


9. CONCLUSION

All investigations are based on improvements on production and cost reduction.

(1) By introducing new payment scheme production and quality improvement can be achieved.

(2) By introducing new working system machine idle time can be minimised.

(3) By increasing machine speed from 100 rpm to 150 rpm three shifts can be reduced to two shifts.

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(4) Sound production control of a machine is essential to minimise article changes in same machine.

(5) New rewinding machine saves Rs 15,288 per month



APPENDIX

TIME TO KINT A PAJR (MINUTES) CLASS INTERVAL	NAME X Y Z	MINUTES MEAN	PAIRS, EXPECTED PRODUCTION DEFER- -ENCE FOR 8 HOURS.	NUMBER OF STOPAGES PER SHIFT	EXPECTED RUNNING TIME HOURS	EXPECTED PRODUCTION BUNDLE
1.900 - 1.949	A	1.924	252 - 246	24	7.63	3.96
1.950 - 1.999	B	1.975	246 - 240	24	7.63	3.86
2.000 - 2.049	C	2.024	240 - 234	24	7.63	3.76
2.050 - 2.099	D	2.075	234 - 228	23	7.66	3.69
2.100 - 2.149	E	2.124	228 - 223	22	7.67	3.61
2.150 - 2.199	F	2.175	223 - 218	22	7.67	3.52
2.200 - 2.299	G	2.275	218 - 209	22	7.67	3.37
2.300 - 2.399	H	2.375	209 - 207	21	7.69	3.23
2.400 - 2.499	I	2.475	200 - 192	20	7.70	3.11
2.500 - 2.599	J	2.575	192 - 185	20	7.70	2.99
2.600 - 2.699	K	2.675	185 - 178	19	7.72	2.88
2.700 - 2.799	L	2.775	178 - 171	18	7.73	2.79
2.800 - 2.899	M	2.875	171 - 165	17	7.74	2.69
2.900 - 2.999	N	2.909	165 - 154	17	7.74	2.59
3.100 - 3.299	O	3.199	154 - 145	16	7.76	2.42
3.300 - 3.499	P	3.249	145 - 137	15	7.77	2.39
3.500 - 3.699	Q	3.599	137 - 130	14	7.78	2.16
3.700 - 3.999	R	3.849	130 - 120	13	7.80	2.03
4.00 - 4.299	S	4.149	120 - 112	12	7.81	1.88
4.300 - 4.599	T	4.449	112 - 104	11	7.82	1.75

Table 7

CLASS INTERVALS	CLASS MEAN	FREQUENCY (f _i)	f _i	f _i x _i
5.00 - 5.499	5.25	///	3	15.75
5.50 - 5.999	5.75	/// // // // // //	28	161.00
6.00 - 6.499	6.25	// // // // // // // // //	47	293.75
6.50 - 6.999	6.75	// // // // // // // // //	38	256.50
7.00 - 7.499	7.25	// // // //	18	130.50
7.50 - 7.999	7.75	//	2	15.50
			Total	136 873.00

Table 8

CLASS NAME	CLASS MEAN x_i	FREQUENCY f_i	$f_i x_i$
A	1.925	-	0
B	1.975		4
C	2.024		1
D	2.074		3
E	2.124		2
F	2.175		3
G	2.275		8
H	2.375		6
I	2.475		5
J	2.575		5
K	2.675		6
L	2.775		6
M	2.875		10
N	2.999		9
O	3.199		13
P	3.249		3
Q	3.599		1
R	3.849		5
S	4.149		3
T	4.449		1
Total		$\sum f_i = 94$	$\sum f_i x_i = 263.094$

Mean Time to knit a pair = $\frac{\sum f_i x_i}{\sum f_i} = 2.8 \text{ min}$

Table 9

	Machine Operator	Operator	Garb	Long Garb	Waste	Sample Garb	Trimming	Garb Oper	Threading Garb	Soft	Remounting	Total
Number of Pairs	3669.5	702	145.0	617.5	561	856	1587	320	673	131.5		9232.5
Number of Shifts	72	72	72	72	72	72	72	72	72	72		1299
Pairs/shifts	50.9	9.75	2.01	8.57	7.79	11.88	22.04	4.4	9.34	2.10		
Percentage	39%	8%	2%	7%	6%	9%	17%	3%	7%	2%		
							44%					

Table 10

NUMBER OF MACHINES	NUMBER OF SHIFTS	Damage PAIRS	Damage PAIRS/SHIFT x MACHINES
12	15	1426.5	7.9
13	3	290	7.4
14	-	-	-
15	-	-	-
16	-	-	-
17	-	-	-
18	-	-	-
19	9	1263.5	7.3
20	6	1722.5	6.0
21	-	-	-
22	3	418.5	6.3
23	-	-	-
24	12	1726.5	5.9
25	3	1208	6.48
26	9	1825	5.6
27	3	1388	4.7
28	-	-	-

Table: 11

MACHINES	PAIRS PER SHIFT (Estimated waste)	PAIRS PER DAY (Estimated waste)
12	93	279
13	93	297
14	104	312
15	109	327
16	114	342
17	119	354
18	123	357
19	126	378
20	130	390
21	133	399
22	136	408
23	139	417
24	141	425
25	145	435
26	147	441
27	148	444

Table - 12

DATE	Dec - Mach.		Dec Knitting		DC Knitting		DC-Mach.		DC Knitting		DC-Mach.		DC Knitting		DC-Mach.		DC Knitting	
	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.	Running	Kaetz W.
1	15	2440					24	7320										
2	13	6060	18	3060					21	4500	12	3600	23	5275				
3	19	7300	21	3120							14	4020	24	5010				
4	18	7403	21	6900					21	6080	15	3840	15	4590				
5	14	7307	18	3420	23	7140	21	5070			12	4680	25	4104				
6	20	6680	21	7094	23	6780	23	5610			11	3750	25	6330				
7	15	3210	22	6740	22	7660	21	7366					26	5100				
8	12	2700	23	6970	23	7720	22	7122			12	3090	26	4950				
9	19	4440	22	7260					21	6360								
10	13	6878	21	6840	24	7500					13	4260	27	6060				
11	20	7500	19	6880	28	7500	21	5790			14	3690	20	4580				
12	20	5760	10	1780	25	7820	22	6420			15	4500	26	4380				
13	19	5280	22	5850	23	7290	22	6160					26	6120				
14	18	4414	21	6570	23	6970	22	7220					28	7915				
15			21	6960	23	7170	20	7320					23	5670				
16	13	5000	20	6250					21	7380			24	6220				
17	13	6060	21	5420	23	6360							27	6590				
18	16	4800	21	6180	24	6480	20	6700			15	3510	18	5040				
19	18	3450	16	2520	21	6840	21	6450			16	5400	27	6300				
20	14	1920	23	6669	17	6440	21	6780			18	5760	22	6440				
21			25	6638	20	6740	21	6330					22	3750				
22			25	6300	20	5940	22	6760			19	6180						
23			27	7360			20	5040			20	5760						
24			24	6120	20	5714					24	5400						
25					24	6450	19	6180			22	5720	22	6210				
26			11	1350	23	6410	19	5950			24	6900	25	7620				
27			24	6930	21	3020	19	6450			23	5520	25	6270				
28			25	6360	21	6360	12	2880			26	1680	24	6360				
29			23	6420			12	5524			20	4640	24	5640				
30			23	6713			12	4170			24	4826	23	4980				
31			23	8560							24	5630	24	7650				
					1194	151594	12	4750										
					22	22												
					22	4891												
	337	100492									404	105116	647	157640				
	19	19	613	76809							23	23	27	27				
	18	5287	29	29			508	156172			18	4604	24	5830				
			21	5800			26	26										
							20	6065										

Table 13

NUMBER OF RUNNING MACHINES	12	13	14	15	16	18	19	20	21	22	23	24	25	26	27
NUMBER OF DAYS	7	2	2	3	3	9	8	9	17	9	6	5	4	5	4
TOTAL PRODUCTION PAIRS	28694	8100	7710	11730	16020	51535	50117	51630	110540	59042	40322	36756	36532	26956	27270
MEAN = $\frac{\text{PAIRS}}{\text{Days} \times \text{Mac}}$	341	311	275	260	333	318	329	286	309	298	243	207	243	207	250
ESTIMATED WASTE PAIRS PER MACHINE	23.2	22.8	22.2	21.8	21.3	19.8	19.8	19.5	19	18.5	18.1	17.7	17.4	16.9	16.4
ESTIMATED WASTE PAIRS + MEAN PRODUCTION PER MACHINE	364.2	333.8	297.2	281.8	354.3	337.8	348.8	305.5	328	316.5	261.1	224.5	260.4	223.9	266.4
ESTIMATED RUNNING TIME FOR A SHIFT. (2.8 minutes is the time to knit one pair)	5.66	5.19	4.62	4.38	5.51	5.25	5.42	4.75	5.10	4.92	4.06	3.48	4.05	3.48	4.14
PERCENTAGE considering running time is 7.74.	73.1	67	59.6	56.5	71.1	67.8	70.0	61.3	65.8	63.5	52.2	45	52.3	44.9	53.4

Table 14

NUMBER OF RUNNING MACHINES	12	13	14	15	16	18	19	20	21	22	23	24	25	26
HIGHERST DAILY PRODUCTION PAIRS	5524	4260	4020	4590	-	7408	9307	7500	8020	7260	8560	7824	7750	6406
PAIRS/MACHINES	460	327	287	306	-	411	489	375	381	345	372	326	310	246
ESTIMATED RUNNING TIME FOR A SHIFT	7.15	5.08	4.16	4.76	-	6.39	7.60	5.83	4.94	5.36	5.78	5.07	4.82	4.10

Table 15

CLASS Intervals	CLASS Mean	CLASS Name	Expected Production Difference	Number of STUFFERS	Expected Running Time
1.900 - 2.099	1.999	A	252 - 225	8	7.87
2.100 - 2.299	2.20	B	228 - 201	8	7.87
2.300 - 2.499	2.45	C	205 - 185	8	7.87
2.500 - 2.699	2.75	D	185 - 165	8	7.87
2.700 - 2.899	3.10	E	165 - 145	8	7.87
2.900 - 3.099	3.45	F	145 - 133	8	7.87
3.100 - 3.299	3.80	G	133 - 120	8	7.87
3.300 - 3.499	4.15	H	120 - 112	8	7.87
3.500 - 3.699	4.45	I	112 - 104	8	7.87
3.700 -		J			

Table - 16



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As an example production minutes from January to May can be examined as in table 17.

	January	February	March	April	May
Production minutes	481839	420831	447239	320603	470598
Number of running machine	613	494	508	404	647
Expected running Time	613×7.78 4727.14	494×7.78 3844.12	508×7.78 3955.24	404×7.78 3145.12	647×7.78 5035.86
Standard hours	877.04	706.78	726.81	578.02	925.65
Earnings	$481839 \times fx$	$420831 \times fx$	$447239 \times fx$	$320603 \times fx$	$470598 \times fx$
Piece rate for three operators	$549.39 \times fx$	$595.42 \times fx$	$615.34 \times fx$	$554.65 \times fx$	$506.37 \times fx$
Piece rate for a operator	$189.13 \times fx$	$198.47 \times fx$	$205.11 \times fx$	$184.88 \times fx$	$168.45 \times fx$

Table 17.

REFERENCES

- 1) INTRODUCTION TO WORKSTUDY-I.L.O. PUBLICATIONS
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- 3) ADMINISTRATION OF WAGES AND SALARIES-ELIZABETH LANHAM
- 4) KNIT INFOR -TEXTILE TRAINING AND SERVICE
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- 5) WORK STUDY -A.R.CUREE
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