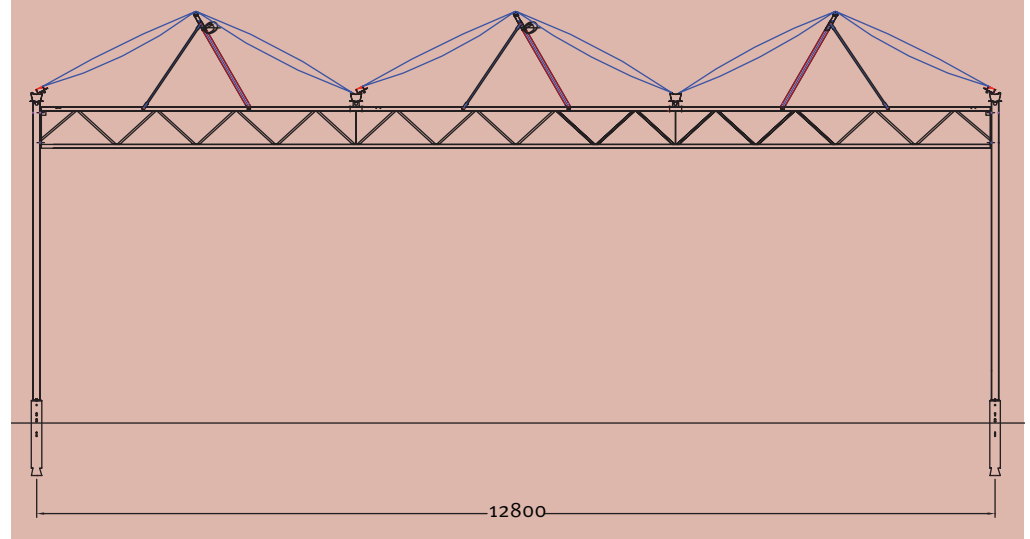
The film is stretched very tightly and for this reason it was necessary to develop a new way of constructing the roof, something which has been a problem for greenhouse builders in Europe. After several years of research VDH Poly Greenhouses and sister company Heuvel-Folies-Serres found a way to make a stable construction and they have already realised several horticultural projects in Germany and in England.

Unique to the Welzel greenhouse is not only the two layers of F-Clean inflated by air pressure, but also the way in which the roofs can be opened by continuous gutter ventilation through a push pull system. This enables the grower to realise maximum ventilation and to reach outside conditions.



The biomass installation which heats Georg Welzel's greenhouses.

A diagram of the new greenhouse with its double layered F-Clean roof.



A comparison of greenhouse coverings

	Float glass	Poly Ethylene	F-Clean (ETFE)
Material	Standard: 4 mm	180 – 200 micron	100 micron
PAR transmission (direct)	90 %	85 – 90 %	93 %
PAR transmission (diffuse)	83 %	81 %	86 – 88 %
UV-B transmission (to 320 nm)	0	Depending	All
Heat transmission Far Infra Red	0	40 – 60 %	15 – 20 %
Flammability	Non	Low	Low

High light transmission through F-clean

For several years, plastic greenhouse covers have been attracting attention in northern European countries, traditionally a region which favours glass. In other countries polyethylene films and acrylate sheets have been used for a long time already in horticulture. The new material F-clean (ETFE) is starting to be used especially in Germany and the United Kingdom.

In 2002, the Japanese company Asahi introduced the transparent, flexible material ETFE during the Horti Fair in Amsterdam. The company has already been supplying it in Japan for almost 20 years where today there are around 2,500 hectares of greenhouse covered with ETFE.

For greenhouses, F-clean is applied with a cross-section of 60-120µm. According to measurements taken by Agrotechnology and Food Innovations (A&F) in Wageningen, the Netherlands, the light transmission is between 4 and 6% higher than through traditional horticultural glass, depending on the cross-section of the material. Certainly the transmission of diffuse light is better than glass. This is an important advantage in the winter when many days are cloudy and the light falls from all directions onto the greenhouse cover.

Also, it is a property of many plastics that light transmission decreases due to ageing. A&F examined a sample of 17 year-old F-clean from a greenhouse in Japan and it appeared that transmission had hardly diminished. It was still 92%.

Other properties of F-clean have also been investigated by A&F. F-clean appears to transmit more heat radiation than glass which means that under cold circumstances in winter about 1 to 3% more gas is needed for heating, depending on the cultivation.

The higher UV transmission is an advantage for some plants because it stimulates the red colour of flowers, such as Pelargonium. Also some pot plants appear to grow more compactly at higher levels of UV light. However there are also crops which have a negative reaction under high UV radiation, for example, it causes some dark red roses to discolour.

And to apply F-clean correctly the greenhouse construction must be adapted. Particularly the attachment system is important because the material is smooth and non extensible. With special sections the material must be kept well stretched.

Improved quality

Since February of this year the German grower has been producing pelargonium and poinsettia in the new greenhouse and he is very happy with the results.

"The climate is ideal and I have never been so early in production. The quality of the plants is perfect. They have a very bright colour and, another important advantage of the high UV transmission is

the compact growth. I was able to reduce the use of chemical growth inhibitors," says Welzel.

Concerning the extra costs of the modern greenhouse the grower is realistic. "Of course, the new approach to the greenhouse is more expensive than a traditional greenhouse. But the greenhouse construction is only one third of the investments. The remaining costs are in the lay out,

such as internal transport systems, propagation tables, automation, etcetera. I think we will earn the extra investment back within five to six years if you consider energy saving and better prices for our high quality pot plants."

The German grower believes in the film. "In our company everything must fit together and the F-clean greenhouse contributes perfectly to the total plan." ■