ARC CONTROLLED ENVIRONMENT USERS MEETING

23rd October. 1975

This was held at Long Ashton Research Station by kind permission of the Director, Professor J.M. Hirst. The Agenda and other preparations were made by Chester Guttridge who also chaired the meeting.

The following were present:

Dr. Gillian Thorne Mr. Ian Pearson	Rothamsted Experimental Station, Harpenden, Herts, AL5 2JQ
Mr. J.R. Stansfield Mr. D.E. Filby	N.I.A.E. Wrest Park, Silsoe, Bedford
Mr. L.E. Piper	Dept. of Education and Science, Elizabeth House, York Road, London S.E.I
Mr. R. Farrow Dr. G.J.A. Ryle	Grassland Research Institute Hurley, Maidenhead, Berks
Mr. D. Bennett Dr. L. Robinson Dr. I. Cumbus Mr. A. Robertson Mr. R. Clare	University of Bath, Claverton Down, Bath, BA2 7AY
Dr. C.C. Guttridge Dr. E.J. Skerrett Dr. E.A. Baker Mr. E.A. Fribbins Mr. John G. Simpson	Long Ashton Research Station, Long Ashton, Bristol BS18 9AF
Dr. A.P. Gay Mr. R.E. Randall Mr. F. Douglas Dr. R.P. Hurd	G.C.R.I. Littlehampton, Sussex BN16 3PU
Dr. R. Hardwick Dr. J. Brewster	N.V.R.S. Wellesbourne, Warwick CV35 9EF
Mr. C. Walter Dr. D. Clarkson Mr. J.M. Rice Mr. R. Mercer	Letcombe Laboratory, Letcombe Regis, Wantage, Berks
Mr. E. Canham	Applies Research Station, Shinfield Green, Reading RG2 9BE
Mr. D. Dickinson	Plant Envrionmental Laboratory, Shinfield Grange, Cutbush Lane, Shinfield, Reading, RG2 9AD
Dr. J. Caseley Mr. R. Simmons Mr. D. Coupland	W.R.O. Begbroke Hill, Yarnton, Oxford 0X3 1PF
Dr. L. Eagles Mr. D. Edwards	School of Biological Science, University College of Wales, Penglais, Aberystwyth SY23 3DA

Mr. T.S. Crosby	Dept. of Plant Science (Baines Wing), University of Leeds, Leeds LS2 9JT
Mr. R. Austin	P.B.I. Maris Lane, Trumpington,Cambridge.
Miss Margaret Ford	
Dr. P. Hayes	Dept. Agric. Botany, Queens University,
Dr. Gorer	Newforge Lane, Belfast BT9 5PX.

Technical problems

Spares replacements and maintenance (Saxcil)

1) Cut-outs for glycol pump, main fan and lamp house cooling fan

These are thermal-magnetic devices which cut-out when the normal running current is exceeded but before the stalled current is reached. Ron Farrow (GRI) pointed out that these cut-outs protect the glycol pump and main fan motor but in the case of the lamp house cooling fan motor the difference between normal running and stalling current is only about 10% and the cut-out is unncessary and may be shorted out or replaced by a fuse (0.5 amp). All these motors are protected by fuses (F7, 8 and 9 on wiring diagram). Replacement cut-outs are obtainable from:

Techna International Ltd.,
Parkville House,
Bridge Street,
Pinner, Middlesex.

They cost £1.40 each, and there is a minimum order value of £10, and the delivery is about three months. These cut-outs have a secondary circuit which are the contractors CWP, CF and MF (on wiring diagram). If the designated spares are not available cut-outs with single pole switching may be substituted and the secondary circuit switched by slave relay fed from the load side of the cut-out. The feed to the relay is routed via the N.O. contacts of the slave relay so that tripping-off the cut-out causes the slave relay contact to open and hence reverse the relative positions of the contactor and the overload cut-out so that the slave relay will close again when the cut-out is reset. If mains on the contacts of the alarm relay is acceptable the spare contacts on the appropriate relayR3, R4, R5 may be used. The overheat cut-out on top of the lamp housing can be replaced by a domestic immersion heater thermostat (20 - 90°C) with a 28 cm stem.

1) Duotronic Controllers

The University of Bath are building their own replacement, but no users present had experience of commercially available controllers as alternative to the Duotronic.

Frank Douglas of GCRI has had satisfactory service from Nobel controllers in glasshouse systems and as reported in the 1973 minutes this firm have a replacement for the Duotronic.

Nobel Engineering Ltd.,
Clare Works, Woods Way,
Mulbury Industrial Estate,
Gorring-by-Sea, Sussex.
Worthing 40777

Before replacing the Duotronic it is important to be sure that this is the source of the trouble. As reported in the 1971 meeting loss of control can be caused by (1) the background heater, cured by altering the position of the cut-in and cut-out so that the background heater is always in or always out, whichever gives the Variac control nearest the middle of the scale, (2) detector faulty, (3) controller faulty - valve failure or out of balance, (4) a hunting cycle with excess high temperature could be caused by the dewpoint setting being too high.

At P.E.L. Reading (D. Dickinson) the cabinets are set at high temperatures for tropical plants and control has been improved by running the two heaters in parellel and controlling them with a larger Variac.

3) Glycol solution

Dr. Bambridge of Sutton Bonnington University of Nottingham sent a written enquiry regarding the life of glycol solution. No practical experience of testing was available, but several users had used the same solution with occasional topping up for 7 years. If in doubt about its condition, the freezing point depression or specific gravity and the development of rust on a clean cut ion surface could be determined. At PBI benolate was added to the glycol to inhibit fungal growth.

4) Metallised Silver polyester

Replacement reflective adhesive lining for Saxcil and other chambers may be obtained from:

Superfine Tapes Co. Ltd.,
110 Leavesden Rd.,
Watford, Herts. WD2 5BQ.
Watford 31934

5) Scale removal in water cooled systems

P.E.L. have installed an electrolytic system from the U.S. supplied by:-

A Colloid-a-tron,
29 Smith Street,
Chelsea,
London, S.W.3
01-352-6552

6) Tubular Tungsten lamps and holders

These are not readily available. Standard or vacuum cleaner (vibration tolerant) pigmy lamps are an alternative and their life in the lamp housing may be prolonged by dropping the voltage.

Monitoring and Recording

Humidity D. Dickinson demonstrated a thin film humidity sensor with nearly linear characteristics in the whole humidity range 0-100% RH and a temperature effect of 0.05% RH/1°C. The indicator, probe and sensor cost £412, but sensing elements can be purchased for £24.50 and P.E.L.

has the circuit diagram. The instrument is made by Vaisala, Finland, and imported by:-

B. Rhodes and Sons Ltd.
Danes Road,
Romford,
Essex RM7 0HR.

Toxicity Problems

No major problems were reported. At Long Ashton the Fisons 1755 GE and Creemer rooms appear to be non-phytotoxic. Ted Baker compared growth and cuticle characteristics from plants grown in the Fison's 1755 GE at Long Ashton and Saxcils at N.V.R.S. set up to give the same conditions and (surprisingly!) no differences were apparent.

Light Sources

1) High and low pressure sodium lamps

Alan Canham reported that both types of lamp as sole source of light in chambers resulted in abnormal plants, e.g. petiole elongation in lettuce. Blue fluorescent tubular lamps 16 - 20% corrected this condition when on at the same time as the sodium lamps, but not alone as an end of day treatment. In the U.S. high pressure sodium have been mixed with mercury halogen lamps in the ratio 3:1 but it is doubtful that uniformity, especially of the blue, would be good. High pressure sodium lamps are now the most economic supplimentary source for glasshouses.

2) Fluorescent tubular lamps

Alan Canham considers that under most circumstances tubular fluorescent lamps are still the most satisfactory light source for controlled environment facilities taking into account the quality and uniformity of the light and initial and running costs.

Richard Constantine is no longer concerned with lamp types for C.E. facilities but his report "Characteristics of fluorescent lamp types for C.E. facilities" is still available from ARC ref. AG 45/45.

N.V.R.S. use Philips Colour 35 High Efficiency fluorescent lamps in their Saxcils which give a 20% increase in light output compared with standard warm white.

High output tubes 8 ft. (215 watt) 6 ft. (160 watt) and 4 ft. (110 watt) made in the U.S. are available from:-

a) (Westinghouse) Troughton and Young (Lighting) Ltd.
Sterling House,
Station Road,
Gerrards Cross,
Bucks. SL9 8EN.
Tel. 02813-87107

b) (Sylvania) Thorn Lighting Ltd.,
Victoria Trading Estate,
Victoria Way,
Charlton, S.E.7.
Tel. 01-858-3281

The current price for an 8 ft. tube is £2.40 - £2.50

3) Red/far red

The proportion of tungsten lamps used in conjunction with fluorescent tubes in ARC establishments ranges between 3 and 20% of total watts. In the 1969 minutes it was reported that to obtain the same proportion of red/far red in a cabinet as in daylight would require 8,000 watts at 240 volts (almost twice the fluorescent total).

Abnormalities due to too low a far red component include subnormal petiole elongation in strawberries which is partly corrected with half-an-hour of Tungsten addition at the end of the day. (Chester Guttridge). Sugar beet grown with 12h fluorescent plus tungsten (normal growth room light) plus 4 hours tungsten at 'end of day' treatment resembled field plants more closely than plants grown in 16h of 'normal' growth room light. Abnormality was greater with 12 hours of 'normal light'. George Milford and G. Lenton are now examining effects of red and far red light separately and together. (Gillian Thorne RES).

CO_2

WHO have made a CO_2 sampling and injection system to maintain constant CO_2 levels based on the one at N.V.R.S. (Bangor Industrial Systems) using the Hampden Gas-o-mat to determine CO_2 level.

New Makes and Designs

The Rothamsted Experimental Station simple growth rooms have a floor area of 9' x 8'3" with 42' x 8' 125 watt fluorescent tubes forming the ceiling. They are constructed of Speedframe and Purlboard (metal foil - polyurethane - white plastic coated foil). Cooling is by two 3 H.P. compressors. In 1974 the cost was about £3,000. These rooms are now running satisfactorily and further details on these and a progress report on the 8' x 3' cabinet can be obtained from Gillian Thorne.

The facilities on view at Long Ashton included (1) the Fisons 1755 GH cabinet which appeared to be well constructed and was performing satisfactorily. (2) Two Prestcold cabinets which are derived from Saxcil cabinet, but are more sophisticated in that the lamp-house cooling is by refrigeration and positive humification is incorporated. (3) Two Creemer rooms with a floor area of just under 8' x 12' with 48 x 5 ft. have fluorescent tubes located internally below the ceiling. In addition to the temperature and light control provided in the original contract, feww standing humidifiers have been added. The rooms are running satisfactorily and further details may be obtained from Chester Guttridge. (4) John Skerrett demonstrated an electro-mechanical device for stepwise control of temperature.

Next Meeting

No definite decision was taken, but WRO is a possible venue and their Votsch room should be operational in October 1976.

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