ilc resources

MINERAL WRITES

FIRST QUARTER 2008

CALCIUM

Feed-grade calcium products are available in a wide variety of particle sizes, from liquid suspendable products to large particle products for laying hen diets.

DICALCIUM PHOSPHATE

Both 18.5% and 21% phosphorus products are available.

SODIUM BENTONITE

Bentonite products are available in a wide variety of particle sizes suitable for any purpose.

POTASSIUM

ILC Resources has both potassium chloride (KCl) and potassium magnesium sulfate (K/Mg/S) available.

All products are available in both bag and bulk.

Status Quo

Status quo is a Latin term meaning the present, existing state of affairs. At first glance maintaining status quo implies stability. On the other hand, there is danger in holding on to outdated principles. There was a time when newfangled automobiles threatened the status quo of "horse & buggy" travel. E-mails and cell phones have dramatically altered "old fashioned" postal mailings and the need for public telephones. Following history's events, many well-positioned examples of *status quo* have been challenged and new ways have replaced *existing states of affairs*. To be sure, proper testing of new ideas must happen before replacing old ones. If new ideas prove sound, then new ways become the new status quo. Life constantly changes, forcing an ever *changing* status quo.

Predictably, humans prefer doing things the way they always have. When human beings are forced into change, they usually resist and question why they must change, if not downright refuse to accept change.

New constructions, expansions and new practices all may challenge ILC's *status quo.* However, is that bad?

For years ILC Resources has inspected trucks at its company-owned facilities to assure a vessel's readiness for product loading. As concerns over food safety mount, the feeding industry is placing more attention on preventing contamination of feed for livestock and poultry leading into the human food chain.

In response to this heightened concern and awareness, ILC modified its inspection procedures. Now the transport hauler accompanies the ILC employee during the inspection. Written documentation noting absence of visible contamination is completed prior to loading products. Although this requires some additional time and effort, it adds substantial reassurance as products leave for customer destinations. Response to this implementation has been positive. But some customers wanted to accept responsibility and requested waivers of inspection after they assessed their risks. Yet our position remains clear. We will continue to deal responsibly with preventing visible contamination of our products as they are loaded. We have also seen that these measures are triggering increased customer awareness of feed safety issues. So, status quo is changing to a new level. That is a good change.

Furthermore, new constructions and expansion plans affect *status quo.* After an extensive investigation, we've decided to expand facilities at both Alden and Weeping Water for greater storage capacity and improved load out of products. Additionally, construction of specific truck inspection and clean out facilities is scheduled to improve those necessary procedures. These projects will occur sequentially over the next couple years. Recognizing need to change the *status quo* and leading the way has always been a part of ILC Resources' ongoing commitment. We believe meeting customer satisfaction by exceeding expectations is paramount to success. We are grateful for customer loyalty and pledge our diligence to remain the trustworthy supplier of mineral ingredients of high quality and safety.

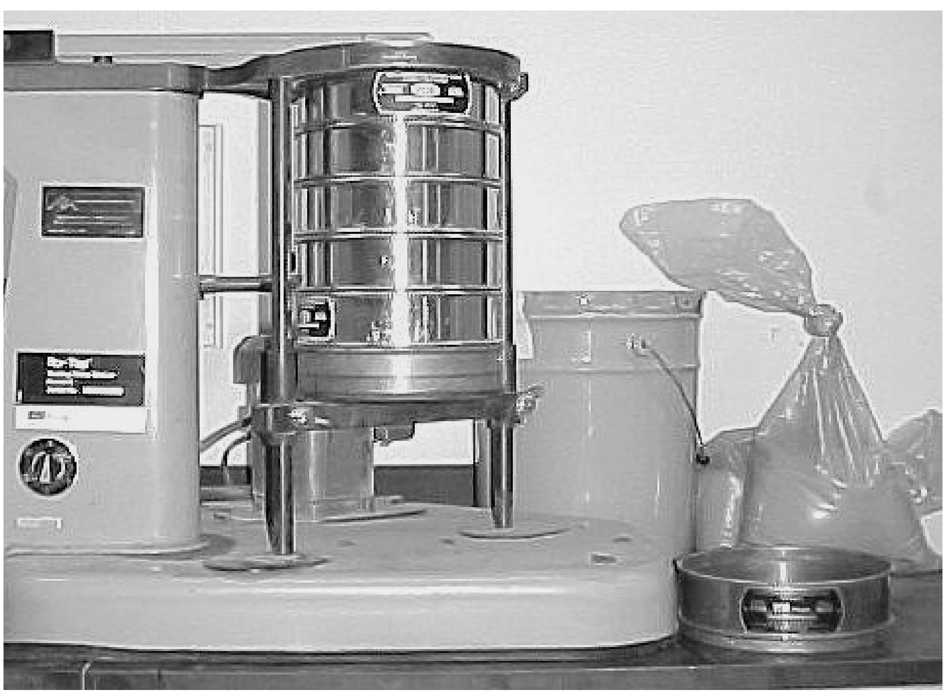
Particle Size Analysis
Sieving gives way to 21st Century Technology

In addition to carefully monitoring the calcium content of our calcium carbonate products, ILC Resources analyzes another important nutritional consideration of these products: particle size profile. Particle size affects ionization rates, which in turn impacts bioavailability. During our processing, consistent production measures and testing enable us to maintain and verify stable particle size profiles. During 2007 we've transitioned our testing operation from sieve screen analysis to laser diffraction.

Sieve screen analysis:

Sieve screen analysis is a fundamental method involving sample material passing through openings in a series of screens featuring descending gap openings. The particle size distribution is then reported as the weight percentage of material sample retained on each of the sieves of decreasing size and the percentage of material passed through the finest size. This method has been the industry standard and used for many years by ILC Resources in tracking specifications of product particle sizing. The series of sieve screens used for testing particle size of material often includes six screen trays—encompassing a sample material's particle size range—and a bottom pan to catch all particles passing through the last screen.

During testing, the analyzer vibrates the stack of screens. A weighed amount of sample is poured into the top screen tray. As the machine vibrates, the sample particles are sieved through the screens, either being caught on a particular screen or passing through to another screen below. After a prescribed sieving time, each screen's captured material is weighed. From that data, the percentage of material on each screen is figured into a composite profile of the tested sample.



Sieve Screen Analyzer

Sieve screen analysis is relatively simple to administer. There are a few drawbacks with this system, however. One is the accuracy of measuring a given particle's size. If all particles measured were perfectly spherical, then sieve screen testing would be close to 100% accurate. But particles such as calcium carbonate are rarely spherical. They are irregularly shaped due to inherent configuration of the mineral itself, plus physical breakage during processing. Vibrating motion of the sieve analyzer may "bounce and wiggle" a larger particle into passing through a screen's openings onto a smaller-sized screen. On the other hand, a smaller particle could be caught on a larger screen's deck and not fall through the openings, depending on how it lies on that screen. Actual particles are not measured but rather their aggregate behavior in falling through a sieve's gap openings or remaining "caught" on a particular sieve's screen is noted.

Further, sieve testing's accuracy is constrained by the practical use of a limited number of screens.

Another drawback when testing finely ground material: sieve screens cannot be made below 500-mesh size. Although that is a very small opening, powdered material often is much smaller. Thus accuracy in defining extremely fine-ground powdered products is nearly impossible to achieve with sieve analysis.

Plus, sieve analysis is relatively time-consuming. An exact amount of sample must be weighed and recorded. After introduction onto the top screen and activation of the machine, sufficient time needs to elapse to ensure complete sieving of material. Our lab testing of $CaCO_3$ products on a six-screen stack takes 30 minutes to complete. To verify results, a second test is often conducted that extends this process to an hour.

Sieve screen analysis has been well accepted and understood as a standard method of particle size measurement, but technology is changing this and ILC is changing too.

21^{st} Century *laser diffraction:*

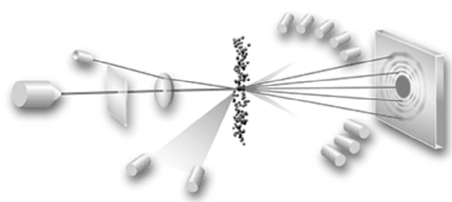
Laser diffraction offers advanced features for measuring particle size. These include greater precision, speed and more detailed results than sieve screen analysis. Laser diffraction has become a leading technology for particle size analysis for all kinds of materials in laboratory and process environments. It is based on the principle that particles passing through a laser beam will scatter light at an angle that is directly related to the particle size. As the particle size decreases, the observed scattering angle increases logarithmically. The observed scattering intensity is also dependent on particle sizes and diminishes in relation to the particle's cross-sectional area. Large particles therefore scatter light at narrow angles with high intensity; small particles scatter at wider angles with low intensity.

The primary measurement that has to be carried out within a laser diffraction system is the capture of the light-scattering data from the particles under study. A typical system consists of:

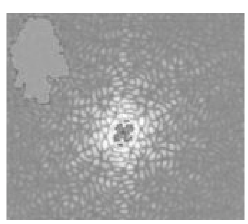
A laser to provide a source of coherent, intense light of fixed wavelength;

A sample presentation system to ensure that material under test passes through the laser beam as a homogeneous stream of particles in a known, reproducible state of dispersion; and

A series of detectors which are used to measure the light pattern produced over a wide range of angles.



The diffraction of the laser light results from the interaction of the light with the particles and can be described mathematically. For a single spherical particle, the diffraction pattern shows a typical ring structure. Irregularly shaped particles scatter light in irregular patterns of direction and light intensity. Using a series of complex mathematical equations, the measurements will accurately reflect each particle's size and shape. The following illustration shows calculated diffraction patterns for non-spherical particles (please refer to the grey particle shape in the corresponding image)



Although the science behind this technology gets quite complicated, repeatability and accuracy of results instill confidence in its ability to measure particle size of $CaCO_3$ products. There are a couple key elements to note in comparing with sieve analysis.

Laser Diffraction (LD) actually takes image measurements of each individual particle, with literally millions of particles passing through the laser light each second. This is in contrast to measuring only a volume of particles falling through particular sized holes in any given screen and eventually being caught on another. The time it takes to measure images by LD is but a fraction of the time required for sieve screening. With LD no exact amount of sample needs to be carefully weighed for testing; using an adequate amount of sample representative of the material being tested is sufficient. Less sample material is needed because each particle is measured and the aggregate sum of all particles tested numbers into the millions. When the computer program activates the instrumentation, the entire test is completed in a matter of seconds, with a report being generated within moments of completion. Two to three representative samples can be tested to verify consistency and thoroughness in a matter of 5-10 minutes. Data is recorded electronically and easily retrieved, allowing for individual sample reporting or for composite reporting.

Sieve analysis is limited by practical constraints of both time and number of screens employed in the test (typically six, with "pan" equaling seven). LD accounts for 31 different points of measurement plotting per each sample test. The size of holes in a given sieve screen can be cross referenced with micron size. But, as explained above, particles larger or smaller may either fall through a screen's openings or be trapped. On the other hand, LD actually measures each particle. With LD technology, mesh size terminology gives way to *microns*. A micron is $1/1000^{th}$ of a millimeter. For perspective, there are 25.4 millimeters in an inch.

When we test our finely ground $CaCO_3$ product (Unical-P), about the best sieve analyzing can do is

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reflect a measurement of particles passing a 200-mesh screen. Two hundred mesh material converts to about 75 microns. In actuality, LD shows that Unical-P particles average closer to 10 microns. Again, LD technology is not about whether particles are captured on a given screen or fall through, but rather the measurement of the actual particles. To further illustrate this difference, let's compare testing of **Shell & Bone Builder** (large particulate $CaCO_3$). By sieve analysis, 89 percent of SBB particles are captured between 4-mesh and 8-mesh screens. It is then referred to as a *4x8 mesh product*. The sieve test shows:

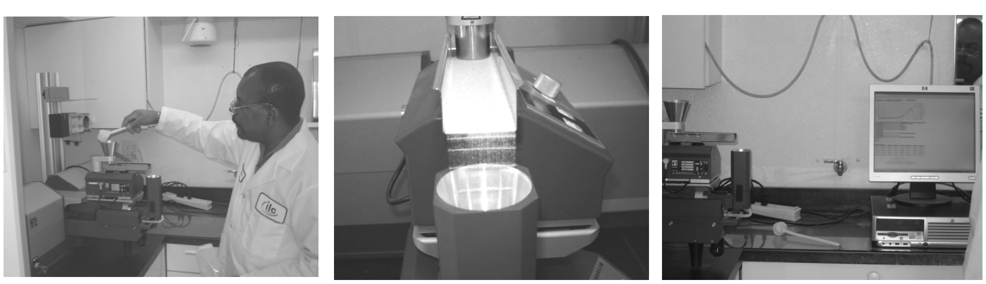
Particle Distribution — U.S. Screen Comparison

4 X 8 mesh product			
Microns	**U.S.Screen**	**%Retained**	**%Passing**
4750	4	5.3	94.7
2360	8	83.8	10.9
1700	12	7.2	3.7
1180	16	2.0	1.7
850	20	0.6	1.1
75	200	0.4	0.7
	Pan	0.7	
Total		100.0	

By laser diffraction analysis, the same product shows a more complete range of actual particle sizes, expressed in microns. *2550-4350 microns product*

Particle Size Measurement — Laser Diffraction
Cumulative Distribution (% Passing through...)

Microns	%	Microns	%	Microns	%
45	0.64	300	0.66	2150	7.43
55	0.66	375	0.66	2550	13.99
65	0.66	450	0.67	3050	28.24
75	0.66	525	0.71	3650	55.08
90	0.66	625	0.79	4350	89.80
110	0.66	750	0.93	5150	99.63
130	0.66	900	1.13	6150	100
155	0.66	1050	1.40	7350	100
185	0.66	1250	1.85	8750	100
215	0.66	1500	2.66		
250	0.66	1800	4.22		



ILC Resources' Sympatec Laser Diffraction Analyzer

Because of the nature of calcium carbonate particles and the accuracy of LD testing, ILC Resources invested in the use of Laser Diffraction technology in 2006. All ILC Resources' mineral ingredient products were tested and monitored by LD throughout 2007. We continued cross-referencing products with sieve analysis throughout 2007. It is important to remember that there have been no processing changes in the production of any products. Consequently, *actual* particle sizes of each product have not changed. The only difference observed among products is accounted for by the two analyses protocols—sieve screen testing versus *Laser Diffraction*. On the average, large particulate and granular $CaCO_3$ products exhibit bigger measured particles with LD analysis versus the older method of sieve screening. Finely ground material can now be accurately defined with LD and is characterized as smaller particles than reported using sieve testing. The products themselves remain the same. The accuracy of testing has greatly improved.

Laser diffraction technology supports ILC Resources' production of products by improved particle-size monitoring while also adding immeasurably to the database of information on finished products.

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