WHAT'S NEW IN FERTILIZER BULK BLENDING

For Presentation at the TVA Fertilizer Conference
Louisville, Kentucky
October 7-8, 1981

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Dry mixing (bulk blending) of solids has been practiced in the U.S. for more than a century; however, the use of granular bulk blends did not get underway until around 1950. It was at that time that bulk blending of prilled ammonium nitrate, superphosphate, and granular potash started becoming popular in Illinois. Bulk blending has grown into a major segment of the U.S. fertilizer industry, now producing about 10 million tons of product in more than 5,000 plants.

As any new industry develops and matures new ideas are generated to improve the industry. The bulk blending industry is no exception. It has been characterized by numerous innovations. From time to time, it is beneficial to identify some of the new concepts being developed. It should also be remembered that some of the concepts are not necessarily new to the industry as a whole, but are new to some areas or new to individual blenders within given areas.

Materials

As urea continues to increase its share of the dry nitrogen market, many blenders are using urea in their operation instead of other nitrogen sources, such as ammonium nitrate. The latest development in urea production has been the manufacture of a granular product. It is estimated that about 25 percent of the urea being produced in the U.S. is in granular form. Compared to prilled urea, granular urea has a particle size which better matches the particle size of phosphatic and potassic materials with which it is blended. Also, TVA has developed a new process termed the "falling curtain" granulation process. This process makes it possible to produce urea with the desired particle size with a significant reduction in energy imput.

Some blenders are using monoammonium phosphate (MAP) as a phosphate source in place of diammonium phosphate (DAP). When used as a corn starter, either

direct or in a blend, MAP is less injurious to germinating seeds than DAP. MAP also is being used as a dual purpose product for the production of bulk blends and fluid materials more frequently than DAP.

Sulfur coated urea (SCU) and other controlled release nitrogen materials are being used by some bulk blenders, primarily in specialty market areas. They are used not only for the homeowner market, but also in the vegetable producing areas and other specialty crop areas.

Even though ammonium sulfate (AS) was used by the original blenders in 1947 primarily as a nitrogen source, it is now becoming a new source of sulfur and nitrogen for many blenders across the nation. Sulfur demand has increased dramatically in the last few years in many areas, and AS is the principal source of sulfur available to bulk blenders. Granular sulfur has also become a relatively new material to some bulk blenders.

Equipment

There are several types of blenders and methods of blending dry granular materials--from rotary drums to gravity fed flow dividers to mixing with augers. However, there has been no significantly new blending equipment developed in some time, although equipment for each of the types of blenders has been improved over the years.

The major change which has become apparent in blend plants is that an increasing amount of corrosion resistant materials is being used, not only in the blending equipment but also in fertilizer handling equipment. It is apparent that more stainless steel, fiberglass, and plastic materials are being incorporated into fertilizer plant equipment.

Egg crate bin dividers (figure 1) for holding hoppers, especially for blended materials which are to be bagged, are becoming more prevalent. The bin divider, which is designed to reduce the amount of segregation in bulk

blends, is not necessarily a new development in the industry but it is new to many plants across the country.

Probably the most recent widely accepted practice in the bulk blending industry is the addition of micronutrients and pesticides to materials being blended. The equipment used for the addition of fluid materials to a bulk blend consists of a holding tank into which a measured amount of the material is placed, a pump, and a nozzle in the blender to spray the fluid onto the materials being blended (figure 2).

Increasingly, bulk blenders are using programmable calculators, pocket computers, and microcomputers. In general, the programmable calculators are used primarily for formulating fertilizers to soil test. The latest pocket computers are also used mostly for the same purpose. However, the pocket computer has several advantages over the programmable calculators--slightly greater capacity, much easier programming, and true portability.

The more sophisticated and more expensive microcomputers are used not only for formulating, but also for least cost formulating. Many computers are programmed to give soil test recommendations when soil test laboratory analysis is entered. These computers are also used for other segments of the blender's business. Some dealers are keeping historical records of individual fields in what are generally called grower files. The computers are used for inventory control and to perform general accounting procedures, such as payroll, accounts receivable, accounts payable, and general ledgers.

Additives

The two major types of additives being used with bulk blends are micronutrients and pesticides. With the continued increase in yield per acre of almost all crops, the demand for micronutrients is increasing and bulk blenders are adding micronutrients to their products.

The blender has the option of adding most micronutrients as granular,

powdered, or fluid materials. Typically, one or more suppliers can furnish most micronutrients in granular form. These are simply added to the blend along with the other materials.

Oxide or sulfate forms of micronutrients are available in powdered form. Although this form is sometimes simply put into the blender with the other materials with the hope that the powder will adhere to the granular materials, this is not a very effective way to add micronutrients. Powdered material can be added fairly successfully to granular materials, however, if a fluid material, sometimes called a "sticker," is used to cause the powder to adhere to the granules. Commonly used stickers are water, ammonium phosphate solution, and urea-ammonium nitrate solution. Oil has been used but it poses an explosion hazard when used with ammonium nitrate and is not generally recommended if the ammonium nitrate content of the blend exceeds 25 percent. Usually, about one gallon of sticker is used per ton of blended product.

Micronutrients in fluid form can be sprayed onto the material in the blender using equipment described above. The fluid could be in the form of a true solution or a slurry of powdered form. It may be an inorganic salt or a chelate.

Pesticides, primarily herbicides, are being added to bulk blends in a rapidly increasing number of blend plants. These materials can also be introduced into the blender in the same physical forms as the micronutrients, namely granular, powder, or fluid. Of course, similar requirements hold true; the powders require a sticker and the fluids require the necessary equipment for addition to the blender. When the amount of fluid additives exceeds about 1 percent of the total weight, a conditioner such as Kaolin, attapulgite or bentonite clay, or diatomacious earth should be added. Since the exact point where the conditioner is required depends on climatic factors and the materials used, the blender must learn by experience when a conditioner is needed.

Application

Extra care should be taken when applying bulk blends to which micronutrients or pesticides have been added. Even distribution of the fertilizer particles on the soil surface is imperative. When broadcasting these products, the applicator often uses a 50 percent overlap to insure proper particle distribution. Some applicators even "double apply" these products; they go over the field two times. To get the required distribution of the pesticides, a minimum of 200 to 300 pounds per acre of fertilizer material should be applied.

In general, bulk blended materials are either applied in a band, primarily as a starter fertilizer, or broadcast on the surface. There have been very few new developments in application equipment in recent years. However, as in blending plants, there seems to be a continued increase in the use of corrosion resistant materials incorporated into application equipment.

Lor-al Corporation is developing an applicator (figure 3) which uses a stream of pressurized air to apply dry fertilizer. The fertilizer is elevated at the back of the spreader approximately seven feet into a divider which distributes it to one of 20 three-inch hoses. Air is pressurized by a pair of fans driven by an independent diesel engine before mixing with the fertilizer in the distribution hoses along a 60-foot boom. Each hose drops the blended fertilizer onto a metal flange at 3-foot spacings. Preliminary field tests show this applicator will generally apply bulk blends uniformly, provided the blends have not segregated prior to and during loading of the applicator. The fertilizer mixes with a stream of pressurized air for distribution of the material to a 60-foot boom.

Problems and/or Considerations

In making high quality bulk blends, it should be remembered that properly matched particle size is vastly more important in eliminating segregation than the specific gravity or shape of the particles. Little segregation results in blends in which all particles are the same size. Thus, every possible effort

should be made to match the size of the particles of all the materials to be blended. Use granular instead of standard or coarse potash. Avoid using fine ammonium sulfate if possible.

If it is not possible to obtain matched materials, blenders should consider adding bin dividers in any holding hopper, especially if the blend is to be bagged. Dividers in bulk application equipment could also be beneficial.

Keeping segregation of a blended material to a minimum is especially important when granular micronutrients or pesticides are included to insure the best possible coverage of the additive.

If fluid materials are added to bulk blends, be aware of possible development of stickiness and resultant resistance to flow. The point at which a conditioner is needed is best learned by experience. Triazines have been reported to react with triple superphosphate (TSP) and some suppliers and bulk blenders recommend that triazine herbicides not be used with TSP. It is a standard recommendation that a blender check with his pesticide supplier before adding a pesticide to a fertilizer blend.

It is possible to sensitize AN by the addition of some pesticides because of the solvents in the pesticides. In general, it is thought that if the AN makes up less than 25 percent by weight of the total blend and the material is spread soon after being blended, no problems will be encountered. When a fluid pesticide is added to a blend containing AN, the blended product should not be bagged or stored in bulk because of hazards of explosion and/or fire, even if the ammonium nitrate content is kept below 25 percent. There is some evidence that more segregation occurs in bagged material when forced-flow baggers are used than when gravity-flow baggers are used. The spread pattern of broadcast applicators should be checked often enough to give the operator confidence that he is getting the best spread possible with the equipment.

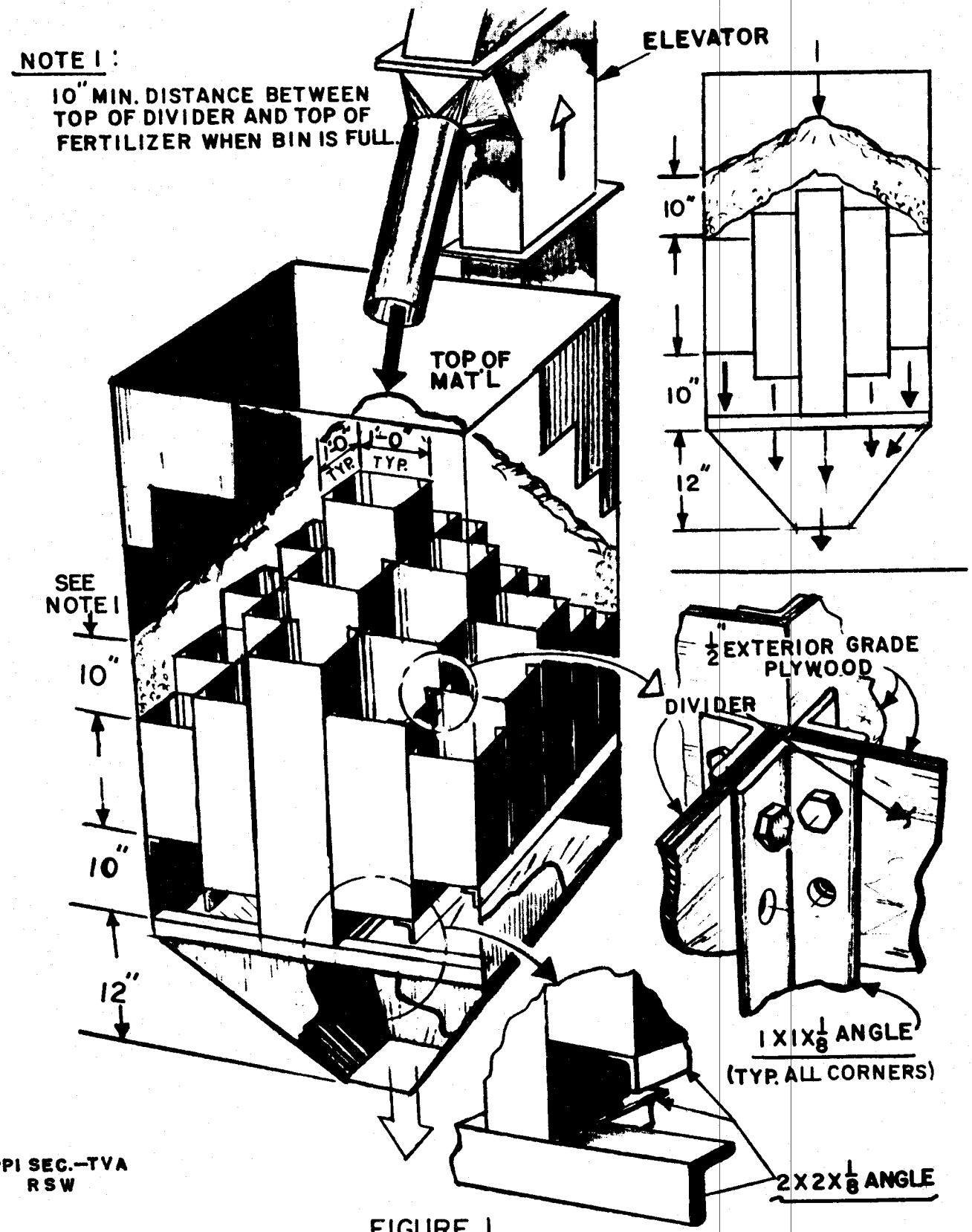
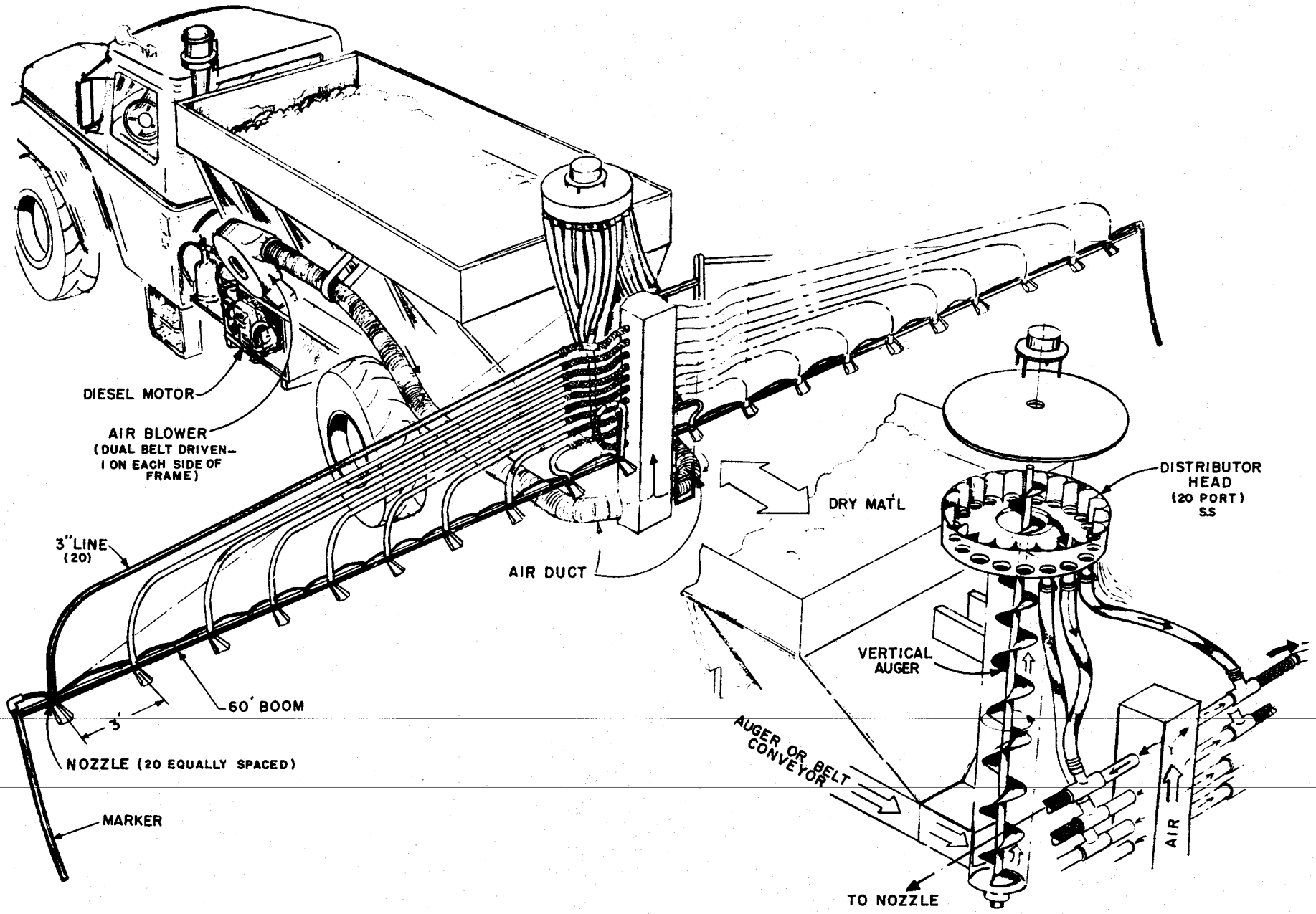


FIGURE 1

ANTI-SEGREGATION DIVIDERS FOR HOLDING HOPPER



LOR-AL AIR-FLOW SPREADER