Sensegood spectrophotometer for color measurement and quality control in salt & sugar

Salt:

Salt is an essential element of life which our body can't produce. It has several health benefits if consumed in moderate amount. Salt also acts as food preservative apart from enhancing flavor, color and texture of the food.

Photo: Salt varieties. Image source: Saltworks, Woodinville, WA, USA. seasalt.com

Nurtured by the power of nature and time, salt's color and taste reflect the distinctive terroir and origin. There are salts beyond white sea-salt that are worthy of being precious jewels in the culinary world. Himalayan pink salt, Cyprus black salt, Persian blue salt, Hawaiian red Salt, French grey salt, and rock salt are few of them which account for niche customer segment.

Sugar:

Sugar has been produced in the Indian subcontinent [1] since ancient times and its cultivation spread from there into modern-day Afghanistan through the Khyber Pass.[2] Sugarcane was a native of tropical Indian subcontinent and Southeast Asia.[1][3]

Photo: Sugar lumps. Image source: Pixabay user Maxmann

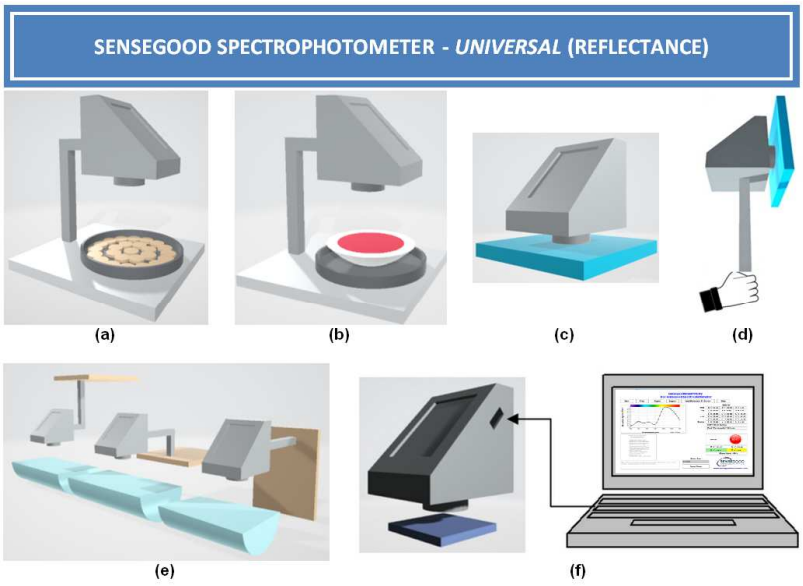
Sugar is an important part of human diet, making food more palatable and for providing energy. After cereals and vegetable oils, sugar derived from sugarcane and beet provides more kilocalories per capita per day on average than other food groups. [4] According to one source, per capita consumption of sugar in 2016 was highest in the United States, followed by Germany and the Netherlands. [5]

Through adjustments in the process of cleaning, crystallizing and drying the sugar, and varying the level of molasses, different sugar varieties are possible. Sugars of various crystal sizes and colors provide unique functional characteristics that make the sugar suitable for different foods and beverages. Sugar color is primarily determined by the amount of molasses remaining on or added to the crystals, giving pleasurable

flavors, its value to some consumers is a richer flavor than white sugar. [6] Heating sugar also changes the color and flavor (caramel).

Instrumental color measurement:

Maintaining the authenticity of true color representation is the first preference for any producer. In the process of visual color match; there are factors like eye fatigue, aging of the eye, stress, individual's different expressive perception toward color, and light source that affect the color match decision. Hence, it becomes difficult to make decision of accepting, reprocessing or rejecting the sample based on visual match. And this directly hampers the quality of the final product. While on other hand there are advantages of instrumental color quality control as it provides results with same accuracy, consistency and reliability.



- ✓ Benchtop/ Tabletop: (a) (b) (Rotating sample platform)
- ✓ Handheld/ Portable: (c) (d)
- ✓ Online/ In-process: (e)

- ✓ Solid: (a) (c) (d) (e)
- ✓ Liquid: (b) (e)
- ✓ Paste: (b) (e)
- ✓ Powder: (a) (b) (e)

- ✓ Contact measurement: (c) (d)
- ✓ Non-contact measurement: (a) (b) (e) (Adjustable height)

Works with:
- ✓ 5V adapter (cell phone charger)
- ✓ Power bank
- ✓ Computer/ Laptop (f)

- ✓ Averaging
- ✓ Auto repeat measurement mode
- ✓ Color match percentage
- ✓ Color indices (whiteness, yellowness, …)

- ✓ *SensegoodSmart* – computer interface software utility

Sensegood spectrophotometer in color management of salt & sugar:

Sensegood spectrophotometer is an analytical color measurement instrument that is widely accepted in the industry and research fraternity. From raw material to final product, it comprehensively evaluates the color attributes of various samples, including solids, liquids, powders and pastes. Large viewing area (sensor's field of view) and rotating sample platform averages out sample and produces accurate repeatable color attributes. As a result, consistency can be maintained and quality standards can be met with less waste, time, and effort.

Natural and processed sugar can be in various shapes and colors: cubes, powder, white, brown, jaggery, syrup, or honey. Sugar manufacturers rely on Sensegood spectrophotometer for sugar sorting and grading of production lots based on the color measured. Food processors use Sensegood spectrophotometer to maintain the input sugar texture quality and consistency over production batches.

Sensegood spectrophotometer helps in picking up even the slightest color difference over the production batches. It helps in finding difference between two colors and shows result in percentage match.

Reference:	Sample:
L*=61.70, a*=4.45, b*=35.22	L*=50.74, a*=12.49, b*=42.24

ΔL*=-10.96, Δa*=+8.04, Δb*=+7.02, ΔE*=15.30
Sample is Duller, Redder and Yellower than reference.
Alarm limit = 95%, **MATCH:** 85%
Alarm triggered as Match % is below user set threshold of 95%

Sensegood spectrophotometer for sugar color measurement for quality-consistency control and assistance in grading and sorting

Photo: Reference can be saved in Sensegood spectrophotometer and can be used at any time to compare it with production batch sample. The measurement information assists for color based sorting and grading of salt or sugar. Sample can be salt, sugar, syrup, jaggery or honey in any color, physical form, grade, or grain size. In photo: Color measurement and finding match percentage in brown sugars.

Reference:	Sample:
L*=72.25, a*=4.50, b*=23.47	L*=36.22, a*=21.77, b*=22.78

ΔL*= -36.03, Δa*=+17.27, Δb*= -0.69, ΔE*=39.96
Sample is Duller and Redder than reference.
Alarm limit = 90%, **MATCH:** 60%
Alarm triggered as Match % is below user set threshold of 90%

Sensegood spectrophotometer for color measurement in jaggery (Gud)

Sensegood spectrophotometer provides information regarding color component differences in between sample and reference. This information assists in reprocessing for color adjustments. Setting and ensuring color tolerances dramatically enhances color quality control. In photo: Color measurement and finding match percentage to ensure color consistency in jaggery (Gud).

If matching is poor; below set threshold, Sensegood spectrophotometer provides audible alarm and display indication on LCD to alert operator. Hence operator can quickly react and take appropriate action. The information assists for the prompt corrective action which eventually leads to quick process parameters control, increase in the throughput and maximization of equipment usage. This surely results into low operational cost with improved product quality, consistency and market acceptability.

Apart from color match percentage; Sensegood spectrophotometer provides color representation in terms of various indices such as – Whiteness index. Index value is a single number that represents overall color attribute of a sample. For instance, whiteness index can be used to know the whiteness attribute of white sea-salt or

sugar to maintain quality and consistency. For other colored products, it has facility and capability to provide color space values: L*-bright or dark, a*-reddish or greenish, b*-yellowish or bluish.

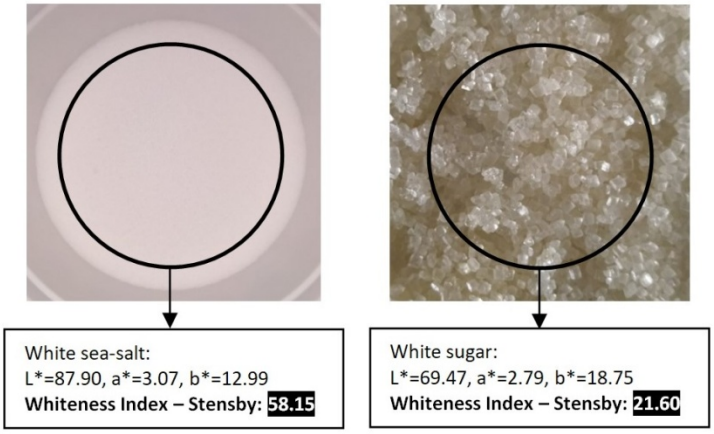


Photo: Using Sensegood spectrophotometer to measure whiteness index of white sea-salt and sugar.

Do more with Sensegood spectrophotometer:

Sensegood spectrophotometer also incorporates continuous auto measurement mode. In this mode, it wakes up at user selectable intervals, takes measurement, compares the sample color with the saved reference, displays percentage match, and alarms to the operator with beeping sound in case if the matching percentage is below preset threshold. It has provision for averaging option in normal mode as well as in auto repeat measurement mode.

Measured color is also represented as reflectance graph, peak wavelength and color temperature on color touch LCD. Sensegood spectrophotometer is non-messy non-contact type instrument which has benefit of measuring sample's color from a distance. Because of this, sensor's optical assembly remains scratch proof enabling long life in retaining calibration. Non-contact measurement avoids any sample contact and contamination on sensor measuring surface. Hygiene is maintained, as non-contact measurement avoids any food contact and bacterial accumulation on sensor measuring surface. Sensegood spectrophotometer is the versatile device that is engineered to work as handheld/portable, benchtop/table-top or in-process/online color measurement instrument.

SensegoodSmart utility:

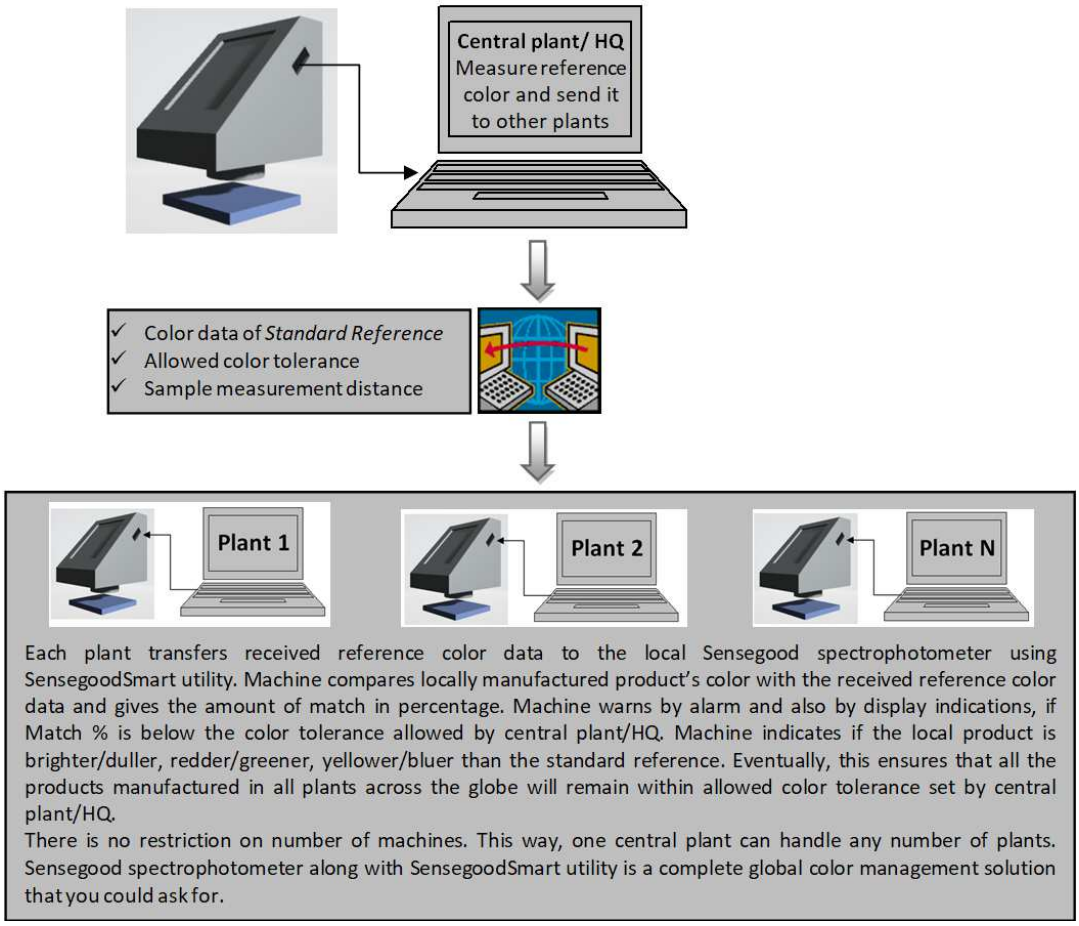


Photo: SensegoodSmart utility for color management across multiple production plants. Apart from this, SensegoodSmart utility enables user to store unlimited number of references to the computer. Any desired reference can be recalled and downloaded to Sensegood spectrophotometer whenever required. The utility provides all color related analytical information on single screen. This feature is even more desirable when using Sensegood spectrophotometer for in-process/online applications.

Sensegood spectrophotometer provides computer interface software *SensegoodSmart* which lets you to convey numeric color data across all production plants that may be located at multiple places across the globe. Each production plant uses Sensegood spectrophotometer to compare color attributes of the product manufactured in their plant with the numerical color information received from central plant or management. This enables them to reproduce each product consistently across all the plants. This feature is highly desirable for wide spread industry with plants at various places. It also assists in color consistency in packaging material supply chain.

References:

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[4] "Food Balance Sheets". Food and Agriculture Organization of the United Nations. 2007. Available at: http://www.fao.org/3/X9892E/X9892E00.htm
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[6] O'Connor, Anahad (12 June 2007). "The Claim: Brown Sugar Is Healthier Than White Sugar". The New York Times. Retrieved 13 May 2017.

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