


MINIATURIZATION ENHANCES COLOR MEASUREMENT

BY ALAN KRAVETZ

 Portable spectrophotometers equal benchtop units for typical QC applications.

A “small” innovation has had a very large effect on measuring and analyzing color finishes and materials. Advances in reducing the size of computer and memory chips and measurement sensors have significantly changed how color quality control is maintained.

The biggest result of chip and sensor miniaturization is measurement, analysis, and, ultimately, the decisions that can be made. For years, the laboratory was the decision-making room. Now, however, accurate quality control decisions can be made immediately “on location,” such as the factory floor and assembly line. Continued advances in chip and sensor design, as well as improved software programs, enable making many more decisions on the factory floor.

Portable spectrophotometers

Portable spectrophotometers were introduced about three years ago. While it was quite an accomplishment compared with earlier color-measuring instruments, the portable spectrophotometer did not replace benchtop versions with more analytical power. But today, in addition to reducing the size and weight of the portable spectrophotometer, technology has made it the equal of benchtop units for typical quality control applications. Sensors have also become more sensitive over the years, enabling portable spectrophotometers to make measurements over the color spectrum from 400 to 700 nm.

It may seem hard to believe that an instrument so small could replace a conventional benchtop spectrophotometer. Significant enhancements have been



Portable spectrophotometers such as this Minolta CM-2002 enable measuring color directly on the factory floor.

made to benchtop units as well in the past few years, but the convenience and time-saving capabilities of the portable unit have made color quality control easier.

In the past, benchtop spectrophotometers could barely fit on a laboratory table, let alone be used on the factory floor. They had large CRT monitors, a number of knobs for controls, and, most important, photomultiplier tubes (PMTs) and moving internal parts. The tubes and moving parts not only required large packages but made the spectrophotometers fragile. So they had to remain stationary in the lab.

Solid-state sensors have made spectrophotometers more durable. Continued advances have led to smaller-sized sensors, and eventually an array of sensors could be designed into a spectrophotometer. Wavelengths no longer have to be sent to a single sensor, reducing the size of the optics as well as stabilizing them. Portable spectrophotometers, including the latest multi-angle geometries, resulted from this advance in technology.

The evolution of computer and memory chips has followed a path similar to that of the sensor, and has profoundly affected color quality control measurements. Today's computer chips can do what an entire desktop computer did only a few years ago. Because of this,

portable spectrophotometer designs include a computer. The result is an instrument that provides accurate color quality control analysis in a second on the factory floor. Older benchtop versions required a stabilizing warm-up period and greater operator involvement during measurement.

Spectrophotometer advantages

By taking color measurements and analyzing them on the factory floor, manufacturers can save time and money. A benchtop demands that a sample be taken from the assembly line and evaluated in the laboratory. During an on-line process, this can be disastrous. Crucial time is lost taking the sample to the lab. If the color is unacceptable, more time is lost returning to the factory floor to shut down the line. Meanwhile, countless unacceptable products have already passed through the assembly line. A portable spectrophotometer provides an answer in an instant.

Data acquisition on the floor would be useless if not for computer technology. Memory cards and software advances allow quality control measurements to be analyzed and evaluated as never before. Measurement readings can be accumulated, and statistical analysis can be applied or memory cards changed and custom

programs tailored to a specific application.

Basic software features have been developed in the past few years to assist in color measuring. A QC package allows simple pass/fail decisions to be made immediately, while a color search or shade library search allows matching new col-

ors with stored approved colors.

Portable spectrophotometers are now being used in more applications. Automotive color quality control, printing, apparel cut and sew operations, and color tile manufacturing are some of the new doors that have opened as a result of the

spectrophotometer's portability. Essentially, if you can get to the application, you can measure the color. □

ALAN KRAVETZ is technical manager of Minolta Corp., Instrument System Div., Ramsey, NJ.