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Contract Number AT-33-1-GEN-53

ROUND LABORATORY

Operated By

MONSANTO CHEMICAL COMPANY

MAANISBURG, OHIO

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H. M. Haring
Laboratory Director

ELECTRONICS ACCOMPLISHMENT REPORT

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Prepared by: M. L. Curtis
L. B. Gragey
C. E. Hites

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ABSTRACTGroup 10STATUS OF CONSTRUCTION

<u>Job Status</u>	<u>Per Cent</u>
1 Scaler Multiplier, Model SM-1, Serial #1 Delivered to Group 34	100%
1 Scaler Multiplier, Model SM-1, Serial #2	95%
6 Thyatron Heater Controls (Scioto Laboratory)	35%
2 Two-input B-wall Mixers (Scioto Laboratory)	95%
1 Two-input B-wall Mixer (Scioto Laboratory)	Started
10 Switch boxes (Scioto Laboratory, Group 17)	20%
Cables for "Y" Section installation (Scioto Laboratory)	95%
Dial Plates, EO-437, (Group 1)	25%

An experimental auxiliary junction box was made to permit paralleling manual and electronic controls and installed in one of the Group 17 hoods. Satisfactory operation was reported for two runs, using a modified high-current control.

Manufacturing specifications for the modified plating controls to be purchased for Scioto Laboratory have been prepared in draft form.

The R. F. Generator, Model PS-7, built for Group 6, was photographed and corrected diagram prepared.

Group 11

P10 gas (90 per cent argon and 10 per cent methane) was tried with the Nuclometer and a methane flow counter as a possible substitute for commercially pure methane now being used. In general, plateau lengths and slopes

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agreed quite closely with those obtained with methane, but there was a marked reduction in the voltage required. On both counters the centers of the various plateaus determined with P10 gas was 35-40 per cent lower than the centers of the same plateaus with methane.

One marked advantage with such a lowering of the required voltage is that beta particles can be counted on the Simpson counter. With methane gas the beta plateau required a voltage which was greater than the output of the power supply in that counter.

An oscillation in the Vibrating Reed Electrometer has been causing considerable trouble but before anything definite could be located as the source of trouble the oscillations stopped. The instrument is now usable although some tendency towards oscillations are still noticed.

The work of refilling spent B-wall tubes is in the process of being moved from the "R" Building to the "E" Building, Room 119.

A model FC-1 Alpha-Beta-Gamma counter has been received and is partially installed. This instrument was procured primarily for beta counting, and it operates with P10 gas.

Three new parallel plate alpha chambers have been received for testing.

A differential microphone was obtained for use with the two-way speech amplifier between Room E-105 and E-107. This microphone reduces background noises to such an extent that they are no longer objectionable, yet sounds originating within six inches are amplified.

Power consumption was checked on all instruments in E-107 to determine whether any of the Sola transformers serving this room were overloaded. All loads were well under the ratings of the transformers.

Group 12

The "off-on" switch in the primary of a Sola supplying regulated AC voltage to an automatic potential controller burned out following a power failure in the Operations Area.

A value has been established for the cobalt 60 standard used to calibrate the Gamma counters in T-267 and T-270.

Routine preventative maintenance continued on electronic equipment used by Groups 16 and 17.

The installation and checking of an ion

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The wiring of an external control panel to a Speedomax recorder for Group 33 is nearing completion.

Tubes have been ordered for repair of the induction heater used by the Machine Shop in T-21.

Work to complete the intercommunication system between corridors T-2, and T-5 has been started.

Another intercommunication station is being added to the system linking T-56, T-57, T-58, T-267, and T-270.

A modified automatic potential controller (see June Accomplishment Report, NIM-314) was installed in T-270 and used in conjunction with the manual control (see this report, Group 10).

The main power switch on scaler multiplier EL-250 in T-318 was changed due to failure of the switch to make proper contact.

A thyatron heater control, EL-241, was found inoperative. The filaments of the 6H6 control tube were open.

The 7B4, series regulator tube, used in the two (2) input B-wall mixers have been changed to 2C53 tubes.

Investigation of the frequency compensated, constant voltage Salas is nearing completion.

Group 14

The general analytical counting load this period consisted of 7189 counts.

DETAILED REPORT

Group 10 - I. B. Adams*, M. D. Birkhold, H. L. Cook, Jr., A. D. Flaughert**, J. L. Gregg, Jr.***, G. E. Hites, M. B. Lambert, G. A. Preston****, and B. Santi

* Vacation July 5-19, 1949, LOA July 19, 1949.

** Vacation July 18-25, 1949.

*** On loan to Scioto Laboratory.

**** Vacation July 18-25, 1949.

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<u>Job Status</u>	<u>Per Cent</u>
1. - 6 Thyatron Heater Controls (Scioto Laboratory)	35%
2. - 2 Two-input B-wall Mixers (Scioto Laboratory)	93%

These units await arrival of the Nuclear Instrument and Chemical Corporation, Model 161 Scalers with which they are to be used. The high voltage series regulator tubes were changed from Type 73A to Type 2353 to provide insurance against arcing. (See report of Group 12 for details). These tubes will be used in future construction of the mixers and specifications have been changed accordingly.

3. - 1 Two-input B-wall Mixer (Scioto Laboratory)	Started
4. - 10 Switch Boxes (Scioto Laboratory)	25%

These are Lucite boxes of a new design, incorporating provisions for selecting either manual or electronic plating controls or for paralleling both controls when plating current in excess of the 60mA capacity of the electronic control is required. The boxes are to be mounted on the outside of the hoods, rather than inside as is the present arrangement in the Group 17 hoods, providing more space for the other equipment in the hood. The Lucite parts are being made in the Machine Shop. Cables, switches, indicator plates etc., are being made up so that assembly may be rapid when the boxes are received.

5. - 19 Dial Plates (EO-437), for Group 1 manual plating controls	40%
6. - Cables for "Y" Section ion gauge installation (Scioto Lab.)	95%

One Scaler Multiplier, Model SM-1, Serial 1, (EO-338), was completed, tested and delivered to Group 34. The ILL Scaler Model 162 used with this unit was fitted with Teflon high voltage connectors and with a connector to adapt it for use with a cathode-follower probe. After the installation of the Teflon connectors, a rather high background count was observed due to arcing of the high voltage connectors. A brisk scrubbing with ethyl alcohol cleaned the connectors so that no counts were obtained at the highest voltage adjustment.

An experimental auxiliary junction box was made to permit paralleling manual and electronic plating controls when plating current in excess of 60mA is required. It was installed in one of the Group 17 hoods. Verbal reports

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the first two runs of the parallel arrangement, using a modified electronic control, were that highly satisfactory operation resulted. See Group 12 report for details.

Manufacturing specifications for the modified plating controls to be purchased for Scioto Laboratory have been prepared in draft form.

The plating control EL-215 was revised to the modified specifications. Photographs of the control and refined power supplies were taken for inclusion in the manufacturing specifications.

The R. F. Generator, Model PS-7, in use by Group 6 since May, was photographed and a corrected schematic prepared. It was found that a blocking condenser inserted in the grid return during grid current tests had been left in inadvertently. Elimination of this condenser increased the power output by perhaps 50 per cent, as judged by the corona discharge.

Construction was completed on the Scaler Multiplier Model SM-1, Serial 2. The measures which were effective in eliminating spurious counts in Serial 1 have not proven effective in this unit. In addition it was found that the input trigger pair of the Multiplier unit acts as an amplifier rather than as a trigger pair, apparently due to the high value of cathode resistance employed. Proper scaling action is obtained, however, when the proper value of input pulse is applied. Systematic investigations of these features are to be made and reported in detail.

Group 11 - L. B. Gnagey, E. H. Daggett*, K. J. Gregerson, and F. M. Teetzat**

* Vacation July 5-8, 1949.

** Temporarily transferred to Scioto Laboratory, July 18, 1949.

L. B. Gnagey, K. J. Gregerson, C. Brennerman (Group 1A)

Two cylinders of P10 gas (90 per cent argon and 10 per cent methane) were received from the Matheson Company for checking as a possible substitute for commercially pure methane now being used in our flow counter. Tests were run on the Nucleometer and a Simpson methane flow counter and the plateau slopes, lengths, and required voltages were compared with previous results obtained with methane. In general the plateau slopes and lengths agreed quite closely with those obtained with methane, but there was a marked reduction in the voltage required. On both counters the centers of the various plateaus determined with P10 gas were 35-40 per cent lower than the center of the same plateaus with methane. For example, the center of a beta plateau on the Nucleometer using methane is approximately 4200 volts, while with P10 it is approximately 2600 volts. Using the Simpson counter with P10 gas, it was also possible to obtain a beta plateau, whereas with methane the beta plateau was not obtainable. The output of the power supply was greater than the output of the power supply.

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The reduction in operating voltage made possible by P10 is quite advantageous in that spurious pulses from lead components is markedly reduced making more precise counting possible. It further makes it possible to count beta samples on instruments previously usable only for alpha detection. This is understandably important in view of the recent increase of beta counting which has resulted in numerous problems in the counting room.

Further work remains to be done with the Simpson counter since it was found that, while both good alpha and beta plateaus are obtained separately, a beta plateau cannot be obtained on a sample emitting both alphas and betas unless an absorber is used to keep the alphas from reaching the sensitive volume of the counting tube. This is caused by the fact that the alpha pulses become so large by the time the beta pulses are detectable that multiple pulsing occurs in the circuit. The cause of this multiple pulsing must be determined and corrected before definite conclusions can be reached concerning the advisability of changing over entirely to P10.

Such a changeover is not as simple as merely exchanging one type gas for the other. The high voltage power supplies of our present flow counters have an output continuously variable from 1500-3000 volts with the indicating meter so calibrated. Since the alpha plateau with P10 extends from approximately 1200-1500 volts, a change of gas will require modification of the power supply as well as new markings on the meter.

Details of the tests with P10 showing actual plateaus obtained will be included in the Quarterly Progress Report.

E. H. Daggitt

The Vibrating Reed Electrometer used by Group 3 has been giving considerable trouble. The cause has not yet been determined. The panel meter oscillated at a frequency of about 200 cycles per minute and any interruption of the circuit would stop oscillations. Replacement of tubes and various components had no effect; the oscillations began again as soon as the entire circuit was completed. Scope patterns were difficult to observe since the trace moved up and down at the 200 c.p.m. frequency. After spending several days on the problem the trouble ceased, and the instrument is now functioning fairly satisfactorily. Any sudden change in circuit conditions, such as switching from one range to another, causes the oscillations to begin, but they damp out in a few minutes. The manufacturer of the instrument has been contacted for such assistance as he might give, but a reply has not been received.

The work of refilling spent 3-wall tubes is to be moved from the "B" Building to the "E" Building, Room 119. Plans have been drawn up for the vacuum rack and the glass details are being worked out.

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A mercury arc discharge tube in the multisource used by Group 6 had an electrode broken from its lead in wire. A replacement is being made by the Glass Shop.

The Perkin-Elmer infrared absorption spectrometer appeared to be too noisy for sample analysis. A check showed that the operating group had replaced all tubes and bias cells in the amplifier and had increased the gain to such a point that the instrument was noisy at the previous gain setting. The signal to noise ratio was better than the satisfactory level indicated in the instruction book, and by reducing the gain setting satisfactory operation was obtained.

Two glass electrodes were changed on "D" Building pH meters.

K. J. Gregersen

The Model PC-1 Alpha-Beta-Gamma Proportional Counter, manufactured by Nuclear Measurements Corporation which was procured primarily for beta counting was received. It operates with P10 gas rather than methane. From a purely mechanical, constructional, and general workmanship viewpoint, this counter appears to be better than any commercially built counter which we have had. Nothing can be said at this time however concerning actual performance, since final installation has not been completed.

Three new parallel plate alpha chambers, manufactured by Kelly-Koett to specifications of the Instrument Section of the Health Division, have been received for testing. On initial trial, two (one was damaged upon receipt) were found to be unsatisfactory. However, since these chambers were not intended to be used with the Kelly-Koett Model K262 scalars which we have, further checks are necessary before any conclusions can be reached.

A differential microphone was obtained and placed in service in E-105 with the two-way speech amplifier between E-105 and E-107. The dynamic microphone previously used picked up so much of the background noise from E-105 and the "R" Building halls that it was objectionable to have the amplifier turned on. By using a differential microphone the background noise is greatly reduced with the gain of the amplifier sufficiently high to pick up sounds which originate six inches or less from the mike. The second stage of this amplifier has been shock mounted to reduce the microphonics which caused objectionable feedback.

Power consumption was checked on all instruments in E-107. The following is a summary of results:

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<u>Instrument</u>	<u>Volts</u>	<u>Amps</u>	<u>Watts</u>
Offner Parallel Plate Alpha	109	2.0	104
IDL Parallel Plate Alpha	109	1.1	120
Higinbotham Parallel Plate Alpha	109	1.4	145
KaRoket Parallel Plate Alpha	109	1.2	125
EDI Methane Flow Alpha	112	1.35	145
Not. Lab. Methane Flow Alpha	112	1.23	145
Dayton Methane Flow Alpha	112	1.72	175
Nucleometer	112	1.2	100
Alpha Monitor	112	.65	35
Higinbotham Beta-Gamma	111	1.05	115

This check was made to determine whether any of the Sola constant voltage transformers serving this room were overloaded or wired to an improper outlet. Everything was found to be in order. Measurements were taken with a Simpson Model 590 wattmeter.

A tentative design and cost estimate for assembly and installation of a suitable sound distribution system for the Cafeteria was submitted for approval.

Group 12 - W. L. Mead, W. A. Dean, E. C. Hochzie*, and P. L. Zinn

* IOA July 11-25, 1949.

The fourth automatic potential controller to be modified was checked on resistive load and installed in T-270. This unit will be available as a replacement unit in lines 1, 2, and 3 until a spare unit can be obtained from Group 10.

A general power failure occurred in the Operations Area on July 20, 1949. When the power went on again the off-on switch in the primary of a Sola transformer supplying regulated AC voltage to an automatic potential controller in T-270 failed. This switch was rated at three (3) amperes. The surge of current at full load on the Sola was too great. This switch has a 10 ampere rating.

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The value of the CO_{60} standard used to calibrate the Gamma counters in T-267 and T-270 has been established. The results obtained from Operations Gamma counting over a period of four (4) weeks has compared with the Logac (low geometry alpha counter) results to within .7 per cent.

The failure of the two-way speech amplifier system in T-57 was traced to a faulty microphone connection. Another amplifier that had been modified by rack mounting and shielding the second amplifier tubes was substituted for the original amplifier. It was reported that the amplifier thus modified is much more suitable to the needs of the operating personnel than the original amplifier.

The standard preventative maintenance program was continued on the electronic equipment used by Groups 16 and 17.

Work has been started on the Westinghouse induction heater for Group 34. This work includes minor wiring, placement of tubes in the unit and complete checking of the unit. This work is to be done on laboratory equipment order number 444 and will be completed by August 5, 1949.

The thermionic induction heater in T-21 has been operating at approximately 10 per cent efficiency. As this unit will be used much more in the future an effort is being made to place the instrument in proper operating condition. The instrument uses two 6L-692 oscillator tubes, only one of which is operating now. Three (3) new tubes have been ordered to place the unit into full service with one tube left for a spare.

The cable for the intercommunication system linking corridors T-24, T-5, and Room T-53 is now available and the electricians are to pull the cable through the conduit. This work will be done on laboratory equipment order 97.

Another master station is being installed on the intercommunication system linking T-56 to the present RMA intercommunication system which links T-57, 58, 267, 270, 274, and 234. H. Anson will issue a laboratory equipment order to cover the electronic work necessary for the installation.

A modified automatic potential controller EL-173-K was installed in T-270, Line 3. This unit was connected by a special switch arrangement to the manual control so that a portion of the total current could be obtained from each of the two plating sources. In this manner much higher currents are available for the plating solution and at the same time the accurate control is maintained by the automatic controller. Preliminary runs on this combination show that the plating efficiency was increased from about 64 per cent to about 94 per cent. T. D. Prather has requested that all the remaining units be thus modified.

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The main power switch on scaler multiplier EL-250 failed to make contact. This switch was replaced as well as a 20-20-mfd. electrolytic condenser that was losing electrolyte.

Group 24 reported that the thyatron heater control, EL-238 was inoperative. The filaments on the 6H6 diode tube were open. This tube was replaced and the unit placed into service.

Frequent high voltage breakdown of the 734 series regulator tubes used in the mixer circuit of the two (2) input B-wall counters was traced to too high a voltage impressed across the 734's. The transformers are the correct rating and are expensive to change, so the 734's were replaced with another tube of much higher rating. The tube used as replacement was the 2C53. This tube has a breakdown rating of 3000 volts. A mixer with this tube change has been operating satisfactory for two (2) weeks.

Test pin jacks have been installed on all the Sola transformers in T-60. This makes it possible to check all the secondary voltages in a short time and correct for load and power factor in T-60. Several inductances and variable resistors have been installed in T-60 as part of the investigation work on the frequency compensated constant Sola transformers. Several of the counters in T-307 are now operating off the regulated lines supplied by this type Sola with the power factor adjusted to 90 per cent.

Group 14 - C. Brenneman, D. Barkalow, H. Glaze, J. Hunt, E. Rysø, and G. Weig

* Vacation July 5-11, 1949.

The counting load this period was as follows:

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<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>
Logace-S (4)	635	744	552	317	1613
Simpsons (3)			576	44	620
Nucleometer (1)	35	134	118	18	270
Beta (2)	306	1179	320	196	1695
Alpha Monitor	48	48			48
Parallel Plate Alphas (5)	<u>1246</u>	<u>2023</u>	<u>803</u>	<u>117</u>	<u>2943</u>
Total	2270	4328	2369	692	7189

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