The American Fertilizer Scene— As Viewed from Abroad

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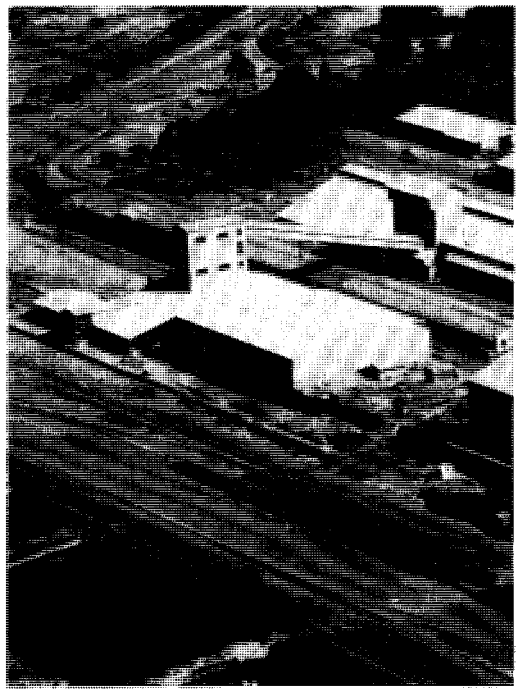


A South African fertilizer technologist presents his candid, but friendly, impressions of U. S. fertilizer technology after a tour of U. S. plants

WHETHER the term evolution or revolution is more applicable to the American fertilizer scene in recent years is a matter for debate. Whatever the view, the change taking place is rapid. In so large a country, extremes in rate of progress are always likely to be encountered in a rapidly changing pattern. Accent here will center more on the forefront of progress and less on the average or backward.

Ever increasing wage rates in all national activities, with their consequent effect on freight, operational, and packaging charges, are accelerating the trend toward fertilizers containing ever increasing percentages of the known plant foods.

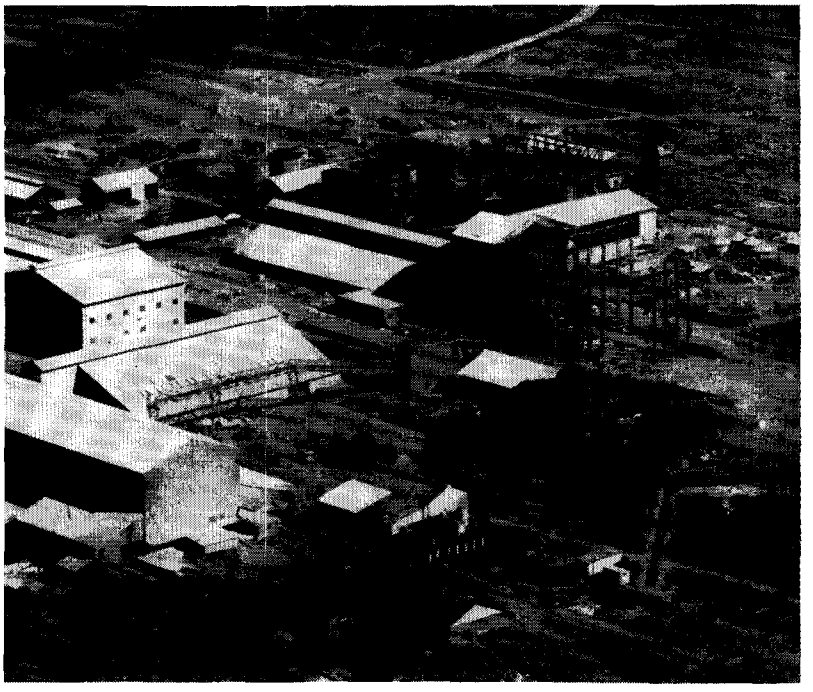
A keenly competitive spirit in the selling of fertilizers has developed cost consciousness of a high order, and a drive to use the cheapest possible sources of raw materials. The less easily evaluated "convenience" value is also having a marked effect on the trend in fertilizer manufacture, despite the fact that "convenience" factors increase costs and to this extent are in conflict with efforts to reduce fertilizer prices. To some extent the granulation of fertilizers is involved in such conflict. In addition, the clothing of fertilizers in bags of ever decreasing weight—for example, within a decade weights have dropped from 100 via 80 to 50 pounds in many states—is another.

The desire to increase the concentration of mixed fertilizers, as well as cost consciousness in other directions, has tended to increase the use of liquid raw materials in the form of anhydrous ammonia, ammoniating solutions, and phosphoric acid. The availability and utilization of these has required a major change in mixed fertilizer manufacture. Progress has been rapid in the United States. In the use of liquid straight or mixed fertilizers, both in the field and the factory, the United States undoubtedly leads the world in quantities used and in technical know-how. In this respect, the work done by TVA personnel has been a major contribution in keeping the small manufacturer in business.

The production of ammonia, nitrogen solutions, and phosphoric acid has introduced into the fertilizer field the larger chemical companies which have considerable research facilities at their disposal. This has tended to accelerate the rate of progress in an industry which previously had only restricted technical resources available. Large companies having not only technical manpower but also ammonia (and its derivatives) with phosphoric acid or phosphates available, and even perhaps potash, are placed in a stronger position vis-a-vis the fertilizer blender who purchases all these plant-food containing materials.

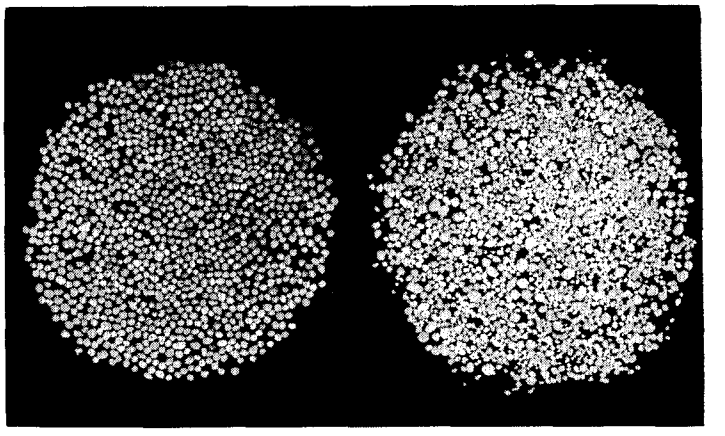
In such a situation, small companies which only blend may have to struggle for survival. The measure of success achieved so far by them is noteworthy. It will be interesting to see if this position can be maintained, especially if techniques become even more involved.

The position in regard to granulation of fertilizers in the United States is of particular interest. Products of excellent quality, judged on the basis of uniformity of granule size and composition, spheroidicity, and freedom from setting, with no granules greater than 8 mesh, are available in single ingredient fertilizers and in some cases in ammonium phosphates. This refinement does not apply to the mixed fertilizer field, however. The so-called "granules" of mixed fertilizer, which could be more aptly described as "chips and dust," are of irregular shape, range in particle size from 6 to 20 mesh, are by no means uniform in composition, and are not completely free from setting; their appearance and composition leave room for improvement. The form in which mixed fertilizer is marketed in the United States represents a standard considerably lower than that of many of the single ingredient materials on the United States market.



The Rodia factory of African Explosives & Chemical Industries, Ltd.

The "elite" granules of mixed fertilizer produced in South Africa as compared with the "chips and dust" granules of U. S. fertilizer



It appears that not only could the range of particle size be narrowed, but accent also should be placed on greater uniformity of granule composition and shape. The granulation processes used for most mixed fertilizers in the U. S. hardly provide for the shaping of granules, but rely more on relatively haphazard agglomeration for particle formation and build-up. Production rates are achieved by including chipped or cracked oversize in product. As a result, attention is not focused on control of granule size in the granulator. Output is achieved even if agglomeration in the granulator is haphazard, because oversize is broken into chips and included in the product.

If oversize were pulverized, on the other hand, and returned with the raw feed instead of being merely cracked and included in the product, an entirely different approach to control of the granulating process would evolve in order to achieve production. The new approach, together with elimination of particles in excess of 12 mesh from raw materials, could result in well shaped and more closely sized particles—and without necessarily causing any loss of production. Attention to detail and establishment of the necessary conditions could, it is suggested, result in vastly improved products at little, if any, extra cost.

Another matter for comment, and perhaps a cause for a raised eyebrow occasionally, is the position with regard to ammonium nitrate and its wholesale distribution. It is greatly to the credit of the United States that the Texas City disaster did not cause panic. The situation within the States has been controlled, and no serious accidents have occurred with fertilizer ammonium nitrate as such. With the advent, however, of the use of fertilizer ammonium nitrate as an explosive, one wonders whether complications will not arise through revival of the knowledge that this material is indeed an explosive or a near relative. Where a country has more than enough capacity in ammonium nitrate for use as an explosive, certainly an extension of the capacity to manufacture ammonium nitrate appears questionable when such a superior substitute as urea, a fertilizer innocuous in respect to the explosion hazard, is available (and in a form more concentrated than ammonium nitrate).

The example set by the United States in the distribution and field application of bulk fertilizers is outstanding. If this practice extends to other countries of the world as it should, the wasteful procedure of putting fertilizer into bags could be eliminated. This would be a major contribution to lower costs and higher productivity which will contribute to a higher standard of living for mankind.

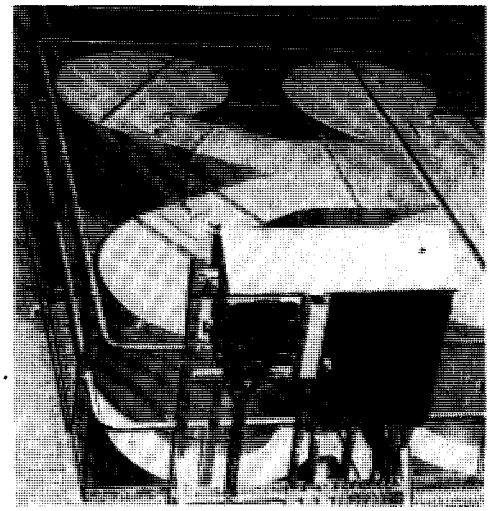
If in this review criticism has been leveled at practices in the United States, it has been done in an objective manner by one who has a close bond in thought and outlook with the United States as a country, and through personal friends amongst its people. Certainly nothing but helpfulness is intended—a helpfulness nurtured by a desire to repay a debt of gratitude for all the author has learned during visits to the United States.

These statements are made with the knowledge that closely sized spheroidal granules, relatively uniform in composition and free from set, are being produced in Southern Africa in large quantities (outputs of over 200,000 tons per annum). The mixtures made cover a wide range of N–P, N–P–K, and P–K grades having percentages of plant foods ranging from 23 to 38%. The "quality" of these granules appears superior to that of any granular mixed fertilizer seen in the United Kingdom, Europe, or the United States in recent years.

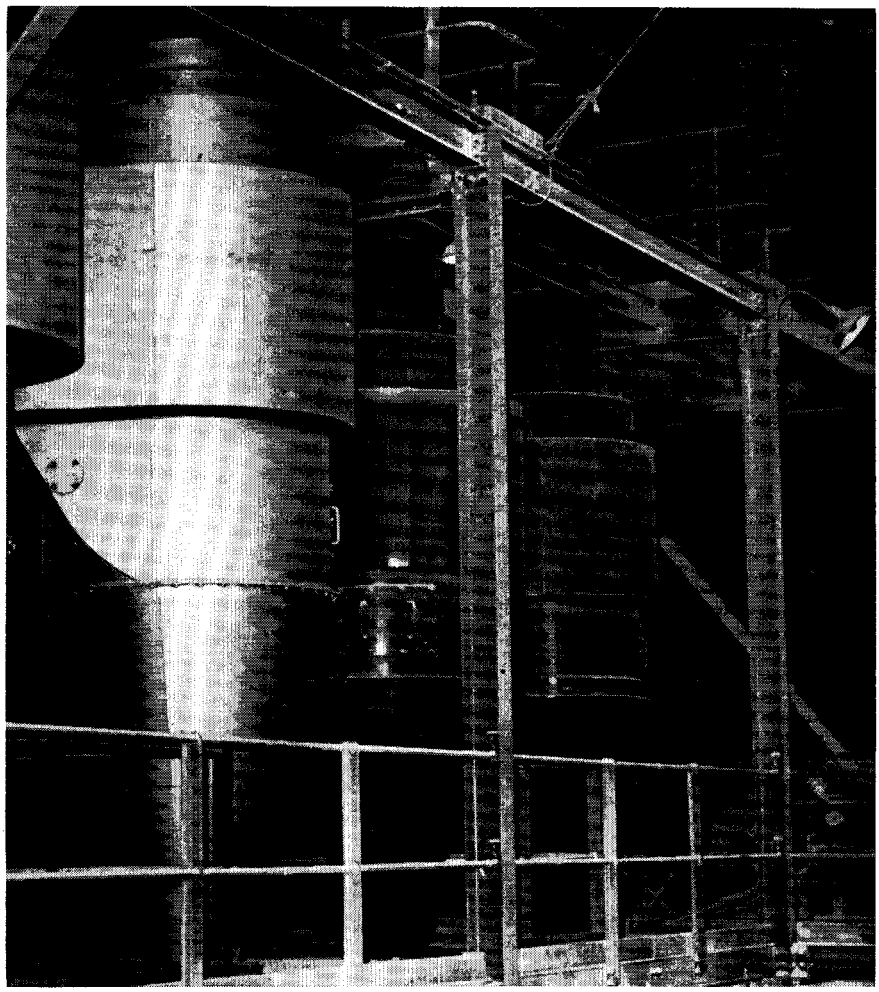
Summarizing the comments on existing processes for granulation of mixed fertilizers in the U.S.A., it is suggested that insufficient rolling surface is provided in most U. S. granulating plants to shape granules whilst these are in the plastic state. The

Left: Granulating drum in a South African plant that turns out 20 tons of "elite" fertilizer granules an hour

Below: Drying and cooling cyclones at the same plant



Below: Drying and cooling cyclones at the plant which produce "elite" granules



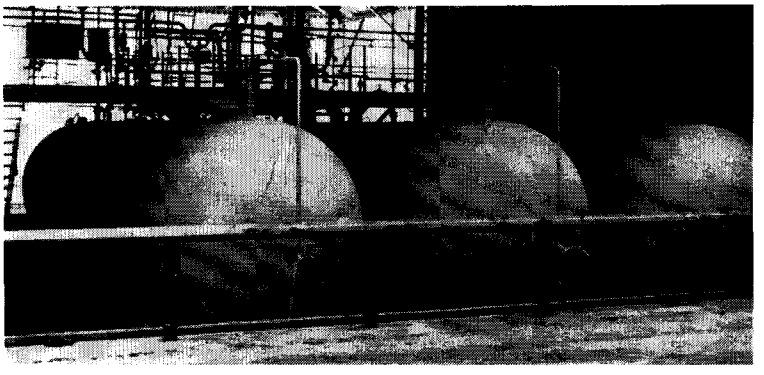
solid ingredients used also are frequently too coarse. They certainly contain too large a percentage of coarser particles considerably larger than the smallest granules in the final product. In addition, the control of the granulation process, if raw materials are of suitable particle size (say, nothing greater than 1 to 1.5 mm. in diameter), and if adequate rolling surface is provided, can be such that the percentage of oversize is very low. In order to improve the final product by the avoidance of chips, this oversize can readily be pulverized by the use of a suitable disintegrator and returned with the fines into the raw mix entering the granulator.

The area of rolling surface for granule formation should be of the order of 25,000 to 30,000 sq. ft./ton hour of product. Thus, for 20 tons per hour a granulating drum 7.5 ft. in diameter and 30 ft. long, revolving at 12 to 15 r.p.m., is necessary.

Competitive Advantage

It has been suggested, and one is inclined to agree, that up to now at all events, commercial enterprise has had a greater influence on the fertilizer usage pattern of a country than have agronomic requirements. On this thesis a company which produces a superior product such as this "elite"

Rotoclones installed at "elite" granulating plant



Anhydrous ammonia storage tanks at "elite" granulating plant that turns out 20 tons an hour

granule could gain a commercial advantage over its competitors, particularly as this superiority is obvious even to the naked eye of the layman (viz., uniformity of granule size, roundness of shape, and accuracy of distribution in the field). In this particular case, of course, the agronomic virtues would be in no way inferior to those of the less attractive competitive product.

It would appear therefore that the "chips and dust" products at present being marketed as "granular" mixed fertilizer in the United States are likely, in so progressive a country, to be replaced by superior products as the science and art of granulation evolve.

One would be remiss, in discussing the evolution of granulation technology, if he failed to give credit to those leading U. S. thinkers in the fertilizer field who gave to the world the definition of the ideal granule—meaning, of course, K. D. Jacob and John O. Hardesty of the USDA. It is somewhat of a paradox that their philosophy has been adopted and applied outside the borders of their own country before it has been accepted domestically. In South Africa the granules conforming to the USDA's definition of uniformity in composition, shape, size, and freedom from set have been called "elite" granules, to distinguish them by name from the cruder products containing a wide range of particle shapes, sizes, and compositions, and consisting to a considerable extent of slivers and chips of various shapes.

There are one or two further aspects of the American fertilizer scene which warrant comment. First and foremost is the relative lack of knowledge among technical personnel about fertilizer production practices in Europe and the United Kingdom. Commercial men from the United States visit Europe regularly as representatives of companies supplying raw materials. Seldom, however, do technical men knowledgeable in processes visit that beehive of industry and technical progress where much of interest to the fertilizer industry is being developed. Top state officials and company executives would do well to give some thought not only to allowing but even to insisting that their technical men travel. At present many technical representatives of other nations visit the United States. It would not be inequitable if there were a counter flow, to allow other countries to contribute something in return for the generosity in regard to all things—including technical knowledge and friendliness—which the U. S. dispenses to the whole world.

Cooler installation at "elite" plant