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JOB-HAZARDS PROFILING AND WORKPLACE IMPROVEMENTS IN SMES – EXPERIENCES FROM INDIA

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Abstract - Small- and medium-scale enterprises constitute 70 - 80 % of India's industry. This is specifically the case in the textile and leather sectors, which are highly export-oriented. The improvement of prevailing working conditions receives particular attention in the context of rising awareness towards corporate social accountability trends. For this purpose, a systematic and comprehensive assessment of workers' exposure was carried out.

Based on on-site studies in a cross-section of textile and tannery as well as footwear units in South India, job specific hazard profiles were prepared. These sector specific exposure and health profiles compiled as baseline database formed the basis for subsequent enterprise-level interventions. This includes creation of a guidance and training support mechanism to implement control measures as well as the assessment of intervention efficacy.

The quantitative and qualitative data collected till date across a range of hazards allow relative risk ranking for the purposes of priority setting for interventions and the determination of the need for implementing controls in several work areas. The chosen approach has been adapted from the ILO "*WISE*-concept". Further efforts will focus on widening the existing database and to explore and propagate the systematic application of control banding methods, such as German Technical Co-operation (GTZ) "Chemical Management Guide".

1 INTRODUCTION

Even though India's cotton textile industry is a major contributor to the worldwide production of textiles, workplace hazard exposure in the cotton textile industry has been associated with many deleterious health outcomes. As part of an effort to generate relevant information, a study was conducted to evaluate the workplace environment for dust, noise, and heat stress levels in a cross-section of textile units in the state of Tamil Nadu. Previously a comprehensive job-exposure profile for textile workers in south India has not been compiled. The situation in tanneries is similar to this. The tanning industry in India represents one of the oldest traditional occupational sectors. Having been predominantly a cottage industry, operating out of small to medium scale establishments in rural settings, it has been only in the last few decades that it has moved in the direction of being an industry in the organized sector. Most tanneries operate out of premises lacking even the most basic facilities required for a safe work environment. Therefore a systematic study have been undertaken to establish the status of occupational safety and health in these tanneries. These two studies, closed in 2000 and 2002, submit a good overview of the work conditions in cotton textile and tannery industries.

2 METHOD AND MATERIALS

Three large (> 15,000 spindles), 3 medium (4,000 – 15,000 spindles), and 3 small (< 4,000 spindles) spinning units were selected as examples for the cotton textile industry. Measurements were also conducted at a large (120 looms), medium (43 looms), and small (28 looms) weaving unit. Seven work areas (blow room, carding/drawing/roving, combing, winding/reeling/doubling, spinning, weaving, and warping/sizing) were

designated for measurements. Area and personal respirable dust samples (n = 253), equivalent continuous sound levels (L_{eq}, n = 281), and wet bulb globe temperature levels (WBGT, n = 311) were collected at these work areas, using personal sampling pumps with PVC filters (37mm diameter, 5µm pore size), a precision sound level meter and a heat stress monitor.

The tanneries study documents

1. detailed hazard profiles for each process step,
2. an exposure profile for select hazards,
3. a health profile for the workers,
4. specific workplace improvements implemented in select tanneries (n = 10) and
5. initiatives to build local capacities in order to sustain the sector specific occupational safety and health maintenance efforts.

Furthermore health assessments are another essential contribution of the reported studies. The textile study describes the results of clinical monitoring of workers associated with specific textile operations, focusing on detailed anamnesis, audiometric and pulmonary function tests. In tanneries this program was expanded by biological (DDT and chromium levels in blood) and clinical monitoring (Urine analysis, serum chemistry for liver and kidney function tests and haematology).

3 RESULTS

3.1 Textile Industries

For spinning units, the highest average respirable dust concentrations were observed in the blow room of medium units (1.70 mg/m^3), and for weaving units respirable dust concentrations were highest in small units (1.52 mg/m^3). The results of the dust measurements were then compared to the national ordinance (Tamil Nadu Factories Rules, 1950, R.102A), which prescribes a permissible exposure level (PEL) for raw cotton dust of 0.2 mg/m^3 for a work-shift. The highest L_{eq} noise levels for spinning units were observed in large units (95.2 dB(A)), and L_{eq} levels measured for weaving units were highest for shuttle looms in a large unit (99.4 dB(A)). The highest WBGT levels for all textile units were observed in large spinning units (30.3 °C). Noise level measurements indicate that most of the monitored operations exceed the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value® (TLV) of 85 dB(A). Those operations that also exceeded the Tamil Nadu Factories Act noise level limit of 90 dB(A) include ring spinning, weaving, soft winding, and picking. Workers that are consistently exposed to noise levels above 85 or even 90 dB(A) may reveal permanent hearing loss.

The prevalence of signs for pulmonary disorder was calculated from the symptoms reported in the questionnaire or were clinical examination findings (378 valid records). The prevalence of respiratory symptoms and byssinosis were significantly higher in the shop floor workers than in the office workers. Pulmonary functions of shop floor workers (n = 316) were significantly lower than the office workers (n = 122). Workers in shop floor area had 0.28 times higher prevalence of grade I byssinosis and 0.22 times higher prevalence of grade II byssinosis diagnosed based on the reported symptoms, as analysed by logistic regression.

The prevalence of both obstructive (30.2 %)) and restrictive (19.1 %) disorders was more in exposed group than the un-exposed group. The prevalence of obstructive disorders was 10.7 times higher in shop floor workers as compared to office workers, which was significant as analyzed using logistic regression.

There was significant decline in the pulmonary function with increasing dust concentration and years of working (exposure to dust) as both are determinants of dust exposure.

In addition with clinical observations pulmonary function results confirm the higher prevalence of both respiratory symptoms related to byssinosis and respiratory impairments (as established through pulmonary function tests) in workers employed at the shop floor areas.

Out of 361 workers 223 (61.8 %) had a normal limit of audibility, 61 (16.9 %) had hearing loss other than noise induced hearing loss and 77 (21.3 %), had noise induced hearing loss. Prevalence of noise induced hearing loss was highest in the workers working in weaving area, followed by the blow room workers and workers in the

so-called carding, drawing, and roving area. This might be associated with the high noise levels in the various work areas as seen in the exposure assessment of the noise levels.

3.2 Tanneries

The initial phase involved identification of select volunteer tanneries and the conduct of walk-through audits in these units. The parameters of the occupational safety and health audit and specific findings are listed below:

- ***Machine safety***

Preventive maintenance was rarely practiced. The range of machines available for processing raw material were all uniformly found lacking in active and passive guards. Anecdotal evidence revealed exposed gears on the fleshing machines and drums or unguarded rollers and knife cylinders resulted in many hand injuries amongst workers.

- ***Electrical and fire safety***

In most tanneries, the electrical installation did not conform to the standards as suitable in wet and corrosive conditions. Fire drills were not found being conducted even in the large-scale units. Exposed wires, storage of incompatible chemicals, wet floors and lack of fire extinguishers in most designated areas, all predisposed the tanneries to multiple fire and electrical safety hazards.

- ***Chemical safety and materials handling***

Lacking in storage of chemicals as per specifications of the MSDS sheets. Only brand names of chemicals were found available and most facilities had no records of MSDS sheets for chemicals being used. Lack of proper flooring, ventilation and drainage facilities results in considerable material losses as well contributes to localized soil and water pollution.

- ***Use of personal protective equipment***

Many small-scale units used a multiplicity of chemicals and handled them in areas with no ventilation or without the use of personal protective equipment.

- ***Emergency preparedness and Hazard Communication***

The combination of all the situations described above clearly indicates that hazard communication protocols are virtually non-existent. In many instances the top-level management was unaware of the hazard potential of their workplace. Lack of hazard communication programs has resulted in poor emergency preparedness. Use of personal protective equipment was especially an area of major concern. Confined space entry, use of incompatible chemicals, fire and electrical safety are all areas where workers deal with emergency situations routinely. Emergency exits were rarely marked for use in emergency evacuation procedures.

Although the quantitative industrial hygiene measurements were confined to a limited set of parameters due to limitations in analytical capacities, multiple areas of concern were identified where interventions are required.

Pulmonary function tests performed on workers with no previous history of tuberculosis showed that nearly 46 % of all workers had impairments suggestive of mild to moderate obstruction. About 5% of the workers had severe restriction. Audiometric tests on workers showed evidence noise induced hearing loss in nearly 70 % of the workers.

4 CONCLUSION

Further investigation is required to determine the individual contributions of each operation toward the total observed respirable dust concentration and noise levels in textiles units. Accordingly to the recognition of sources of high noise levels, specific textile operations can be identified as potentially damaging to the health of workers. Heat stress assessments also indicate that potential of heat exhaustion is high in many areas, since WBGT measurements were collected in late summer and autumn.

The present programme concerning tanneries has demonstrated that much improvement can be accomplished with the co-operation of the individual management, through nothing more than simple walk

through audits. Further, for the continued success of such programmes it is imperative that local capacity building exercises for the provision of such services be undertaken. Nevertheless recommendations for improvement were given.

The results of the clinical monitoring thus revealed multiple areas of concern where routine surveillance had to be initiated.

Sector specific exposure and health profiling is an important element for creation of local occupational health databases and the results of the study have provided baseline information to serve as an input to the development of such databases. The studies have also demonstrated the value of quantitative workplace evaluations in strengthening the relationship between the observed health impairments and the conditions prevailing in these work environments. Quantitative measurements across a range of hazards allow relative risk ranking for the purposes of priority setting for interventions. The studies have provided baseline values for the determination of the need for implementing and augmenting controls in several work areas. The results would therefore also allow lend itself to application in assessing efficacy of future interventions.

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