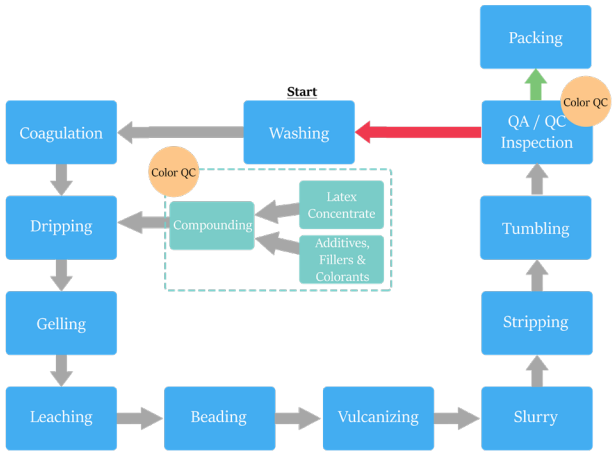
Rubber Gloves Color Evaluation and Control

Introduction

Traditionally, the color of rubber gloves such as nitrile and latex gloves is limited and only comes in blue and white or cream colored. With the growing awareness of color coding concept, gloves are available in a variety of colors.



To ensure the color of gloves remain consistent batch-to-batch, manufacturers are moving from visual evaluation to objective color evaluation using color instrumentation. Color instrumentation is commonly deployed within the compounding process and the Quality Assurance (QA) / Quality Control (QC) process.

Color Control in Incoming QC at Compounding

Natural or synthetic rubber has poor properties and manufacturers use chemical formulations to obtain the desired physical and chemical properties. Colorants are added into the liquid compound and this process is known as compounding. Latex compounding ingredients include:

- Latex/Latex concentrate
- Color pigments
- Fillers (carbon black or non-black materials like calcium carbonate)
- Anti-degradants (anti-oxidants, anti-ozonants, protective waxes)
- Processing aids (oil, surfactants, release agents)
- Thickening agents
- Wetting agents
- Vulcanizing and Dispersing agents
- Softeners

Compounding ingredients affects the shade of the liquid rubber which, ultimately, influence the color of gloves. Incoming color quality control of ingredients prior to compounding is needed to ensure color consistency. Key ingredients that are evaluated for color:

- Latex concentrate (liquid form)
  - Higher grade light colored latex is preferred for pastel shades while cheaper grades are usually used only in darker shades.
- Pigments (powder, granular or paste form)
  - Pigments color strength
- Fillers (powder, granular or paste form)
  - Whiteness/Brightness/Yellowness of non-black fillers

Measurements of compounded latex in liquid form are sometimes performed by glove manufacturers in an attempt to establish a relationship with the final product color.

Color Control in QA/QC Process

Besides the compounding ingredients, color quality

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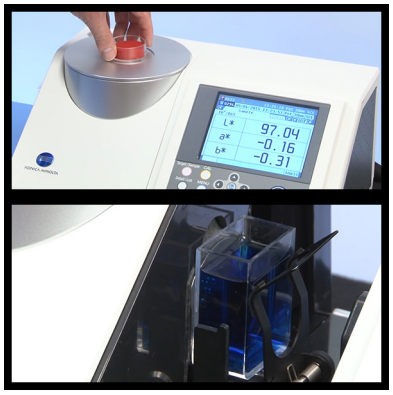
control is also conducted during the QA/QC process. The pigments and fillers used for rubber coloring are often sensitive to curing conditions. Hence, processing time and temperature used for curing have to be controlled properly to ensure color consistency of the final product.

Product testing is usually done on a random sampling as specified in the sampling plan ISO 2859. The result is expressed in AQL's – Acceptable Quality Levels. The sampling size depends on the AQL adopted by the respective product. The lower the AQL, the probability of finding defects in the batch of gloves decreases.

Measuring Methods

Concentrates and fillers come in various forms like liquid, powder, granular and paste. To ensure color data acquired are accurate, the use of either transmittance or reflectance measurement mode is selected in accordance with their opaqueness or transparency. Furthermore, it is recommended to maintain consistent sample thickness, size, and quantity for each measurement.



Both Spectrophotometer CM-5 and Spectrophotometer CM-600d, with accessories like petri dish, is capable of handling liquid (opaque), paste and powder ingredients color evaluation. The spectral reflectance measurement from both CM-5 and CM-600d is useful for color strength evaluation of pigments used in the compound during the lab dip process. Using it together with SpectraMagic NX Professional Software, color strength indices can also be calculated.

For finished products, most of them are not fully opaque due to its thickness and multiple folds of the glove is recommended to ensure opacity before measuring. The opacity of gloves can be determined by using a technique called contrast ratio. For highly translucent gloves, a trans-reflectance measurement, using a white ceramic tile as backing, is recommended.

Color Reader CR-20 is deployed in the in-process or outgoing QC as a simple Go /No-Go gauge to ensure color consistency of the latex glove. CR-20 is the ideal solution to meet the entry-level users' need due to its affordability and ease of usage.

For more information on rubber gloves color evaluation and control or product demonstration, please click here.

Alternatively, you may also contact us at (+65) 6563 5533 for a free consultation.