Colour Measurement

When daylight strikes an object the light can either be wholly absorbed by the object, in which case it appears black, or totally reflected, in which case it appears white. If however, the object absorbs some portions of the spectrum then it will appear as the colour of the light which is not absorbed.

The visible light spectrum is made up of seven colours – red, orange, yellow, green, blue, indigo and violet. So, for example, if an object absorbs red, orange, green, blue, indigo and violet it will appear to the eye as yellow. However, if the light which shines on the object is not daylight but contains a predominance of one section of the spectrum, then the true colour of the object will be distorted. For this reason colour is measured using a standard light source which is specified by an international standard.

By using filters it is possible to measure the amount of light reflected from an object over all sections of the spectrum. Whilst this would give us extremely accurate readings, the result (comprising seven different numbers) would be very cumbersome. To simplify this, the spectrum is divided into three zones made up of red/orange area (x), the green/yellow area (Y) and the blue/indigo/violet area (Z). These three measurements are called the Tristimulus Values and are measured by a Spectrophotometer.

The purpose of colour measurement is principally to assist the dyer when the wool is being processed. Dying is an additive process and it is therefore impossible to dye the wool lighter than its original colour. If a very light pastel colour is required the wool must be very white and bright. On the other hand, if dark colours are to be dyed, stained and dingy wool could successfully be used.

Preparation of Results

What is the process:

Sub-samples are placed in a special holder with one face exposed to a light source. After the colour readings have been taken the specimen is turned over for a further set of readings. This process is repeated on another spectrophotometer all readings are averaged to give the certified result.

Interpretation of Results

A Certificate will show all three tristimulus values. In practice the X and Y values are very similar in colour measurement and for practical purposes the X value can be ignored.

From a value point of view, two aspects of colour measurement are important. One is lightness (brightness) and the other is yellowness. In this context, Y is regarded as the level of brightness and Y-Z is an indicator of yellowness. If Y is numerically high the wool will be bright but if it is low they wool will appear dingy. Generally, if the value of Y-Z is numerically low the wool will be white, but if Y-Z is numerically high the wool will be yellow. Good colour wools are lighter (higher value of y) and less yellow (lower value for Y=Z). Two lots of wool may appear visibly different, but if their measured colour values are identical they will be indistinguishable in colour after processing.

As a Guide:

BRIGHTNESS		
	D65/10	**C/2**
Very Bright	>70	>66
Bright	68-70	64-66
Average	64-68	60-64
Slightly Dingy	59-64	56-60
Dingy	<59	<56

YELLOWNESS		
	D65/10	**C/2**
Very White	<9	<-2
White	9-10.5	-2-0
Slightly Creamy	10.5-12.5	0-3
Creamy	12.5-14.5	3-6
Quite Yellow	14.5-16	6-8
Heavily Stained/Yellow	>16	>8

NZWTA Limited
Cnr Bridge & Lever Street
PO Box 12065
Ahuriri, Napier
NEW ZEALAND

Tel 06-835 1086
Fax 06-833 5622
e-mail: testing@nzwta.co.nz