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MOUND LABORATORY

Operated By

MONSANTO CHEMICAL COMPANY

MIAMI BEACH, OHIO

M. M. Haring
Laboratory Director

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Authority of P.B. Jones 8/20/70
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ELECTRONICS ACCOMPLISHMENT REPORT

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ABSTRACT

The following items of equipment have been completed:

Two Scaler Multipliers, EO-18 and EO-338, undergoing tests and adjustment.

One Thyatron Heater Control for Scioto Laboratory.

One Pilot model switch box for Group 16 hoods at Scioto Laboratory. It provides for selection of either of four electronic or one manual plating control or the paralleled combination of electronic and manual controls for each plating cell, and is more compact and easily installed and maintained than the present design.

One Pilot model patch box used as auxiliary to the present switch boxes. It will facilitate paralleling of manual and electronic controls when currents above the 60 ma. capacity of the electronic control are required.

Installation of electronic equipment and sorting and cataloguing of stock at Scioto Laboratory has been started. The "Y" Section induction heaters have been installed electrically; tests await installation by the "Y" Section of "plumbing" and work coils.

With the present setup in the "WD" Building, it has been necessary to recycle all the solution which passes through the pH chamber on the clariflocculators. A suitable immersion type assembly was not commercially available, so a design of such an assembly was made and submitted to Group 27 for construction. The model has been in operation for a period of about three weeks but the practicability of this type assembly has not been determined.

The inability of the electronic sewing machine to consistently fuse vinylite was apparently due to the fact that we erroneously received at least two rolls of vinylite which were a type which is not fusible by such a dielectric heater.

Sufficient tests have been run on the Berkeley Decimal scaler to indicate that, by using a preamplifier, it will be a satisfactory replacement for the scaler multiplier. There are indications that the instrument is not following at as high a frequency as it should, but tests are not sufficiently conclusive at this point to say definitely. Two additional scalars of this type have been ordered for Scioto Laboratory.

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Reworking of B-wall tubes has been held up pending the delivery of neon gas. An agreement has been reached with Argonne National Laboratory under which they will furnish us the necessary components for reworking these tubes.

Further investigations have been made on the frequency compensated constant voltage Sola transformers. Data clearly show that the output voltage at rated load rises very sharply with an increase of power factor above 90 per cent. Several counting instruments are now operating from transformers which have been properly loaded at 90 per cent power factor.

Three automatic potential controllers have been modified in accordance with investigations of Group 10 (Electronics Progress Report, MLM-352, May, 1949). One has been installed and has operated satisfactorily.

The program of preventative maintenance on automatic potential controllers has resulted in a marked reduction of service calls and "down-time" for the operating group.

A routine check on a new methane flow counter showed that the instrument was totally inoperative and could not have been properly checked by the manufacturer. Corrections were made, and the manufacturer is being notified.

Evidence was found that inexperienced personnel have been tampering with a Leeds and Northrup densitometer on at least two occasions. It was recommended that the operating personnel notify the Security Division concerning the matter.

Routine counting this month totaled 6525 counts.

DETAILED REPORT

Group 10 - C. E. Hites, W. B. Adams, H. L. Cook,* A. D. Flaughner, J. L. Gregg,** M. B. Lambert, G. A. Preston, and D. Santi

* Reentered from University of Cincinnati June 13, 1949.

** Transferred to Scioto Laboratory June 13, 1949.

Two Scaler Multipliers, one for Group 24 (EO-18) and one for Group 34 (EO-338) have been completed and are being tested. On first test it was found that the input trigger pair grid resistor (20 K ohms) of the multiplier unit loaded the final scaling stage of the I.D.L. Model 162 scaler with which the multiplier is used. This condition was corrected by inserting a 51 K resistor in series with the interchassis coupling condenser. This reduced the loading effect and permits normal operation of the scaler. The input trigger pair is more than adequate for operation at the

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Some spurious counts are being thrown by the relays, especially by the Time-It stop-start contacts. When this condition has been cleared up the units will be ready for delivery.

The Model 162 for use by Group 34 was further modified by replacing the polystyrene high-voltage connectors with an improved type of Teflon connectors and the addition of an auxiliary connector for measuring the high voltage with an electrostatic voltmeter.

One Thyatron heater control (Model TR-1-A) has been completed and one is 80 per cent complete. The chassis of the remaining four for Scioto Laboratory have been laid out and are being punched.

At the request of Group 17 the plating hood switch boxes for Scioto Laboratory have been redesigned to smaller physical dimensions. The switch boxes now in use provide for switching each plating cell to either of four electronic control channels or to a manual control. They are approximately $6\frac{1}{2} \times 6\frac{1}{2} \times 21$ inches in size and are installed in pairs inside the plating hood, necessitating perfect sealing against the corrosive atmosphere. Controls are brought out to the sloping front panel of the hood by means of stainless steel rods, shop-made couplings and panel bearings and angle bushings (to adapt to the sloping panel). The new design, of which a pilot model has been constructed, is about $3\frac{1}{2} \times 3\frac{1}{2} \times 18$ inches and plugs into the outside of the front panel. Thus, the usable space inside the hood is considerably increased, the box is accessible for repair and is located in a low risk area, sealing requirements are less severe as the atmosphere is not normally nearly so corrosive, and the connecting cable passes from low risk to low risk eliminating a low risk to high risk cable seal. Anode and half-cell leads will enter the hood through solid banana jacks. Installation will be greatly simplified as there is no need for extension shafts and panel bearings. Commercial components can be used throughout except for the special banana jacks which are not commercially available. In addition, jacks are provided for paralleling manual and electronic controls when current requirements are higher than the 60 ma. capability of the electronic control.

The first model of a small (approximately $3\frac{1}{2}$ -inch cube) patch box has been constructed to facilitate paralleling manual and electronic controls for high currents requirements in the existing Group 16 installations at Mound Laboratory. Constructed of Lucite and sealed against corrosion, the box has male and female cable connectors into which the cables to the present switch boxes can be plugged. Banana jacks are tapped into the manual anode leads inside the box. Jumpers can be plugged into these jacks and clipped to the plating cell anodes so that current can be supplied from manual controls to supplement the current from the electronic control.

Parts and instructions for conversion were furnished Group 12. One high-current control incorporates the pentode amplifier circuit and is

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One member of the group has been temporarily transferred to Scioto Laboratory to install electronic equipment. The induction heaters have been installed and power connections made. As soon as the water-cooled load lines have been installed by the "Y" Section, these units will be ready for tests. Equipment and supplies for installation and electronic stock is being transferred from the Warehouse to the Electronics Laboratory, sorted, and catalogued. Property records have been made upon Class B items.

Group 12 - L. B. Gnagey, E. H. Daggett, K. J. Gregersen, and F. M. Teetzel

F. M. Teetzel

The setup for measuring the solution pH in the clariflocculators in the "WD" Building, while functioning satisfactorily does have some drawbacks. At present a sample of the solution is tapped off about three feet below the surface of the solution and is drained through a flow chamber in which the electrodes for the Leeds and Northrup pH meter are located. After flowing through the chamber, the solution falls into a sump from which it is pumped back into the clariflocculator and is recycled. It has been calculated that, with a sufficient flow of solution through the chambers, 1/4 of the water processed has to be recycled.

A second problem is that the sampling pipes and flow chambers are sometimes clogged by the sludge in the solution. Still another problem is that a film forms on the electrodes and causes erroneous pH readings, despite flushing the chamber each night with fresh water. Due to this film formation, the pH reading has drifted as much as 0.2 in a 24-hour period. At present this error is corrected by zeroing the meter at the start of each day's operation, and when the limit of zero adjustment is reached, the electrodes are cleaned with 0.1 N hydrochloric acid. Cleaning the electrodes is an unhandy job and would consume an appreciable amount of time if done daily as well as increase the danger of electrode breakage.

It was decided the procurement of an electrode assembly which could be immersed directly into the clariflocculator and would be readily removable should be investigated. Leeds and Northrup informed us that they are not yet marketing such an assembly although they expect to have such a type available sometime in the fall of 1949. Since Group 27 was anxious to try a device of this nature, an immersion assembly was made to a design furnished by Group 11. Actual construction was handled by Group 27. The construction of the assembly is shown in Figure 11-1.

The electrodes are inserted into the rubber gasket, a snug fit to prevent water leaks. Electrical connections are made to the electrodes by leads which extend from the terminal box on the top of the assembly to a point inches below the bottom of the flange on the brass body. The rubber gasket is placed against the flange, the tops of

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IMMERSION ELECTRODE ASSEMBLY

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the brass tube and the extra lead lengths coil up in the top of the tube. The sealing ring is then fitted up under the rubber gasket, and bolts between the flange and the ring pull the ring up snugly to make the chamber water-tight.

An angle iron frame has been bolted to one of the beams on a clariflocculator and the conduit is clamped to this frame, holding the assembly upright and rigid. Depth positioning is attained by loosening the clamps and sliding the assembly up or down as desired. In the same manner, the assembly can be raised out of the solution and clamped, making the electrodes easily accessible for cleaning.

This assembly is temporarily attached to one channel of the influent pH meter, and its recorded pH is checked against the recorded pH of the original installation. Checking this assembly presents several problems which will have to be solved over a period of time. The radial location as well as the depth at which a representative sample is obtained must be determined. The amount of drift due to film formation on the electrodes and whether or not there will be a change in control action time must also be determined. To date, insufficient data have been accumulated upon which to base any conclusions.

The Electronic Sewing Machine, a dielectric heater used for fusing vinylite, was apparently not operating correctly. The seams made in the vinylite looked very good, but they were quite easily pulled apart. Thorough cleaning, checking, and returning the oscillator failed to reveal any difficulties. The radii of the rollers between which the vinylite is fused were found to vary as much as 0.003 inches, but this was not believed to be the trouble. It was finally noted that material from two rolls would not fuse while material from one roll fused very nicely. A check of warehouse stock showed that the vinylite in stock was the type specifically ordered for use with the Electro-Seamer and a sample of the stock material worked satisfactorily. It is felt that the two rolls which would not fuse were not the proper type and were received by mistake with the remaining rolls of the correct number. The cartons which contained the rolls and upon which the number is stamped were destroyed upon removal of the vinylite, so there is no way to check this probability.

The range of a Wheelco Celectray Millivolt Indicator was changed from 0-1 to 0-12 millivolts for Group 7. This was done by substituting two decade resistance boxes for R-5 and R-7 (Figure 11-2) and changing their value until there was a 12 mv. drop across the slidewire with the proper amount of current flowing through this arm of the bridge. Resistors were then wound of manganin wire to match the values of the resistance boxes. After annealing and treating the resistors they were installed in place of R-5 and R-7, and the unit was checked for correct calibration and delivered.

K. J. Gregersen

Tests run to date on the Berkeley Decade will be satisfactorily replacement for the scale

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Figure 11-2

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WHEELCO CELECTRAY BALANCING CIRCUIT

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counters for this use have been ordered for Scioto Laboratory. It will be necessary to construct a preamplifier for using this instrument as a proportional counter since the counter has a G. M. input.

A visual inspection shows that, while the scaler is quite compact, the parts are fairly accessible for maintenance. Wires are neatly cabled and color coded for ease of tracing. The plugs and sockets on the plug-in units are keyed in such a manner that, for example, a decade unit cannot be placed in the socket for the RF power supply.

The unit scales properly over a variation of line voltage variation from 110 v. to 130 v. The sensitivity (which was 0.25 v. at 115 v. line) varied from 0.27 v. to 0.20 v. with the line variation of 110 v. to 130 v. It has been established that the unit will follow up to 20 kc., but above this frequency there appears to be some improper scaling. There is not sufficient evidence of this as yet, however, and further tests must be run before the upper frequency limit is definitely established. This circuit should follow properly to approximately 200 kc.

The two gamma counters which have been used by Unit I were checked and adjusted during this period. The mica window tube used with one counter was replaced and the input sensitivity was reset to 0.25 v. The second counter required recalibration of the high voltage and resetting the input sensitivity. During these checks, there was some evidence noted that different lengths of cable had a greater effect on the counting rate than would be expected. This group anticipates making a thorough investigation of this as well as a general study of mica window tubes as soon as time permits.

The two tanks of an argon-methane mixture for experimental counting have been received and some tests run. There are insufficient data at this time to report.

E. H. Daggett

Reworking of B-wall tubes is being held up pending the delivery of neon gas. Argonne National Laboratory has agreed to furnish us some of the component parts required in the reworking of these tubes, and to date end caps, wire, and springs have been received. The glass seals are to be made up by an external company using these kovar end caps. The ethyl ether will be purified by refluxing over distilled sodium in a vacuum system now under construction.

The variable frequency RF source (EO-338) for use in spectroscopy is being handled jointly by Groups 9 and 11. Group 9 is designing the oscillator portion of the circuit while Group 11 is designing the power supply.

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All storage batteries which were moved from Unit III into R-107 have been thoroughly checked, and 23 were found completely unusable. These have been turned in for salvage, and six new batteries have been ordered. These batteries will be under the supervision of this group, and it is anticipated that longer life and greater usefulness will be achieved by having definite charging schedules.

All batteries in the dynode voltage power supply (Beckman spectrophotometer) were replaced. The voltage of the batteries was approximately 54 v. (67 1/2 v. type) and it appears that the instrument functions properly until the voltage reaches about 58 volts at which time replacement is necessary.

Group 12 - W. L. Mead, W. A. Dean, E. C. Hoelzle, and T. L. Zinn

T. L. Zinn

Tests have been run on the Frequency Compensated Sola transformers to determine within what limits with regard to per cent full load and power factor they can be operated and maintain a useable output voltage. Figure 12-1 shows the difference of the output voltage versus per cent of load for two different volt-amp. ratings of transformers. The 530 VA transformers has a useable output voltage (121 volts) at 75 per cent full load and 90 per cent power factor, while the 475 VA transformer has an output voltage of 129 volts with the same percentage load and power factor.

Figure 12-2 shows the effect of a changing power factor with rated load. The output voltage increases sharply with an increase of power factor beyond 90 per cent.

Figure 12-3 shows the effect of changing the load at different power factor ratings.

Several Solas have been properly loaded at the correct power factor and some of the counting instruments are operating from these transformers.

W. A. Dean, E. C. Hoelzle, and W. L. Mead

Three high current automatic potential controllers, EL-172, EL-173, and EL-176, were modified in accordance with the work done by Group 10 (Electronics Progress Report, MLM-352, May, 1949). EL-176 was put in service for Group 17 on June 20, 1949 and has performed satisfactorily to date. The other two controls will be placed in service as soon as convenient with the operating personnel. Jacks have also been installed on the front panel of the control chassis of these units for more convenient checking of the vacuum tube voltmeter circuit.

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Figure 12

SECONDARY VOLTAGE V.S. PERCENT RATED FULL LOAD

FOR

475 V.A. SOLA

530 V.A. SOLA

— POWER FACTOR 90 % —

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Figure 12-2

475 V.A. RATED FCCV SOLA AT FULL LOAD
SERIAL NO. 91254
SECONDARY VOLTAGE
V.S.
POWER FACTOR

Figure 12-3

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A program of preventative maintenance on plating controls has resulted in a marked reduction in time losses by the operating groups. There were no service calls by Group 17 during this period. All plating controls are checked and calibrated each Friday afternoon during the time operations are suspended for clean-up. Operations gamma counters are checked and calibrated each Monday morning.

A model 161-S (NICC) gamma counter was installed in T-270, Line 4, to be used by Group 33. Plateaus were determined and Tau was computed to be 6.1×10^{-6} .

Tau was also computed on the gamma counters used by Group 16 as follows:

Line 1	3.1×10^{-6}
Line 2	Being serviced
Line 3	4.8×10^{-6}

Work is being started on a more accurate method of determining geometry and the gamma factor for these gamma counters.

The remaining spare methane flow proportional alpha counter (NICC Model 117, Serial No. 52) was uncrated, checked, and found to be totally inoperative. The following had to be corrected before the instrument could be used:

1. The Plasticon high voltage condenser (0.1 mfd. 5000 v.) was broken.
2. The lead from the A.C. input plug to the primary of the high voltage transformer was missing entirely. There consequently was no high voltage available.
3. The instrument would not scale or reset. S-4, the "Stop-Count-Reset" switch was incorrectly wired.
4. The Cyclotron register was sticking and required adjustment.

It is quite evident that this instrument could not have been checked for actual counting by the manufacturer. The manufacturer is being contacted concerning the matter.

Two service calls were made on the Leeds and Northrup gas flowmeter which indicated that someone unfamiliar with the instrument had been using it.

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with it. The scanning unit plate carriage had been wound by means of the hand crank to such an extreme that the moving strap was rewound on the drive wheel in the opposite direction. The motor drive thus moved the scanning carriage in the reverse direction.

A second call showed that the focusing unit carriage had been turned past its limit and the worm gear drive had become entirely disengaged. It was recommended that the operating personnel report the situation to the Security Division.

Group 14 - A. C. Brenneman, D. Barkalow, M. Glaze,* J. Hunt, E. Hyso, and G. Wright

* Transferred to Group 14 on June 13, 1949.

The counting load this month was as follows:

<u>Instrument</u>	<u>No. of Chemist's Samples</u>	<u>Counts on Chemist's Samples</u>	<u>No. of Standard Counts</u>	<u>No. of Background Counts</u>	<u>Total Counts</u>
Logacs-S (4)	1009	1116	679	309	2104
Simpsons (3)			733	56	789
Beta (2)	349	1383	340	112	1835
Alpha Monitor (1)	26	26			26
Parallel Plate Alphas (5)	<u>469</u>	<u>806</u>	<u>864</u>	<u>101</u>	<u>1771</u>
Totals	1853	3331	2616	578	6525

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