

Micronutrients

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TBCC Notes

Technical Information for Users of *Micronutrients TBCC*[®]

Feed Mill Issues – Flow Properties and Inventory Control

Micronutrients TBCC[®] (TBCC) is an improved source of copper for animal feeds. Compared to copper sulfate, TBCC is more concentrated, flows better and is less irritating to workers handling the product. However, operating personnel need to be aware of its different properties to take full advantage of the available savings.

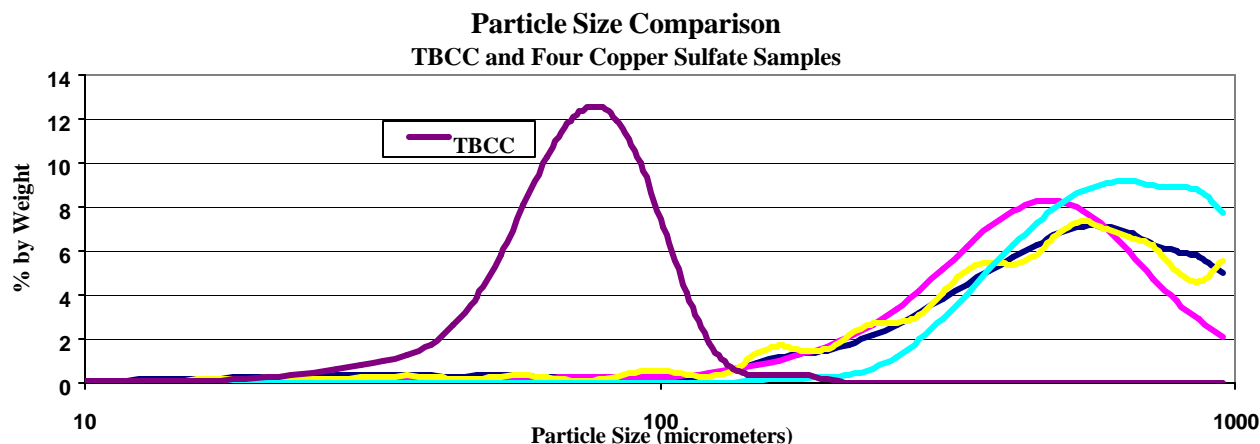
Copper sulfate is hygroscopic – it draws moisture out of the air – and therefore its assay actually changes depending on relative humidity. This same property causes it to recrystallize. The result can be small lumps removed by the feed mill’s cleaner screen (under-dosing copper), larger lumps that clog the micro bin auger (downtime and worker exposure), or, in the worst case, wasted time for return of a shipment of hardened material.

Because copper sulfate is an acid, it is very irritating to skin, eyes and mucous membranes. Workers unclogging a micro bin or auger can get nauseated from exposure to the dust. By contrast, TBCC is a neutral compound and thus inherently less irritating in the case of accidental contact. Since it is non-hygroscopic, there is little probability of needing to unclog equipment.

Flow Properties

Users report that TBCC “flows like water”. This obvious improvement over copper sulfate is caused by two factors:

1. Due to acidity and hygroscopicity, copper sulfate crystals tend to have a “sticky” surface.
2. TBCC particles have a smoother, more spherical shape, are smaller and have a much tighter size distribution. By comparison to the sulfate salt, they behave more like marbles.



Inventory Management

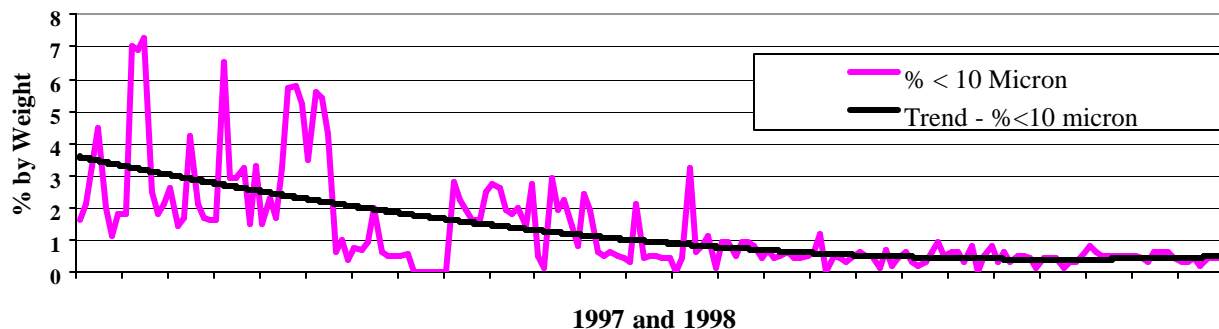
After switching to TBCC some mills have experienced problems reconciling consumption against inventory measurements. In each case, these problems have been eliminated by fairly simple adjustments in procedures and/or equipment. Compared to copper sulfate, TBCC's copper concentration is higher by a factor of 2.3 and its bulk density by 1.3 (these factors are multiplicative). Any measurement errors or losses have a correspondingly bigger material management impact. The following are some contributing factors mentioned by various users.

- **Micro feeders need to be adjusted**- not only to feed less but also to shut off or reverse earlier. The flow-through experienced with all products is more significant with TBCC. The higher density, concentration and flow mean that a given volume of run off and/or flow-through contains 3 times as much copper.
- **A lip should be welded across the bottom of the auger tube** - TBCC's excellent flow properties can cause more volume of flow-through. This effect is exaggerated if vibration is present. This can be eliminated by welding a small dam across the bottom half of the outlet end of the auger tube.
- **Inventory measurements should be taken at consistent levels** - Measurement of inventory in the micro bin is typically done by measuring down from the top. The volume calculations need to be adjusted for the higher bulk density of TBCC (110#/cu.ft.). In addition, since the sides of the bin taper toward the auger, a volume vs. height chart needs to be used that is specific for the bin in use. Since any error here is about 3 times as significant with TBCC, it is best to take the measurement each time with the bin nearly full or nearly empty.
- **Damaged bags should be repaired immediately** - Spillage losses become more significant with TBCC. A loss of 20 pounds of copper sulfate may be only 4% of a day's consumption in a large mill. With TBCC, the same 20 pounds would represent more than 9% of daily consumption. Because it flows so well, even a small hole can result in considerable loss when a bag is moved around in the mill. Therefore any bag punctures (i.e. for QC samples) or leaks should be taped immediately.

Dust Issues

When TBCC was first introduced to the market, it had a significant dust component – defined as particles less than 10 micron. Particles larger than 10 micron do not float in the air or behave electrostatically. Improvements in the manufacturing process have steadily reduced this fraction.

Reduction of Fines in TBCC



The level of dust in TBCC is currently lower than in most samples of domestically-produced, feed-grade copper sulfate evaluated in our laboratory, including three of the four in the earlier graph on particle size distribution. Mills using TBCC report that workers find it far more comfortable to handle than copper sulfate.