Sensegood spectrophotometer for color measurement – quality, ingredient and consistency control in snacks

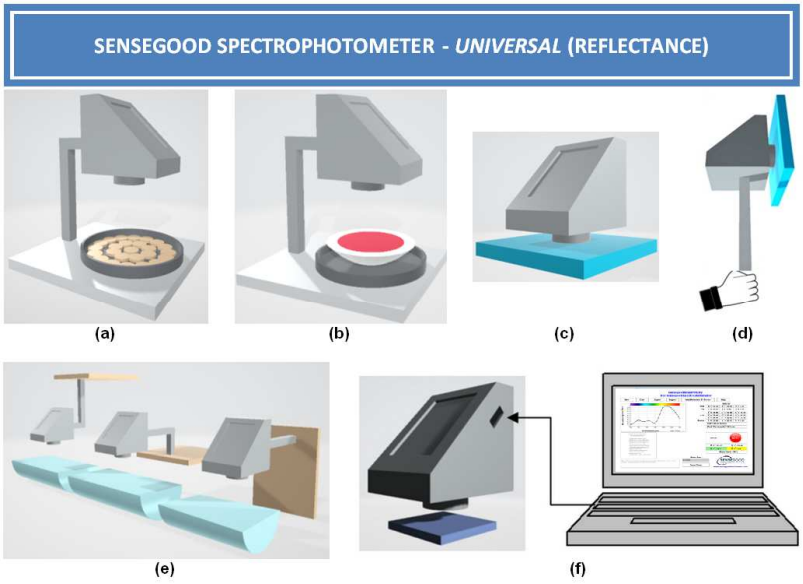
Snack food has emerged as an alternative to full-fledged meals with the paradigm shift in consumer behavior patterns. Higher disposable incomes, growing urbanization and increasing preference for convenience food, have triggered the growth of the snacks industry.

Global snack food market is projected to grow at a CAGR of 5.34% with Asia Pacific being fastest growing and Europe being largest market by 2025. [1] Global snacks market is expected to reach to 138.2 billion USD by end of 2020. [2]

Photo: *Food on the wheels* – crackers, wafers, chips, fries, crisp breads, cookies, cereal flakes, oats, muesli, granola bars, crisps, roasted nuts, chocos and fryums-papad pipes to name a few.

Importance of color in snacks:
Color is the first thing that customers see in any food. It is an indication of quality and freshness. Hence color is an important parameter for quality; and indication of oxidation and contamination. Color is associated with hunger and provokes it. Appealing mind triggering color of a food can convince customer to buy it. If color of the food is not right, consumer will not be willing to purchase thinking it is stale. And most importantly, study reveals that the color can influence the perceived flavor. [3][4]

Instrumental color measurement:
Maintaining the authenticity of true color representation is the first preference for any manufacturer. 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)

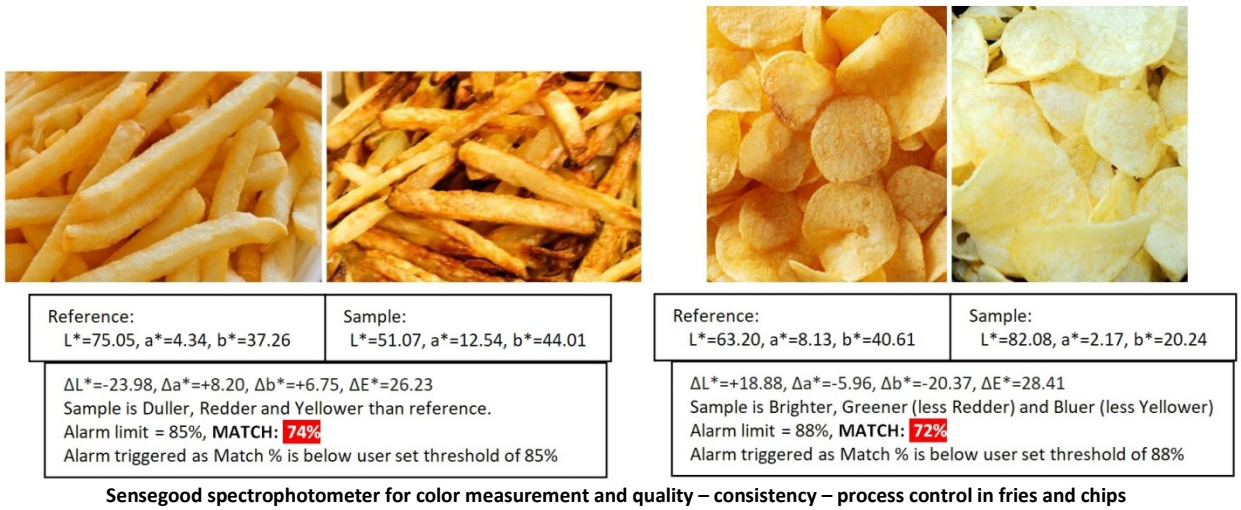
- ✓ Averaging
- ✓ Auto repeat measurement mode
- ✓ Color match percentage
- ✓ Color indices (whiteness, yellowness, …)

- ✓ *SensegoodSmart* – computer interface software utility

Sensegood spectrophotometer for color quality and consistency control in snacks:

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. Sample can be non homogeneous with different shape and size. Sensegood spectrophotometer has rotating sample platform with large viewing area (sensor's field of view). It takes multiple measurements over number of rotations and generates average result representing the sample's color. As a result, consistency can be maintained and quality standards can be met with less waste, time, and effort.

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.



Sensegood spectrophotometer for color measurement and quality – consistency – process control in fries and chips

Photo: Reference can be saved in Sensegood spectrophotometer and can be used at any time to compare it with production batch sample. Sample can be crackers, wafers, chips, fries, crisp bread, cookies, cereal flakes, oats, muesli, granola bars, crisps, roasted nuts, chocos or fryums-papad pipes.

In photo: Color measurement and finding match percentage in fries (left) and chips (right). Right color indicates tight process control. Measurement information assists in tuning process parameters to achieve right color; minimizing oil and electricity consumption. This in turn saves significant time and cost; and more importantly it leads to a consistent product appearance and wide market acceptance.

Sample (right) is Duller and Bluer (less Yellower) than reference (left).
ΔE*=10.63, Alarm limit = 95%, **MATCH: 89%**
Alarm triggered as Match % is below user set threshold of 95%

Sample (right) is Brighter, Redder and Yellower than reference (left).
ΔE*=16.76, Alarm limit = 90%, **MATCH: 83%**
Alarm triggered as Match % is below user set threshold of 90%

Sensegood spectrophotometer for color measurement and quality - consistency control in cereals and granola bars

Photo: Color has direct impact on "perceived" taste. Sensegood spectrophotometer provides information regarding color component differences in between sample and reference. This information assists in quick process parameter controls and 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 corn flakes (left) and granola bars (right). Color mismatch in production batch samples of granola bars indicate poor quality, inconsistent proportion of ingredients, and process parameter variations. Result is inconsistent taste and appearance; and ultimately leads to customer dissatisfaction. To build and maintain a brand of repute; product's consistency is one of the most important parameter to be addressed.

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.

Reference:
L*=56.95, a*=18.39, b*=21.36
BCU: 3.31

Sample:
L*=44.63, a*=19.64, b*=12.36
BCU: 2.51

ΔL*=-12.32, Δa*=+1.25, Δb*=-9.00, ΔE*=15.31
Sample is Duller, Redder and Bluer (less Yellower) than reference.
Alarm limit = 90%, **MATCH: 85%**
Alarm triggered as Match % is below user set threshold of 90%

Sensegood spectrophotometer for quality and consistency control in baked products

Photo: Color measurement, finding color match percentage, and backing contrast unit (BCU) measurement in cookies for process standardization and to ensure color consistency.

Apart from color match percentage; Sensegood spectrophotometer provides color representation in terms of various indices such as – Whiteness index, Yellowness index, Baking contrast unit (BCU) to name a few. Index value is a single number that represents overall color attribute of a sample. For an example, Sensegood spectrophotometer has facility to measure BCU for baked items. BCU is the measure of the lightness or

darkness of a product and it is developed specifically for the bakery food industry. BCU ranges from 0 for the darkest to 5.25 for the lightest baking.

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 CIE L*a*b* values indicate strength of color parameters like: bright or dull, red – green and yellow – blue respectively. 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:

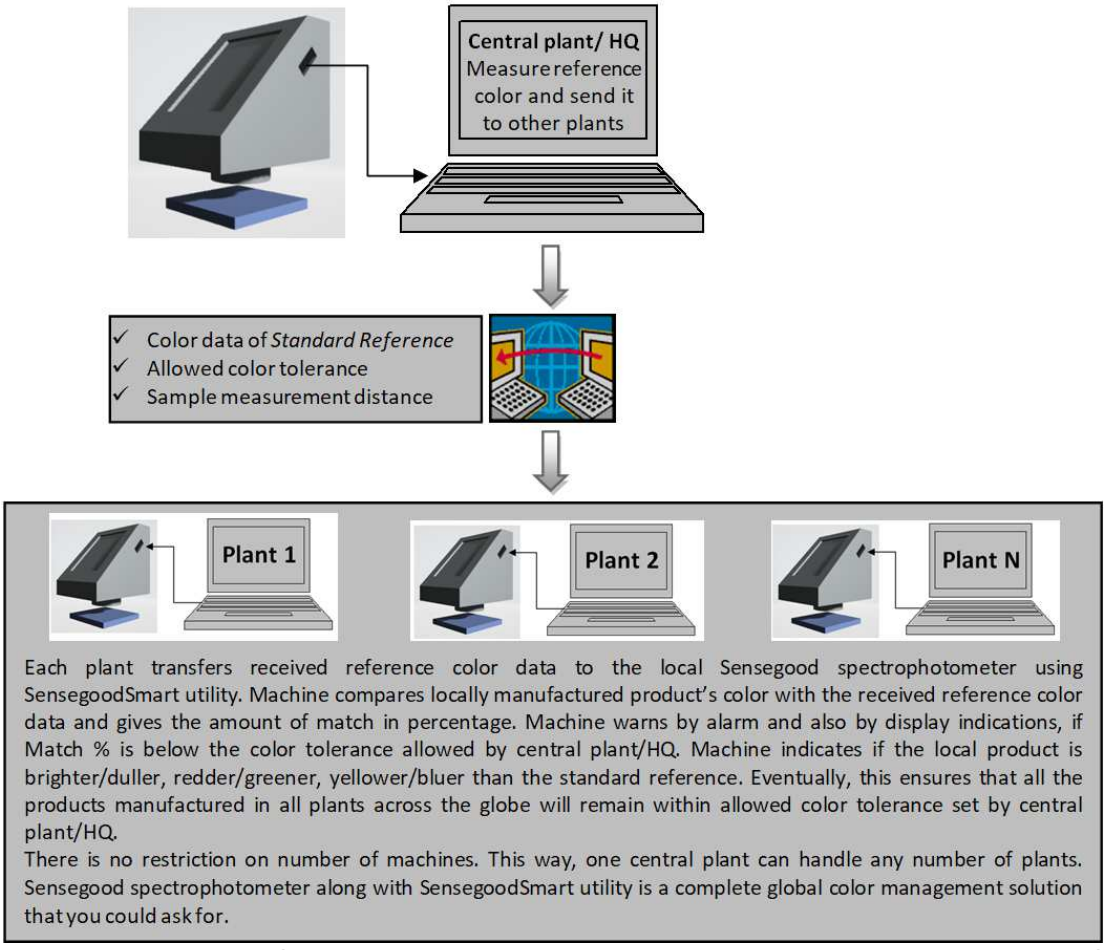


Photo: SensegoodSmart utility for color management across multiple production plants. Apart from this, SensegoodSmart utility enables user to store unlimited number of references to the computer. Any desired reference can be recalled and downloaded to Sensegood spectrophotometer whenever required. The 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:

[1] Snack Food Market - Growth, Trends and Forecasts (2020 - 2025), Mordor Intelligence report. Available at: https://www.mordorintelligence.com/industry-reports/snack-food-market
[2] Research from several organizations including Technomic, FONA International, Sterling-Rice Group and Mintel, points to a similar conclusion.
[3] Spence, C. On the psychological impact of food colour. Flavour 4, 21 (2015). https://doi.org/10.1186/s13411-015-0031-3
[4] Van Doorn, G.H., Wuillemin, D. & Spence, C. Does the colour of the mug influence the taste of the coffee?. Flavour 3, 10 (2014). https://doi.org/10.1186/2044-7248-3-10

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