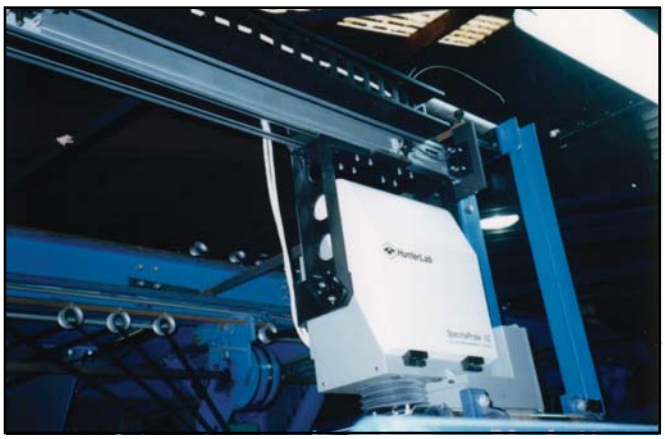
Technical Note

SpectraProbe® XE

How to Measure: Warp Yarn- Indigo Dye Range

An essential component of process control for indigo dyeing is color measurement of the ball warp yarn as it exits the dye range. The shade of the product is analyzed and compared with a standard, which can be defined numerically, read with the sensor, or taken from the first measurement of the run. Virtually any illuminant/observer combination, color scale, or index, including 555 shade sort coding, can be reported in the analysis of the product.

Typically several ropes (the number depending upon the yarn count and number of ends generally contained within each rope) are threaded through pot eyes, which are installed above the coiler section of the range. The SpectraProbe XE sensor is installed in a dual-point position mount, which remains above the yarn bundle, reporting colorimetric data as often as every 5 seconds. Color plots, control charts, trend plots, and spectral plots can be used in the viewing and comparison of this data. Alarm conditions can be set based upon tolerances defined for these colorimetric values/indices, as well as upon principles of Statistical Process Control (SPC), such as when more than seven datapoints are reported on one side of the center line of the control chart for any measured parameter.



The system has provision for analog/digital outputs, which serve to report color data to a plant DCS or PLC control system, allowing color measurement data to be used in the control of range process variables. Some parameters potentially controlled by this output data are chemical feeds to the range, such as indigo, sodium hydrosulfite, and sodium hydroxide; dyebox/washbox levels and temperatures; nip roll pressures; and drying can temperatures/pressures. The SpectraProbe XE color management system is an essential component of a closed loop control system for indigo dyeing.

Additionally, other process variables can be displayed onscreen with colorimetric data via DDE, NT Public Interface Socket, or user entry. This data can be stored in the database along with the corresponding measurement data and included in dyelot reports, thereby aiding the customer in determining correlations between shade and other range parameters and in identifying cause when off-shade conditions occur. Detailed and summary reports are available for the run including event logs, alarm conditions, and process variable information.

HunterLab has successful installations for this application on rope dye ranges ranging from 20 to 40 positions and at production speeds in excess of 40 yd/min (36.6 m/min).

HunterLab

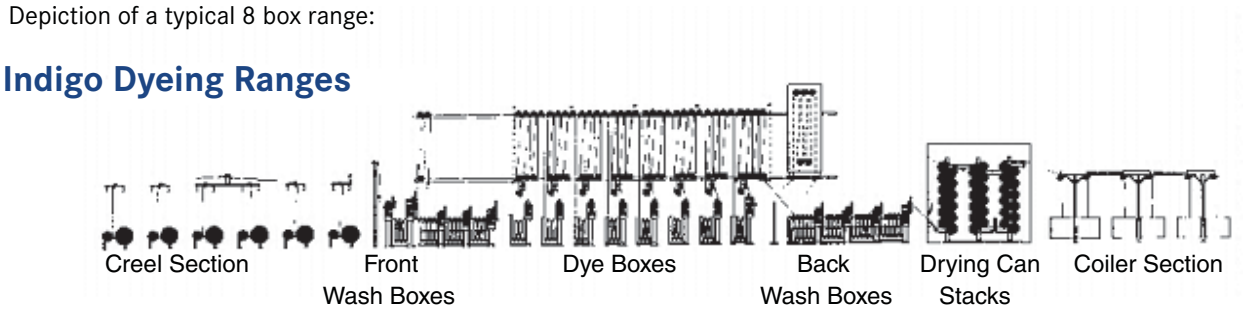
Measure Color...Measure Quality

ISO 9001:2000 Certified

Hunter Associates Laboratory Inc., 11491 Sunset Hills Road, Reston, VA 20190-5280
Tel 703-471-6870 Fax 703-471-4237 sales@hunterlab.com • www.hunterlab.com

Method of presentation of the warp yarn to the sensor:

Depiction of a typical 8 box range:



The SpectraProbe XE sensor is mounted over the warp yarn in a fixed-point position over the coiler section of the range. Depending upon the yarn count and the number of ends per rope, the number of ropes that are gathered together and threaded through poteyes for passage under the sensor head is determined. Typically, the number of ropes used ranges from four to six – four for heavy to standard weight yarn skeins, such as a 5.5's cotton count with 330 ends, six for light-weight skeins with high yarn counts, such as a 22.0's Gabardine.

Typical Color Scale Used: CIELAB, CIELCH
Typical Single No. Indices Used: dEcmc (measurement of overall shade difference from standard)
SSC (555 Shade Sort Coding)

Measurement Method:

Using HunterLab's EasyMatch OnLine software, a system and product setup must be defined.

1. The System Setup is located under the System/System Configuration menu and these system settings are unique to each installation. Some parameters defined here are whether the system is traversing or fixed point, communications settings, rail position settings, data output settings, calibration requirements, activation of run options, and configuration of tile positions.

2. The Product Setup can be found under the Run Menu and is typically as follows:

Page 1:
Color Scale: CIELAB
Optional Index: dEcmc
Data Collection Units: Yards/Meters
Data Collection Frequency: 25 readings per second (depending upon range speed, traversing speed and scan pattern selected)
Secondary Calibration: Every 30 minutes
Illuminant: D65 (selectable)
Observer: 10 degrees

Page 2:
Product Standard: Numeric for existing products
Adhoc/Physical for new products
3CMC Auto-Tolerance

Page 3:
CMC Parameters –
Commercial Factor: 1
l: 2
c: 1
Tolerance Alarm Deadband – 5%
Scan Pattern: Sensor is fixed
3 Output to Lot File – If in addition to saving data in the database and to a job file, the customer would like to save lot data as a text file
3 Analog Outputs – If this option is purchased and customer would like to output colorimetric data to a PLC or DCS system

Page 4:
Page Titles and Descriptors: Unique to installation

Page 5:
Shade Space Parameters Type: 555
Shade Sorting: On with Trend

3. After selecting the Product Setup as active, defining it, and saving it under the applicable System, select Begin Run from either the toolbar or the Run Menu.