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WE WILL RISE UP WE WILL SHINE

Department of Textile Engineering

Project/Thesis on:

Causes of Loom stoppages and their impact on Fabric production

Course Title: Project Work / Thesis
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This report we have presented in partial fulfillment of the requirement for the Degree of Bachelor of Science in Textile Engineering.

Advance in Fabric Manufacturing Technology

Declaration

We hereby assure that, Md. Tuhin Hossain , Md. Fariduzzaman, Akilma Khatun, Md. Uzzal shaikh and Md. Shahadat Hossain have done this project under the Department of Textile Engineering, Sonargaon University.

We further confirm that this project report is an actual work and that no part of this report has been copied from elsewhere.

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Abstract

The way the warp and filling threads interlace with each other is called the weave.
The majority of woven products are created with one of three basic weaves: plain weave, satin weave, or twill weave.

In weaving, we observe two types of weaving in different time. Fabric is produced by two types of machine. Such as,
1. Air jet weaving machine
2. Rapier weaving machine

Weaving machine can be stopped by different causes and these machine stoppages cause loss of fabric production. The smooth running of weaving machine depends on yarn quality, weaving machine conditions and weaving production conditions. Air jet and Rapier weaving machine stops due to different causes. In this work it was found that the causes of stoppages are warp yarn breakages, Weft yarn breakage, Electrical problems, mechanical faults, set-off, Miss pick, Warp yarn loose, finished weft yarn package, damaged warp yarn size problem, machine cleaning and fabric roll cutting, yarn joining, and oil problem. The major cause of Airjet weaving machine stoppage was machine cleaning, warp & weft yarn breakage and Warp yarn loose, Finished weft yarn package.

In Rapier weaving machine causes of stoppages are warp yarn breakages, Weft yarn breakage, Electrical problems, mechanical faults, set-off, Miss pick, Warp yarn loose, finished weft yarn package, damaged warp yarn size problem, machine cleaning and fabric roll cutting, yarn joining, and oil problem. The major cause of Rapier weaving machine stoppage was machine cleaning, warp & weft yarn breakage and Warp yarn loose, Finished weft yarn package.

Keywords: Weaving, Air jet & Rapier machine, causes of stoppages, yarn breakages, set-off, machine cleaning; roll cutting, , yarn joining ,electrical faults, mechanical faults.

Table of Content

Introduction

In this paper the causes of weaving machine stoppages were investigated and their magnitude and impact on production analyzed. In woven fabric production process, due to different minor stoppages the amount of fabric production decreases. The more the stoppages the lesser the fabric production. There are many causes of weaving machine stoppages. These causes not only stop the production but also the output fabric quality is also hampered. This cannot be considered as mere production loss. This also leads to waste of time, labor and raw material. Again, the weaving industries produce fabrics mainly for Ready Made Garments sector which has to work with a very short time schedule and where wastage is not acceptable like all other production processes. Though the weaving machine stoppages are mainly due to minor causes of short durations but it impacts a lot of loss collectively. In this paper the common causes of stoppages are identified and their magnitudes are graphically represented and their impact on production is calculated. This study was indented to find out the causes and their impact on production on woven denim fabric production.

Literature Review

Factors for weaving machine stoppages: There are basically three factors which are responsible for optimum fabric production. They are: a. Yarn Characteristics.
b. Machine Quality Requirements.
c. Weaving production conditions

a) Yarn characteristics: This includes tenacity and breaking extension, elasticity and friction of yarn. Tenacity is expressed as specific stress at rupture. It is usually expressed in cN/tex (for staple fiber yarn) and in cN/dtex (for filament yarns).
The strength of the yarn must be sufficient to resist the tensile stress those occurs while weaving. Especially during withdrawal from the yarn packages and in the region Drawing in through drop wire and Heald eye, Denting of the fabric formation.
In a yarn made from staple fiber, the strength is to a very large extent directly proportional to the amount of twist which is inserted during spinning.
Breaking extension is the extension that the yarn exhibits at the highest strength during a standardized tensile test. It is expressed as percentage. Extension of yarn is necessary, so that it can resist bending strain or neutralize them by getting extended. The extension of yarn (made from staple fiber) is inversely proportional to their twist.

Friction occurs if a body or a surface is in the path of yarn and the yarn rubs against it during its movement. This leads to increase in tension. During weaving it is expected that friction is at the lowest possible level. One of the measures lies in the construction and the shape of the yarn package. In order to improve the slide performance yarns made from staple fiber, they are waxed. While producing the cross-wound cone on a winder, paraffin wax in dry state is applied to the yarn surface to reduce friction.

b) Machine Quality Requirements: Long lasting and trouble-free quality functioning of the weaving machine could be possible by proper maintenance care. Proper horizontal installation of the machine, tension free yarn feeding, flawless yarn guides, proper fabric take-off and proper machine rpm are the basic quality needs of a weaving machine.

Following maintenance schedule may be carried out:

Use and maintenance of air-jet looms:

I. Periodic Maintenance

1. Daily maintenance and handling

Maintenance workers need to carry out routine maintenance of electric oil pump, centralized oil supply, heat dissipation part of main motor, input shaft of open cam box, electromagnetic brake, weft detector, scissors, winch, side brace and edge-trapping yarn.

2. Maintenance and disposal of machine time

Check whether the side brace ring rotates flexibly, whether it is worn, whether there are flying flowers, whether the interval between stop pin and main drum is 0.5 mm, whether the air pipe leaks,

whether the centralized oil supply leaks, whether the oil pipe is damaged or bent, whether there are flying flowers in the control box, confirm whether the height error of the Heald frame is less than 2 mm, and whether the air filter exhausts. Whether the pipe is unblocked, whether there are flying flowers on the pinion of the warp shaft, whether there is yarn head on the bevel gear shaft of the opening device, whether the screen hole on the oil filter is blocked, whether yarn head is rolled on the warp let-off and loosening axles, whether there is damage to the insulating sleeve of the wire and whether the clearance of the brake is correct. Fuel the nozzle, the gear face and chain of the open gear, and check whether the Heald frame and the guide plate of the Heald frame are worn or not.

3. Half-yearly overhaul and treatment

It is necessary to check whether the winding is clean, whether there are yarn marks and scars on the main drum and pin drum, whether the inside of the stop pin assembly is dirty, whether the open wire rope is elongated or damaged, whether the recovery spring is damaged, and whether the bearing of the open wire rope connecting seat is worn. Whether the belt tension is appropriate or not, whether there is damage, whether the sensors are working properly, whether the transmission gear box, coiling gear box and sending gear box are replaced with lubricating oil, whether the filter sieve is blocked, whether the reed is stained with dirt, whether the wind speed value is normal, and whether the U-shaped shaft lining of the pull-down hook is normal. Whether the wear is less than 2 mm, whether the main nozzle duct is bent, whether the coiling roller chain is elongated, whether the clearance between planetary gears is normal, whether the wear of the axle lining of the planetary tube seat is less than O.5 mm, whether the wear of the axle lining of the planetary tube is less than 0.5 mm, whether the wear of the axle lining of the planetary tube is less than O.5 mm, whether the auxiliary nozzle is scratched or not. There are yarn marks, whether bending or not, whether there is oil in the scissor's device, and so on.

4. One-year overhaul and disposal

Whether the screw of the support foot of the main nozzle is loose or not, the screw should be tightened again.

5. Overhaul and disposal in two years

Whether the winding roll, pressing roll and rough rubber are worn, whether the warp and warp parts of the warp axle are worn within 0.3 mm, whether the buffer performance is reduced, whether the nylon bushing and the guide pin column of the buffer are worn, whether the auxiliary nozzle is dirty, whether the weft is cut correctly by the side shearing device of the yarn supply, whether the stop pin hole of the stop pin assembly is worn or not.

Whether the wear of the roll shaft of the coiling cloth is less than 0.5 mm or not is less than 0.5 mm.

6. Overhaul and disposal in three years

Whether the lubricating oil of solenoid valve is insufficient and whether the coiling cloth roll rotates flexibly.

7. Seven-year overhaul

It includes the maintenance of bearings, oil seals, gears, cams, axle linings, stop pins, main motors, frame, opening, warp feeding, winding and weft storage parts.

Contents and Notices to be Preserved by Loom Institutions after Long-term Use

(1) Main transmission part: After long-term use of the loom, it is necessary to replace the oil seal of the crankshaft bearing seat of the driving part.

(2) Opening part: It is necessary to replace the cam open arm bearing, wire rope, Heald spring and Heald arm bearing.

(3) Replacement of synchronous toothed belt and cleaning of oil filter.

(4) Clean reed regularly.

(5) The inner parts of the length measuring and weft storage drum are replaced, the inner parts of the stop pin are replaced, and the encoder is cleaned.

(6) Main nozzle cleaning, filter cleaning, cleaning and repair of solenoid valve and pressure regulating valve, inspection and configuration of gas pipe.

(7) Servo motor maintenance and replacement, buffer repair and internal parts replacement.

(8) Check coiling brake rollers, chains, tensioning wheels, adjusting pins and replacement, maintenance and replacement of friction discs and discs.
Inspection and replacement of rough rubber.

(9) Check and replace planetary gear, tube bearing, guide arm shaft and coupling.

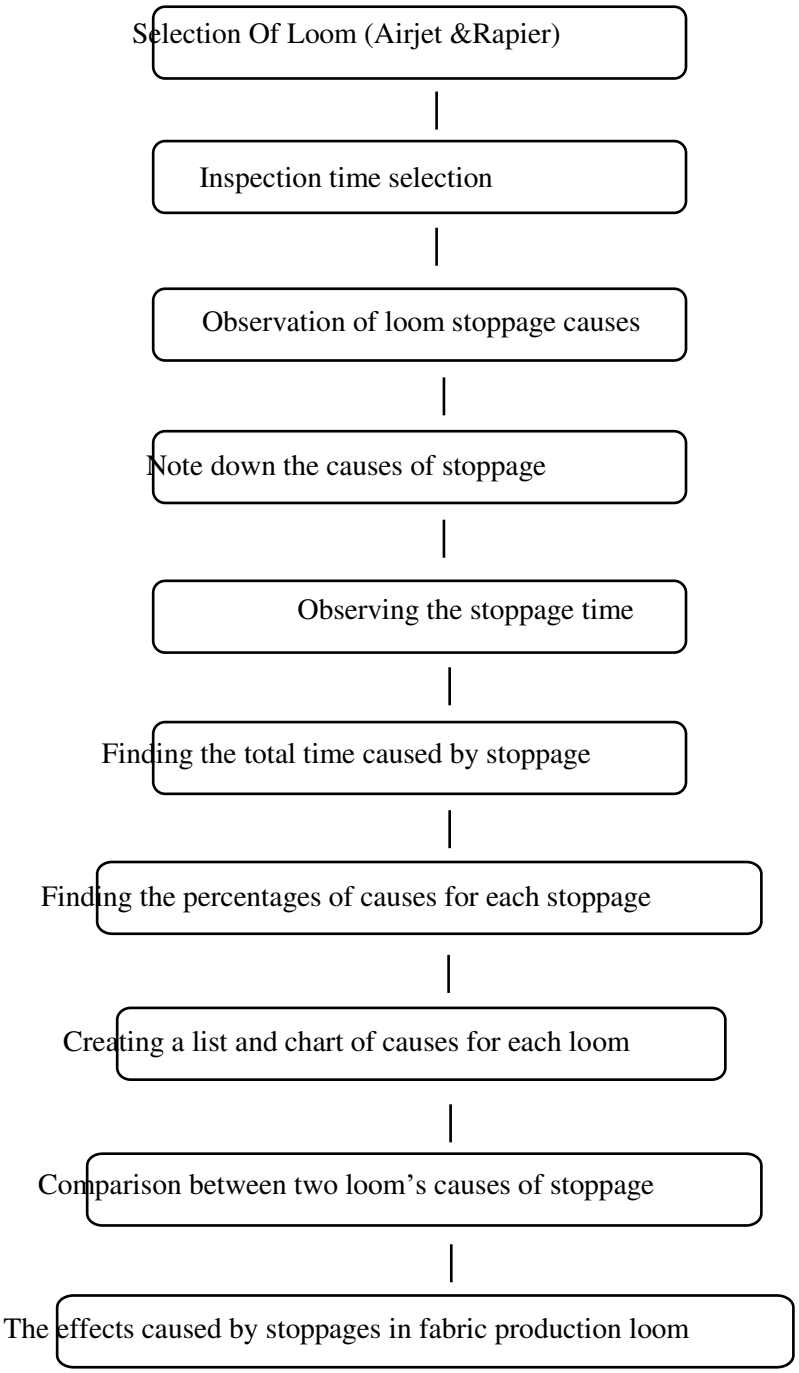
(10) Inspection and replacement of weft detection cable

C) Weaving production conditions:

1. **Suitable yarn count:** Selection of suitable yarn count should be based on machine rpm, machine types and weaving structures.
2. **Machine setting:** Optimum setting is based on yarn type and woven structure. For this balanced yarn tension prior and after to feeder is maintained. Lower fabric take up tension is also observed in machine setting. Finally proper needle timings of dial and cylinder needles in order to obtain loose or tight structure.
3. **Yarn storage:** For the yarns to have sufficient moisture for weaving, they should be stored at 20-25^0 C and 65% RH. Storage under extreme temperatures must be avoided. Higher temperature leads to paraffin migration and lower temperature leads to water condensation.
4. **Air conditioning:** Air conditioning of weaving plant prevents yarn dry up, reduces yarn breaks and improves the surface structure of fabric. The recommended conditioning is 55% + 10% RH and 25^0 C + 3^0 C temperature.

Methodology

Diagram Of Methodology –



In the process of completing this thesis project we had to follow the steps serially to get the results. We also needed some equipment's for this work like Stopwatch, Data Table etc. The format of data table provided by our supervisor for data collection are given below

Data on Loom Stoppage

Type of loom:	Warp Count:
Brand of loom:	Weft Count:
Origin / Country of manufacturer:	E.P.I.:
Loom Speed (P.P.M.):	P.P.I.:
Width:	

Duration:

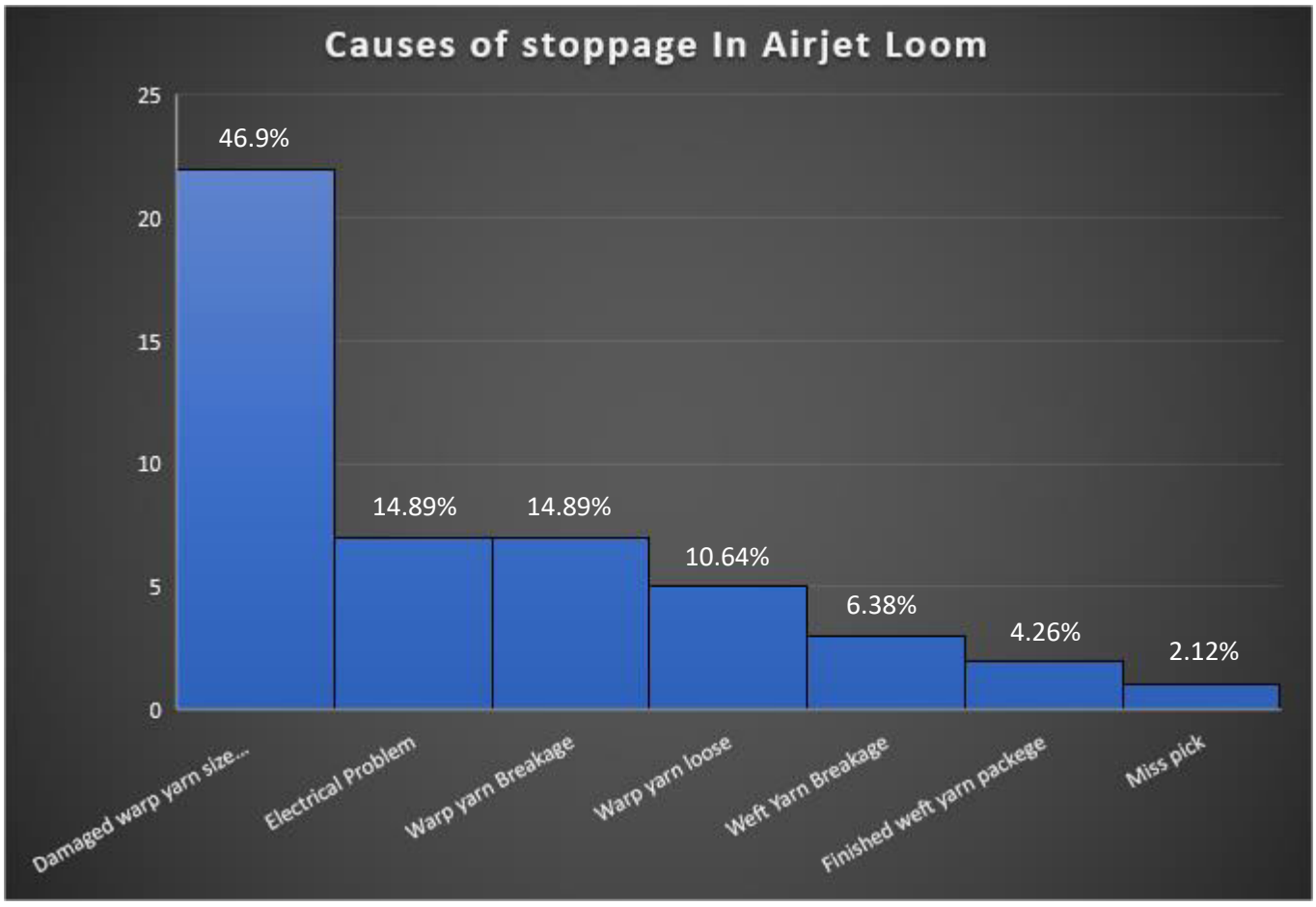
Cause of stoppage	Duration of stoppage

Result And Discussion

Airjet Loom

Below are given some data and calculations from Airjet Loom's causes of stoppage inspection.

Causes of Stoppage	Day 1 (min)	Day 2 (min)	Day 3 (min)	Total (min)
Electrical Problem	2	0	5	7
Weft Yarn Breakage	1	1	1	3
Warp yarn Breakage	2	3	2	7
Miss pick	1	0	0	1
Warp yarn loose	0	5	0	5
Finished weft yarn package	0	1	1	2
Damaged warp yarn size problem	0	0	22	22
Total Stoppage Time				47



Total time loss Electrical Problem % = Total Electrical Problem time/Total Stoppage Time x 100

=14.89%

Total time loss Weft Yarn Breakage % = Total Weft Yarn Breakage time/Total Stoppage Time x 100

=6.38%

Total time loss Warp yarn Breakage % = Total Warp yarn Breakage time/Total Stoppage Time x 100

=14.89%

Total time loss Miss pick % = Total Miss pick /Total Stoppage Time x 100

=2.12%

Total time loss Warp yarn loose % = Total Warp yarn loose time/Total Stoppage Time x 100

=10.64%

Total time loss Finished weft yarn package % = Total Finished weft yarn package time/Total Stoppage Time x 100

=4.26%

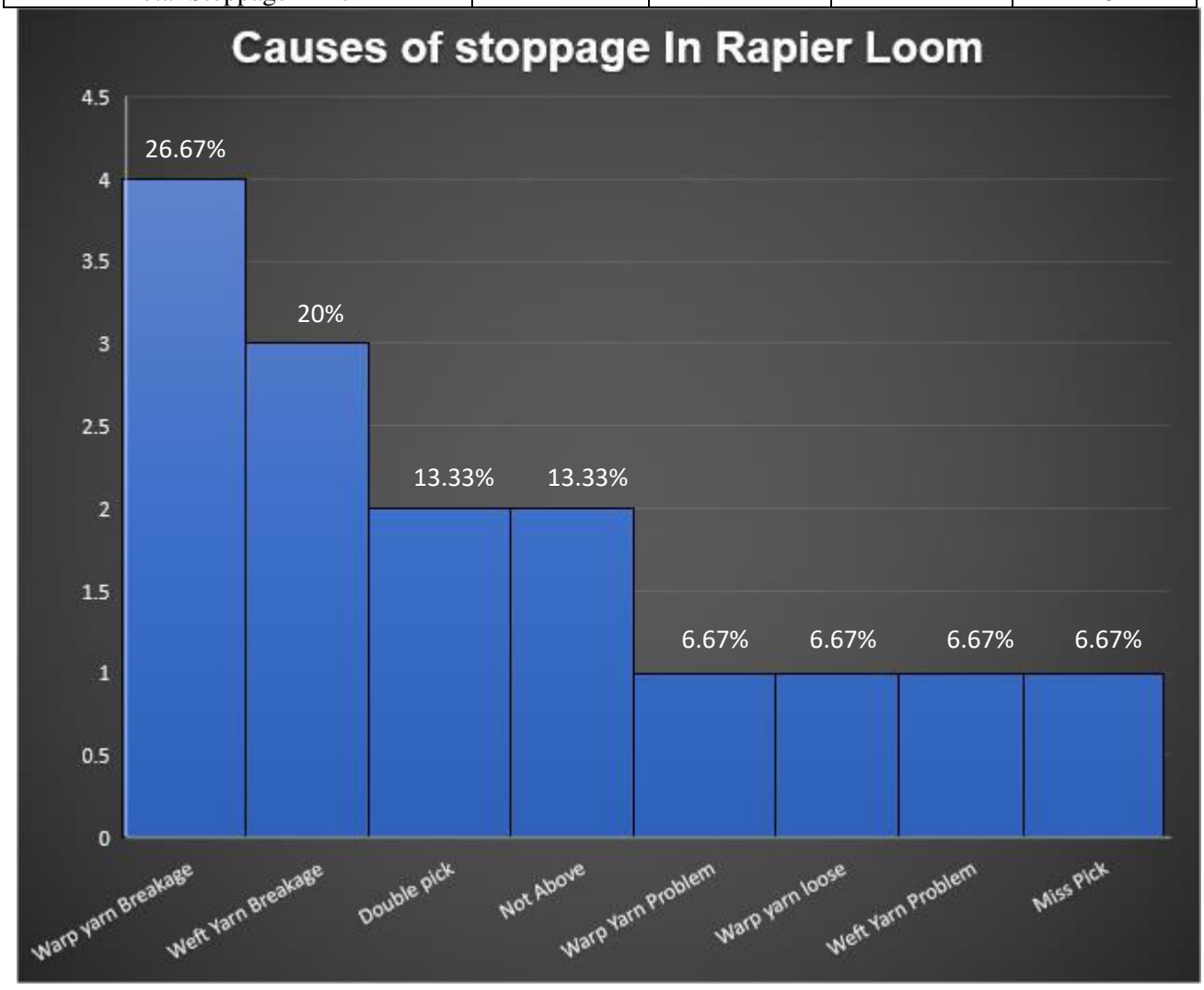
Total time loss Damaged warp yarn size problem % = Total Damaged warp yarn size problem time/Total Stoppage Time x 100

=46.9%

Rapier Loom

Below are given some data and calculations from Rapier Loom's causes of stoppage inspection.

Causes of Stoppage	Day 1 (min)	Day 2 (min)	Day 3 (min)	Total (min)
Warp Yarn Problem	1	0	0	1
Weft Yarn Breakage	0	1	2	3
Warp yarn Breakage	1	1	2	4
Double pick	1	1	0	2
Warp yarn loose	0	0	1	1
Not Above	2	0	0	2
Weft Yarn Problem	1	0	0	1
Miss Pick	0	1	0	1
Total Stoppage Time				15



Total time loss Warp Yarn Problem % = Warp Yarn Problem time/Total Stoppage Time x 100

=6.67%

Total time loss Weft Yarn Breakage % = Weft Yarn Breakage time/Total Stoppage Time x 100

=20%

Total time loss Warp yarn Breakage % = Warp yarn Breakage time/Total Stoppage Time x 100

=26.67%

Total time loss Double pick % = Double pick time/Total Stoppage Time x 100

=13.33%

Total time loss Warp yarn loose % = Warp yarn loose time/Total Stoppage Time x 100

=6.67%

Total time loss Not Above % = Not Above time/Total Stoppage Time x 100

=13.33%

Total time loss Weft Yarn Problem % = Weft Yarn Problem time/Total Stoppage Time x 100

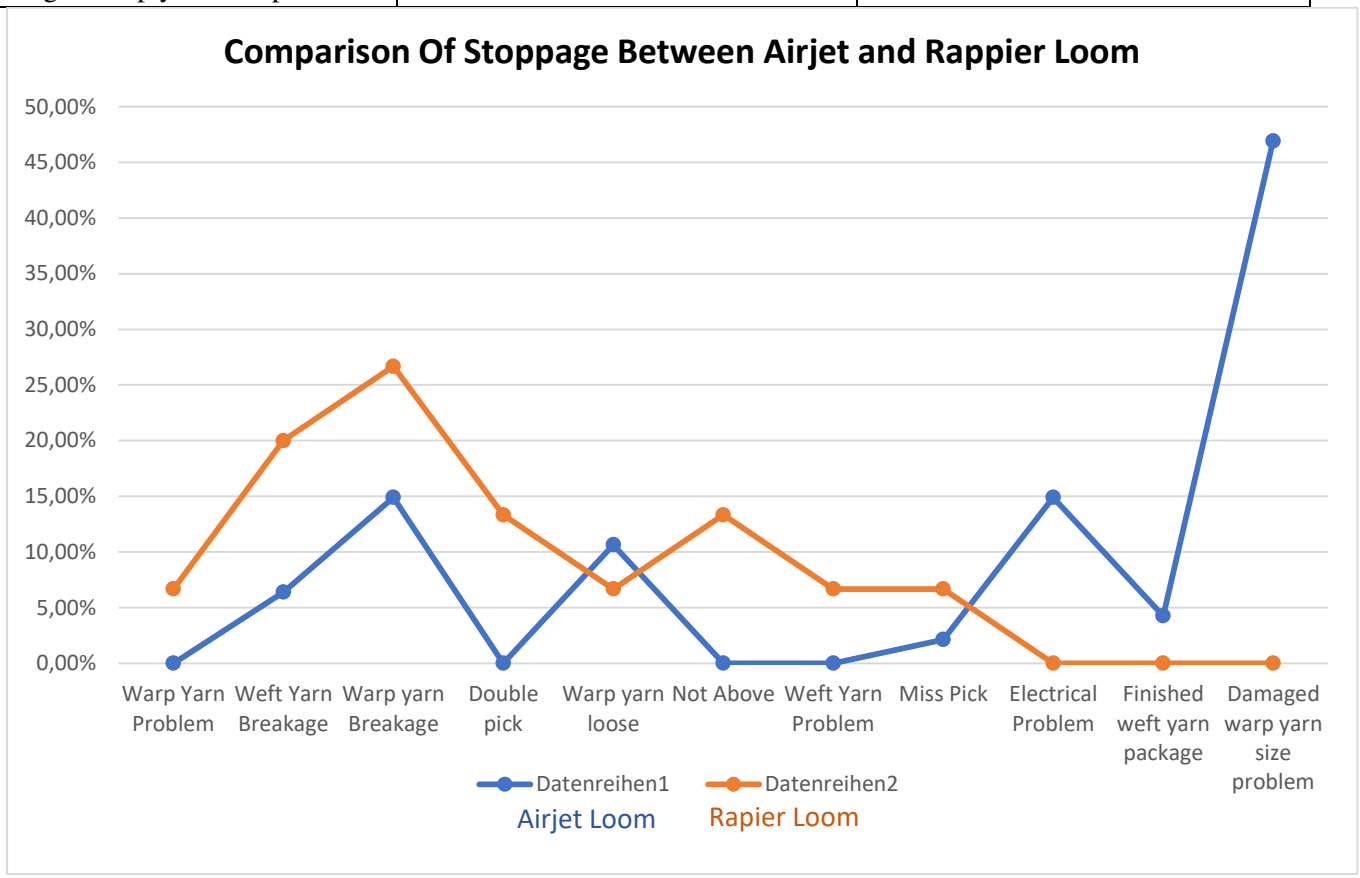
=6.67%

Total time loss Miss Pick % = Miss Pick time/Total Stoppage Time x 100

=6.67%

Comparison of causes for stoppage between Airjet Loom and Rapier Loom –

Causes of Stoppage	Effective Time loss in Airjet Loom	Effective Time loss in Rapier Loom
Warp Yarn Problem	0.00%	6.67%
Weft Yarn Breakage	6.38%	20%
Warp yarn Breakage	14.89%	26.67%
Double pick	0.00%	13.33%
Warp yarn loose	10.64%	6.67%
Not Above	0.00%	13.33%
Weft Yarn Problem	0.00%	6.67%
Miss Pick	2.12%	6.67%
Electrical Problem	14.89%	0.00%
Finished weft yarn package	4.26%	0.00%
Damaged warp yarn size problem	46.90%	0.00%



The Effects caused by stoppages in Fabric Production Loom

1. **Rapier Loom –**

For the following loom,

Average PPI = Picks/Inch = 44

Average PPM = Picks/Minute = 625

Loom Production = PPM/PPI = 625/44 = 14.20 inch/min

So, in 1 min produced fabric = 14.20 inch

Total produced fabric in between inspection time for 3 days with 2hr per day inspection = 14.20 X 3 X 2 X 60 = 5112 inch

Total fabric that could be produced in between total stoppage time when inspecting = 14.20 X 15 = 213 inch

So, The Loss of fabric production % = (213/5112) X 100

= 4.17 %

2. **Airjet Loom –**

For the following loom,

Average PPI = Picks/Inch = 50

Average PPM = Picks/Minute = 950

Loom Production = PPM/PPI = 950/50 = 19 inch/min

So, in 1 min produced fabric = 19 inch

Total produced fabric in between inspection time for 3 days with 2hr per day inspection = 19 X 3 X 2 X 60 = 6840 inch

Total fabric that could be produced in between total stoppage time when Inspecting = 19 X 47 = 893 inch

So, The Loss of fabric production % = (893/6840) X 100

= 13.06 %

Conclusion

Conclusion -

The results for the thesis on causes of stoppage in fabric loom's reports are given below –

1. Total time loss For Electrical Problem stoppage % Airjet loom = 14.89%
2. Total time loss For Weft Yarn Breakage stoppage % Airjet loom = 6.38%
3. Total time loss For Warp yarn Breakage stoppage % Airjet loom = 14.89%
4. Total time loss For Miss pick stoppage % Airjet loom = 2.12%
5. Total time loss For Warp yarn loose stoppage % Airjet loom = 10.64%
6. Total time loss For Finished stoppage weft yarn package % Airjet loom = 4.26%
7. Total time loss For Damaged warp yarn size problem stoppage % Airjet loom = 46.9%
8. Total time loss For Warp Yarn Problem stoppage % Rapier loom = 6.67%
9. Total time loss For Weft Yarn Breakage stoppage % Rapier loom = 20%
10. Total time loss For Warp yarn Breakage stoppage % Rapier loom = 26.67%
11. Total time loss For Double pick stoppage % Rapier loom = 13.33%
12. Total time loss For Warp yarn loose stoppage % Rapier loom = 6.67%
13. Total time loss For Not Above stoppage % Rapier loom = 13.33%
14. Total time loss For Weft Yarn Problem stoppage % Rapier loom = 6.67%
15. Total time loss For Miss Pick production loss stoppage % Rapier loom = 6.67%
16. Total Loss of fabric production in Rapier Loom caused by %= 4.17%
17. Total Loss of fabric production in Airjet Loom caused by %= 13.06%

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