ABSTRACT

The Khadi industry is one of the largest employment generation initiatives in the country. This sector employed about 14.79 lakh people both full time and part time in khadi spinning during 1994. However today, the employment generation has come down to 7 lakh, in 2004.

This is mainly due to the fact that khadi spinner has to put in a lot of physical drudgery to earn low wages. Hence this khadi sector is not attractive to him and the spinners migrate to other jobs in the cities, causing more problems to the city life. The skills imparted to the spinners also become waste.

Hence a research has been undertaken to help the khadi spinner to earn a better wage in his rural home itself by redesigning the spinning wheel and adding some more spindles without unduly enlarging the size of the spinning machine.

The objectives of the study are clearly defined in the second chapter. The methods to increase the speed of spindle and production rates in the charkha spinning machine have been discussed. The motorization of the charkha and its advantages have also been discussed at length.

This chapter deals with the design of the work and review of literature. Here the researcher has conceived idea of redesigning the
charkha on the lines of the spinning machines that are working in large textile mills.

As the ring frame is built on 8 Spindles per staff length, the researcher has taken 16 spindles (2 staff length) so that commercially available parts are cheaper and could be easily fixed on to the machine frame such as flutted rollers, rings, spindles and top arms. The spinning angle and train of wheels to drive the machine have all been modified. The bigger package size allows for higher yarn comfort and longer running time of the charkha. Addition of spindles also contributes to increased production.

Various literature have been scanned from KVIC Bombay, KVIB Chennai, Sarvaodaya sangams, Khadi commissions, Annual reports, etc. The researcher has visited Mumbai, Ahmedabad, T.Kallupatti, Gandhigram, Dindigual, Madurai, Coimbatore, Tirupur and remote villages to study the problems faced by the Khadi spinners.

Chapter three covers the flow process chart and the functioning of the central processing unit that prepares the input for charkha spinning. The evaluation of the spinning charkha and the further developments that could be done to improve both productivity & quality and motorization to remove drudgery and fatigue to the khadi spinner are narrated in this chapter.

Chapter four deals with the end breakage analysis on the new 16 spindle charkha that was developed. The doffing time for different
counts spinning at different speeds of spindles where analyzed and compared with the conventional charkhas.

The production rates achieved for different counts were also studied and the hanks produced by the spinners were calculated. Knowing the Khadi cost chart rate we could easily calculate the wage earnings per day of the spinner. There is a 105 - 118 percentage increase in both production and wage earnings to the spinner on the improved 16 spindle charkha machine in all the counts that were spun.

Chapter five deals with quality parameters of the charkha yarns. The yarns that were spun on different charkhas which are available commercially and compared to the performance of 16 Spindle Modified Charkha for yarn quality. The ten quality characteristics that were studied were CV% of TPI, U%, Thin places/km, Thick places/km, Neps/km, Total imperfections in yam /km, Yarn strength, Elongation percentage of yarn and Hairiness Index. In all these parameters studied, the 16 spindle machine gave good results which were comparable to SITRA norms for yarn quality. The trails were conducted at two speeds namely 5500 rpm and 6500 rpm of spindle speed. Factors influencing the quality parameters have also been analysed deeply.

Chapter six deals with power consumption studies in the improved charkha. As far as power saving goes, there is a 33% increase in power consumption if the spindle speed is increased by 118%. The 16 Spindle Charkha does not consume more than 160
watts of power per shift which means a single phase $\frac{1}{4}$ hp motor is sufficient to work in rural homes.

Chapter 7 deals with cost economics of coarse count spinning and handloom weaving of bedspreads with capital investment of less than 5 lakhs. It is possible to provide employment to 12 skilled khadi workers and they can earn a living wage of more than Rs 100 per day. Handloom weaver’s wife can also help him and earn another Rs 100 daily. Human drudgery is eliminated. This will prevent skilled spinner from migrating to cities in search of other jobs.

The number of people employed in Khadi sector, which was 14.79 lakhs in 1994 has steadily come down. This new 16 spindle modified charkha that has been developed gives better quality, improved production and hence yarn should fetch a better price in the market.

This will bring back prosperity to the khadi spinner as he will be able to earn higher wages of Rs 350 by looking after two improved charkhas. (Details of calculations given in chapter seven)

There is non-measurable social benefit from the khadi sector such as availability of quality product without affecting the eco system besides measurable benefits like profitable employment, wages etc. It also facilitates to enroll a peaceful society.

In this chapter 10\textsuperscript{o} Nm count of yarn was spun on the newly developed charkha. This yarn was used as both warp and weft to
produce a bed spread of 2.25 meters length and 1.25 meters width. After weaving on a handloom, it was sent for dyeing and finishing. It was found that the bed sheet weights 640 gms and cost of production was Rs 117 per bed spread. This bed sheet could fetch a price of Rs 141 and generate a profit of 20%. A small project with capital investment of Rs 5.00 lakhs including working capital and fixed capita! could easily provide employment generation for 12 persons daily. This project gives a return on investment of 25.8%, which should be encouraged.

By the present research work, millions of rural women who are in khadi industry can be retained in charkha spinning without any drudgery and earn a reasonable wage of Rs 174 per day of 8 hours working in Improved 16 Spindle Charkha spinning 10s Nm. The yarn produced from the narrow width spinning charkha with 16 spindles is quite comparable with SITRA norms and could be used for making bed spreads with optimum returns to the weaver also.