MODIFYING A DOMESTIC BOILER

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In September, 1985, an existing glasshouse was converted into a mist propagation unit at Midland Nurseries. After looking at several systems of base heating, we opted for a hot water system, which we would design and install ourselves.

The system. At the heart of the system is an ordinary, domestic 100,000 BTU boiler, fired by liquid petroleum gas. The warm water is heated to about 30°C, and pumped along a flow header. This then feeds a flow sub-header, which feeds four 20mm alkathene pipes, which run the length of the bed. These four pipes turn at the end of the bed, to become four returns. These flow and return pipes alternate in the bed, to give even heat distribution. The warm water from the return alkathene pipes flows into a return sub-header, and from there into the return header, and back into the boiler.

The construction. The flow and return pipes are in copper for the first two metres to and from the boiler, but then change to 50mm P.V.C. pipe. The temperature in these plastic pipes must not be allowed to reach 60°C, or damage will occur. The sub-headers are in 40mm P.V.C. pipe, and the pipe used to heat the bed is 20mm alkathene, connected to the P.V.C. pipe with a screw-on adaptor.

The beds are insulated with 50mm of polystyrene at the base, and 25mm at the sides. The alkathene pipes are placed on a layer of sand, and kept separated and equally spaced by passing through holes drilled in a wooden board. The bed is then topped up with sand, to give a depth of 15 cm. Each bed is 34 sq m and, with seven beds heated this way, we have a total area of 238 sq m of heated sandbed.

Operation and control. At first, the system was operated by the boiler thermostat, which was set at its lowest setting. The pump was constantly running, which had the effect of smoothing out any fluctuations of temperature in the beds. This gave us a base temperature of about 23°C, which was higher than necessary, and a lower temperature was only achieved when outside conditions were extremely severe. To achieve the more desirable base temperature of 15°C, we have fitted a separate thermostat and controller, which takes the average temperature of two probes, which can be placed in the growing medium of any of the beds. This controller now switches the boiler on and off but the pump is left running constantly, to help keep the temperatures in the sand beds even.

Each bed can be switched in or out of the system by a gate valve, which is situated between each flow header and flow sub-header. This valve also regulates the flow of water along each bed, and can

[1] Propagator

be used to raise or lower the temperature of the bed.

Problems. We have experienced two teething problems with the system. Firstly, the ordinary domestic heating pump that we initially installed could not cope with the 1456m of alkathene pipe that is in the system, so a larger industrial pump was fitted.

The second problem was air-locks in the alkathene loops, so each loop had to be bled individually, and a piece of pipework modified to bleed off the air once it was in the return header. Since these two problems have been solved, the system has run without a hitch for the past 18 months.

Cost. The cost of the system, at 1985 prices, was about £2,800, which includes £1,000 for the purchase and installation of the boiler, £1,000 for the sand and polystyrene to construct the beds, and £800 for the pipework.

EXPERIENCES WITH FOUR BASE HEAT SYSTEMS

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The provision of basal heat for providing optimal conditions for rooting cuttings has been accepted for many years. The phrase "cool tops, misty middles, and hot bottoms", was coined for MacPenny's Mist System at a precursor of these meetings held many years ago at the old Kent Farm Institute in Swanley, Kent.

ENERGY

Costs. In the balmy days of low energy costs the use of electrical heating cables controlled by fairly crude rod type thermostats set on 20°C to 21°C was the order of the day. Today much work, particularly at Efford Experimental Horticulture Station, has investigated the use of lower temperatures than the normal of 20°C, also the provision of restricted heating periods utilising times of low cost electricity availability.

Three other important steps have been taken to reduce bottom heat energy costs: the use of extensive insulation to prevent heat escaping to areas where it is not required; the use of alternatives to electricity which can often result in lower running costs and perhaps most importantly the use of accurate controllers to ensure that heat is only provided where it is required at precisely the right temperature.

Sources. Electricity is still an important energy source because