DigiEye

Putting Colour in Context

sheen
uneven
non-solid colours
lace
fabric
with
pile
gloss
liquids
multi-coloured
colour
curved
ceramics
measurement

Measuring the unmeasurable

The Importance of Colour

Many diverse and complex factors influence our decision to purchase a product. They may include cost, suitability for the end-use, appearance, perceived value for money, design and the trust in a brand.

Of these many factors, it is widely acknowledged that the visual aspect of the product, i.e. the colour and overall appearance, is directly related to the product's associated quality and, as such, ultimately determines if the consumer buys or rejects the product.

The importance of managing a brand's colour accuracy and consistency has acquired increasing prominence as international trade and process complexity increases throughout the global supply chain. At the same time, we see an increasingly demanding end-user and an equally competitive market place across all sectors.

In light of this, it has never been more important to effectively manage colour from concept to consumer thereby facilitating cost control and waste minimisation, retail revenue optimisation, manufacturing and supply chain efficiencies, brand integrity protection and customer retention.

The Evolution Of Colour Assessment
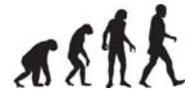
1 'At Desk' Approval

Prior to the arrival of lighting cabinets, the prevailing method of colour quality assurance, typically involved an untrained user evaluating colour in inconsistent viewing conditions usually at their desk or point of manufacture.

❌ No control of ambient lighting.

❌ Subjective and unreliable.

2 Lighting Cabinets

The introduction of lighting cabinets, together with an increased level of colour training and education, undoubtedly led to significant improvements and standardisation of viewing environments and of the overall colour quality levels across industry and retail.

✅ Controlled & consistent viewing conditions.

✅ Improved colour knowledge.

❌ Still a subjective process.

3 Spectrophotometers

The next logical quest for a greater degree of objectivity and consistency, gave birth to the concept of instrumental colour measurement using either colorimeters or spectrophotometers.

✅ Reliably measures reflectance of sample and interprets results for other illuminants.

✅ Provides objective pass/fail results.

❌ Limited in application.

4 The 'Missing Piece'

Whilst the introduction of instrumental colour measurement was widely acknowledged as a significant step change, its application was largely limited to products with a solid colour appearance only. This was due to the fact that traditional instruments intrinsically measure "average" colour only, assessing the limited area of the product exposed to the instrument's aperture. The limitations of instrumental colour measurement are further compounded when the target sample has . . . .

- Any sort of surface effect i.e. pile, gloss or sheen,
- Any form of multi-coloured characteristics or appearance,
- Uneven or inconsistent surface characteristics that cannot be presented to the aperture,
- Colour areas that are simply too small to be repeatably captured by the instrument.

An attempt to address some of these challenges has typically been made via the grinding or destruction of the original sample but whilst this offers a slight improvement, inadequacies prevail in terms of its overall accuracy as an average measurement. Crucially, these isolated and unrepresentative areas bears limited correlation to the overall visual appearance of the final product.

These shortcomings, coupled with the large proportion of todays manufacturing output that is non solid colour, clearly represented a significant market opportunity for a non contact solution that could measure the unmeasurable to the same degree of accuracy and repeatability as traditional instrumentation.

tel: +46 33 235 000

The Solution: DigiEye – Measuring the unmeasurable

The DigiEye System was developed in response to this market demand, and provides a 'best practice' combination of lighting and visual assessment principles, together with non-contact instrumental measurement for quantifiable and objective quality control.

Using controlled, consistent and defined illumination conditions, DigiEye captures and measures product colour and appearance with an amazingly high resolution and great precision.

The DigiEye System allows the entire product to be measured thereby ensuring that all colours, not just an 'average' of a small unrepresentative section, can be analysed and quantified in context, together with all other visual and surface effect elements of that product.

The method of image capture also allows simultaneous measurement of more than one sample at the same time, to facilitate for example, the measurement of multiple batch samples against the established standard.

Put simply, it measures and evaluates the colour in context - as seen by the consumer and provides quantifiable, correlated, consistent visual assessment against an agreed visual standard.

- ✅ Controlled, consistent & enclosed lighting, total elimination of ambient light.
- ✅ Objective colour measurement.
- ✅ Non-destructive sample measurement.
- ✅ Total visual consistency.
- ✅ Global communication of colour data together with image.
- ✅ No sample size limitation due to aperture size.
- ✅ Measures both solid and non-solid colours.
- ✅ Non-contact system, unaffected by samples with uneven surfaces, sheen or multiple colours.

What is DigiEye?

DigiEye is a digital colour imaging system used by leading companies and organisations throughout the world, with applications within an increasingly diverse array of industry sectors.

Included in the DigiEye System are;

- **A characterised digital SLR camera, enabling capture of outstandingly detailed images, recording colour data at millions of points.**
- **A calibrated monitor and printer which provide highly accurate visual on-screen representation of the product and printed colour accurate authentic representations of the product for use as master product standards.**

Samples are captured on a neutral grey background within the 'DigiEye Cube'. To ensure consistency and repeatability, this cube provides a totally controlled and defined lighting environment which eliminates all ambient light. The lighting used within the cube closely matches the CIE D65 lighting and can be used with angled & diffuse lighting.

The two images of eyeshadow, (right), taken using the DigiEye system, illustrate the differing visual appearance obtained from using angled and diffuse lighting.

Diffuse illumination is useful as it removes the specular reflections of products with glossy and curved surfaces. This enables reliable colour measurement of product such as fruit, metallics, ceramics and satin fabric. Angled illumination allows product with uneven surface structures and texture to be clearly displayed, measured and evaluated.

The colour measurements are made in CIE colour space. Colour data can be presented in a wide range of specifications such as LAB, XYZ and LCH. Colour difference measurements can be assessed in a variety of industry standard equations such as CIELAB, CMC and CIEDE2000, with colour difference information between standard and batch shown in both numerical and via an on-screen visual format, including texture.

ANGLED ILLUMINATION

Highlights surface details. Ideal for accurate appearance.

DIFFUSE ILLUMINATION

Flattens the images. Ideal for colour measurement and QC.

email: andreas@cromocol.se

DigiEye Virtual Selection

The DigiEye Virtual Selection application allows the user to assess the appearance of a product or substrate in a variety of colours without the need to manufacture all of the intended colour options as physical samples.

Using just one sample, for example, an item of clothing or a mobile phone fascia (as illustrated), the user can accurately simulate other colours or colour combinations onto this *'donor'* image.

As DigiEye individually retextures each pixel on the image the authentic appearance of the original image such as the detail and the areas of lightness & shadow, are retained. Having first captured the image of one prototype sample, the new colours are applied using the DigiPix colour replacement application.

New colours can originate from in-built colour libraries (Pantone, NCS etc), from measurements via DigiEye or a spectrophotometer, or by creating the colour using the colour slider functionality within the software.

A calibrated monitor and printer allows the user to make onscreen and hard copy assessments of the commerciality of the new colours, thereby negating the need to physically prototype all the colour combinations within a range. This offers major associated benefits in terms of speed to market sampling and overall cost reduction
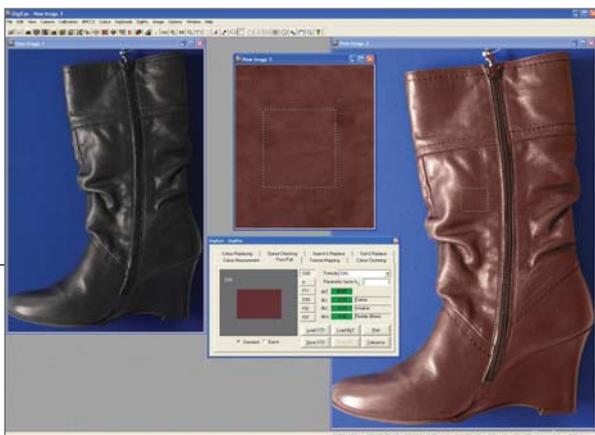
This process can be used for multiple product types in various market sectors including Fashion Retail, Consumer Products, Print & Packaging, Personal Care, Flooring or any other area where sampling costs are typically high, manufacturing timescales extended or when the prototyping timescales are under pressure.

A further extension of the Virtual Selection application is the subsequent use of the initial prototypes as photographic standards for ongoing production.

DigiEye Digital Standards

DigiEye allows the generation of colour accurate, digital visual assessment standards. High resolution images are captured, within the DigiEye 'Cube' under controlled and consistent illumination conditions. This ensures the images have a realistic appearance, which is repeatable, allowing objective comparisons. Once the digital standards are defined, they can be shared with the supply chain or multiple production sites electronically via *'full'* or *'satellite'* systems or in hard copy format.

The image format is colour managed for use with an ICC profile, which is produced by the team at VeriVide, using the client's own products. This ensures colour accurate printing and gives the optimum visual accuracy.

Digital photographic standards are particularly useful in establishing at the outset, the agreed standards for product colour and appearance.

They can add further value by helping manage products with transient properties such as food stuffs, and can prove useful controlling the challenges of product shelf-life.

These colour accurate images can be used throughout the production process including areas where it may not be practical to have instrumental equipment, such as ovens, freezers etc.

Production tolerances can also be defined using these photographic standards to help to ensure product meets the visual expectations of the customer.

tel: +46 33 235 000

DigiEye Virtual Sampling

Once the digital standards have been defined and shared with the supply chain, the opportunity of electronic sample submission is available, from point of manufacture through to point of approval.

Physical production samples can be produced to meet the defined tolerances and subsequently imaged in the DigiEye System for electronic evaluation and sample submission using DigiEye's QC Matrix package. This software provides clear and accurate information, allowing the user to make both numerical and visual assessments of their standard/batch colour differences on their desired product or substrate.

This is supported by a clear indicator of the pass/fail status, and also includes a 'virtual light box' allowing the user to toggle through up to three illuminants and check for any visual and numerical metamerism.

The QC matrix can be sent via email to the point of approval where it is evaluated on a calibrated monitor. The solution optimises the files so that image size is no longer a constraint plus it is also fully compatible with all existing files formats.
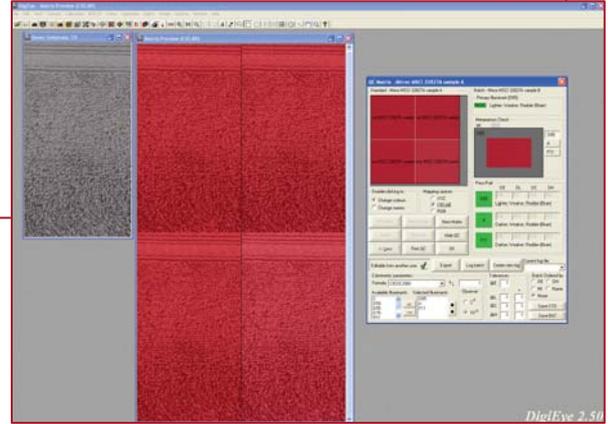
DigiEye Sample Evaluation

DigiEye's various software selection tools enable the user to measure the colour of the total sample or specific area of interest to assess individual product elements in context within the colour of the total sample. This capability significantly extends the boundaries of instrumental measurement for the 'non-measurables'.

From a retail perspective, lingerie or any other multi-component product can be addressed, similarly patterns and prints, home furnishings, hard & soft goods, personal care items and cosmetics.

Outside of the retail sector, the evaluation of the varying surface characteristics of any industrial or consumer product is an ongoing challenge. DigiEye addresses this challenge in two ways;

- The *'Colour Clustering'* function, which gives the percentage of each colour on the visible surface and
- The *'Sort & Replace'* method which also gives a clear, visual representation of where these colours are within the sample.

This process has numerous proven applications within many sectors, examples include industrial flooring manufacturers (aggregate distribution for non-slip), wood producers for home flooring and kitchens (grain distribution) and also for multiple applications within the food sector.

Such applications include the quality control of coatings on biscuits and cake, the percentage of different visual products in a mix, the assessment of the percentage of visible fruit on the surface of yogurts and sauces - to name but a few.
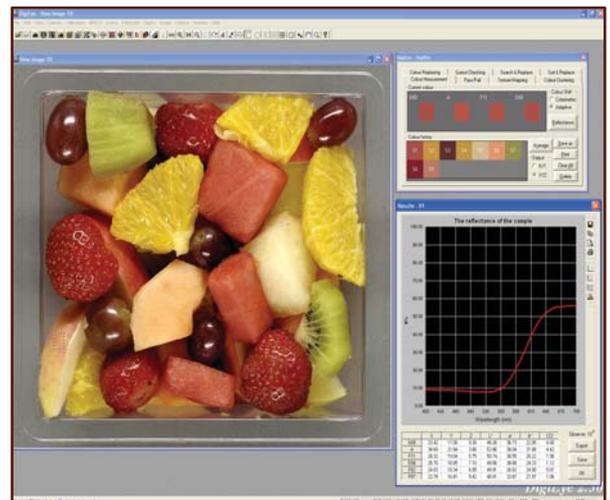
Traditionally these QC checks were limited to subjective visual assessment methods.

DigiEye offers Industry the opportunity to apply an objective fixed numerical tolerance resulting in faster & more accurate decision making, fewer people involved in that process and a higher production throughput.

DigiGrade - Colour Fastness Grading

Colour Fastness grading for both change of shade and staining of adjacent fabric has traditionally been undertaken by trained and experienced graders using a standard illumination cabinet and a set of grey-scales. Today, grading can now be achieved digitally using the Colour Fastness feature within DigiEye – DigiGrade

By capturing images of treated samples together with the adjacent multi-fibre test fabric DigiGrade can be used to objectively evaluate change of the shade and the staining.

Colour Fastness grading using DigiGrade can be undertaken with minimal training allowing the laboratory team to utilise their skills elsewhere and, as the system also allows multiple samples within a single image, an additional benefit is the speed of the process over traditional visual techniques. This can lead to a reduction in time to market for the manufacturer and an increased laboratory throughput.

The images and results can be sent electronically, thereby saving the time and expense of shipping the relevant samples.

The DigiGrade Colour Fastness feature is most commonly used to evaluate wash fastness results; however, it is also capable of evaluating Crocking (dry and wet rubbing), change of shade for all products and determining the endpoint and final grade for light fastness.

DigiGrade is used by major retailers, throughout their supply chain and by independent and mill test houses around the world and is accepted as part of ISO 17025 UKAS accreditation (or the equivalent national body).
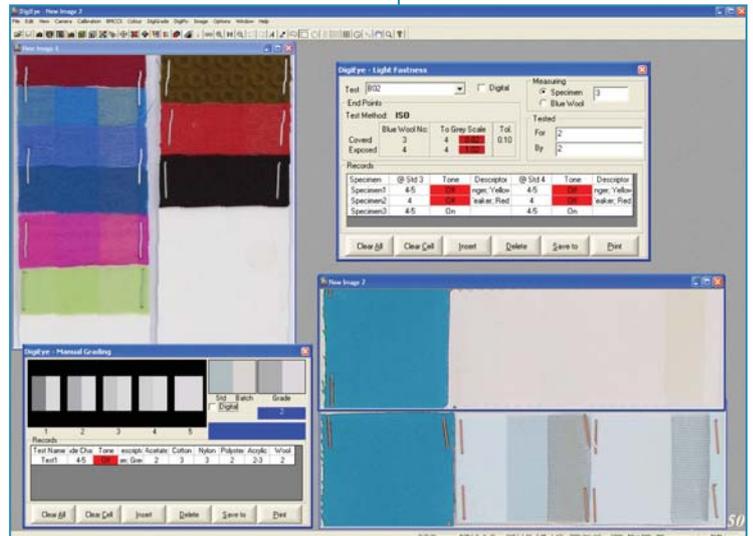
LAI - Large Area Imaging

DigiEye further expands the scope of the 'non-measurables' by offering a Large Area Imaging system, known as the 'DigiEye – LAI', for product larger than that which can be accommodated within the standard illumination cube.

The booth can readily accept product within a field view of 1300 mm x 1300 mm and offers optimised and controlled lighting across the whole target area. This has typically included full garments, print repeats, full-sized mannequins & models and even automotive wheels.

An additional proven application for the LAI is use as an 'Imaging Tool' for web and catalogue photography. The system is quick and easy to use, requires very little post-processing and gives the business direct control of the process, especially during the 'sale season' or when a quick response is necessary.

Images can also be re-coloured using the DigiEye system negating the need for multiple colour sampling, usually at short notice.

The system has even been deployed as a warehouse QC tool by a major UK High Street Retailer for the visual assessment of incoming merchandise and to assist with fault identification and trouble shooting.

tel: +46 33 235 000

What DigiEye Offers You

Features	>	Benefits

Non-contact colour measurement, surpassing the capabilities and restrictions of the spectrophotometer.
> Increases tremendously the types of product that can now be accurately colour measured.

A totally enclosed area for sample image capture.
> Eliminating the detrimental effects of ambient lighting. Controlled & consistent lighting ensuring controlled, reliable & repeatable results.

'Colour Clustering' - measurement of the differently coloured visible elements in a product or sample.
> DigiEye can calculate the percentage of each visible colour, supplying quantifiable quality control data for each element in context with the total sample.

Global electronic communication of product colour, shape, size & texture together with unequivocal colour data.
> Visual consistency across multi-location production units and improved product reliability as colour data and images can become part of the product specifications.

The system has easy to use controls, suitable for all levels of computer proficiency.
> As the camera settings are largely controlled by the DigiEye Software, there is no requirement for prior photographic knowledge.

Ability to measure powders and liquids without the need to dispense or decant product or to destroy the sample.
> Measurement of colour as seen by the consumer, e.g. liquid within a transparent bottle, the appearance of yogurts, eyeshadow within a clear container.

Colour Replacement feature
> Digitally change the on-screen colour of the product to assess the alternate colours of new and existing products, e.g. changes in the colour of footwear or to assess different colour options of plastic products.

Easy retrieval of master production standards.
> Removes subjective manual visual assessment during production. The system enables timely detection of non-standard product, creating opportunities for a reduction in retailer returns & significant waste and cost reduction.

Measures 'Colour in Context'
> Measure the colour of the total sample, multiple areas of the sample or specific small areas thereby optimising brand integrity & sell-through revenues.

colour in Context

email: andreas@cromocol.se

> **"** *Finally, a solution that can bridge the 'non-measurable' gap and still offer high-end instrumental performance and accurate visual & numerical colour data.* **"**

CROMOCOL
SCANDINAVIA AB

Cromocol Scandinavia AB
Åsboholmsgatan 16,
SE 50451,
Sweden

Tel: +46 33 235 000
Fax: +46 33 135 095
Mob: +46 737 063 363

Email: andreas@cromocol.se

web: www.cromocol.com

VeriVide
See in Truth

VeriVide Limited.
Quartz Close
Warrens Business Park
Enderby,
Leicester.
LE19 4SG
United Kingdom

Tel: +44 (0) 116 284 7790
Fax: +44 (0) 116 284 7799

Email: enquiries@verivide.com

www.verivide.com/digieye
www.digieye.co.uk