Current Developments in

PLANT MANAGEMENT

Costs of testing raw materials which are used in the manufacture of chemical products should be kept reasonable.

Discussed by Walter von Pechmann

RIGID control of raw materials expedites determination of the operating conditions needed to create a product of standard quality. However, chemical and physical analyses do not reveal all the facts necessary to guide the production chemist during the manufacturing process. This is especially true in the compounding of certain organic substances or in the incorporation of raw materials in the product in powder and crystal forms which are themselves mixtures of several batches blended together. It is not uncommon for production men to complain that the use of a new container in a shipment has caused trouble in production. The experience of such difficulties is often accompanied by a request to develop new testing methods in the laboratory or to increase the number of samples taken out of each shipment. The acceptance of these recommendations without thorough investigation of existing conditions is likely to result in a expenditure for testing which is out of proportion to other manufacturing costs. Furthermore, the new measures may not bring about the expected improvements. Before an additional burden is put upon existing laboratory facilities, it is recommended that the following investigations be made: (1) Are variations in quality of product really caused by faulty raw materials? (2) What will be the cost of expanding present testing procedures? (3) Is this figure in proportion to the expected advantage? (4) What other measures can be taken to solve this problem at a lower cost?

To make a good product, it is essential to keep the fluctuations in product specifications as low as possible. This applies not only to raw materials but also to working standards. Therefore before it can be concluded why a product has not turned out as expected, it is necessary to investigate job performance and manufacturing facilities as well as the raw materials used. Such factors as poor workmanship, air-bound pipes, split thermometers, and contaminated equipment can produce faults in a product which are likely to be attributed to inferior raw materials. Statistics which show that a raw material used in a product has not entirely met laboratory specifications should not be considered proof that the fault lies in the use of this ingredient. Quality specifications for raw materials are often so strict that suppliers are unable to meet them consistently. This applies especially to color and texture specifications. Quality deviations from such overstated requirements are therefore meaningless. In some cases raw material specifications are too strictly designed by production purposely in order to have an excuse if the product does not turn out as expected.

The importance of using raw materials as directed is not always given sufficient consideration. Department heads frequently accept a raw material at a lower cost with the understanding that the chemical has to be refined (recrystallization, filtering, etc.). Because the difficulties involved in the employment of an additional process have been underrated or because the supplier's request has been forgotten, products are made as before. If trouble in production arises, the "inferior material" is unjustly blamed.

The amount of money spent in the chemical industry for testing raw materials is frequently underestimated. This applies especially to plants where the material testing is not centralized but is under the supervision of individual manufacturing units. Too often little attention is given to the importance of apportioning correctly the laboratory expenses of a centralized testing unit to the various departments. Mediums of cost distribution, such as direct labor dollars, number of people employed, and number of square feet occupied by each department simplify the work in the accounting department. However, such factors do not put the money where it belongs nor do they allow the various manufacturing units to keep an accurate check on their testing expenses. There is a tendency in the chemical industry today to employ more modern and efficient methods of accounting in laboratories. Some concerns prefer the job cost system, whereas others believe that the process cost system is more suitable. The writer has found that either system works satisfactorily if the head of the laboratory is accounting conscious and supervises the entries to assure that they are more than mere guesses. The contention that work in the laboratory is too complicated and varied to allow accurate time recordings is frequently an excuse for avoiding a small additional assignment. Routine testing procedures do not vary in principle from manufacturing procedures and are often less complicated. The supervisor in the laboratory should know what his men are doing, how long it takes to do the job, and for which department his employees are working. With little effort he should be able to make arrangements for the proper recording of these facts. When a cost system for testing laboratories is developed, consideration should be given to making the proposed measures practical. This may make it necessary to sacrifice accuracy occasionally in order not to interrupt the work in the laboratory or not to increase too much the work in the accounting department. For instance, employees can be asked to record their activities only twice daily. Although this procedure is liable to produce statistics which are not entirely correct, the cost distribution on this basis may nevertheless be sufficiently accurate for proper allocation of the money spent in the laboratory. If the expenses are distributed on an apportioned basis, a medium of apportionment will have to be selected which can be obtained without too much effort. However, this does not mean that laboratory expenses can be apportioned by using the labor dollars spent in the department which receives the service—a method found often even in up-to-date concerns. The writer is not in favor of distributing cost on a predetermined basis even if the apportionment has been established on previous accurate recordings or on a study made by an industrial engineer. Laboratory techniques change frequently, and the number of tests and retests cannot be sufficiently standardized to foretell which portion of the entire work in the laboratory is chargeable to each department. In most instances the overhead expense of a laboratory can be distributed together with the labor. However, where testing methods require the use of special and expensive equipment, or where a large amount of energy or floor space is needed to conduct one type of test, it might be necessary to find another more appropriate means of expense distribution.

Accurate accounting makes it possible to determine more closely the amount of money which will (*Continued on page 104*)

have to be spent on testing raw materials. Justification of the increased cost should be judged not on the amount of money which will have to be spent, but on whether the additional expenses are less than the loss which might be expected if the present method of testing were maintained.

It is often believed that materials which go into large batches have to be tested more thoroughly because of the loss which will be suffered when such a batch is spoiled. This is not entirely true. The money lost by the repetitive spoilage of small batches—usually not given much attention—frequently exceed the one time loss of a large batch.

Control Record

The measures usually taken to improve control of raw materials are developing new testing methods, increasing the number of samples which are taken out of each shipment, and compounding small sample batches. Insufficient recognition is given to the fact that intelligent recording enables the production chemist to spot deviations in production before serious damage occurs. This method is not employed more frequently because of the work connected with segregating entries which have no meaning from the deviations which should be analyzed. By stripping a record of all routine entries and recording only the deviations, it is possible to see at a glance all the changes which occurred in production. Applied to the control of raw materials, such a record enables the production chemist to learn without effort in which batch one material was replaced by another, or when a new shipment was made, or even where a new container was used. The technique of developing such a record was described by the writer in detail in an article entitled "Executive Production Control in Chemical Plants" (*Chemical Industries*, October, 1942). In brief, the method works as follows: A control board is made up where the horizontal lines represent chemicals and the vertical lines depict production batches. On the left-hand side of the board exact descriptions of all chemicals used at present are entered in code form. The code numbers contain four digests, one for each of the following: the chemical, its manufacturer, the shipment number, and the container number. For example, material: sodium hydroxide; manufacturer: Merck & Company, Inc.; shipment: No. 135; box: No. 4. The code might be "A — M — a—4"; the key, A = sodium hydroxide, M = Merck & Company, a = first shipment of year (No. 135), and 4 = fourth box in use.

No entries are made on this record until a change takes place in the manufacture of a product. The changes are entered in the squares formed by the vertical and horizontal lines. They are also coded. If, for example, a new barrel is used on the above described chemical, the code number A-M-a-4 changes to A-M-a-5. In order not to clutter the board with unnecessary entries, only the number 5 is recorded. The writer has found it advantageous to color the squares so that the various types of changes stand out more sharply. Changes in shipments, for instance, can be colored yellow, and changes from one manufacturer to another can be indicated by a red marking. This method has the advantage that all changes which occur in an individual batch can be gathered quickly by reading the chart vertically, whereas a complete picture of the changes in the use of one chemical can be analyzed by reading the chart along horizontal lines.

It is recommended that such a control board be given consideration before steps are taken to improve upon the control of raw materials by overloading existing testing facilities.

Last-Minute Flashes
FROM THE EDITOR'S DESK

THE surplus problem in benzene and toluene resulting from the sudden cessation of explosives manufacture may be solved. Europe is submitting an active export demand for both as solvents and fuel.

★ A natural rubber price of 16 cents per pound is seen by P. W. Litchfield, Goodyear Tire & Rubber Company chairman. To prevent it from going higher we should produce 200,000 tons of synthetic a year.

★ When Japanese and Chinese menthol return to the market, they will find plenty of competition from Brazilian producers and synthetic manufacturers in this country.

★ Automobiles for 1946 will have no more plastics in their construction than in 1942. Manufacturers are too anxious to get cars off the assembly lines to engage in much research.

★ During the first half of 1945, imports of industrial chemicals rose to $21,000,000, from $15,000,000 in the similar 1944 period.

★ Insecticide users in coming years will want prepared dusts and sprays which require only mixing with water, according to J. J. Davis, Purdue University entomologist.

★ Paper supplies will continue critical for some months to come, warns the Bureau of Foreign and Domestic Commerce. Because of insufficient labor, cutting of domestic pulpwood is still not up to the desired level.

★ Europe's huge nitrogen industry is idle for want of coal, the No. 1 priority problem.

★ The Government is worried over a shortage in castings, which are essential to the automobile and other industries. Gray iron and malleable iron foundries will become serious transition bottlenecks if production is not increased.

★ A survey finds that the average drug wholesaler stocks about 40,000 different items, in some cases as many as 70,000 different products. As a result, labor accounts for over 50% of costs in such establishments.

★ Part of the dismantled German chemical manufacturing equipment in the American occupation zone will be sent here for study.

★ Farm county agents are urged to buy no DDT insecticide preparations unless the label definitely stipulates the percentage of DDT in the container.

★ Out of a dozen categories of plastics, current supplies exceed demand in only two, according to W. S. Landes, head of the Plastic Materials Manufacturers Association.

★ The Navy reveals that one project alone, the radio-operated VT fuse, required each month a total of 1,000,000 pounds of polystyrene, vinyl resins, laminated phenolics, acetate butyrate, and ethylcellulose.

★ Sodium peroxide demands are still not fully satisfied although more sodium metal has been made available for burners. One producer has installed additional burning capacity.

★ The Midwest continues to outstrip the rest of the Nation in increased fertilizer sales. Sales in that area from January to October of 1944 were 199% over the 1935 figure. Sales in the South increased 61%, and seventeen reporting states showed a gain of 73% in fertilizer consumption.