An assessment of occupational health hazard and safety in selected working community of textile industry

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Abstract- *Textile manufacturing is a major industry. It is based on the conversion of fiber into yarn and yarn into fabric. These are then dyed or printed, fabricated into clothes. Different types of fibers are used to produce yarn. Indian textile industry is one of the oldest industries in the world dating back several centuries. The main objectives of this project are an assessment of occupational health hazards in the work area and provide safety in the selected working community in the textile industry. Textile is the basic essential things of human life, next to food. And the textile sector is growing day by day. There is thus, a need to have a look at the occupational health of workers so that they can remain healthy and perform the task carefully. There are numerous health and safety issues associated with the textile industry. We have used some methodology for finding out the level of hazards and its consequences and provided the control measures to the worker by an assessment of all selected work area in textile industries.*

Keywords- Sound level meter, Lux meter, dust sampling machine, cellulose filter paper, double beam spectrophotometer.

I. INTRODUCTION

Textile manufacturing is a major industry. It is based on the conversion of fiber into yarn, yarn into fabric. These are then dyed or printed, fabricated into clothes. Different types of fibers are used to produce yarn. Indian textile industry is one of the oldest industries in the country dating back several centuries. Even today, textile sector is one of the most significant contributors to India's exports with approximately 13 percent of the total exports. The industry is also labor intensive employing more than a million people in different fields.

Textile Industry is providing one of the most basic needs of people and the holds importance; maintaining sustained growth for improving quality of life. It has a unique position as a self-reliant industry, from the production of raw materials to the delivery of finished products, with substantial value-addition at each stage of processing; it is a major contribution to the country's economy. This paper deals with structure, growth and size of the Indian textile industry, role of textile industry in economy, key advantages of the industry, textile industry export and global scenario and strength, weakness, opportunities and treats of the Indian textile industry and while producing or manufacturing the product there are different types of hazard are present there like physical hazard chemical hazard mechanical hazard and ergonomically hazard and person affected from these hazard so basically what we have to do in this topic is that we have to assess the level of hazard like noise hazard and how it is affecting to the workers and their real life problem because working life time a person may be exposed at any time depends on the situation that which kind of atmosphere are present there and what kind of working community are there and as we know the workers they are not much more educated about the anything's as we will guide them they will have to do as it is occupational health and safety programs comprise to encourage a safe and healthy work environment occupational health and safety may also protect workers and as well as their family members and so many others who may be exposed by the workplace Textile is the basic essential things of human life, next to food. In textile industry the problems are always faced Our broad objective has been to draw insights into the exports of Indian textile and apparel sector and provide a lead to future policy-making. Our specific objectives have been to study the broad issues and perceptions related to apparel export barriers, to analyze how the apparel exporting firms are grouped and to develop a probable sectored model for knitwear exports taking a bilateral context.

II. ANALYSIS AND METHODOLOGY

We have analysis the data from textile industries for process like noise, dust, light, water, and we have taken the sample of selected working industries

Table 1.1 noise level as per the Standard

Sound level in dB(A)	Permissible exposure limit (PEL)In hours
85 dB	16 hours
90 dB	8 hours
92 dB	6 hours
95 dB	4 hours
97 dB	3 hours
100 dB	2 hours
105 dB	1 hours
110 dB	½ hours
115 dB	¼ hours

Fig.1.1 Sound level Meter

Table 1.2 Observation table of noise before recommendation at T1 Textile industry at three shifts:-

Sr. no	Process	Laf min	Laf max	1st day shift-1 Lavg	Laf min	Laf max	1st day shift-2 Lavg	Laf min	Laf max	3rd day shift-3 Lavg	Total Avg value (L1+L2+L3)/3=
1	Blow room	72.3	84.6	**80.46**	71.4	84.9	**80.54**	72.9	84.8	**80.74**	**80.58**
2	Carding	72.2	85.4	**81.09**	70.8	85.8	**81.20**	71.9	85.9	**81.45**	**81.25**
3	Draw Frame	84.7	92.2	**89.23**	84.7	92.3	**89.30**	84.9	92.6	**83.82**	**87.45**
4	Ring Frame	83.2	94.2	**90.33**	83.9	94.9	**91.03**	83.2	94.9	**90.88**	**90.75**
5	Winding	79.9	89.4	**85.88**	80.1	90.4	**86.69**	79.9	90.2	**86.49**	**86.35**
6	Warping	76.7	88.9	**84.78**	76.7	88.6	**84.54**	75.9	87.5	**83.50**	**84.27**
7	Sizing	76.9	87.5	**83.72**	76.2	87.6	**83.64**	76.4	87.8	**83.84**	**83.73**
8	Dyeing	72.8	87.9	**83.28**	72.8	88.2	**83.54**	72.8	89.9	**85.01**	**83.94**
9	Loom Shed non- auto	86.2	96.4	**92.71**	86.3	96.7	**92.97**	86.7	96.6	**92.99**	**92.89**
10	Loom Shed auto	88.7	97.6	**94.24**	88.4	97.9	**95.92**	88.9	97.6	**94.29**	**94.82**

Table 1.3 Observation table of noise overall average of 1st 2nd and 3rd days of T1 Textile industry before recommendation:-

Sr. no	Process	1st day	2nd day	3rd day	Total average value of noise (D1+D2+D3/3)=
1	Blow room	80.58	81.56	82.11	**81.42**
2	Carding	81.25	82.76	83.01	**82.34**
3	Draw Frame	87.45	88.97	88.76	**88.39**
4	Ring Frame	90.75	91.49	92.12	**91.45**
5	Winding	86.35	87.65	87.89	**87.30**
6	Warping	84.27	85.80	86.19	**85.42**
7	Sizing	83.73	84.34	84.98	**84.35**
8	Dyeing	83.94	84.56	84.76	**84.42**
9	Loom Shed non-auto	92.89	93.01	93.54	**93.15**
10	Loom Shed auto	94.82	95.12	95.89	**95.28**

Table 1.4 Observation table of noise after recommendation at T1 Textile industry at three shifts:-

Sr. no	Process	Laf min	Laf max	Lavg1	Laf min	Laf max	Lavg2	Laf min	Laf max	Lavg3	Total avg value (L1+L2+L3)/3=
1	Blow room	70.8	84.8	**80.35**	70.9	84.9	**80.45**	71.2	84.1	**79.85**	**80.22**
2	Carding	72.7	84.1	**80.14**	71.3	84.3	**80.03**	71.7	84.9	**80.59**	**80.25**
3	Draw Frame	80.5	90.7	**87.01**	81.4	90.4	**87.01**	80.2	91.2	**87.33**	**87.12**
4	Ring Frame	81.6	92.9	**88.97**	81.5	92.9	**88.94**	81.9	92.8	**88.95**	**88.95**
5	Winding	78.8	88.2	**84.71**	78.2	89.1	**85.25**	78.1	89.8	**85.78**	**85.25**
6	Warping	73.3	86.4	**82.11**	72.9	86.1	**81.79**	72.6	85.9	**81.56**	**81.82**
7	Sizing	74.4	86.2	**82.16**	74.2	86.4	**82.28**	74.8	86.9	**82.80**	**82.41**
8	Dyeing	70.1	87.3	**82.40**	70.6	86.9	**82.11**	70.8	85.8	**81.20**	**81.90**
9	Loom Shed non-auto	82.8	94.3	**90.32**	82.5	94.6	**90.50**	83.1	94.2	**90.31**	**90.38**
10	Loom Shed auto	84.3	95.3	**91.43**	84.7	95.9	**91.99**	83.9	95.7	**91.66**	**91.69**

Table 1.5 Observation table of noise overall average of 1st 2nd and 3rd days of T1 Textile industry after recommendation:-

Sr. no	Process	1st day	2nd day	3rd day	Total average value of noise (D1+D2+D3/3)=
1	Blow room	80.22	81.65	81.87	**81.25**
2	Carding	80.25	82.09	82.9	**81.75**
3	Draw Frame	87.12	88.07	88.12	**87.77**
4	Ring Frame	88.95	89.56	89.87	**89.46**
5	Winding	85.25	86.56	86.14	**85.98**
6	Warping	81.82	82.34	82.63	**82.26**
7	Sizing	82.41	83.16	83.50	**83.02**
8	Dyeing	81.90	82.74	82.89	**82.51**
9	Loom Shed non-auto	90.38	91.34	91.76	**91.16**
10	Loom Shed auto	91.69	92.45	92.62	**92.25**

Table 1.6 observation table of overall average data from all days before recommendation and after recommendation:-

Sr.no	Process	Total Average value of noise in dB Before recommendation	Total Average value of noise in dB after recommendation
1	Blow room	81.42	81.25
2	Carding	82.34	81.75
3	Draw Frame	88.39	87.77
4	Ring Frame	91.45	89.46
5	Winding	87.30	85.98
6	Warping	85.42	82.26
7	Sizing	84.35	83.02
8	Dyeing	84.42	82.51
9	Loom Shed non-auto	93.15	91.16
10	Loom Shed auto	95.28	92.25

(2) illuminance (light) parameter :-

Fig.1.2 Lux Meter

Table 1.7 Observation table of illuminance (light) overall average of 1st 2nd and 3rd days of T1 Textile industry before recommendation:-

Sr. no	Process	1st day Lux level Shift -01		1st day Lux level Shift-02		1st day level III Shift Shift-03		Average level of Lux (L1+L2+L3)/6 =
		Lux min	Lux max	Lux min	Lux max	Lux min	Lux max	
1	Blow room	84	90	84	90	85	89	**87**
2	Carding	86	91	86	92	85	90	**88**
3	Draw Frame	220	233	220	233	221	232	**227**
4	Ring Frame	221	234	220	232	219	232	**226**
5	Winding	218	231	218	231	219	229	**224**
6	Warping	219	233	220	232	221	230	**226**
7	Sizing	83	89	83	91	84	90	**87**
8	Dyeing	85	90	85	90	85	89	**87**
9	Loom Shed non-auto	224	232	225	234	223	232	**228**
10	Loom Shed Auto	225	234	224	234	224	232	**229**

Table 1.7 Observation table of illuminance(light) overall average of 1st 2nd and 3rd days of T1 Textile industry before recommendation:-

Sr. no	Process	Total average value of light in 1st day	Total average value of light in 2nd day	Total average value of light in 3rd day	Total average value of Lux (D1+D2+D3/3)=
1	Blow room	87	87	86	**87**
2	Carding	88	87	88	**88**
3	Draw Frame	227	227	226	**227**
4	Ring Frame	226	225	225	**225**
5	Winding	224	224	224	**224**
6	Warping	226	226	225	**226**
7	Sizing	87	86	87	**87**
8	Dyeing	87	85	87	**86**
9	Loom Shed non-auto	228	228	227	**228**
10	Loom Shed Auto	229	227	228	**228**

Table 1.8 Observation table of illuminance (light) overall average of 1st 2nd and 3rd days of T1 Textile industry before recommendation:-

Sr. no	Process	1st day Lux level L1		1st day Lux level L2		1st day Lux level L3		Average level of Lux (L1+L2+L3)/6=
		Lux min	Lux max	Lux min	Lux max	Lux min	Lux max	
1	Blow room	112	122	113	122	112	122	**117**
2	Carding	110	122	110	121	113	121	**116**
3	Draw Frame	282	292	283	292	283	293	**288**
4	Ring Frame	283	292	282	292	282	293	**287**
5	Winding	281	293	281	293	280	292	**287**
6	Warping	280	292	281	292	281	293	**287**
7	Sizing	113	123	114	123	114	122	**118**
8	Dyeing	111	123	112	122	111	123	**117**
9	Loom Shed non-auto	242	254	241	254	241	256	**248**
10	Loom Shed Auto	241	256	239	256	239	256	**248**

Table 1.9 Observation table of illuminance (light) overall average of 1st 2nd and 3rd days of T1 Textile industry after recommendation:-

Sr. no	Process	Total average value of light in 1st day	Total average value of light in 2nd day	Total average value of light in 3rd day	Total average value of Lux (D1+D2+D3/3)=
1	Blow room	117	117	116	**117**
2	Carding	116	115	115	**115**
3	Draw Frame	288	288	288	**288**
4	Ring Frame	287	286	287	**287**
5	Winding	287	286	286	**286**
6	Warping	287	288	287	**287**
7	Sizing	118	118	117	**118**
8	Dyeing	117	116	116	**116**
9	Loom Shed non-auto	248	247	247	**247**
10	Loom Shed Auto	248	248	247	**248**

Table 1.10 observation table of overall average data from all days before recommendation and after recommendation:-

Sr. no	Process	Total Average value of illuminance in Lux Before recommendation	Total Average value of illuminance in Lux after recommendation
1	Blow room	**87**	**117**
2	Carding	**88**	**115**
3	Draw Frame	**227**	**288**
4	Ring Frame	**225**	**287**
5	Winding	**224**	**286**
6	Warping	**226**	**287**
7	Sizing	**87**	**118**
8	Dyeing	**86**	**116**
9	Loom Shed non-auto	**228**	**247**
10	Loom Shed Auto	**228**	**248**

(3)Dust parameter:-

Fig.1.4 Dust sampling machine

Table 1.11 Observation table of dust before recommendation at T1 Textile industry at three shifts:-

Sr. No	Process	1st day shift-01 Dust level	1st day shift-02 Dust level	3rd day shift-03 Dust level	Average level of Dust (d1+d2+d3/3)=
1	blow room	1789	1733	1756	**1792.66**
2	ring spinning	1954	2078	2029	**1953.66**
3	weaving	2480	2389	2467	**2445.33**
4	waste recycling	3990	4196	4002	**4062.66**

Table 1.12 Observation table of dust overall average of 1st 2nd and 3rd days of T1 Textile industry before recommendation:-

Sr. No	Process	Average level of dust 1st day	Average level of dust 2nd day	Average level of dust 3rd day	Average level of Dust (D1+D2+D3/3)=
1	blow room	1792.66	1782.33	1788.66	**1787.88**
2	ring spinning	1953.66	1954.33	1954.66	**1954.21**
3	weaving	2445.33	2446.67	2446.33	**2446.11**
4	waste recycling	4062.66	4058.67	4064.66	**4061.99**

Table 1.13 Observation table of dust overall average of 1st 2nd and 3rd days of T1 Textile industry after recommendation:-

Sr. No	Process	1st day shift-01 Dust level	1st day shift-02 Dust level	3rd day shift-03 Dust level	Average level of Dust (d1+d2+d3/3)=
1	blow room	1390	1323	1311	**1341.33**
2	ring spinning	1645	1797	1778	**1740**
3	weaving	1790	1809	1889	**1829.33**
4	waste recycling	2916	3278	3190	**3128**

Table 1.14 Observation table of dust overall average of 1st 2nd and 3rd days of T1 Textile industry before recommendation:-

Sr. No	Process	Average level of dust 1st day	Average level of dust 2nd day	Average level of dust 3rd day	Average level of Dust (D1+D2+D3/3)=
1	blow room	1341.33	1342.66	1343.66	**1342.55**
2	ring spinning	1740	1743.33	1743.66	**1742.33**
3	weaving	1829.33	1827	1828.66	**1828.33**
4	waste recycling	3128	3127.66	3126.33	**3127.33**

Table 1.15 observation table of overall average data from all days before recommendation and after recommendation:-

Sr. No	Process	Permissible exposure limit (PEL)	Total average level of dust Before recommendation In microgram per cubic meter	Total average level of dust After recommendation In microgram per cubic meter
1	Blow room	200	1787.88	1342.55
2	ring spinning	500	1954.21	1742.33
3	weaving	750	2446.11	1828.33
4	waste recycling	1000	4061.99	3127.33

Note- Same two other industries the data has been collected and put in the formulas so we get the result like (T2 Textile industry) and (T3 Textile industry) which has been shown in the result part.

III. METHODOLOGY

We have used the T-Test hypothesis for comparing the value of two groups from three textile industry like noise level, dust value, Lux level and water quality and then we have put out the value in the formulas of t-test hypothesis which will proof the mathematically

T-TEST HYPOTHESIS:-

A t-test is a type of inferential statistic used to determine if there is a significant difference between the means of two groups, which may be related in certain features. It is mostly used when the data sets

Mathematically, the t-test takes a sample from each of the two sets and establishes the problem statement by assuming a null hypothesis that the two means are equal. Based on the applicable formulas, certain values are calculated and compared against the standard values, and the assumed null hypothesis is accepted or rejected accordingly.

If the null hypothesis qualifies to be rejected, it indicates that data readings are strong and are probably not due to chance. The t-test is just one of many tests used for this purpose. Statisticians must additionally use tests other than the t-test to examine more variables and tests with larger sample sizes.

TESTING OF HYPOTHESIS:-To begin the calculation we need to calculate the degree of freedom (Df)

So here two degree of freedom has been used

Df (A) = n1+n2-2 = 10+10 -2 = 18; where Df is the Degree of Freedom

Df (B) = n1+n2-2 = 5+5 -2 = 8; where Df is the Degree of Freedom

$$t = \frac{\overline{x}_1 - \overline{x}_2}{\sqrt{(s^2(\frac{1}{n_1} + \frac{1}{n_2}))}}$$

In this formula, t is the t-value, x1 and x2 are the means of the two groups being compared, s2 is the pooled standard error of the two groups, and n1 and n2 are the number of observations in each of the groups

IV. RESULT

(T1 textile industry) The calculated T value of noise, light and dust is found to be higher than the tabulated T value hence we reject the Null hypothesis and accept the alternate hypothesis.

Parameter	Tabulated value	Calculated value
Noise	$T_{1.1}$=2.262	$T_{1.1}$= 5.09
Light	$T_{1.2}$=2.262	$T_{1.2}$= 6.82
Dust	$T_{1.3}$=3.182	$T_{1.3}$= 3.63

(T2 textile industry)
The calculated T value of noise, light and dust is found to be higher than the tabulated T value hence we reject the Null hypothesis and accept the alternate hypothesis.

Parameter	Tabulated value	Calculated value
Noise	$T_{2.1}$=2.201	$T_{2.1}$= 7.75
Light	$T_{2.2}$=2.201	$T_{2.2}$= 14.68
Dust	$T_{2.3}$=2.776	$T_{2.3}$= 4.69

(T3 textile industry)
The calculated T value of noise, light and dust is found to be higher than the tabulated T value hence we reject the Null hypothesis and accept the alternate hypothesis.

Parameter	Tabulated value	Calculated value
Noise	$T_{3.1}$=2.201	$T_{3.1}$= 9.84
Light	$T_{3.2}$=2.201	$T_{3.2}$= 7.20
Dust	$T_{3.3}$=2.776	$T_{3.3}$= 9.04

V. CONCLUSION

As per the assessment we have found the level of risk and we can improve the working Evaluation of various hazards such as noise, dust, light, water and occupational health were analyzed which is useful to take better decisions and precautionary measures.

- The Textile industries can improve and maintain healthy and safe operating conditions by installing a medical unit and using various safety practices in the textile industries and mainly go for smart system.
- With this research work the health hazard are adequately addressed.
- The proper training of handling the equipment and using the safety measures should be followed in the textile sectors

- After this continues inspection, monitoring and implementation of this Assessment technique, will be helpful for the textile industry

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