Knitting Technology

Module - 4 : FAQ

Q1 Consider two yarns each of 20^s N_e, one made of acrylic fibre and the other of cotton fibre. Can one knit each of these yarns on a single jersey machine of gauge 20 with same degree of ease?

Ans.: The acrylic yarn would be thicker owing to its lower fibre density and packing factor. Hence a slightly higher gauge would be required for the acrylic yarn.

Q2 Considering that knitting on an Interlock machine and on a circular single jersey machine of same gauge effectively means knitting with same number of needles at any instant, why is a much finer yarn used for the Interlock construction?

Ans.: The rib knitted by one feeder in an interlock fabric has to have sufficient gaps amongst its loops occupying the same plane in which the rib knitted by the succeeding feeder may squeeze in.

Q3 How can good quality yarns ensure better control of loop length on multi-feeder machines?

Ans.: Better quality yarns have more uniformity in physical properties such as elastic rigidity, thickness, coefficient of friction etc. not only within a package but also between different packages. This suppresses the effect of variation in loop length at different feeders caused by variation in yarn properties.

Q4 If the cam setting is changed by 10%, by how much would the theoretical loop length change?

Ans.: Take some realistic values for “a” and “h” and work out the value of “l”. Increase h to 1.1h and figure out the % increase in “l”.

Q5 What is the major flaw in the model of loop length depicted in Fig. 45?

Ans.: It is a geometric model, totally ignoring the effect of physical properties of the yarn.

Q6 Why should coefficient of yarn friction play a role in deciding actual loop length?

Ans.: Every yarn segment within the knitting zone has to slide across other yarn segments as also across sinkers and needles. Applying Amonton's law on coefficient of friction it is possible to figure out that all these yarn-yarn and yarn-metal wraps would gradually raise the tension in the loop being formed from a smaller value to a much higher one, at times close to its breaking point. The resultant uneven tension in the various loops under formation within the knitting zone causes some length of yarn from the loop at the knitting point to flow away to neighboring loops, resulting in a lower value of loop length than what is estimated theoretically from the geometrical model.

Q7 Considering the expressions of P and Q it is observed that higher loop length (l) leads to a rise in P (kg/h) but has no effect on Q (m/h). Explain this paradox.

Ans.: The expression of Q does not figure the loop length (l) explicitly but contains the variable "C" in the denominator. Higher loop length would lead to lowering of C and hence a rise in Q as well. There is therefore no paradox.

Q8 Considering the expression of P as also relation between gauge (g) and yarn count (t), would a machine of higher gauge be expected to deliver higher amount of fabric per unit time?

Ans.: A machine of higher gauge would always produce less amount of fabric, both in terms of m/h as also in terms of kg/h because the yarn count in "tex" as also the loop length would be lower.

Q9 On a given circular multi-feeder weft knitting machine how does one maximize production and minimize skewness?

Ans.: Knit the smallest possible loop with the finest possible yarn. If the structure is single jersey then one may adjust the spirality of wale line to nullify the skewness.

Q10 Summarize the effect of machine productivity (v.n) on machine efficiency, machine downtime, fabric defects and conversion cost/kg of material produced.

Ans.: For higher values of machine productivity, the machine efficiency would be lower, which is primarily due to a rise in machine downtime, which in turn is primarily due to an increase in thread breakage rate. Overall fabric defects are not influenced by machine productivity while the conversion cost/kg would show a downward trend, in essence due to a lowering of salaries/kg of fabric produced.

Q11 Calculate the production in kg/h of a 30-inch diameter 30 rpm 24 gauge machine equipped with 90 feeders knitting loops of 3.3 mm length to a course density of 170 per dm from 20 Tex yarn at an efficiency of 90%

Ans.: Production in kg/h = 0.6 [90x 30x 90 x π x 30x 24x 3.3x 20]. 10^{-9}

= 21.75

Q12 Calculate the production in kg/h of a 90 feeder 30 inches diameter 24 gauge knitting machine running at 30 r.p.m. & producing fabric of 100 GSM at 90% efficiency to 270 courses/dm & 180 wales/ dm

Ans.: Number of courses per inch is 270/3.937 = 68.6

Width of fabric in m = [π x Machine diameter in inches x gauge]/ [10 x180] = 1.256m

Length of fabric produced in m/h = 1.524x 90x 30 x 90/ [100 x 68.6] = 54

Production in kg/h = 54 x 1.256 x 100 x 10^{-3} = 6.78

Q13 It is desired to knit a plain single jersey fabric of 60" stable width & areal density of 150 g/m^2 from 30^s N_e Cotton yarn. Calculate the loop length (mm) as also the cam setting (mm) & diameter (inches) of the required knitting machine. What would be the production in m/h & in kg/h, if the machine – revolving at 30 r.p.m. and equipped with 110 feeders – runs at 95% efficiency?

Ans.: machine gauge = $\sqrt{[20 \times 30]} = 24.495 \approx 24$

Areal density = 150 g/m^2 = K_S x yarn tex x 39.37 / 1000 x loop length $_{inch}$

For K_S = 4.29, Loop length $_{inch}$ = l = 0.121" = 3.1 mm

Number of wales per inch = 4.29/ 0.121 = 35.4

Fabric width = 60" = π x machine diameter D x Gauge/35.4 ⟹ D = 28"

Using the formula $l^2 = a^2 + h^2$ where a = 1/gauge and h = cam setting one gets the value of h = 0.0569"= 1.445 mm

Length of 30^s N_e yarn knitted in 1 sq. m. of fabric weighing 150 g = 7,603m

Total number of loops in 1 sq. m. of fabric = 7,603 x 1000 / 3.1

Total number of loops in 1 sq. dm of fabric is 7,603 x 10/3.1 = 24,525

Number of wales per dm = 35.4 x 3.937 = 139.37

Hence number of courses/m = 24,525/139.37 ≈ 1760

Hence courses/inch = 1760/39.37 = 44.7

Length of fabric knitted in m/h = [1.524. 95.30.110]/ [100. 44.7] = 107 m/h

Mass of fabric knitted per hour = $0.6x\pi x28x24x3.1x30x110x95x19.73x10^{-9}$

= 24 kg/h