



STORES CONSUMPTION IN SPINNING MILLS

1. Introduction

Periodical replacement of consumable stores is one of the essential requirements towards maintaining the machinery in good condition and obtaining good yarn quality. Though in a spinning mill, the expenses towards stores consumption amount to only 1.5% to 2.0% of sales turnover, nevertheless it is important, as like other manufacturing costs, to exercise control over the stores expenses also. However, many mills have been spending less than what they should, by delaying replacement schedules of vital items. Therefore, control of stores cost should not be treated as synonymous with reduction in cost, but should be taken as optimisation of consumption.

Presently, in view of the introduction of high speed machinery, replacement of consumable stores such as top roller cots, aprons, travellers, metallic wires, spindles, rings etc. is much faster than the earlier periods.

A study on stores consumption was conducted in 140 mills. Data on stores consumption pertaining to the last two years (2004-05 and 2005-06) were collected through 19th 'Costs, operational performance and yarn quality' (CPQ) – inter-mill study – questionnaire.

This Focus discusses the consumption of top roller cots, aprons, travellers and spindle tapes in ring frames and gears, bearings, belts and lubricants in all departments put together. The consumption rate of these items in high productivity mills is also given.

2. Consumption of stores in ring frames

The consumption rate of some of the major stores items in ring frames such as top roller cots, aprons, spindle tapes and travellers is given in Table 1.

Table 1 Consumption of stores items – ring frames

Items	Avg. consumption per 10000 spindle shifts* (numbers)		Average life (years)	
	All mills	High productivity mills	All mills	High productivity mills
Top roller cots	8.7	9.7	2.3	2.1
Top aprons	5.3	6.3	1.9	1.6
Bottom aprons	7.4	9.6	1.4	1.0
Spindle tapes	2.2	2.1	1.1	1.2
Travellers**	1100	1300	3.2 days	2.7 days

* Represents consumption for 10 spindles per year ** All varieties (ordinary, silver coated, etc.)

Note: (i) High productivity mills account for about 25% of the total mills.
(ii) Ring frame machine productivity index (MPI) in these mills is 100 and above.

$$(iii) MPI = \frac{\text{Mill's actual prodn./spl.(g) (adj.to 40s) } \times \text{mill's spl.utilisation (\%)}}{\text{Standard prodn./spl. for 40s (105 g) } \times \text{standard spl. utilisation (98\%)}} \times 100$$

2.1. Cots and aprons

Mills consumed on the average 8.7 top roller cots, 5.3 top aprons and 7.4 bottom aprons per 10 spindles per year. High productivity mills however, in view of high spindle speeds, used 10% to 30% more number of cots and aprons.

Average life of top roller cots works out to 2.3 years. As cots with different shore hardnesses are being used in the industry, in mills using exclusively soft cots (65⁰/75⁰) the average life can be expected to be lower marginally. Similarly, in mills producing 100% synthetic yarns and blended yarns, in view of more wear, the average life will be lower by 3 to 6 months.

Both top and bottom aprons play a vital role in guiding the fibres in controlled manner in the drafting zone. Hence, it is preferable to replace both the aprons together.

MPI vs consumption of cots and aprons

The consumption of top roller cots and top and bottom aprons tends to show some association with ring frame machine productivity index (MPI) (Table 2).

Table 2 MPI vs consumption of cots and aprons

MPI	Avg. consumption per 10000 spindle shifts (in numbers)		
	Top roller cots	Top aprons	Bottom aprons
100 and above	9.7	6.3	9.6
90 – 99	8.8	5.5	7.1
80 – 90	8.8	5.1	7.2
70 – 80	6.5	3.4	7.7
60 – 70	6.8	4.7	5.4
Below 60	5.8	3.7	5.0

In high productivity mills (MPI: 100 and above), the consumption of top roller cots (9.7 per 10000 spindle shifts) is about 65% more than that of low productivity mills having below 60 MPI (5.8 per 10000 spindle shifts). In the case of top aprons, the consumption rate is 70% more than the low productivity mills, while the consumption of bottom aprons is 90% more. Besides MPI, the other aspects that influence the consumption of cots and aprons include the quality, frequency of replacement and maintenance of these items, average count and the type of yarns manufactured such as cotton and synthetic.

In order to maintain good yarn quality, particularly U% and imperfections, the cots and aprons must be maintained properly till they are replaced with new ones. Some of the defective maintenance practices noticed in the mills, which would affect the condition and working of cots and aprons, are given below:

- Using knife/blades to remove lapping on cots.
- Improper tension/alignment of bottom aprons leading to apron cut/fold.
- Insufficient traverse of roving guide causing channeling on cots/aprons.
- Eccentric bottom rollers.
- Not lifting the top-arms from bottom rollers when the machine is stopped for longer duration.
- Frequent buffing of cots.
- Too high top arm pressure.
- Defective bottom apron movement.
- Wrinkled/poor flexible aprons.

2.2. Spindle tapes

Synthetic tapes offer significant reduction in power consumption and long life as compared to cotton tapes. In view of this, almost all the mills are found to use synthetic tapes.

Mills consumed 2.2 tapes per 10000 spindle shifts, ie 0.22 tape per spindle per year. High productivity mills also consumed almost the same number of tapes. Ten years ago, as per an earlier study by SITRA¹, mills consumed on the average 1.8 tapes per 10000 spindle shifts. The spurt in the consumption may be attributed to the increase in spindle speeds. The average life of tapes is around 13 months. No clear relationship is observed in the consumption of tapes with ring frame machine productivity.

Tapes must be replaced in all the spindles in a frame at a time as per schedule, instead of replacing them as and when a tape cut occurs. Extending the use of tapes even after the schedule will elongate them significantly which inturn would cause high tpi variation in yarn.

2.3. Travellers

Overall consumption of travellers works out to 1100 per 10000 spindle shifts, ie an average life of 3.2 days. As compared to the previous study¹, the present consumption is high by 40%, mainly due to higher spindle speeds. The consumption of travellers tends to show some association with ring frame machine productivity (Table 3).

Table 3 MPI vs traveller consumption

MPI	Consumption/10000 spindle shifts (in numbers)
100 & above	1300
90 – 99	1300
80 – 90	1000
70 – 80	1100
60 – 70	900
Below 60	800

In high productivity mills, the traveller consumption is 60% more than the low productivity mills. Besides MPI, the other aspects that influence the consumption are the condition of rings, frequent count changes, wastage of travellers, yarn quality requirement, etc.

Traveller Consumption Index

Traveller changing frequencies must be fixed based on traveller burn-out rate, condition of rings and yarn quality requirements, particularly hairiness. Mills could monitor the consumption of travellers by estimating 'Traveller Consumption Index (TCI)' on regular basis, where

$$TCI = \frac{\text{Actual traveller consumption}}{\text{Expected traveller consumption}} \times 100$$

Illustration:

Number of travellers actually consumed during the year : 16.51 lakhs
Traveller changing frequency : Once in 7 days
Actual spindle shifts worked : 305 lakhs
Expected traveller consumption (in numbers) : 14.52 lakhs

$$TCI = \frac{16.51}{14.52} \times 100 \Rightarrow 114$$

The TCI of 114 implies that the mill consumed about 15% more travellers than that required.

In many mills, higher consumption of travellers than that expected has been noticed, which is possibly due to

- Accounting error.
- Frequent count changes.
- More wastage by workmen during changing and
- Not strictly following the reported changing frequencies.

3. Consumption of lubricants

Lubrication is a major item of expenditure in the maintenance of machinery and it also represents the most important factor in protecting the machinery from wear, corrosion and possible failure. Proper lubrication of machinery is of immense importance, as majority of the problems stem out due to inadequate lubrication of parts or wrong selection of lubricants.

Table 4 gives the consumption rate of lubricants such as spindle oil, other oils and grease.

Table 4 Consumption of lubricants per 10000 spindle shifts

Items	Unit	Avg. consumption*	
		All mills	High productivity mills
Spindle oil	Litre	0.16	0.17
Other oils	Litre	0.57	0.61
Grease	kg	0.27	0.29

* *all departments put together*

When compared to the previous study¹, about 40% reduction in the consumption of spindle oil and other oils has been noticed which may be attributed to the improvement in technology of machinery, increased awareness of the need for proper lubrication, better handling of lubricants, etc. In the case of grease, the reduction is only marginal at 10%. The consumption rate of these items in high production mills is almost the same as all mills' average.

Some of the measures that can be taken to improve the quality of lubrication and reduce the consumption of lubricants are outlined below²:

- Method of lubrication and consumption of lubricants should be critically studied and suitable corrective measures should be taken to ensure proper lubrication and avoid wastage.
- Mills should prepare their own detailed lubrication schedules based on the recommendations of oil companies and machinery manufacturers.
- Lubricants should be stored at a specified centralised place in the stores and in clean places in the departments.
- Lubrication points which have the same frequency should be grouped together and marked with distinctive colours for easy identification.
- Separate containers for each grade of oil or grease should be used so that contamination of one with the other does not take place.
- Lubricants should not be left exposed, and it is preferable to indent required quantities.
- Attention should be paid to the selection of proper equipment for lubrication such as oil can, grease gun, grease cup, and spindle oiling device.
- A machine should not be generally lubricated while running. Apart from being dangerous, it would also result in splashing of oil. Besides, one cannot be sure whether proper amount of lubricant has applied.
- Oil cans, grease guns and all other lubrication appliances should be maintained in clean condition, and oil hole covers, bearing caps and other lubrication points should not be kept open.

4. Consumption of general items (bearings, belts and gears)

The consumption rate of major general items like all types of belts, bearings and gears is shown in Table 5.

Table 5 Consumption of belts, bearings and gears per 10000 spindle shifts (in numbers)

Items	Avg.consumption*	
	All mills	High productivity mills
Belts	0.24	0.24
Bearings	0.74	0.74
Gears	0.18	0.14

** all departments put together*

On the average, a 30000 spindle mill consumes about 700 belts, 2200 bearings and 500 gears per year in all departments put together.

5. Stores expenses

The expenditure on stores normally depends on the following aspects:

- Schedules of replacement of various items and their adherence.
- Cost of individual items.
- Type of machinery and post spinning processes.
- Extent of use of imported components.
- Condition of machinery and maintenance practices.
- Type of counts and variety of yarns manufactured.
- Work methods, material handling and house keeping.

Hence, a wide variation in stores expenses among the mills is inevitable. However, as a broad guideline, a norm of around Rs 300 per spindle per year may be considered towards stores expenses (excluding long life and high cost items such as top arms, spindles, flyers, unicombs, etc.). In the case of hi-tech mills, the stores expenses will be 30% to 50% higher.

References

1. Shanmuganandam D. 1998. A study on stores consumption and packing materials cost in spinning mills, SITRA.
2. Ratnam T V and Chellamani K P. 2004. Maintenance management in spinning, SITRA.

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