

CABINET USERS' MEETING

GRASSLAND RESEARCH INSTITUTE, HURLEY.      OCTOBER 28. 1970

The following were represented:

Biochem Dept., Birmingham University	N.V.R.S.
Botany       "     Aberystwyth	Agriculture Dept., Oxford
Dept. Education & Science	Heading University
Elec. Res. Council	Rothamsted
G.C.R.I.	S.H.R.I.
G.H.I.	W.P.B.S.
	W.R.O.

These notes report the discussion at the meeting and additional information provided since by various participants.

1. Humidity monitoring and control

Rothamsted have found thermocouples next to the dewpoint detector a most useful guide to setting up the required humidity levels.

There were no major improvements in wet and dry psychrometry. The Foster instrument is too bulky where many plants need to be grown in a cabinet. The combination of a remote aspirator and water supply had not been neatly solved. Failure to aspirate at the limiting velocity was not really satisfactory for long term monitoring. Shandons were agents for a small (6" x 4" x 2") battery operated wet and dry thermistor device, but the continuous running time was 15 minutes maximum (Y.S. Inc.). An automatic dew cell is made by Phillips at a cost of about £30 - 40 but it is slow in response due to the hunting cycle. It is, however, an absolute physical measurement.

Rothamsted have Billman humidity controllers which have proved very reliable in some growth rooms. (Saline impregnated hygroscopic plastic - Agents - Electromatron Ltd., 54-58 High Street., Edgware, Middlesex.

Lithium chloride cells working on the heat-to-infinite-resistance principle are made by Honeywell (at £100, fitted in Prestcold rooms at Hurley); Yellow Springs Inc. (Agents - Shandons, £250); Siemens (Great West House, Great West Road. Brentford, Middlesex); and Hartman and Braun (967 Harrow Road, Wembley, Middlesex).

A misting unit has been designed at S.H.R.I., using air operated nozzles (G.A.N. 1 Mistaire, made by Delavan-Watson Ltd. Gorse Lane, Widnes - further details from Mr. R. MacDonald, S.H.R.I.)

2. Carbon dioxide monitoring and control.

Infra red gas analysers remain the most reliable method (Grubb Parsons and Infra Red Development Co. are now combined)

The Brennig James conductivity method is being used at G.C.R.I., but it requires daily calibration checks. Jacobs Van den Bergh are the agents for the James cell and Solplan of Poole also have a similar system. Dr. Thorne will be following these two firms up next spring. The intermittent flushing type of conductivity cell developed by Bowman at N.I.A.E. was better for single determination but not readily adapted to a control function.

3. Lighting.

Mr. Canham had found someone to undertake work on light and lighting on his A.R.C. grant. In response to his enquiry, no-one seemed bothered about A C ripple.

Dimming The Darco system as used at Beltsville was effective but expensive. It could be used for a programmed intensity cycle or for obtaining equal light

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1 metre are obtainable from Westinghouse through Troughton and Young, 5 ft. lamps cost £2.2.0. per lamp and the ballast is £13.10.0. for a pair of lamps. It is not possible to replace the existing tubes in the Saxcil cabinets by S.H.O. lamps without replacing the ballasts and starting gear. The Standard British Warm White gives about 40,000 lux at 1 metre with new tubes and a double layer of perspex. The G.C.R.I. are having S.H.O. lamps in the cabinets being built for than by Environment and Air Conditioning Ltd. The Canberra phytotron uses Phillips TLMF 140/33 R.S. 5 ft. 140 watt lamps which give 50,000 lux at 1 metre. Increased wattage of lamps in the existing cabinet light housing is likely to lead to overheating. The same occurs with much tungsten in the light housing. The main danger is distortion of the perspex ceiling which may occur before the lamp housing safety stat cuts out.

Other sources were briefly mentioned. Aberystwyth (W.P.B.S.) had a room 8' x 8' with 50 MBFR 400 watt lamps. Letcombe Regis had 1 similar room. Mercury - halide lamps are about 30% more efficient 'but the source is localised and one must avoid looking at the lamps. High pressure sodium are short in blue but have a farred peak. At Electrical Research Council (Capenhurst} a trial of light sources using 24 hour illumination for 3 weeks showed no bolting of lettuce in low pressure sodium, some bolting in daylight fluorescent tubes, M3 MBF KBI and substantial bolting in high pressure sodium.

A solar simulator with very high intensity over a square foot or so is available from the U.S.A. via ITT Components, Brixham Road, Paignton, Devon.

It was felt that we could be more rigorous and consistent in the method and units used in measuring radiation. In all cases the source and the measuring instrument should be clearly defined (particularly regarding cosine correction of the detector and its spectral sensitivity. The aim should be to give a spectral response curve and energy in J/M/S.

#### 4. Toxicity

N.V.R.S. had not identified the cause of the trouble with turnips which grew all right in the glasshouse but not in the cabinet. Damage had occurred to capsicum in Sutton Bonington which was traced to the effect of the HLRG lamps on the varnish on the gravitone wall lining a growthroom.

#### 5. Cultural conditions

G.C.R.I, had equipped one cabinet with controlled root temperature, permitting two levels. The basic system consisted of two large water tanks held at the two desired temperatures, and valves and pumps to connect the root cooling coils to the appropriate tank.

N.V.R.S. had been monitoring root temperatures. G.C.R.I, are having trouble growing cucumbers in water culture in cabinets. Cotyledons curl and roll resembling an epinastic response. The first true leaf is better and the second almost normal. Tomatoes were similarly affected. Cucumbers were also somewhat chlorotic. Suggestions were to change concentration of nutrient solution, check on U.V. level and alter humidity. Any other thoughts welcome.

#### 6. Servicing and spares

A number of places reported melinex bubbling at high temperature and high humidity. With care it can be shrunk back with an electric fire. When replacing melinex the old adhesive could be cleaned off with white 'spirit'.

IRGA. Irregular output signal is often due to contamination of the silver plated sockets for the coaxial cables on the detector.

Saxcil cabinet. Main fan neon flashing and interfering, due to oxidation, and then has rectifier action.

While the spares lists circulated previously were not exact as to numbers  
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The chokes used in Saxcil cabinets were obsolescent. It was felt that it was not practicable to lay in a large stock, even if they could be hunted down. The replacement is Atlas Catalogue No. AME 69014 T. These were supplied to G.C.R.I. by Electrical Components Ltd., 53 Regent Street Brighton 1.

N.V.R.S, reported that water condensed in the insulation between the inner and outer panels due to a cold spot caused by the cooler tank. On investigating this the lower compartment was found to be rusty and was wire brushed and recoated with Bosco seal (a car underseal). Another participant had used Dulux Matt Black after brushing down.

Wires from heater elements had corroded and some gone open circuit. The plastic protective cover had disintegrated. The naked leads and terminals had been potted in Araldite.

The contactors on Mk2 cabinets are made by Kraus and Naimer and are "Blue Line" Series. U.K. agents are Chilton-Solenoid (U.K.) Ltd., Hungerford, Berks.

Temperature instability is often due to worn feed back potentiometer on the servo-motor for the variacs cooler valve or heater variac.

The chain sprockets on earlier heater variacs had loosened also giving temperature instability.

The drybulb detector on earlier cabinets is now obsolete, the replacement is shorter and needs a bracket.

7. Other makes of Cabinet known to be in England

Percival	-	Not known.
Fison	-	S.H.R.I. 140G2 Cabinet 4' x 2'
Votsch	-	Good but expensive. Agent: Tar Residuals Ltd., Plantation House, Mincing Lane, London E.C.3 (Mr. F.G. Buckland)
Sharer-Gillette	-	SHRI., Wiring poor but generally good. 4' x 2'. Agents: Laboratory Equipment Consultants Ltd., V, Cock Street. Liverpool, L2 9R3.
Controlled Environment Inc.	-	Sussex (3) Good and reasonable. Jealotts Hill (2) Dr. Slade
Environment & Air Conditioning Ltd	-	Capenhurst
Prestcold	-	Norwich
"	-	Rank-Hovis-McDougall (2). Dr. Priestby
Saxcil (still said to be in production)	-	Mr. E. Radcliffe R.K. Saxton (1969) Ltd., Arc Works, Bredbury, Cheshire*
Naturally lit cabinets	-	For use in glasshouse G.C.R.I. For outside - Rothamsted/Wellesbourne

It was really not thought possible to say which was the "best" cabinet. The limitations of the Saxcil cabinets are well known but there are only a very few of a number of other makes as shown by the list above.

It was agreed that participation in the Cabinet Users' Meeting should remain confined to Cabinet Users, the members of the A.R.C. Ad Hoc Committee on Controlled Environment Cabinets and anyone immediately concerned with Saxcil Cabinets (for example Mr. Canham who has an A.R.C. grant for lighting sources and Mr. Piper from D.E.S, who is concerned with the purchase of cabinets for teaching and research).

9. Electricity charges

A new system of electricity charges introduced recently places much greater penalties on the maximum demand rate during December and January, and to a lesser extent in November, February and March. Lower rates during the summer are unlikely to compensate. Some saving in running costs will be made if artificially lit growing space is not used during December and January. The consequences of the heavy demand on restarting after a power cut could be serious.

10. The Institute of Biology are holding a symposium on "Controlled Environments for Plant Growth" in conjunction with Labex on Tuesday, 30 March 1972 at 14.15 h. Dr. Thorne is the Convenor and Chairman and the speakers are: Mr B. Chandler (Environmental requirements); Dr G.R. Sagar (Uses in teaching); Mr. R.B. Ausitn (Uses in research). There will be a concluding discussion.

11. The invitation from Dr. Dullforce to meet at Sutton Bonington next October was gratefully accepted.