EXHIBITORS BY PRODUCTS

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Heating

The Dutch grower paid about $1.42 per 1000 cu ft of gas for heating his glasshouses just over ten years ago. In those days, it would probably have taken up to 8.8 thousand cu ft of gas to heat 1 acre of early tomatoes, with other crops taking more or less gas in the course of a season.

The Dutch grower is now paying $12.75 per 1000 cu ft or about 8½ times as much as ten years ago. It could, of course, be argued that other countries have experienced similar increases in energy costs and that, if anything, glasshouse growers in other countries were hit earlier and harder by soaring energy costs. However leaving politics aside one can make other much more interesting calculations.

In 1979, total gas consumption by the Dutch glasshouse industry was 130 billion cu ft for the total acreage of heated glasshouse vegetables, cut flowers and pot plants. According to my calculations this works out at an average gas usage of 153.6 cu ft per sq ft glass. Obviously, some crops would use more and others less gas in the course of a year.

Four years later, in 1983, the Dutch glasshouse industry used 81 billion cu ft or an average of 94.8 cu ft per sq ft glasshouse, a decrease of about 40%. Since crop yields have also increased significantly right across the board during this four year period, it cannot be argued that energy savings were obtained by substantial changes in the cropping pattern, by changing over to lower temperature crops, or simply by dropping the growing temperatures. This would inevitably have resulted in reduced yields and quality.

The conclusion must therefore be that the Dutch have improved energy productivity to a considerable degree. A recent calculation of the Dutch Ministry of Agriculture claims a 90% improvement in energy productivity, brought about by energy-saving measures and equipment, better environmental control systems, improved growing techniques and varieties. In other words, a pound of tomatoes, a cucumber, or a bunch of cut flowers is now being produced in Holland using little more than half the amount of energy it took in the 1970s.

However energy costs have risen a good deal faster than it has been possible to make energy savings with the result that energy still accounts for 18 to 25% of total production costs depending on the crop. The energy factor is more important in production costs today than it was ten years ago so the pressure to save energy is unabated.

The Dutch glasshouse industry, its supporting services and equipment manufacturers, have tackled these problems with unparalleled vigor. It is doubtful whether any other country could match the Dutch improvements in energy efficiency and productivity.

Of course, it has cost the Dutch glasshouse industry a great deal of money in capital investment which — in fairness to the Dutch — is often overlooked by the critics of Dutch gas prices. Three years ago, the Dutch government offered the glasshouse industry a subsidy of about $64 million for energy-saving investments. By the end of 1984 the subsidy was terminated and funds were exhausted.

Since under EEC rules the maximum subsidy allowed is 25% of the proposed investment, it must follow that the industry invested a total (including subsidy) of at least $255 million in energy-saving installations over the past three years alone and, calculated over a longer period, the investment is likely to have been a good deal higher. To put it all in perspective, the Dutch investment in energy-saving installations alone over the past three years exceeds the industry's total energy bill for a whole year.

Thermal screens and glasshouse insulation are the more obvious installations and are being improved all the time. As a rule, because it is important to retain maximum light transmission, the Dutch have opted for thermal screens in the glasshouse roof and insulated cladding for the gables and sides. Anyone interested in these applications will find the NTV a happy hunting ground.

The many developments in heating and environmental control systems have made at least as important a contribution towards energy savings and are well worth investigating. Boiler manufacturers have concentrated on maximizing boiler and burner efficiency. Combustion gas condensors, salvaging waste heat from the flues, and smoke retarders fitted to boiler are now standard equipment on Dutch nurseries. The operational range of burners has been increased to allow the wider variations in heating requirements, partly the result of improved glasshouse insulation.

Alternative heating systems and fuels, like infra red heating, coal, wood and waste fuels, wind power and solar heating, are all to be found, but except for a few special situations have not generally been accepted by the Dutch industry. The same could be said for heat pumps and the total energy concept.

Impartial and scientifically-based information on these and other aspects of energy saving is available. The Dutch equivalent of NIAE, IMAG is also the coordinating organization in Holland for energy-saving research.

Most Dutch nurseries are on gas heating and CO_2 is obtained as a cheap by-product of the combustion gases. However when growers insulated their glasshouses, using less heat, problems started. When the sun shines, which is when CO_2 enrichment would do most good, there is no carbon dioxide because the heating is not on. To run the boiler at below minimum capacity just to obtain CO_2 is not only uneconomical but also dangerous as it could release ethylene gas.

One solution is to couple the main boiler with a separate small boiler for CO_2 production in off-peak periods and to store the heat in the main boiler for use at night. Another solution is to have separate CO_2 burners in the glasshouse for use during off heat periods. Yet another solution is to use pure CO_2 which is, of course, much more expensive.

Excessive humidity is also a problem with glasshouse insulation. It has received a lot of attention in Holland and is

now gradually being solved by various methods, most of which can be found at the NTV.

Revolution

Quite a revolution has taken place in the layout of heating pipes in Dutch glasshouses. The modern grower talks of crop heating rather than glasshouse heating — pipe loops and connections have been redesigned and arranged so that the pipes can be raised or lowered to bring the heat to the level where it will do the crop most good. Split heating, supplying part of the total heat requirement below the crop and the rest within or above it, is another development. Gilled and flanged pipes, light pipes and alkathene or tubylene, all have a place in the drive to make the best use of heat.

The discovery that heating pipes in an insulated glasshouse do not perform according to heating engineers' rules and theories has opened up a whole new field of investigation into heat loss, transfer, and distribution. Rather ironical if one considers the massive amount of work on these subjects in the past 40 years.

The introduction of the computer for environmental control has made one of the largest contributions to energy saving and — more important — energy productivity. There are now an estimated 5,000 computers on Dutch glasshouse nurseries which means that half the glasshouse growers in Holland now use one for environmental control and other growing processes. Five companies — Brinkman, Hoogendoorn, Indal, Priva and Van Vliet, all members of Dicotu, an organization of computer suppliers — claim to have 95% of the Dutch horticultural market.

Computer hardware is now more or less standard, although each supplier claims to have his own system. It is in the software, the programs, that most of the work is being done, much of it in cooperation with the Dutch research organizations. Developments are taking place so fast now that already programs are having to be rewritten every three or four years.

This year, a big drive has started to introduce business computers into the horticultural industry, which are much more sophisticated than the process computers with almost limitless possibilities for the automation of business recording, accounting and administration. It is anticipated that by the early 1990s many Dutch growers will have computers linked into a network giving them instant access to auctions, banks, advisory services etc. The big question at the moment is whether the Dutch post office and communications services will be able to cope with all the new technology.

Glasshouses

Total Dutch glasshouse acreage five years ago, in 1979, was about 21,150 acres, increasing to about 22,000 acres by 1983. Compared with the late 1960s and early 1970s when most of the glasshouse expansion took place, the three years between 1980 and 1982 were slump years for the Dutch glasshouse construction industry.

Investments in new glass fell to a very low level. Of over 40 glasshouse construction companies operating in Holland in the 1970s about 20 have survived, including most of the leading companies, those which have been innovators and trend setters for many years. Although reduced in numbers, the Dutch glasshouse construction industry is very strong compared with any other country and dominates the European market.

During 1983 it became clear that the worst of the recession was over. Production was up, growers were getting reasonable prices again at the auctions, and the investment rate started to increase again. At the beginning of 1984 it was forecast that glasshouse builders would be erecting at least 1,000 acres of glass a year in Holland over the next few years and probably about 500 acres a year in other countries around the world.

When up-to-date statistics become available they may well show that the figures have actually exceeded expectations. Whereas Dutch glasshouse builders would have been falling over each other to get any British orders in 1982 and 1983, last year several British orders were scorned by the Dutch because they were considered too small, a sure sign that the Dutch were busy elsewhere.

Dutch economists and leaders of the glasshouse industry generally believe that there is no case for a further expansion of the Dutch glasshouse acreage in the next few years. Much of the Dutch demand for new glass will therefore be for renewal operations because of greatly increased energy and labour costs.

At one time, a glasshouse was expected to last 20 to 25 years, but developments in technology and production systems made it necessary to modernize and renew glasshouses more frequently. Ten to 15 years is probably the most one can expect of a glasshouse today without modernization or renewal. On the basis of this calculation and taking into account the backlog from the slump years it seems reasonable to assume that before long the Dutch glasshouse construction industry will be busy modernizing or renewing up to 2,000 acres per year in Holland alone.

One should also add the new glass which will be erected in the course of resettling holdings due to urban and industrial development. Especially in the densely populated Western provinces of Holland, the pressures on land are enormous and there are several ambitious schemes in the pipeline for redeveloping whole areas. Inevitably this involves relocating nurseries and building new glass.

An interesting byproduct of all this activity is the development of a thriving glasshouse demolition trade. There are several companies which specialize in removing glasshouses and supplying and erecting second-hand ones. These are often very good value for growers of low-energy crops which do not require maximum winter light transmission.

The basic concept of the Venlo glasshouse block has stood the test of time for well over 50 years in Holland and many other countries. Its success is due to the high degree of standardization, labour efficiency, and versatility.

Of course there have been changes in the construction details and materials over the years, but the basic idea of a standardized module capable of being multiplied up to any size at the lowest cost has remained unaltered. The main features of the modern Dutch glasshouse are double-glazed gables and sides, single-glazed roofs, 1m-wide panes, narrow gutters and 4m between the gutter stanchions. A block may consist of single, double or triple span modules and the height of the house can be tailored to the grower's needs.

In recent years, roof structures have been tidied up considerably to allow for the installation of thermal screens which most companies now offer as an integral part of the glasshouse. Double-glazed roofs have been investigated in Holland but they are not considered viable for the immediate future, except perhaps in glasshouse work areas and for a few crops which are not very light dependent like ferns. Most growers prefer mobile thermal screen installations of one type or another which are cheaper and allow them to keep their options open.

By using stronger materials and eliminating superfluous structural parts glasshouse designers have managed to gain an extra 5 or 6% in light transmission. Used in conjunction with a thermal screen installation the modern Dutch glasshouse also saves 30 to 40% more energy than those of the 1970s.

In recent years, in particular, Dutch research and experimental organizations have been scrutinizing every component and aspect of the Dutch glasshouse. It is quite surprising what information they have managed to turn up.

Last year for instance IMAG published a survey which showed that horticultural glass could vary by as much as 4% in its capacity to transmit light. In a few cases, second-hand glass was found to be better than new. It is believed that a further 2 or 3% of light could be gained by using the right kind of glass and Dutch growers can now have the light transmission capacity tested before ordering glass.

However fundamental changes in the design of Dutch glasshouses are not expected for the next few years at least. Any innovations shown will most likely consist of small but nevertheless important improvements in structural details. It is also worth mentioning that an increasing number of Dutch glasshouse construction companies have developed plastic greenhouse designs especially for their foreign customers. Some of these designs are quite ingenious.

$1.0605 = 1 British pound
1 cu m = 35.3 cu ft
1 sq m = 10.8 sq ft
1 British pound = 4.5 Dutch guilders

Editor's Note: *It is quite obvious that the Dutch feel computers offer considerable advantages. This question has often been asked of me, especially by the CGGA Research Committee. There is no good, public information in the U.S. to say computers are justifiable commercially. However, the development at CSU shows an outstanding opportunity for major technical advance in the industry.*

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