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Analysis and Style of Jacquard Drive System for Textile Powerloom Machines

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ABSTRACT

The Indian textile business is one among the biggest and oldest sectors within the country and features a major share within the economic system. Loom business in Tirupur is earlier growing business than in different states in Bharat. Tirupur is that the home of loom and loom business that provides employment total is variety of employees (approximately 100000). The jacquard drive system during a loom is obtained by a sequence drive system. Within the gift system, frequent chain failure and jerky power transmission is discovered. Field visits are disbursed so as to analyze the explanations of failure of the prevailing chain drive system. The chain drive fails because of long distance between shafts, swaying result, arrangement between the axis of shaft and inadequate lubrication. Failure problems are accountable for the down time and probable rejection of product because of interruption in weaving cycle. Another for jacquard drive is thence felt necessary so as to avoid/reduce the amount of failures. The chain drive is thus studied very well for the desired speed reduction and kinds of drugs pairs required to switch the chain drive. Pinion and crown wheel drive system is chosen from numbers of attainable alternatives. The present work represents systematic try of design the jacquard drive system for textile loom. Radical style procedure is applied so as to style the gear drive system. The analytical results square measure, valid victimization numerical simulation. planned style of positive gear gear is factory-made that has shown no failure over an amount of 1 month as compared to four failures for a series drive system for a similar amount up the system dependableness.

Keywords: chain drive, gear drive, Jacquard drive system, textile loom

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INTRODUCTION

The Indian textile industry consists of three distinct sectors representing broadly three levels of technology and Organization, namely, mills, power looms and hand loom [1]. The ability loom business is that the biggest little scale business of Tirupur. Tirupur is referred to as town of textiles attributable to its producing capability and capabilities particularly for towels and napkins [2]. The jacquard drive system during a loom is obtained by a sequence drive system. An outline of the chain drive system was done through the visits to the textile industries and it had been found that there's frequent chain failure and jerky power transmission [3].

This developmental chargeable for the period of time and rejection of product once the weaving cycle is interrupted thanks to chain failure. It is essential to check the chain system concerned speed ratios and to forestall the failure of chain drive system or otherwise replace the drive by some appropriate various. As mentioned on top of the issues of chain failure thanks to jerky power transfer is self-addressed to the long length of chain

used for jacquard movement. This downside is dominantly thanks to longer center distance of driver and driven shaft and drooping of the chain. Frequent lubrication is additionally a demand of this drive system. The yarn particle gets embedded/adhered to the chain (due to lubricant) thereby touching the performance of the chain drive system. In tune with these problems the objectives of the present study are to check the failure of existing chain drive system and to check different positive drive systems; which may replace chain drive system. Style to style and develop a brand new design of positive gear drive gear mechanism and analyze the projected gear drive system.

REASON FOR FAILURE OF CHAIN DRIVE SYSTEM

In addition to the communicated literature [2], visits square measure undertaken within the industries and around Tirupur to urge the experiential information concerning the failure of chain system. Two sorts of chains square measure employed in native textile industry: simple chain and roller chain.

Simple Chain

It is used for 70% Textile industries in Sholapur. It is created from forged iron link shinged along. It is used for standard recent looms for power transmission. It provides smart performance than easy chain.

Roller Chain

It is used wherever recent looms square measure put in. The links square measure product of steel blocks and combined along. various failures of each chain in textile business are determined and square measures.

The reasons for failure of chain drive area unit because of long distance between shafts, swaying impact, placement between the axis of shaft and inadequate lubrication. So as to resolve this crucial issue, various systems area unit studied.

REVIEW OF LITERATURE

As mentioned on top of, it became necessary to develop an alternate for the chain drive system so as to unravel the matter of break down. Visits to close textile and allied business were undertaken so as to amass the data regarding similar technology or application that employed in the business.

(a) Belt gear it was possible to replace the existing chain system by belt drive as the distance was large but in gift application, the thought of belt drive unbroken aside thanks to following reasons. Belt was a versatile drive and application needs a rigid drive. The rate quantitative relation not remains constant. Slip may be a vital issue. Due to friction there'll be significant loss of power which can end in lower potency. Belt drives had relatively short service life.

(b) Command follower system: Belt drive wasn't appropriate for the current application and also the choice was thus rejected. As an alternate, the command follower system was thought of since it employed in mat weaving machine. once finding out the command follower system, following observations were noted. It needed planning specific kind of cam profile. Single motor won't fulfill the necessities. Speed variation was not attainable significant quantity of vibrations.

(c) Gear wheel Drive System: it's simplest variety of a gear that is simple to manufacture and a rigid drive conjointly. However, it has the following limitations it's conjointly not selected:

It cannot be transmit power for 900 aligned shafts it's clamant operational

Inaccurate speed reduction

It conjointly need additional lubrication and fewer power transmission

(d) gear Drive System: the ultimate probable choice was prompt concerning the gear drive. in line with power transmission direction, speed reduction, the gear is chosen thanks to following reasons:
Power transmission in ninety degrees needed, which may be achieved victimization bevel gears. Straight gear will fulfill the necessity and square measure simple to style and manufacture and might offer fairly smart service. Smooth teeth engagement leads to quiet operation. High power transmission vibrations square measure less as compared to chain drive.

Less lubrication needed as compared to chain drive system and covering the drive was doable.

Design of substances based mostly gear. The design of gear based transmission system was divided into following three main parts and layout is additionally.

1. Design of bevel gears at motor finish
2. Design of bevel gears at jacquard drive finish
3. Design of intermediate shaft

For planning the system it had been needed to live the speed of driver shaft that is administered by exploitation measuring system. it had been additionally noncommissioned the info needed for material choice of assorted parts equivalent to gear and pinion with facilitate of measurement instruments equivalent to vernier micrometer, measurement length tape, etc.

By victimization the quality formulae the analytical style gear drive system was procedure for carried out [4–13]. The final calculated dimensions of the gear drive system square measure given in Table 1.

Table 1. *Design of bevel gear.*

S. no.	**DM parameters**	**Design of bevel gears at motor end**		**Design of bevel gears at Jacquard drive finish drive end**	
		Gear	Pinion	Gear	Pinion
1	No. of teeth	16mm	16mm	20mm	40mm
2	Modules	5mm	5mm	4mm	4mm
3	Pitch Diameter	80mm	80mm		
4	Cone distance	56.568mm	56.568 mm		
5	Mean radious	33.33 mm	33.33mm	66.66mm	33.33 mm
6	Face width	18.85 mm	18.85mm		
6	Beam Strength	391.153 N		1745.39N	
7	Dynamic load	7.318N		22.524N	
8	Effective load	680.099N		695.315	

An intermediate shaft is needed to own an affiliation between motor finish and Jacquard finish through the gear wheel pairs. The forces working on shaft area unit investigated through the force analysis on both ends. Considering intermediate shaft as a simply supported beam the instant wase taken; severally shear force and bending moment diagram area unit drawn. Finally, diameter of shaft is noted as 25 metric linear unit.

MODELING AND ANALYSIS OF PINION AND CROWN WHEEL DRIVE SYSTEM

The bending Stress value in the bevel gear found out within the permissible range with the analytical results.

RESULTS

It comprises of the results and discussion related to the gear drive model developed, its validation using through ANSYS software.

The gear drive is designed according the load conditions and the induced bending stress is validated using the ANSYS software. The results of bending stress according to analytical and ANSYS software are illustrated in Table 2.

Table 2. *Results of bending stress of bevel gear.*

S no	Area analytical results	Engine end bevel ANSYS	Software difference in both comes about values	
1	Adapt Jacquard Drive	39.88 MPa	40.433 MPa	1.01%
2	End	58.74 MPa	63.695 MPa	7.7%

Based on Prior System Failure Rate

The regular chain drive framework was having the issue of influencing which because of long shaft remove i.e. 2 m. The influencing impact causes the framework vibrations and misalignment which will decreases the transmission proficiency of the framework. The recurrence of grease is likewise more and also it is a noisy framework. The disappointment of chain drive happens all the more oftentimes which totally closed down the creation of Power linger. The disappointment information gathered from concern upkeep office from the plant; which is as said in beneath Table 3.

Table 3. *Data of chain drive failure.*

Power loom machine	Frequency of failure per month	Total average shut down time
Power loom No. 1	4	3 hours 10 min
Power loom No. 2	6	4 hours 34 min
Power loom No. 3	5	3 hours 56 min

According to the gathered information the recurrence of disappointment is 4 times each month. The recurrence of changing the new chain is additionally every year for a basic chain for every machine. It is additionally watched that a tie begins to give inconveniences from six to seven months from its establishment period.

Based on Present Gear Drive System

The recently outlined slope equip framework totally diminishes influencing impact. It likewise diminishes the grease recurrence because of which support time additionally limits. The slant equip drive system also increases the power transmission efficiency upto 99%. The rigid bevel gear drive system minimizes the frequency of failure which will ultimately increase the working life of the system. The watched disappointment information as perconcern support office from the plant is said as underneath in Table 4.

Table 4. *Failure data of gear drive system.*

Machine	Failure per month	Average shutdown time
Powerloom 1	Nil	Nil

Ultimately the failure rate is drastically reduced by comparing the data obtained from Tables 3 and 4. Thus, gear drive system can operate without shut down by proper preventive upkeep. One might say that the unwavering quality of the framework is progressed.

CONCLUSION

The study of failure of existing chain drive system was carried out by visiting the plant and through various literatures. The specific conclusions are as follows.

The existing chain drive fails due to long distance between shafts, swaying effect, misalignment between axis of shaft, frequency of lubrication and due to vibrations. The frequency of failure is 4 times per month. The bevel gear drive based transmission system is developed and found to be effective. By proper preventive maintenance can operate the system almost without shut down. The analytical design, modeling using CATIA-V5 R19 and simulation using ANSYS of bevel gear drive system is successfully carried out.

In the present work, the validation of ANSYS results is in close agreement to the analytical method results. Simulation is found to be avital tool in analysis and also validation of a gear drive system.

REFERENCES

[1] https://www.dnb.co.in/SMEstextile/overview.asp.
[2] K.C. Goli. A review on redesign of drive system for textile power loom machine to prevent downtime and improve relibility of system, *Int J Eng Trends Technol*. 2014; 12(1).
[3] A. Anjum. An analytical study of the functioning and the problems of the power loom industry in Tirupur with special reference to Malegaon Dist. Nashik, *Int J Trade Econ Finan*. 2011 Vol. 2, No. 3, June 2011.
[4] Manual on energy conservation measures in Textiles Cluster Tirupur, Bureau of Vitality Efficiency, Zenith Energy Services Pvt. Ltd., Hyderabad, S.M. Bosnjak, Failure analysis of the stacker crawler chain link, *Proc Des.* 2011; 10: 2244–9p.
[5] V. Kerremans. Wear of conveyor chains with polymer rollers, *Sustain Dev Des.* 2011.
[6] G. Pantazopoulos. Fatigue failure of steel links operating as chain components in a overwhelming obligation drawbench, *Eng Fail Anal*. 2009; 16: 2440–9p.
[7] T.D. Bhoite, Fe a based study of effect of radial variation of outer link in a typical roller chain link assembly, *Int J Mech Ind Eng (IJMIE)*. 2012; 1(4).
[8] Sadagopan, Wear and fatigue analysis of two wheeler transmission chain, *J Logic Ind Res*. 2007; 66: 912–8p.
[9] J.C. Conwell. *Experimental Investigation Of Chain Tension and Roller Sprocket Impact Forces in Roller Chain Drives*.Vanderbilt University, December 1989.
[10] U. Singh. Failure analysis of bridle chain used for hoisting in mines, *J Concoct Eng Mater Sci*. 2013; 4(3): 38–45p.
[11] K. Mahadevan, K. Balaveera Reddy. *Design Data Handbook*. 3rd Edn., CBS Publishers and Distributors Pvt. Ltd., 8.51–.2p.
[12] V.B. Bhandari. *Design of Machine Elements*. 3rd Edn., McGraw Hill Education Private Ltd, 334, 573–575, 671–673, 724p.
[13] R.M. Jadeja. Bending stress analysis of bevel gears, international diary of innovative research in science, *Eng Technol*. 2013; 2(7).

