

**Odor and Flavor - Mary An Godshall, Sugar Processing Research, Inc.**

A number of types of odors have been noted in white beet sugars. In rough order of importance they include:

1. Volatile fatty acids - principally butyric and isovaleric acids - giving a cheesy, fermented, sour mash odor - from microbial activity..
2. Earthy odors - beet like, moldy, musty straw odors - possibly due to native soil organisms - from soil adhering to beets.
3. Green plant odors - floral, citrus, plant like, geranium odors - from leaves and tops.
4. Ammonia - from the breakdown of nitrogenous compounds in the juice.
5. Chocolate, nutty - from reactions of sugar with other process compounds.
6. Caramel, sweet, browned - from thermal breakdown of sugars in the process.

The principal factor in the odor in sugar is, of course the composition and concentration of any impurities on the crystal surface. The intensity of odor is also impacted by the temperature of the sugar. Length of time in storage can influence the odor, particularly of odor components resulting from microbial activity.

What can we do to limit odor in sugar shipments?

1. Extra washing in the white centrifugals. Odor is directly associated with the amount of impurities left on the surface of the sugar crystals.
2. Improve quality of wash water. Use an alternate source, or treat with activated carbon..
3. Dilute the odor by blending with higher quality sugar.
4. Aerate the sugar to disperse the odor. Possibly use compounds like ozone.

There is a need for research in the area of odor - its cause, its nature and its elimination. Also on the impact (perceived and real) of sugar odor, and related flavor on customer's products. Odor is the principal differentiation between cane and beet sugar. Odor has a potential to limit sales and prices relative to the "better" smelling cane product.

**Microbiological Issues - Mike Fowers, Amalgamated Sugar Co.**

Granulated sugar is relatively free of microorganisms. This is true in large measure due to the very low water activity or water vapor pressure found in granulated sugar. Water activity is a measure of the free water available for use by microorganisms. Sugar solutions greater than about 70%DS have a water activity so low that most microbiological activity stops. Even though there is no growth there may be a contamination potential. Sugar may still carry sufficient numbers of organisms that customer's products are adversely affected.

How do these microorganisms get into the sugar? There are a number of modes of infection -

1. Inadequate standard liquor filtration. The standard liquor filters are the only tool available to remove spore forming organisms that are not killed by process temperatures.

Research has shown that we need to remove particles as small as .5 micron. If the filter aid used is

too coarse, or if cracks are allowed to develop in the cake high thermophilic counts will result.

2. Poor maintenance and housekeeping around white centrifugals will result in contamination being carried into the sugar. Condensate running into the basket may carry contamination into the sugar. Openings may allow airborne organisms entry.

3. Poor filtration of air to the granulators can result in contaminated product. Filters must be properly installed in well maintained housings. The porosity of the filter media must be tight enough to exclude airborne organisms.

4. Sugar handling equipment must be tight and dry to exclude airborne contamination and limit the accumulation of any moisture which would promote microbiological growth and contamination. Each time sugar is handled or transferred the potential for microbial contamination increases.

5. An important factor is the packaging used - this includes everything from a 1# pouch to a 200,000# bulk rail car. How well these containers are stored and maintained has a significant impact on the final quality of the sugar.

Microbiological quality is becoming more and more important due to increased customer awareness. Both retail and industrial users are raising food safety issues. Not only are process related programs like HACCP required, but environmental testing of our sugar production and handling areas is being requested. The level of testing has increased from the traditional Canners and Bottlers tests for total bacteria, yeast and mold to specific tests for pathogenic organisms.

#### **Chemical Issues - Bev Jacobson, American Crystal Sugar Co.**

Because of sugar's intrinsic chemical purity only a few chemical parameters are of interest to users. Assay, or % sucrose, for example is only of concern to a few specialized users like the pharmaceutical industry. The same is true for trace impurities like chlorides, sulfates and heavy metals.

Sugar is frequently tested for total ash, but the common industry limit of 0.015% is only an issue when standard liquor colors are very low.

Color is the major chemical variable of interest to sugar users. In a few applications sugar color may impact final product color, but a more important aspect is color's perceived relationship to sugar purity - lower sugar color being equated to higher purity sugar. Sugar color is primarily a function of the color level of the standard liquor and the degree of white centrifugal washing. It is also impacted by time and temperature in storage.

For many years the beet industry's *de facto* sugar color limit has been 35 IU (ICUMSA Units). The cane industry raised this limit into the 40 to 45 IU range a decade or so ago. American Crystal followed this trend recently, and raised its color standard to 45 IU with little negative response from the trade. Following an initial letter informing customers of the change, customers with color limit problems were worked with on an individual basis. Many customers were found to be using the 35 limit out of tradition, rather than any real product need.

#### **Physical Quality Issues - Charles Schmalz, Amalgamated Sugar Co.**

Today's sugar customer has four primary concerns as far as the physical aspects of sugar quality -

Consistency, Conformance, Convenience, and Confidence.

Customers want Consistency - They want the same product , shipment to shipment. They want each delivery to behave exactly like the previous one. They don't want to have to change their process to accommodate variations in sugar granulation or other properties.

Customers want Conformance to their specification (or to your's). If you agree to their set of parameters, they expect you to meet them. Likewise, if you state you will produce sugar meeting a particular set of limits, they feel you have an obligation to do so.

Customers want Convenience - They want to use the product with no hassle or special handling. They don't want to fight lumps, to clean up after leaking bags, to put up with excessive dust. They want sugar that is free flowing and uncontaminated. They want bulk RR cars that open easily and empty completely.

Customers want Confidence - They want to be comfortable that the sugar is safe and wholesome. They want it free of foreign material and harmful substances. They want you to have metal protection, a HACCP program, and a documented pest control program. They want assurances the sugar has not been adulterated or exposed to dirt and filth.

The bottom line is - sugar is a food product and must be treated accordingly. Our industry is faced with the challenge to in a dirty root and produce a pure, wholesome compound. They then have to protect it against contamination and prove this to the customer.