

# Seminar Presentations: Texture Analysis and Colour Measurement

#### Stable Micro Systems



- An Introduction to Texture Analysis
  Presented by: Paul Brown, Stable Micro Systems
- Choosing the most suitable Test Method & Test Advice
  Presented by: Paul Brown, Stable Micro Systems
- An Introduction to Colour Measurement
  Presented by: Chris Wallace, Konica Minolta



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# masontechnology.ie





#### STABLE MICRO SYSTEMS

- Selling Texture Analysers for over 30 years
- All products designed and manufactured in UK
- Sell in over 60 countries through our distribution
  network
- · Leading innovators































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#### SUMMARY

- Texture analysis is a highly adaptable way to gain an objective assessment of the characteristics of materials.
- The combination of excellent hardware, software, a huge range of fixtures, and the very best application support has made Stable Micro Systems the global leader in texture analysis for the past 20 years.















- accurate starting point Pre-test speed less than or equal to Test Speed .
- •
- Slower pre-test speed for very soft / very hard samples Maximum post-test speed unless the probe return is part of the analysis (e.g. back extrusion) Micro
  - For penetration, sample diameter should be at least twice the probe diameter to avoid 'wall effects' Test distance should not exceed 80% of sample height/depth to avoid 'base effects'

  - Thin samples or variable heights in the same test benefit from "button trigger"
  - Trigger force must be greater than noise level (3g for 5kg load cell)





CONSIDERATIONS IN CREATING A TEST METHOD

- can we see actual differences? 50

table























# AN INTRODUCTION TO COLOUR MEASUREMENT

Seminar: Mason Technology - 20 September 2023

Giving Shape to Ideas



# **INTRODUCTION**

- Chris Wallace Area Manager UK, IRE, Benelux, Nordic, ZA & SADC
- 20+ Years working in Colour
- Print, Packaging, Automotive, Paint, Plastics and Food Industries to name a few!
- Chris.Wallace@seu.konica,minolta.eu



# **INTRODUCTION**

#### Konica Minolta Group

- Established 1873
- 39000 Employees
- Total net Sales of 1,011.7 Billion Yen (€6.3 Billion EURO)
- https://www.konicaminolta.eu/eu-en

#### Konica Minolta Sensing

- Manufacture Instruments for measuring Colour, Light & Display
- <u>https://www.konicaminolta.eu/eu-en/navigation/featured-business-areas/measuring-instruments</u>
- <u>https://www.specim.com/hyperspectral-imaging-applications/food-quality-and-safety/</u>

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# WHY MEASURE COLOUR

- Processes require control of inputs to predict outputs
- Colour indicates other factors i.e., overcooking, poor dispersion, thin coating
- Substrates or ingredients may change with time or temperature

# **CUSTOMERS EXPECT CONSISTENCY**

- Customers perceive change with suspicion
- Colour is a visual quality indicator
- Inconsistency can be seen as poor manufacturing

# **COLOUR TRIANGLE**



 Colour is an interaction between a light source an object an observer.





# LIGHT

- Light is visible radiation within the electromagnetic spectrum.
- The wavelengths of that energy dictates the chromaticity (hue) of the light.
- Measuring the energy within this range gives us a Spectral Power Distribution curve.



Spectral power distribution of A, D65 and C



# **RODS CONES AND TRISTIMULUS COLOUR**



- Spectral power and its interaction with an object produce a reflected colour that is interpreted by the observer.
- The human eye interprets light through rods (normal vision conditions) and cones (low light conditions) with sensitivity in 3 overlapping wavelength ranges that cover the visible spectrum.



# **LIGHT AND COLOUR**



Different light sources (spectral composition) alters perception of colour



## **SPECULAR & DIFFUSE REFLECTION**



- Gloss or texture on the sample surface effects the way that the light is reflected and therefore how the colour is perceived.
- Measuring or observing a colour with or without the gloss can make a big difference in the measured colour.





Perfect Mirror

Perfect Diffuser



# 

# **VISUAL ASSESSMENT**

- Visual assessment is the ultimate objective of instrumental colour measurement. In the end, it's the visual assessment of the customer that matters.
- Visual Assessment must be standardised
  - Light sources, viewing angle

#### Must follow best practice

- Rest eyes, no contamination, sample positioning
- LED solution increasingly replacing tube and halogen systems
  - More retail environments are LED lit and fluorescent tubes are being phased out for environmental reasons





# HOW CAN WE STANDARDISE AND COMMUNICATE COLOUR

- An instrumental colour measurement solution controls two of the variables in the colour triangle. Light source and Observer.
- 🖊 Tristimulus Data
  - Measures as the eye sees using filters that match the rods and cones of the average human observer.
- Spectral Data
  - Measures reflected light throughout the visible spectrum.

- Chroma Meter
  CR-400, CR-410, CR-5
- Spectrophotometer
  - CM-5, CM-26dG



- **COLOUR DATA**
- Spectral data allows you to communicate colour using globally recognised and consistent colour spaces.
- Keeping your instrument calibrated keeps measurement data traceable to international standards.
- Colour data can be sent electronically, recorded and analysed over time, using software and colour data you are able to work definitively and quantitively with suppliers and customers on colour specifications and tolerances.





# **COLOUR DATA INTERPRETATION**

- L\*a\*b\*, L\*C\*h\*,XYZ(Yxy), BCU, whiteness etc
- Colour difference commonly set by tolerances or as △E\*ab from a target
- Colour differences can be simplified to on-screen Pass/Warn/Fail

L\*



- L\* = lightness d
- a\* = redness
- b\* = yellowness —
- darkness
- greenness
  - blueness

# **CR-400 CHROMA METER**

- Tristimulus instrument
- Portable
- 8mm measuring aperture
- Optional Data Processor/Printer
- Simple display and data
- Pass/Warn/Fail Settings
- Glass plates available for wet, moist or irregular surfaces

# **BEST FOR**

- Homogenous Samples
- Curved Samples
- Smaller Samples







# **CR-410 CHROMA METER**

- Tristimulus instrument
- Portable
- 50mm measuring aperture
- Optional Data Processor/Printer
- Simple display and data
- Pass/Warn/Fail Settings
- Glass and Acrylic projection plates available for wet, moist or irregular surfaces

# **BEST FOR**

- Irregular surfaces
- Larger Samples





# CR-400 vs CR-410 WHICH APERTURE SIZE?







# **CONFIGURATIONS**

#### CR-400 with cell holder and glass cells

- Ideal for powders and opaque liquids

#### CR-400 and glass projection plate

 Ideal for solids that are moist or with give like meats and fish or for products like margarine, yoghurt, mashed potato etc

#### CR-400 and measuring jig

 Ideal for repeatable sample positioning i.e. biscuits or using a consistent backing for products that are not opaque

# **CHROMA-METERS VS SPECTROPHOTOMETERS**



- Chroma-meters measure using only one light source so cannot 'see' metamarism.
- Chroma-meters cannot measure spectral component (surface effect).
- More suited to simple QC tasks
- Chroma-meters provide less detailed data



## CM-26dG PORTABLE SPECTROPHOTOMETER WITH ISO GLOSS SENSOR

- Spectral data
- Portable
- 8mm & 3mm measuring aperture
- Built in ISO compliant gloss sensor
- On-board colour display and advanced firmware
- Close tolerance instruments developed for digital colour data management
- Compatible with CM-CT1 remote support and configuration tools

# **BEST FOR**

- Surfaces requiring gloss control
- Supply chains
- Central administration and colour communication







# **CM-5 SPECTROPHOTOMETER**

- Spectral Sensor
- Benchtop Instrument
- Transmission measurement for liquids and transparent/semi-transparent samples
- 3mm, 8mm and 30mm measuring aperture
- Built-in display
- Industry specific colour indices in firmware

# **BEST FOR**

- Liquids
- Overall Accuracy
- User Friendliness









# HOW IS COLOUR DATA USED

- Testing products or ingredients against specification at goods-in or throughout manufacturing
- Quality control measurements of goods to ensure a consistent appearance for the eyes of the customer
- R&D development of products, processes and consumer preference testing
- Specification and record keeping with supply chain partners



# **SPECIFIC SOLUTIONS FOR FOODS**



- Customers in the food industry measure solids, powders and liquids.
- The suggested solution for powders and liquids in a lab is the CM-5.
  - Top Port measurement through a petri dish
  - Transmission chamber
  - Built-in Measurement Wizard and colour display
  - Profiles saved to USB
- Many also implement a QC system, you could use a CR-410 with Glass Projection Tube for the powders or a CR-5 delivering simple Pass/Warn/Fail measurements to your tolerances.

- The supply chain for Foods includes
  - Packaging
  - Fats
  - Colourings/flavours
  - Meats
  - Grains
  - Etc.
- The range of solutions is as broad as the range of applications but it is recommended that you maintain
  - Instrument training of new staff
  - Onsite best practice
  - Clearly defined processes and settings



