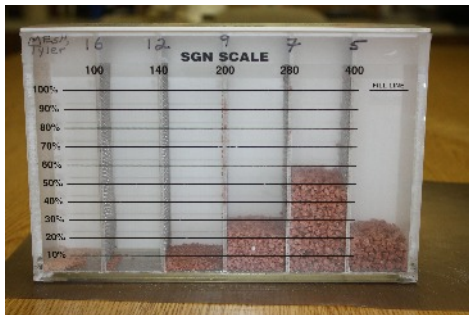


Granular Fertilizer Quality Factors

Modern precision agriculture requires that the right rate of fertilizer be applied to meet the needs of individual fields and/or management zones within a field. Modern fertilizer blending techniques allow nutrients to be custom blended to meet those specific needs. Using soil test results the nutrient needs are accessed and the farm manager can purchase fertilizers blended to meet the exact needs of the crop and soil. Modern fertilizer blending allows the grower to move beyond the one-size-fits-all approach to nutrient management.

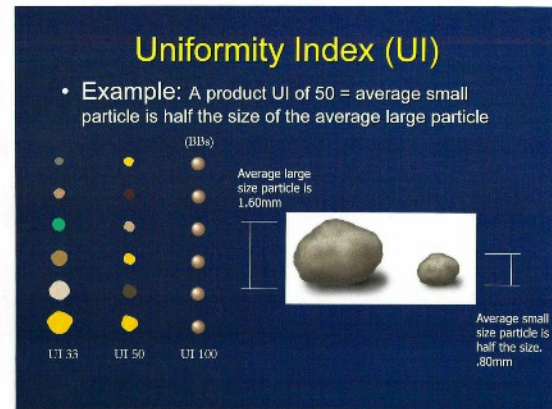
Modern fertilizers are screened to size the granules so that they produce a homogeneous blend that can be uniformly spread across the field or management zone within the field. Several quality factors need to be considered when purchasing quality fertilizers for precision blending. Those factors are estimated by SGN (size guide number) and uniformity index.



The SGN is an estimate of the median granule size in mm x 100. It is used to compare fertilizers to one another according to size and was developed by the Canadian Fertilizer Institute. To calculate SGN, the sieve opening (in millimeters) that retains or passes 50% of the weight of a fertilizer sample is determined and then multiplied by 100. Fertilizers with similar SGN number will blend well together. Fertilizers with dissimilar SGN numbers will segregate while blending, shipping and application.

The second factor is Uniformity Index (UI). The Uniformity Index is a means of determining the consistency the diameter of granules within a lot of fertilizer. To calculate the UI, the size of the sieve opening in millimeters that retains 95% of the sample (or passes 5%) is divided by the size of the sieve opening that retains 10% (or passes 90%) of the sample. This frac-

tion is then multiplied by 100. If all of the granules within a lot of fertilizer were exactly the same size like a sample of BB's then the UI would be 100. In contrast, a fertilizer with a UI of 50 contains a range of variable-sized particles with the average small particle being one-half the size of the average large particle. The average smallest size granule in a fertilizer with a UI of 33 is one-third the size of the largest particle. The chart below illustrates this concept. (FieldScience by Dr. Tom Samples, Dr. John Sorochan and Adam Thom)



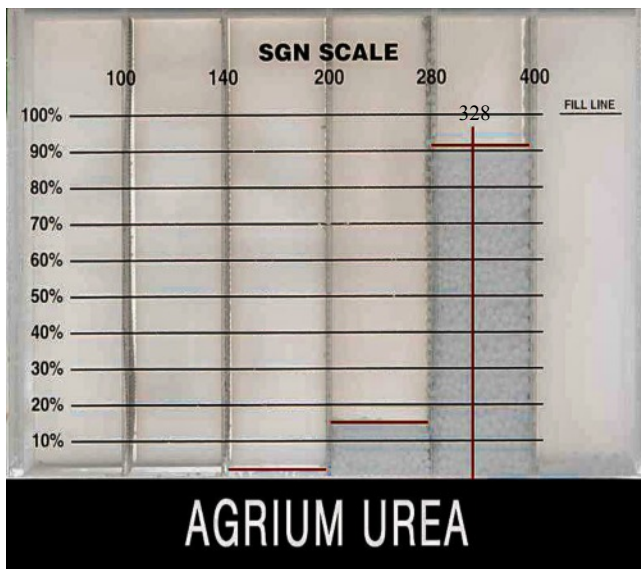
Micronutrients such as zinc sulfate or sodium borates are usually applied to the field in a fertilizer blend since they are applied at relatively small amounts per acre compared to macronutrients such as nitrogen and phosphorus. They must have an SGN and UI similar to the products that they will be blended with to form a homogenous blend and to be applied evenly over the field. Urea and MAP are two macronutrients that are commonly blended with micronutrients.

A survey of 23 published macronutrient SGN's of large international fertilizer companies revealed that the average was 280.

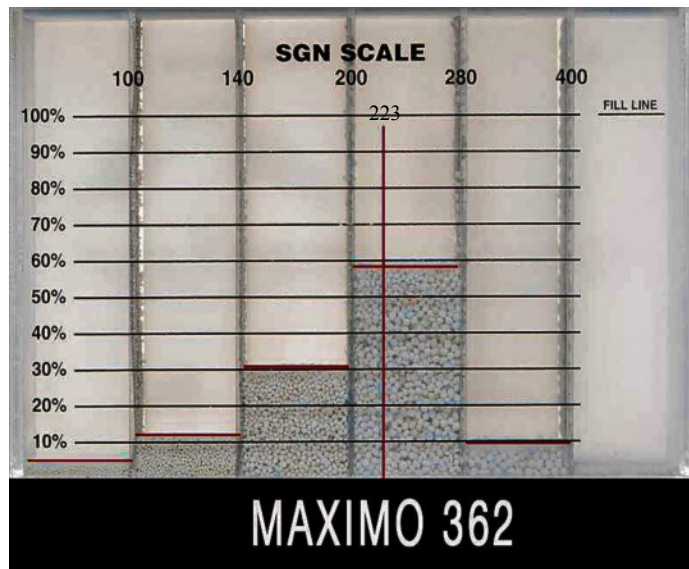
The picture below shows an example of a non-homogenous fertilizer blend that has segregated due to non-uniformity of particle sizes. (FieldScience by Dr. Tom Samples, Dr. John Sorochan and Adam Thom)



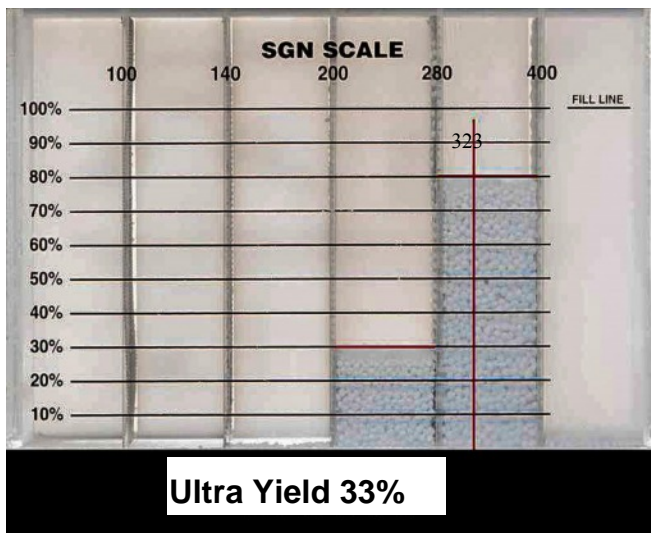
Tom Samples,
Dr. John Sorochan
and Adam Thom)



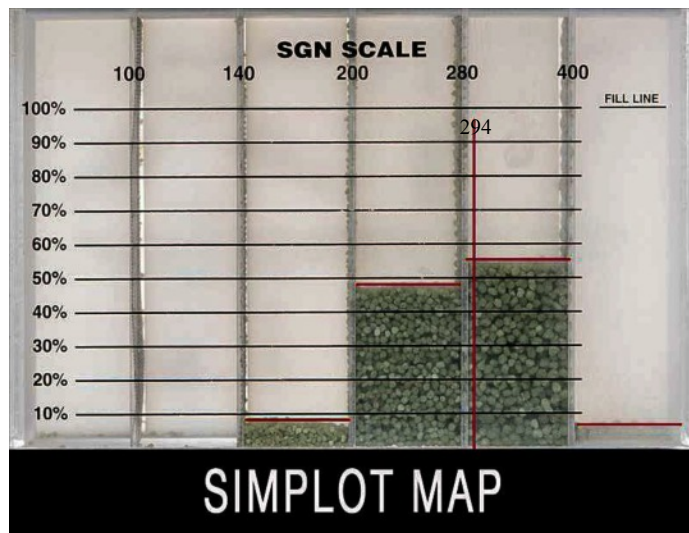
Uniformity index-75



Uniformity index-46



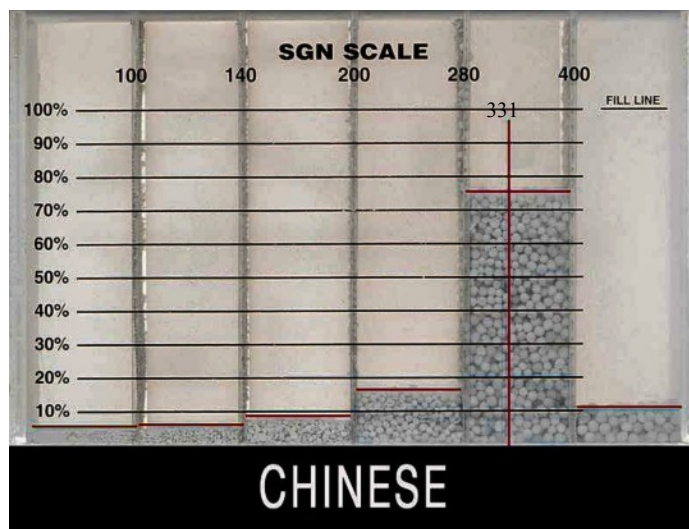
Uniformity index-75



Uniformity index-63

The pictures on this page are of SGN scales containing a variety of fertilizer products. They show the granule size distribution of each product. The vertical red lines marks the estimated SGN for the products. The horizontal red lines highlight the amount of product that passed through each screen. You will note that the Ultra Yieldzinc sulfate, the urea and MAP have similar SGN numbers. This product is screened through 5 on 8. This is a tight screening. These products will blend well together and provide a homogenous blend that will spread well on the field. The Maximo 362 has a smaller SGN than MAP or urea and a low UI. The publish screening for this product is through 6 on 16 which is a wide screen cut.

The Chinese zinc sulfate also has a fairly wide size distribution but a SGN fairly similar to MAP and urea.



Uniformity index- 41

Granule Distribution through Various Sized Screens

Product (200 g)	Screen size in mm						
	1	1.4	2	2.36	2.8	3.35	4
Grams of sample passing through the screen							
Simplot 11-52-0	0	0	15	50	90	180	190
Ultra Yield 33%	0	0	10	10	150	195	200
Maximo 362	0	25	110	160	190	200	200
Agrium urea	0	0	0	10	110	190	195
Chinese (round)	0	0	0	3	35	110	185
Chinese 34.5	0	10	35	50	90	140	185
Chinese 35%	0	0	0	15	70	135	195

Uniformity Index $UI = D_{10}/D_{95} \times 100$

D10=grain diameter (mm) corresponding to 10% passing

D95=grain diameter (mm) corresponding to 95% passing

	10%	95%	UI
Simplot 11-52-0	2.1	3.35	63
Ultra Yield 33%	2.4	3.2	75
Maximo 362	1.3	2.8	46
Agrium urea	2.5	3.35	75
Chinese (round)	2.6	4.1	63
Chinese 34.5	1.7	4.1	41
Chinese 35%	2.5	3.9	64

The data above is for the products whose SGN scale pictures are shown on the previous page. They allow the reader to see the exact amounts of granules passing through the various sized screens. The chart contains more products than are pictured in the previous page.