

FIRST QUARTER 2010

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.

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Consistency of ILC Resources' CaCO₃

Consistency is an interesting word. Even without a clear definition, just speaking or reading the word conjures up thoughts of stability and well sought after results time and time again. However, change is all around us. We've all heard it said that *change* itself is the only constant. Thus, in an ever-changing environment, making reliable predictions is difficult, and making plans is challenging at best.

In feeding livestock and poultry, adjustments are always needed when formulating diets to optimize performance and achieve repeatable results. Regardless of what performance goals are targeted, nutritionists are faced with challenges of changing conditions. Whether formulating for milk production in dairy, eggs in laying hens, or meat production in pork, beef or broilers, annual differences in many feedstuffs produce varying results. Predictably, adjustments need to be made in both energy and protein fractions of the diet with each year's crops, corn and soybeans being the most noticeable. By-product derivatives from these two or from other sources vary annually, as well as by different locations and differing processing methods. The more adjustments, the more the challenges become to formulate diets properly. These examples, along with a host of others, must be accepted as a given to deal with. Is there any part of dietary formulations that IS consistent?

Before addressing this question, we should pause to ask what we mean by **consistency**. According to Webster's Dictionary, consistency is defined as "being in agreement or harmony." Additionally, it is "conformity with previous practice." *Reliability or uniformity of successive results to maintain a particular standard with minimal variation* is perhaps the benchmark measure of consistency for our present purposes. With this understanding imprinted in our thinking, yes, there is a contributor to dietary formulations that is consistent and reliable. ILC Resources' CaCO₃ products of various gradations ranging from coarse particulates down to large and small granules and even all the way down to finely ground powders are dietary calcium contributors of exceptional consistency. This may sound suspiciously like a marketing *sound bite*, but it happens to be true. Let us examine what we base this claim on.

What measurable components of CaCO₃ products are important considerations for feeding to livestock & poultry? There are five parameters which give us meaningful data in three key areas. The three are calcium content, measurements indicating performance, and product density measurements.

The first to consider is calcium content. Bedrock to this ingredient is its contribution of calcium (Ca) for meeting this important nutrient requirement. From bones and teeth to eggshell production to milk production to an abundance of additional metabolic needs, either for structural or functional purposes, calcium is the single largest mineral needed by any species. A fairly wide array of feedstuffs contains calcium, but never enough

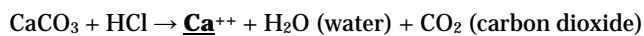
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individually or in combination to meet adequately any animal's requirements. Supplemental calcium is dictated in all diets. Thus, calcium carbonate is a vital ingredient to meet that need. ILC Resources tests and monitors calcium content daily on production sampling and tests composite samples of all products monthly.

In addition to calcium content, performance measurements encompass three parameters helping to target successful animal performance. First, all products are measured for particle size definition and consistency. Three years ago we adopted *laser diffraction* technology to monitor particle size more accurately. This technology allows for more complete data depicting a clearer picture of each product. Second, knowing each product's range of particles allows for determination of exposed surface area of products. Knowledge of particle size and exposed surface area combine to help predict each product's rate of digestion, leading to subsequent release of ionized calcium (Ca⁺⁺) for absorption and utilization. Third, each product is measured in the lab (*in vitro*) for its relative acid solubility rate. What is acid solubility and why is it important?

Calcium carbonate (CaCO₃) reacts with hydrochloric acid (HCl) in the stomach to release ionized calcium:



Knowing the speed of this reaction will help us interpret how well a given product might best suit achieving optimal utilization of Ca, thus, to best meet a given production goal. Not always is the fastest solubility rate the best. Coarse particulate CaCO₃ slowly reacts in acid due to its large particle size but corresponding small surface area for exposure. This material works well in laying hens because egg production needs a slow release of Ca⁺⁺ for eggshell production throughout the day and not just at feeding times. Since chickens have the gizzard to deposit pebble-sized particles, the particles will remain available for digestion round the clock. On the other end of the spectrum, small granules to finely ground powders react much quicker, releasing Ca⁺⁺ rapidly, which tends to suit best for species and situations where digesta rate of passage is fast. There are a host of conditions covering multiple species and various production needs that call for CaCO₃ particles from large granular to small granular with correspondingly lower acid solubility rates to higher solubility rates. The reaction equation above is measured in our laboratory with a small sample of CaCO₃ product introduced into a beaker of dilute HCl solution for a short specified period of time. This procedure mimics *in vivo* digestion in the animal.

What particles left undissolved after the test period are weighed back, and the amount of dissolved sample is calculated. The portion of original sample that disappeared

is the measure of a given product's solubility. As indicated above, finely ground powders solublize very rapidly, and coarse particles are slowly solublized. Gradation particles from large to small granules have intermediate solubility rates.

These three measurements of particle size, surface area, and acid solubility allow for better interpretive evaluation for proper product use.

Lastly, each gradation product's material density is charted. This measurement is two-fold. We determine its value as both loose and packed. To illustrate, a product's density that is loose best describes its value as it is just being loaded into a vessel (truck or bin); whereas, its packed value would describe its density as it either sits in the bin or just arrives, yet on the truck after the particles have been shaken and settled. These measurements are reported in pounds per cubic foot. Often we are asked for this data, perhaps to help determine dimension requirements for a storage bin. Other applications may include the spreading of our material on a surface area to a certain depth as in the case of Barnlime or bedding lime material.

To monitor tangible consistency of CaCO₃ products, these measurements are conducted daily-weekly-monthly. If any abnormalities show, production personnel can readily determine if a mechanical malfunction exists and make necessary adjustments or repairs to bring back into conformity. We also maintain databases on each product for dissemination of pertinent information. We maintain product spec sheets on an annual basis, compiling samples tested throughout the year for composite analyses. Comparing one year to the next is taken from many data points of information to give a good barometer on each product's tracking.

It is heartening to observe and compare products within years and among successive years to discover how consistent those measurements remain. We need to understand, however, that calcitic limestone rock harvesting and production into gradation products are always in a dynamic state of continuous flow processing. Thus, the process dictates continuous monitoring and compiling of measured informational data. Occasionally, production changes do need to be adjusted, resulting in some changes within the processing flow. The changes may be slight, but are nonetheless necessary. Mostly, these may reflect small adjustments in particle size due to improving mechanical efficiencies. Other parameters are closely monitored to maintain overall uniformity of product specifications.

To quantify these points, the small granular product Unical-S from both ILC Resources' company plants at Alden, IA, and Weeping Water, NE, are presented in Table 1 spanning the last four years.

Table 1 -- Unical-S:

Plant	Year	% Ca	% CaCO ₃	Particle	% Acid Solubility	Bulk Density		Surface
Location				Size		Loose	packed	Area
				<i>microns</i>		Lbs/cu.ft.		Cm ² /gm
Alden	2006	39.35	98.38	187	57.89	83	93	374
	2007	39.24	98.10	189	59.83	83	93	363
	2008	38.82	97.05	191	60.88	83	92	376
	2009	38.88	97.20	181	58.43	84	91	393
	Ave:	39.07	97.68	187	59.26	83	92	377
Weeping	2006	38.70	96.75	-	47.77	91	100	190
Water	2007	38.69	96.73	412	46.72	90	99	153
	2008	38.74	96.85	391	47.39	90	100	190
	2009	38.72	96.80	464	46.60	91	102	176
	Ave:	38.71	96.78	422	47.12	91	100	177

Three years of data on FreFlo is presented in Table 2. FreFlo is a blend of large to small granular particles. These two products represent a major portion of all calcium products used in livestock feeding.

Table 2 -- FreFlo:

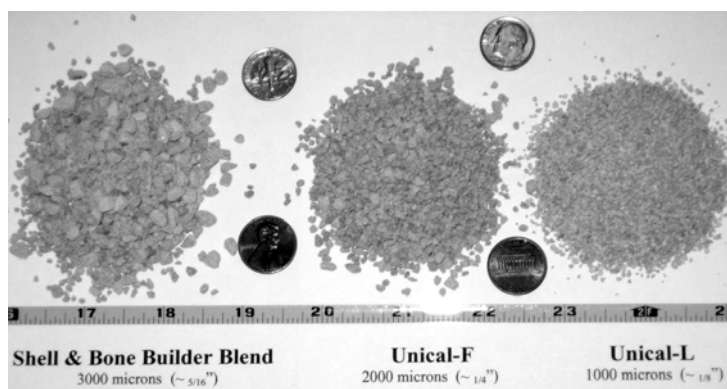
Plant	Year	% Ca	% CaCO ₃	Particle	% Acid Solubility	Bulk Density		Surface
Location				Size		Loose	packed	Area
				<i>microns</i>		Lbs/cu.ft.		Cm ² /gm
Alden	2007	39.06	97.65	670	54.21	92	103	146
	2008	38.83	97.08	550	54.29	92	103	173
	2009	38.85	97.13	536	54.40	92	100	179
	Ave:	38.91	97.28	585	54.30	92	102	166
Weeping	2007	38.79	96.98	850	47.87	95	104	102
Water	2008	38.83	97.08	785	47.11	95	106	110
	2009	38.81	97.03	815	45.58	95	105	106
	Ave:	38.81	97.03	817	46.85	95	105	106

Our interpretation concludes that these data verify uniformity from one year to the next in all parameters. The evenness among measurements ensures repeatable performance of products. In other words, the data fits our definition of **consistency**.

Particle Size CaCO₃ Selection for Minerals *Weather Proofing Considerations --*

Weatherproofing of *free-choice* feeding of minerals suggests two properties to consider. One is dealing with the wind blowing exposed mineral component particles out of any container such as mineral feeder - or in the end of bunk or turned tire or on the ground. In this situation, larger particles would be heavier and present less surface area to exposure, thus, reducing the potential for being blown away. Depending a bit on a particular *calcium carbonate* (CaCO₃) product's particle size, material densities run in the neighborhood of 90-100 lbs per cubic foot. Heavier dense material alone resists blowing versus lighter material. The other aspect of weatherproofing is exposure to moisture -- rain and snow. In this situation, as far as CaCO₃ goes, there are no real concerns of dissolution because CaCO₃ is insoluble in water regardless of particle size. However, washing away of particles would be greater with small particles than with coarser material.

Inquiry of ILC CaCO₃ products for use in weatherproofing *free-choice* range mineral application has ranged from coarse particulate sizes down to smaller granular particles. The three products of **Shell & Bone Builder Blend** (~ 3000 microns), **Unical-F** (~ 2000 microns) and **Unical-L** (~ 1000 microns) encompass this range.



Average Particle Size (Microns)

The *coarse* particle sized products of SBBB and Unical-F are typically used in the laying hen market as a large particle calcium source that readily deposits in the gizzard for slower solublizing and thus releasing Ca at a slower, more prolonged rate. Unical-L is a large granular product that has common use in a variety of other livestock feeds.

On visual inspection, these *coarse* products would have appeal for "weatherproofing" mineral. Both resist wind separation and certainly both would not dissolve or likely wash away in the rain. However, there are a couple inherent concerns we should acknowledge. First of all, because these coarse particle products' rather slowly dissolve in stomach acid, rate of digesta passage -- especially high roughage -- would tend to result in a fair portion simply passing through the GI tract and ending up in the manure. Historical studies in the 80s suggest for cattle effective particle size ranges of 1000-1200 microns (large granular) and down as more effective for digestion and subsequent absorption and utilization. The other concern is simply the size and weight of coarse particle material. In a high forage diet resulting in a dense mat of digesta in the rumen, the likelihood of most of the large particles being carried along to the abomasum is fairly high. However, those larger very dense heavy particles can slip through this mat and settle in the rumen before passage on to the abomasum. Little or no digestive reaction occurs in the rumen to release calcium (Ca). Intact particles need to reach the acidic conditions in the true stomach (abomasum) to react with hydrochloric acid to release ionized calcium (Ca⁺⁺). This would indicate that the largest particles in SBBB may not adequately pass to achieve optimum utilization.

Additionally, even if sufficient coarse particle CaCO₃ does pass into the abomasum, solubility factors need to be considered more closely. CaCO₃ reacts with hydrochloric acid (HCl) in the abomasum to release ionized Ca⁺⁺. This reaction of acid solubility is basically a function of surface area exposure to acid. We measure acid solubility rates of our products in a timed lab test. A sample of CaCO₃ is reacted in HCl solution for ten minutes. Product disappearance then is the measure of solubilization. The amount of measured disappearance varies with different particle size. Even though one cannot apply these percent solubilities to exact *animal* conditions, they do give us a measure for relative comparisons. The coarse products SBBB and Unical-F test 41% and 43% acid solubility, respectively. The granular product Unical-L tests 48% *acid solubility*. Thus, more Ca⁺⁺ will be available for absorption and utilization more rapidly from the granular product than from the larger coarse products. Rate of passage allowing time exposed to stomach acid becomes the critical determination of a product's effectiveness.

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One last comment, the most effective range of CaCO₃ particle sizes may not mean much if the material is blown away in the wind or washed away in the rain. The bottom-line suggests there may be other factors to consider than simply the most effective range of particle sizes for animal utilization.

Particle sizes of other mineral ingredients will influence choice of CaCO₃

product too. As an example, calcium phosphates (18.5 or 21.0) typically range in particle size similar to Unical-L. If other mineral ingredients are in larger prilled form, that condition may dictate a different CaCO₃ choice. Maintaining homogeneous particle sizes in a mineral mix is certainly important to reduce separation of particles.

Thus, with some reservations due to lessening bioavailability, it still may make sense to use a large granular to medium coarse particulate CaCO₃ for weatherproofing of minerals. Of the three products discussed here, Unical-F and Unical-L would lend themselves better for both animal and weather considerations. For strictly animal performance, Unical-L tops this field.

(Imagine... Continued from back page)

Then you realize you were only having a nightmare and start to breathe easier. You even start to feel energized. You hit on the same idea as in your dream and decide to take your family out to breakfast for real this time. In today's life here in Midwest U.S.A. you will still be able to enjoy that breakfast all of you in your family expect. But for how long? We need to wake up to reality and recognize our world could change dramatically and not for the better. Today we take much of the production of eggs, meat and milk products for granted.

After all, we buy our food down at the grocery store, don't we? The food cycle for these food items begins with animal agriculture at its hub, caring and rearing livestock and poultry. The many spokes emanating outward from that hub support both ends of the wheel, finally culminating in affordable nutritious meat, eggs and milk to

feed people. Those of us involved in this food production chain are being seriously jeopardized. Not only are we in the "business" affected, but everyone who eats is being jeopardized.

It isn't some nebulous *factory farm* that conjures up strong negative images to an unsuspecting populace. These ill-reputed *factory farms* don't really exist. Those sets of modern buildings we see throughout the countryside housing today's livestock and poultry are owned and operated by farmers, not *factories*. Farmers have always been responsible in their farming practices and are good stewards of their animals if they want to stay viable in their farming business. Otherwise, they would be biting their own noses off to spite their faces. Farmers are hardworking folks, raising families and trying to earn a living like most everyone else in America. They also play the vital

role of feeding a hungry world, us included.

The loud uninformed clamor from *animal rightists* just plain shows they do NOT know what they are talking about. They do not want solutions for better animal care. It appears they want to propagate and proliferate the funding of their own existence and profitability – PERIOD.

We cannot afford to be duped on this issue. Farmers have respect for their animals and are devoted to providing good animal welfare. They don't just shout a good game. They live it! In the process, we are fed well and inexpensively because of these responsible farmers' efforts. Tell someone you know or run into about this "nightmare." The dangerous reality is that it is not an episode in *The Twilight Zone*, but rather a distinct possibility starting to happen already.

Imagine....

(an editorial)

Imagine if you woke up some Saturday morning maybe in the spring and you don't have to go to work. The particularly nice morning makes you just plain feel energized. Instead of your usual routine, you decide to take the family out for breakfast – perhaps Perkins if nearby or even the café up town. You pack your wife and kids in the car and head out for breakfast. The drive may be a short one, but you feel especially alive with your family along as you look forward to a good breakfast.

After getting in the café and seated, the waitress brings menus over and takes your drink order while you decide what you want to eat. You and your wife ask for a cup of coffee and some orange juice while the two younger kids order milk, and your teenage son asks for a coke instead. You have enough time to decide on what you want as the waitress returns with water for all plus coffee and orange juice as well as the coke, then asks for your order. You think it seems odd she forgot the milk, but she'll surely be back – hands were probably full. She then takes your orders. You want a big slab of ham along with two eggs – over medium – hash browns, wheat toast and a side of a couple *dollar* pancakes; “real butter too, please.” Your better-half just orders two scrambled eggs and a side of bacon, plus whole wheat toast. Your youngest boy orders *French toast*. Your daughter asks for pancakes, “blueberry, please.” Then, your oldest son wants a three-egg omelet, side order of pancakes, large milk, after all, and a double side of sausage. Obviously, he's out for sports and is in training. You all sit back and are smiling in eager anticipation of the food while you share conversation amongst each other.

Finally, the waitress comes back to your table with just the toast and hands out jelly packets along with more coffee and water for refills. She leaves and says, “Enjoy, folks...”

“Wait a minute, for crying out loud! Where's the rest of the food we ordered? Is it still on the way, and why is it taking so long?”

“Well, we don't really have those items anymore” comes the nervous reply. “We could bring you some fruit if you like.”

About then the owner comes over and sits down with you. He says, “We are out of eggs now after the clamor from the animal rightists got some new laws passed. Seemed like it was a good bill at the time – even helped vote it in although I thought it was about cats and dogs, not about livestock and poultry. Egg farmers can no longer raise hens to lay eggs profitably so they're going out of business. Our café would be able to get eggs shipped in, but at \$14.50 a dozen, so we couldn't afford to use eggs anymore. So much stink was raised by HSUS and PETA over what they called “Factory Farms” that good people like Bill and Mary just outside of town had to sell off their hog farm. They're not raising pigs anymore. We'd have to ship in bacon and ham and sausage from overseas if we wanted to keep them on our menu. We just can't afford to do so. This has been happening all over our county and lots of other places too. High feed cost for cows has put most dairy farmers out of business, and people are desperately hunting for some kind milk substitutes. There just aren't any that replace real milk very well. Pancakes and French toast along with muffins and biscuits, plus desserts like pies, chocolate cake and donuts are either too costly or we just can't get the needed ingredients. We can't get milk and cream anywhere. Very little ham and bacon are available, and having a juicy steak is strictly a meal of the past. Haven't you noticed the *T-Bone Steakhouse* east of town is closed now? The cold hard reality facing us is that we are forced into becoming vegetarians. Now, I have nothing against folks who choose their own vegetarian lifestyle, but what about those who still want to eat meat, drink milk or enjoy scramble eggs? Not possibly anymore...! Besides, what's around just isn't affordable. By the end of the month I expect to close too.”

Imagine. You suddenly wake up in a cold sweat from dreaming, half expecting to see Rod Serling in the corner of your bedroom saying you've just entered the Twilight Zone.



(Continued on page 5)