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Problems in Seed Blending

G. M. Dougherty

PROBLEMS IN SEED BLENDING

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In a recent discussion on seed blending I was very politely advised "You cannot blend seed, you can only mix it". Well, blending or mixing, you term it as you will, most seedsmen are obliged to perform the operation at one time or another if they are to operate profitably. For the benefit of those of you inthe audience who are non-processors let me hasten to add that I am not implying that professional seedsmen, in order to operate at a profit, blend trash with good seed. Furthermore, let me assure you that our attempts at solving blending problems are not designed to encourage individuals to engage in such operations.

Most of you have been here at the laboratory now for nearly four days. You have heard speakers present talks on many different pieces of processing equipment. For example, you have heard talks on width and thickness separators, length separators, density separators, separators that will remove particles differing from the good crop seed in terminal velocity, and many others. In fact, by now some of you may be wondering if it is really necessary for the tag on a bag of seed to show; percent pure seed; percent other crop seed; percent weed seed; per cent inert matter, and even perhaps percent germination. To you, I say, if our speakers have convinced you that all processing problems can be solved using the equipment we have available today, then you have been mislead. For proof, just ask the gentleman who brought in the giant foxtail - red clover mixture.

All weed seed - crop seed mixtures cannot be separated. Furthermore, just because a separation is possible it is not always a profitable separation to perform. Therefore, we must be realistic. A seedsman with a quantity of seed not meeting minimum standards for seed planting purposes because of the presence, for example, of an excessive amount of an inseparable contaminant, cannot be expected to just discard it. He must protect the investment he already has in the seed if at all possible. Frequently, one way of

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doing this is by blending the low grade seed with a quantity of high grade seed to produce a product acceptable for sale through seed trade channels. For this reason, some people consider blending as a "Necessary Evil". Be that as it may, the label attached to the bag of seed indicates to the buyer the quality of the seed in the bag. All the buyer expects, or is entitled to, is that what is in the bag is as good or better than the information on the label has let him to believe.

Misunderstanding tends to cause confusion. I hope I have succeeded in clearing up any misunderstanding anyone may have had relative to the necessity or legitimacy of seed blending. There are, however, two more frequently misunderstood points relative to the blending of solid particles that I would like to briefly elaborate on.

First, invariably in a discussion on seed blending someone gets the urge to compare the apparent successfulness of blending operations in other industries with the erratic results obtained in the seed industry. Based on a review of the literature on the blending of solid particles, which is not voluminous, most of the research being conducted today is in the industrial field. To me, this signifies that blending is still a problem of considerable magnitude in industries other than the seed industry.

Second, there is frequently a tendency to compare a "blend" in one industry with a "blend" in another industry. For example, let me ask <u>you</u> the question "What is a blend"? I seriously doubt that we would all answer this question in the same way. In fact, it is safe to assume that even some of you have, for the moment, started to think of a blend in terms of a product other than seed. The point I wish to make is that a blend in one industry does not necessarily constitute a blend in another industry. Each industry has its own "Scale of Scrutiny", or tolerances, by which its blend is measured. Furthermore, industries differ in the methods used to test for a blend. In the seed industry we draw samples, in a specially prescribed manner, and analyze them in a specially prescribed manner for the percentages of the various quality factors in which we are interested. We then declare that within certain prescribed tolerances the information obtained from the analysis is a true indicator of the composition of the seed-lot. To ascertain whether a seed-lot has been satisfactorily blended, a second sample is drawn. If the difference between these two analyses (for each quality factor) is within the tolerance established for the average of the two analyses then we declare the seed-lot to be satisfactorily

blended. At this point I should add, the procedures, rules, and methods employed in the seed industry for analyzing for lot uniformity were not hastely developed, nor, are they unjustifiably severe if you understand that they are based on the assumption that a seed-lot is a homogeneous mass of seed. This I wish to stress. Legally, a seed-lot is defined in "Rules and Regulations under the Federal Seed Act as "a definite quantity of seed every portion of bag of which is uniform, within permitted tolerances, for the factors which appear in the labeling". Let me further stress, seedsmen who blend two or more "seed-lots", and I use seed-lots in the strictest sense of the word, experience few problems with law enforcement agencies.

In my opinion, blending problems are no more numerous in the seed industry than they are in other industries. They are, however, more complex. What,then, are the problems associated with seed blending, and why are our problems more complex. As I see it we have three primary problems:

(1) There is actually very little known concerning how to blend solid particles. This does not mean we know nothing. We do know that an outside force must be applied in order to set the particles in motion; we also know that free-flowing seed mix more readily than most non-free flowing seed. We further know that blending is a randomized arrangement of particles. Lastly, and this is what really gives us fits, we know that factors such as particle size, shape, surface texture, density, numbers, and electrostatic properties all influence a particles' blending potential.

(2) Few so-called seed-lots are acutally seed-lots in the strictest sense of the word. Mr. Sundermeyer (on Tuesday) cited examples of what occasionally constitutes a seed-lot in seed trade channels. To be sure, some of the examples presented by Mr. Sundermeyer were extreme cases not too often encountered (I hope) but believe me there are very few seed-lots in the trade channels that if sampled frequently enough would deserve the right to be called a seed-lot.

(3) The product we are working with is seed. And, as you well know seeds differ in all those factors previously mentioned as having an effect on a particles ability to move about.

The mere fact that we are working with seed is the reason our problems are more complex than those in most other industries. Seed are alive and they must remain that way if they are to retain their value. Not only must they remain viable, but they must also remain uninjured, if at all possible.

I mentioned earlier that considerable amounts of effort have been expended in the area of blending solid particles. I also stated that this work has been, to a large extent, done in the industrial field. They have developed blending devices for blending their particular types of particles usually particles that can withstand severe punishment without showing signs of fatigue. Needless to say most of these machines are not too well adapted to the seed industry. Because of this, research has been, and is presently being, conducted in the area of designing blenders or blending methods that are adapted to the blending of seeds. That is, blending seeds to a high degree of uniformity. Our results to date are encouraging. But as it is with all research more questions arise than are usually answered.

Some of the findings from this research have already been mentioned. However to refresh your memories they are as follows:

(1) Free-flowing seeds tend to blend more readily than non-free-flowing seeds.

(2) Blending can occur quite rapidly.

(3) Factors such as particle size, shape, density, surface texture, numbers, and electrostatic properties all influence the behavior of the particle in a mass of seed.

(4) A mixture of particles differing in these above mentioned factors or physical characteristics are very difficult to blend to uniformity.

(5) Observations and experience gained in earlier work conducted at the Seed Technology Laboratory indicate that physical characteristics of the seed themselves exert a greater influence on the patterns of movement of seeds in a mass, and uniformity of blends, than do the mechanical components of the blending system.

While these results, supplemented by others not mentioned, appear encouraging to us, I don't imagine that they convey the idea to you that your blending problems are on the verge of being immediately solved. Actually, we believe that effective and efficient blending systems for agricultural seeds cannot be developed until the physical principles controlling the movement of seed and other particles during blending operations, and the limitations imposed by these on blending effectiveness are identified, understood and considered in the design of blending systems. Further, all the factors limiting or influencing the mass behavior of seed and other particles in blending systems must be established.

What the fore-mentioned results should indicate to you is that present day seed blending problems are but a fraction of what they might well be in the not too distant future. Tuesday , Mr. Bill Acheson in his talk on "Quality Control Through Automatic Sampling" mentioned the interest law enforcement people are showing in the use of automatic sampling devices. Should the use of these devices become mandatory, which to me, would be a giant step forward for a farmer purchasing planting stock seed, many more seedsmen will be becoming acquainted with their local seed law enforcement personnel.

We don't want to see this happen any more than you do. Besides I don't want to end on a pessemistic note. We will continue to search for the answers, and perhaps even come up with a blending device on which we will put our stamp of approval. In the meantime, however, many of the problems being experienced in blending, I believe, can be resolved by adopting the following three rules:

(1) Don't attempt to blend lots of seed unless you are reasonably sure of exactly what they contain. This information can best be obtained by analyzing samples drawn at fairly frequent intervals.

(2) Attempt to determine how homogeneous each of the so-called seed-lots entering into the blend really are. Knowing what is in the lot is not enough, you must know whether or not a particular contaminant is uniformily distributed throughout the mass or concentrated in one particular area.

(3) Limit the size of the lots to your blending capabilities.

Following these rules should help you increase your processing profits.

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