

GOOD HOUSEKEEPING TRIMS THE BILLS¹

By Ben Smith, ADAS glasshouse engineering specialist at the National Institute of Agricultural Engineering

In the course of conversation recently, a grower related how he came across a large leaking steam valve on a nursery. "That sort of thing makes me see red," he said. (He had a financial interest in the business.) "How much money is it wasting?"

The question, without being more precise, is rather like asking the length of a piece of string. However, the grower was given a rough guide: a $\frac{1}{16}$ in diameter hole will pass 9lb per hour of steam from 50lb per sq in. That's about 2gal of oil fuel per day or, if the situation is unchecked for two weeks, \$27.00 at current prices. "It took me two minutes to stop the leak," said the grower, "one minute to find steps and spanner and one minute to tighten the gland nuts." Then he asked for the cost of leaks on pressurised hot water systems. "Rather worse than the steam example," he was told. "About four times worse."

The conversation concluded with mutterings that it might be an idea to threaten to knock \$13.00 a week off the wages of the maintenance man for every leak found on the nursery. The 'good housekeeping' message was well summed up by this dialogue. Good housekeeping to some people is boring; not an attractive or particularly interesting part of glasshouse growing. Tracking down unnecessary heat losses can be tedious and putting things right awkward and fiddly (at least sometimes).

Good housekeeping however is important - many \$ per week important. Important enough surely to make sure that nursery staff are properly informed about fuel economy measures and given the right incentives to be vigilant. This 'education' should not stop at the maintenance man though. Every person on the nursery must be made aware of the importance of fuel in ensuring the profitability of the enterprise. Always remember, no profits mean no jobs!

On most nurseries there are three areas to look at for energy economy: in the boilerhouse, in the distribution mains, in the glasshouses. (Of course if the nursery uses oil- or gas-fired air heaters then there are no distribution mains to worry about.)

Boiler Priorities

In the boilerhouse the main job is to ensure that fuel is being converted into useful heat efficiently. Primarily this means correct adjustment of the burners and cleanliness of boilers. A boiler efficiency test kit or instrumentation to check efficiency *must* be available for regular use. The

person who has responsibility for looking after the boilers must of course have the knowledge to do the job properly.

Training courses are organized by some of the burner manufacturers and by the Agricultural Training Board. If your boilerman or you have not been trained to carry out routine maintenance and adjustment of the burners it is high time he or you were! Training is usually money well spent and never more so than now.

If the boiler is correctly adjusted it will reduce the amount of cleaning necessary. So that it is done regularly, all the tools necessary should be to hand and easy to use. If the doors are not hinged, have an easily-rigged block and tackle available so that it is a one man job. Do not expect a hot boiler to be worked on before it has cooled to a tolerable temperature (making a mucky job hot and sticky as well as asking for it to be put off till tomorrow). Consider too, purchasing purpose-made automated tube cleaning equipment. It is expensive but makes tube cleaning much more pleasant.

The water side of the boiler must be kept clean too. Correct water treatment of steam boilers is most important and regular checks of the boiler water must be made. Even if this is done by your water treatment company, daily checks by a nursery worker will make double sure and help maintain a proper level of interest in the job. Regular checking improves fuel efficiency and avoids expensive breakdowns and remedial work.

Still in the boilerhouse, check that all surfaces where heat losses could occur are insulated - this includes valves and flanges. Long gone are the days when flanges and valves were left unlagged for (infrequent) maintenance purposes. Medium and heavy fuel oil tanks should also be insulated. The latest oil price rises have tipped the financial balance in favour of insulating medium fuel oil tanks. Don't exclude all the valves and flanges and other hot equipment around the tank outflow heater either. It is awkward to fit but the price of not insulating is now just too high to tolerate.

The heat distribution mains on the nursery must be well insulated and there must be positively no leaks. Easier said than done? That is certainly true; doing the insulation job properly is frequently not cheap and saying "no leaks" certainly is easier to say than do. Nevertheless leaks which develop can usually be corrected in a matter of minutes.

Where the mains are above ground heat leaks and poor or damaged insulation may be easily seen. If there are underground ducts on the nursery ad hoc inspection is more difficult and therefore regular formal checks must be made. Flooded ducts rot insulation and pipes and conduct heat away rapidly. Mistakes here quickly become expensive.

¹Reprinted from *The Grower*, August 23, 1979. Dollar figures are conversions from british pounds.

3 Glasshouse Factors

As to the glasshouse itself, there are three particularly important factors:

- Air-tightness of the structure;
- Good temperature distribution;
- Accurate temperature control;

Air tightness means replacing slipped and broken glass quickly, keeping doors closed and draught-proof, ventilators adjusted to shut tight all the way along their length and sealing up any gaps in the structure.

A modern glasshouse properly constructed normally has an air change rate of about half per hour. Leaks from any source can quickly increase this rate to five per hour and this will push up fuel consumption by nearly 50%.

Good temperature distribution within the house is not so much about fuel economy as using energy effectively. If you wish to produce heated glasshouse crops then they must all be effectively heated. Poor temperature distribution in the horizontal plane means that some plants are given the correct temperature to perform well at economic energy inputs but others are not. If the heat distribution system warms up the air above the crop and not the crop itself it is a bad heating system. It has a positive vertical temperature gradient which is costing you dearly. Temperature gradients may be checked using integrating jars fitted with accurate thermometers reading the average night temperature at the point at which they are hung. Temperature control in glasshouses is a complete subject in its own right.

Microprocessors

Microprocessors and computer controls are now beginning to be used. One of the great merits of such controls is that they provide very accurate control and just as important, minute-by-minute monitoring of temperature and alarm-raising if a fault occurs. However while computer control systems may be justifiable on large nurseries, small and medium size businesses cannot at present prices justify the investment; yet the need for accurate control and monitoring remains.

The performance of any temperature control system may be checked with a thermograph mounted in an aspirated screen. Thermograph traces show how quickly the heating system is responding whether the correct day and night temperatures are consistently being achieved, whether the day/night change-over time is correct, and many other facets.

On larger nurseries the prospects of servicing and maintaining a large number of thermographs becomes slightly daunting and consideration should be given to installing centralised temperature recording using one or more single or multi-channel chart recorders.

Chart Recorders

Thermographs cost about \$267 each but multi-channel chart recorders are less expensive to buy where more than about four zones are to be monitored. In addition they are a better management tool in that the recording instrument may be in the nursery office and easily seen by the manager at all times. Unlike thermographs, chart recording systems do not have to be filled with ink and wound up either.

You may find, having checked the performance of your heating system, that some improvement is desirable. Consult someone familiar with glasshouse heating systems, your local heating engineer or one of the firms supplying temperature control equipment or ADAS mechanization adviser. But whatever you do do it quickly because inaccuracy is expensive; just half a degree C too hot can add 7% to your fuel bill.

It is quite often more attractive to consider the more dramatic and easily quantifiable ways of reducing energy consumption; thermal screens can save 25 or 35% of annual fuel bills, boiler flue gas isolating dampers 5%. Changing boilers or even changing fuel may also show big savings.

All these have their place. But before them should always come the patient and diligent work necessary to ensure that existing equipment is, and continues to be, operated at maximum efficiency.

Published by
Colorado Greenhouse Growers Association, Inc.
Dick Kingman, Executive Vice President
2785 N. Speer Blvd., Suite 230
Denver, Colorado 80211
Bulletin 355

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Direct inquiries to:
Office of the Editor
Horticulture Department
Colorado State University
Fort Collins, Colorado 80523