By M.H.RANA Textile Calculation

FIBER FINENESS, YARN COUNTS AND CONVERSIONS

Micronaire Value (Cotton):

The unit is micrograms per inch. The average weight of one inch length of fibre, expressed in micrograms(0.000001 gram).

Denier (Man-Made Fibres): Weight in grams per 9000 meters of fibre.

Micron (Wool): Fineness is expressed as fibre diameter in microns(0.001mm)

Conversions:

Denier = 0.354 x Micronaire value

Micronaire value = 2.824 x Denier

YARN COUNTS

It is broadly classified into;

INDIRECT SYSTEM

DIRECT SYSTEM

INDIRECT SYSTEM

English count (Ne)

French count(Nf)

Metric count(Nm)

Worsted count

Metric system: Metric count(Nm) indicates the number of 1 kilometer(1000 meter) lengths per Kg.

Nm = length in Km / weight in kg (or)

Nm = length meter / weight in gra

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DIRECT SYSTEM

Tex count

Denier

CONVERSION TABLE FOR YARN COUNTS

Name	Tex	Den	Nm	Grains/yd
Tex		den/9	1000/Nm	gr.yd x 70.86
Ne	590.54/tex	5314.9/den	Nm x .5905	8.33 / gr/yd
Den	tex x 9		9000/Nm	gr/yd x 637.7
Nm	1000/tex	9000/den		14.1 / gr/yd
Grains/yd	tex / 70.86	den / 637.7	14.1/Nm	

Where, Nm – metric count, Nec – cotton count

CONVERSION TABLE FOR WEIGHTS

	Ounce	Grains	Grams	Kilograms	Pounds
Ounce		437.5 grains	28.350 grams		
Grains	0.03527 ounces		0.0648 grams		
Grams	0.03527 grains	15.432 grains		0.001 kgs	
Kilograms	35.274 ounces	15432 grains	1000 grams		2.2046 pounds
Pounds	16.0 ounces	7000 grains	453.59 grams	0.4536 kgs	

CONVERSION TABLE FOR LINEAR MEASURES

	Yard	Feet	Inches	Centimeter	Meter

Yard		3 feet	36 inches	91.44 cms	0.9144 meter
Feet	0.3333 yards		12 inches	30.48 cms	0.3048 meter
Inches	0.0278 yards	0.0833 feet		2.54 cms	0.254 meter
Centimeter	0.0109 yards	0.0328 feet	0.3937 inches		0.01meter
Meter	1.0936 yards	3.281 feet	39.37 inches	100 cms	

CALCULATIONS

Grams per meter = 0.5905 / Ne

Grams per yard = 0.54 / Ne

Tex = den x .11 = 1000/Nm = Mic/25.4

Ne = Nm/1.693

DRAFT = (feed weight in g/m) / (delivery weight in g/m)

DRAFT = Tex (feed) / Tex(delivery)

DRAFT = delivery roll surface speed / feed roll surface speed

No of hanks delivered by m/c = (Length delivered in m/min) / 1.605

WINDING

1. Slub catcher settings :

a. Fixed Blade = Carded - (2.0 to 2.5) x diameter
Combed - (1.5 to 2.0) x diameter

b. Electronic yarn clearer = 3 cm x 3 diameter

Diameter in inch for Blended yarn = 1/(28 x count)
= 10 to 15% more settings

Number of objectionable thick faults removed by slub catcher

2.Yarn clearer efficiency=.....x 100

Total objectionable thick faults present in yarn before winding

Total breaks during winding (at faults)

3. Knot factor =.....

No. of breaks due to objectionable yarn faults

Strength of spliced joint x 100

4. Retained splice strength = ...

Strength of parent yarn

5. Winding Tension = 0.1 x Single yarn strength in grams

4500 x Y

6. Expected efficiency E = ...

S x N (12 + 98)

7. Winder's workload (0.17 min/operation on conventional winding m/c) = 2300 operations per shift of 8 hours

Where,

1 creeling or 1 piecing = 1 operation

1 doffing = 2 operations

8. Winder's workload on autoconer (0.08 min per operation) = 4800 operations/shift of 8 hours

Where,

1 bobbing feeding = 1 operation

1 doffing (manual) = 4.5 operation

Y = Length/Bobbin (metres)
B = Breaks per bobbin
S = Winding speed (metres/min)
C = English count

9. Production in Kgs / 8 Hrs = (0.2836 x L x Effy x Nd) / (Ne)

L - delivery speed in m/mi

effy - efficiency

Ne - english count

Nd - No of delvieries

10. P =(L x 1.0936 x 60 x Effy) / (Hank (Ne) x 36 x 840 x 2.2045)

P - production in kgs / hr

L - delivery speed in m/min

effy- efficiency

Ne - English count (number of 840 yards in one pound)

840 - constant

2.2045- to convert from lbs to kilograms

WARPING

$$1.\ \text{Machine Efficiency } E = \frac{R \times 100}{R + S}$$

R = Uninterrupted running time for 1,000 meters (in sec)

$$= \frac{1000 \times 60}{\text{Machine speed in mtr/min.}}$$

S = Total of time in seconds for which the machine is stopped for a production of 1,000 meters

$$= R + \frac{B \times N \times T1}{400} + \frac{T2}{L} + \frac{T3}{L \times C} + T4$$

B = Ends breaks/400 ends/1,000 meters

N = Number of ends

L = Set length in 1,000 meters

C = Beams per creel

Timing of activities in seconds are :

T1 = To mend a break

T2 = To change a beam

T3 = To change a creel

T4 = Miscellaneous Time loss/1,000 mtrs.

2. Production in metres per 8 hrs. (K) = 480 x mtrs/min x E/100 kgs.

3. Production in Kgs. per 8 hrs. = (K x N)/(1693 x English Count)

4. Warping Tension = 0.03 to 0.05 x Single thread strength

SIZING

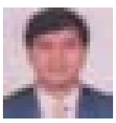
1. Warp weight (in kg.) = $\frac{\text{Length in metre} \times 1.094 \times \text{Total ends}}{840 \times 2.204 \times \text{Warp count}} \times 100$

2. Size pick-up % = $\frac{\text{Sized warp weight} - \text{Unsized warp weight}}{\text{Un-sized warp weight}} \times 100$

3. Weight of size = Warp Weight x Size pick up %

Sized warp length - Unsized warp length

4. Stretch % = ...x 100



Un-sized warp length

5. Sized yarn count = $\frac{\text{Total-ends x Warp length in yards}}{\text{Sized warp weight (lbs) x 840}}$

6. % of Moisture content= $\frac{\text{Wt. of sized yarn - Wt. of oven dried yarn}}{\text{Wt. of sized yarn}} \times 100$

7. % of Stretch = $\frac{\text{Deliver counter reading - Feed counter reading}}{\text{Feed counter reading}} \times 100$

8. % Droppings on loom = $\frac{840{,}000 \times D \times C}{454 \times Y \times N \times P} \times 100$

D = Dropping in gms.

C = English Count
Y = Length woven (yds.)

N = Number of Ends
P = % size add on

9. Invisible Loss%

$= \frac{\text{Amount of size material issued - Amount of size added on yarn}}{\text{Amount of size issued}} \times 100$

Steam, Consumption (Sizing M/c) = 2.0 kg/kg of sized yarn
(Cooker) = 0.3 kg/kg of liquor
(Sow box) = 0.2 kg/kg of yarn

10. Max. Speed of machine = $\frac{\text{No. of Cylinder x 1,000 x English count}}{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots}$

(metres/min) Number of ends

Number of ends x 0.6

11. Wt. of warp in gms/mtr = ……

English count

WEAVING

1. Reed Count : It is calculated in stock port system.

EPI

Reed width = ……

1 + Weft crimp %age

No. of dents in 2 inches is called Reed Count

2. Reed Width :

100 + Weft crimp %age

Reed width = Cloth width x ……

100

3. Crimp % :

Warp length - Cloth length

Warp Crimp %age =…… x 100

Cloth length

Weft length - Cloth length

Weft Crimp %age = …… x 100

Cloth length

EPI

4. Warp cover factor = ……

Warp Count

PPI

5. Weft cover factor =……

Weft count

Wp.C.F. x Wt. C.F.

6. Cloth cover factor = Wp.C.F. + Wt.C.F. - ……

7. Maximum EPI for particular count :

a. For plain fabrics = 14 x Count

b. For drill fabrics = Count x 28 x 4/6

c. For satin fabric = Count x 28 x 5/7

d. Other design = $\frac{\text{Ends/repeat x 1 / yarn diameter}}{\text{No. of intersections / repeat + ends/repeat}}$

8. Yarn diameter = $\frac{1}{28 \times \text{Count}}$

Weave Density

1. Warp density = Ends/cm x Tex x K
= < 250

2. Filling density = Picks/cm x Tex x K
= < 350

3. Weave Density = 50 + $\frac{\text{(Warp density - 100) x F.D.- 100}}{\text{(Weft density - 100) x F.D.- 100}}$

4. Effective weave density = W.D. x K of loom width x K of Design = < 72

Wp/filling-K	Loom Width-K	Weave Design-K
Cotton = 1.00	140cm - 0.99	Plain1/1 = 1.00
Polyester/Cotton = 1.03	180cm - 1.00	Twill 1/2 = 0.87
Viscose Filament = 1.17	190cm - 1.01	Mat. Gabardine 2/2=0.82
Polyester Filament = 1.22	220cm - 1.02	Drill 1/3 = 0.77
	250cm - 1.08	Satin 1/4 0.69
	330cm - 1.15	
	360cm - 1.20	

Count Table

To change the count and number of thread/inch, keeping the same denseness of the fabric :

1. To change the EPI without altering the denseness :

$$\text{EPI in Exp.Cloth} = \frac{\text{EPI in given cloth} \times \text{Warp count in expected cloth}}{\text{Warp count in given cloth}}$$

2. To change the count without altering the denseness :

$$\text{EPI in exp. cloth} = \frac{\text{EPI in exp. cloth2}}{\text{EPI in given cloth}} \times \text{Count in given cloth}$$

Warp requirement to weave a cloth :

1. Warp weight in gms/mtrs. $= \frac{\text{Total ends} \times 1.0936 \times 453.59 \times \text{crimp\%}}{840 \times \text{Count}} \times \text{Wasteage\%}$

2. Weft weight in gms/mtrs.

$$= \frac{\text{R.S. in inches} \times 453.59 \times \text{PPI}}{840 \times \text{Count}} \times \text{Crimp \%} \times \text{Waste \%}$$

3. Cloth length in mtrs.with the given weft weight

$$= \frac{\text{Weft wt. in kgs. x Weft count x 1848 x 0.9144}}{\text{PPI x R.S. in inches}}$$

For Silk and Polyester :

1. Warp weight in gms/mtrs.

$$= \frac{\text{Total ends x Count (Denier)}}{9000} \text{ x Crimp\% x Waste \%age}$$

2. Weft weight in gms/mtrs.

$$= \frac{\text{RS in inches x PPI x Count (Denier)}}{9000} \text{ x Crimp\% x Wasteage\%}$$

<u>Allowance for count in Bleached and Dyed Fabric :</u>

Count becomes 4%

Finer Dyed counts become max.6% Coarser

FABRIC PRODUCTION

1. Loom speed = Motor RPM x $\frac{\text{Motor pulley diameter}}{\text{Loom pulley diameter}}$

2. Loom Efficiency % = $\frac{\text{Actual production}}{\text{Calculated production}}$ x 100

$$3.\ \text{Moisture Regain \%} = \frac{\text{Yarn weight - Dryed yarn weight}}{\text{Dryed yarn weight}} \times 100$$

$$4.\ \text{Moisture Content \%} = \frac{\text{Yarn weight - dried yarn weight}}{\text{Yarn weight}} \times 100$$

$$5.\ \text{Warp weight in Kg.} = \frac{\text{Total ends x Tape length in metre}}{\text{1693.6 x Warp count}}$$

$$6.\ \text{Weft weight in Kg.} = \frac{\text{RS in centimetres x Coth length in metres x PPI}}{\text{4301.14 x Weft count}}$$

$$7.\ \text{Cloth weight in GSM} = \frac{\text{EPI}}{\text{Warp count}} + \frac{\text{PPI}}{\text{Weft count}} \times 25.6$$

$$8.\ \text{Oz (Ounce) per sq.yard} = \frac{\text{GSM (Grams per sq. metre)}}{34}$$

Material measurement :
For calculating of length of any rolled fabrics :

$$L = \frac{0.0655\ (D - d)\ (D + d)}{t}$$

Where,

L = Length of material (feet)
t = Thickness of fabrics (inches)
D = Outside diameter (inches)
d = Inside diameter (inches)

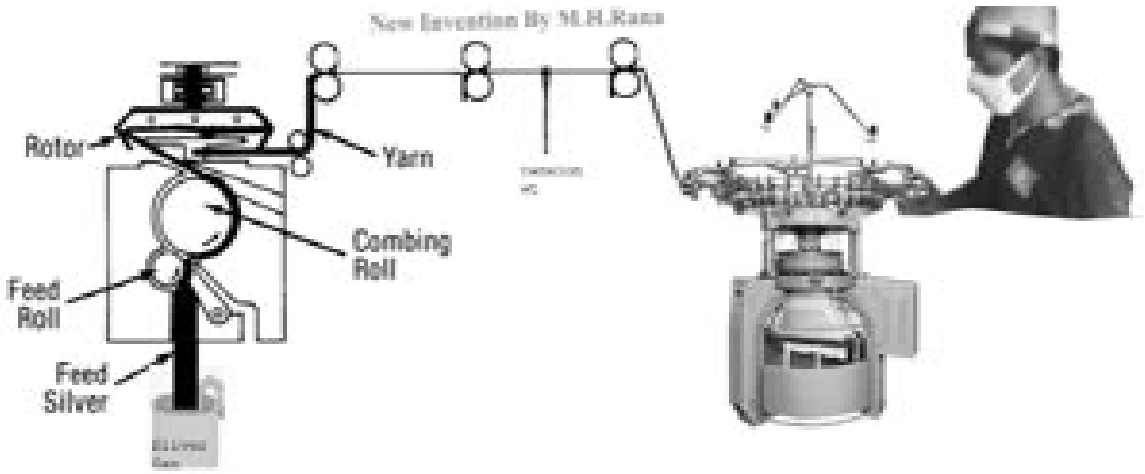
Weight of yarn in a cloth :
The weight of cloth manufactured on loom depends upon the weight of yarns in the warp and weft : ends/inch, picks/inch and the weight of size on the warp.

Therefore, Cloth weight = Weight of warp + Weight of weft + Weight of size (All in lbs.)

$$\text{Where as Weight of warp in lbs} = \frac{\text{Total No. of Ends x Tape length in yds.}}{\text{840 x Warp yarn count}}$$

Also Weight of weft in lbs.

$$= \frac{\text{Length of cloth (yds) x Picks/inch in cloth x Reed width (inch)}}{\text{840 x Weft yarn count}}$$



SLIVER TO FABRICS:

This is from drawing sliver direct feed to the knitting machine with 24 x 4 =96 in 4 x D shape Surrounding of knitting machine this will not use any simplex, Ring frame and autocoener.
process flow chart as will blow room >> carding >> breaker drawing >> finisher drawing >> then knitting output will knit fabrics.
so spinning cost will reduce 50%
here is knitting space will more required then previous.

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Spinning layout with mcs