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September 29, 1947

Micro-Assay Tentative Operation Plans For Unit 5 at 3 Delivery Commitment Levels. ✓

THIS DOCUMENT CONSISTS OF 5 PAGES

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The following is a tentative plan and an estimate of materials, equipment and personnel which will enable Micro-Assay to deliver purity results for:

- I 4,000 units/mos. on 1 shift at 5 days/wk.
- II 6,000 units/mos. on 2 shifts at 5 days/wk.
- III 8,000 units/mos. on 3 shifts at 5 days/wk.

To estimate the number of products that would be sampled for the above delivered figures, the following has been done. All units per month delivered have been multiplied by 2.41 (a factor derived from averaging the past 4 months units processed, divided by units delivered). For further simplification of the problem, these estimates of units processed have been converted into products processed. A product contains 25 units. Thus, 4,000 units/mo. delivered becomes 9,650 units/mo. processed or 385 products/mo. processed.

One further step was deemed advisable and that was to convert products/mo. to products/day; twenty-two days, working days in one month, at 5 days/week. Now 385 products/mo. = 18 products/day.

All estimates made herein are on a product per day basis.

- I 4,000 units/mo. del. = 18 products/day = 18 prod./shift ✓
- II 6,000 units/mo. del. = 26 products/day = 13 prod./shift ✓
- III 8,000 units/mo. del. = 36 products/day = 12 prod./shift

Micro-assay purities are determined in the following manner. For each product solution that is to be micro-assayed, three equal aliquots of 1 ml. each are taken. These aliquot samples are delivered in special 2 ml. plating beakers. For each product solution to be micro-assayed three platinum micro-foils are cleaned and tared on a quartz fiber micro-balance. The foils and aliquot samples are both mounted in a plating hood - the foil becomes the plating cathode and the sample the plating bath. The foils are then plated for 1 hour and 50 minutes at a controlled potential (using an automatic electronic controller). The foils are then weighed and the difference in weight is considered Q + impurities or total weight. Finally, the plated foils are counted for alpha emission using a long tube low geometry alpha counter. This alpha count is then converted to weight and the alpha divided by total wt. x 100 gives the percentage purity of the

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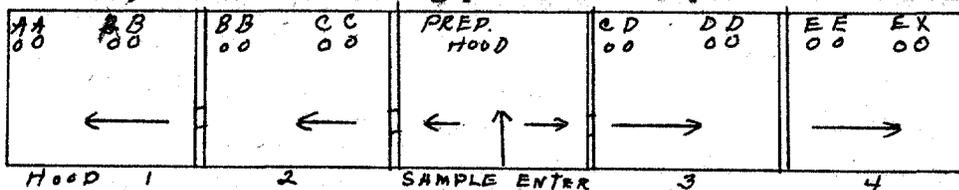
platable portion of the sample, the average purity of the three aliquot samples is determined and an accurate purity estimate of the product is obtained.

Consideration of I - 4,000 units/mo. del. using one shift.

This commitment would necessitate the purity determination on 18 products/day and would be most pressing to accomplish.

Plating Room

It is planned at Unit 5 that Micro-Assay shall have 4 (four) production plating hoods, each hood to contain 4 micro plating channels. Initially, it was hoped to have one plating channel as a standby in each hood. This would have allowed one product per hood per plating run (3 samples are for each channel) or a total of 4 products per plating run. Utilizing the 8 hours available in one shift and allowing ten minutes for removing and mounting the plating units (a feasible time estimate) only four such runs could be made. This would allow assay of only 16 products/day. An alternative which must be taken is the use of all but one, the 16 available plating channels, divide the product samples throughout the four hoods (this means separating into two different hoods the samples for two products and will impair efficiency and be a source of possible error (see sketch). This, however, allows for running purities on 5 products simultaneously.



PRODUCTS A, B, C, D, E
SAMPLES AAA BBB CCC DDD EEE

Figuring on four runs a day, this allows for 20 products/day and gives a much needed leeway of 2 products/day. This would be the absolute maximum that could be plated in any one 8 hour period and as plating is the limiting factor in Micro-assay operations, this becomes the micro-assay purity maximum.

Balance Room

On a 20 product/day basis the balance room operator would have to tare 90 cold foils and weigh 60 plated ("hot") foils per day.

Logac-1 calculations would be carried on in the Logac-1 room and 60 "hot" foils would be counted per day and then unloaded from their holders. Calculations would have to be made on all 60 foils run and records of these kept.

Foil holder decontamination and foil cleaning and loading, would have to be carried out on a scale to insure a sufficient backlog

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of clean, loaded foil holders for taring by the balance room personnel.

Requirements necessary to meet above estimates:

Equipment

To avoid any possible bottleneck in equipment - material on hand, micro-assay would need a minimum of 250 foil holders of the type now in the final design stage. Four plating elephants each, equipped with a four channel plating stirrer and an automatic potential control. There should be at least two standby stirring units and a 4 unit potential controller for each one in use (four) would be feasible (two standbys would be a minimum). Minimum plating room requirements; six 4 channel plating stirrers, six four channel automatic potential controllers, one 4 channel manual potential controller-portable. The balance room minimum requirements consists of three balances all installed in the balance room ready to operate. A fourth as a standby would be an ultimate requirement. The Logac-1 room must have installed, calibrated, and operating, two Logac-1's and a third as a standby, calibrated and ready to install, this means a minimum total of 3 Logacs.

Material

Foil sheeting to supply our micro-foils is supplied in 6" x 3" x .001" sheets. A 6 mos. supply is estimated at 60 sheets, 150 sheets should be on hand at Unit 5.

Micro Beakers: There are 120 micro beakers used every day, 60 for samples, 60 for residuals, providing a method can be devised for recleaning these beakers on a grand scale, 1000 on hand would suffice. A constant supply of 200/mo. would be a bare minimum if decontamination were possible.

Personnel

To operate at level, I above, would require 13 men. This breaks down as follows:

Five men for mounting and removing runs in the plating hoods and keeping these hoods in constant operation. This allows for one man per plating hood plus one man - his duties would be of a nature to keep him outside the hoods, making salt bridges, half cells, solutions for 1/2 cells, repairing and remaking electrodes, etc.

Two men for the balance room, one man on each of the two regularly used balances. Their duties would be the taring of the 90 foils and the weighing of the same when plated.

Two men required for decontamination of hot foil holders, cleaning of newly punched foils and reloading of the clean foil holders.

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Three men required for the Logac-1 and calculations operation, two men to operate the logacs and one man to make calculations and keep records.

One shift supervisor, or counterpart, to coordinate activities in the three rooms and to keep a reportable check on all operations for the group leader.

II - 6,000 units/mo. delivered = 26 products/day = 13 prod./shift

This level would be met using two shifts and would require the following. All equipment and material estimates have been made on a maximum output of 8,000 units/mo. delivered and so remain unchanged.

Personnel

Eight additional men would be required to maintain two shifts per day. These men would have the following assignments:

- 1 Shift supervisor
- 3 men mounting and removing plating runs
- 1 man counting and calculating
- 2 men weighing and taring
- 1 man decontaminating, cleaning foils, reloading foil holders

III - 8,000 units/mo. delivered = 36 products/day = 12 prod./shift

This level requires an additional shift and 7 more men. These men would have the following assignments:

- 1 Shift supervisor
- 2 men weighing and taring
- 2 men mounting and removing plating runs and keeping plating lines in operating condition
- 1 man counting and calculating, storing "hot" foils
- 1 man decontaminating foil holders, cleaning new foils, loading clean foil holders

Totaling the personnel requirements for three shifts gives 28 men, this is a bare minimum requirement and does not take into consideration time off for vacation and sickness, turnover and necessary extra men for Unit 5 installation work, transfer period from Unit 4 to Unit 5 and the unforeseen development work that will obviously be necessary in an untried installation, adding 15 per cent to the bare minimum to give some leeway for these considerations gives a grand total of 32 men plus the Group Leader or a need for 33 men in the Micro-Assay Group. One possible means (which on consideration becomes almost mandatory) of making this transfer period from 4 to 5 and operating at both units simultaneously in one shift, would be to hire the men required for three shifts at Unit 5 immediately, this would make them available in a useful capacity in a minimum of 4 months

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(8 weeks for clearance from date of hiring - 8 weeks training after clearance). This four month period from date of hiring must be borne in mind if men are to be available when most urgently needed.

Type Personnel

The four basic jobs performed in Micro-Assay, etc., counting, calculating, taring-weighing, mounting and plating and loading - decontamination must obviously be interchangeable to allow any flexibility in the use of the number of men required for the Group. On this assumption all men hired should meet the same basic requirement and that is a BS degree in chemistry, Chem. Eng. Physics, or any of the associated sciences. It would be advantageous if a man with some electronics or electrical engineering background could be acquired, such a man should have a primary interest in control work, however, he could make a thorough study of all our electronic equipment and perhaps avert some of our electronic troubles. Two men with metallurgy and/or electropolishing training or experience would aid in investigation and development of our electro-decontamination procedure. For the rest of the personnel, experience in control work or micro chemistry is more desired than electrodeposition (unless it be micro-electrodeposition) background. Inexperienced college graduates who show an interest for micro-analysis, micro-electrodeposition or micro-balance work would be acceptable.

Philip J. Lowry

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