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Responding to Global Standards

A Framework for Assessing Social and Environmental Performance of Industries

Case Study of the Textile Industry in India, Indonesia and Zimbabwe

BY

RITU KUMAR, NEBIYELEUL GESSESE AND YASUO KONISHI

MAY 1998

United Nations Industrial Development Organisation, Vienna, Austria

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United Nations Industrial Development Organization
P.O.Box 300, A-1400 Vienna Austria
Tel: 431 26026 3797
Fax: 431 26026 6841
E-mail: ykonishi@unido.org
ritu.kumar@commonwealth.int

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Preface

Responding to Global Standards presents the results of a pilot project undertaken by the United Nations Industrial Development Organization (UNIDO) in collaboration with the Confederation of Indian Industry, (CII) New Delhi, the Institute for Research and Development of the Textile Industry, (IRDTI) Bandung, Indonesia and the National Cleaner Production Centre, (NCPC) Zimbabwe. The project was initiated in 1997 as part of UNIDO s role as a global forum for industrial development. The objectives of the project were two fold:

to provide manufacturing industries with a general framework for assessing their environmental and social performance to facilitate benchmarking (inter company comparisons) as well as comparisons with international and national norms. The framework includes a knowledge based software COMPARE (Cleaner Operations and Manufacturing for Productivity and Resource Efficiency) structured to be used to obtain information about the various aspects of the cotton textile industry as well as to assess an organisation s performance vis- -vis national, corporate and international norms and standards.

to test the framework for selected woven cotton fabric finishing mills in India, Indonesia and Zimbabwe.

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Contents

Executive Summary

Industry is increasingly being required to meet stringent social and environmental specifications in the international market. A number of developing country industries fear that they may not be able to meet these requirements without loosing their competitive edge in international markets. They are also aware that if they do not meet these requirements in a cost effective way, they will not be in a position to access new foreign markets or large international buyers who stipulate their own codes of corporate ethics[1]. Non-compliers are therefore being forced to reconsider environmental and social specifications of their operations. But, very often small and medium scale enterprises are at a loss on how to effect the technical and managerial changes that would enable them to meet emerging environmental and social standards.

It is clear that there is a pressing need for private industry in developing countries to have a set of global norms against which to judge their own performance, as well as to have an internationally acceptable framework to assess their performance in terms of environmental and social parameters. This would also enable industry to identify areas for improvement to make them globally competitive, and, not be victims of non-tariff barriers such as those inherent in ecolabelling requirements.

Responding to Global Standards presents such a framework and outlines an approach for assessing industrial processes, taking the textile industry i.e. woven fabric finishing (cotton) as a case study. In developing an assessment methodology, the report draws upon concepts borrowed from three different approaches and combines them in one single framework. The three pillars of the methodology are: benchmarking literature; life cycle analysis; and an assessment of in-factory working conditions and social aspects of the production process. Results can then be compared to standards, national and international, to assess the extent to which industries are able to meet the requirements inherent in them. The report is divided in three parts.

Part A is a brief theoretical description of benchmarking, the life cycle assessment approach and social assessment methods.

Part B of the report combines the three approaches and presents a hands-on framework for assessing the performance of selected textile enterprises in India, Indonesia and Zimbabwe. The methodology follows a hierarchical approach where the first step defines the system under examination, and subsequent steps define the boundaries for investigation and select parameters to be analysed within the system boundary. The basic methodology is presented in a generic form which can be adapted for different industrial processes and parameters. In addition, Part B also presents a framework tailored to assessing the performance of selected textile enterprises in Indonesia, India and Zimbabwe based on a range of environmental and social parameters. This is the pioneering and innovative aspect of the report since it presents a comprehensive methodology for undertaking social and environmental assessments of industrial processes (as opposed to products) in a practical and feasible manner in developing countries. The framework developed in this report constitutes the basis for a computerized software model, Cleaner Operations and Manufacturing for Productivity and Resource Efficiency (COMPARE). COMPARE is a knowledge-based tool structured to provide information about various aspects of the cotton textile industry, as well as to conduct assessments of an organisation s performance vis-a-vis national, corporate and international norms and standards. It contains a comprehensive data base on international standards and corporate codes of conduct that companies can use to compare their performance levels with. It also suggests pollution prevention measures to meet prescribed standards together with case studies that illustrate the techno-economic feasibility of these measures.

1. The term corporate codes of ethics and corporate codes of conduct have been used interchangeably in this report.

In part C, the report illustrates the results and analysis of applying the framework to three selected factories engaged in producing woven cotton fabric for shirts and blouses. The factories have been selected from India, Indonesia and Zimbabwe. The case studies demonstrate the usefulness of assessing and benchmarking environmental, and social performance of enterprises, especially those competing in global markets. The assessment was found particularly useful for identifying areas for improvement in the adoption of cleaner technologies and in corporate practices relating to occupational health and safety provisions, training, education and awareness of workers.

The links between environmental improvements and better working conditions are especially important. The case studies suggest that there is a positive correlation between reduced environmental loads, and, training and awareness programmes for workers. Increased awareness about conserving inputs such as water and energy results in better utilisation of these inputs. It was also found that in companies that had a formal environmental policy, well communicated to workers, the environmental performance was far superior.

It is in the interest of management to ensure that workers receive technical training and are educated and made aware of the importance of conserving raw materials and resource use. It is true that very often small and medium scale enterprises (SMEs) cannot afford continuous training and skills upgradation of workers. This is where governments as well as industry associations can assist by providing SMEs with access to training. Furthermore, development assistance may also be targeted at providing small and medium scale industries with the necessary information, resources and capability to undertake their own assessment of environmental and social performance to enable them to identify areas for improvement and meet global standards.

The case studies also suggest that corporate managers need to pay more attention to in-factory occupational health and safety conditions. Factories that had high levels of in-factory air pollution levels were also those that had inadequate occupational health and safety conditions. In addition, if a company were to reduce emissions of volatile organic compounds through investments in cleaner technologies, it could reduce its expenditures on occupational health and safety measures and at the same time meet international requirements or specific requirements of buyers, thereby improving its export potential.

Responding to Global Standards highlights the fact that for export oriented firms, the dictates of large international buyers reflected in their own codes of ethic, are more instrumental in bringing about improvements in social and environmental performance than guidelines recommended by international agencies such as the International Labour Organization, World Bank, World Health Organization etc. Consequently firms that cater to corporate codes of practice of their foreign clients are better able to exploit trade opportunities inherent in the demand for sustainably produced goods. This results in increasing export sales as well as better environmental and working conditions.

The case studies underline the importance of economic incentives and removal of subsidies for achieving better environmental and social performance. Prolonged subsidies have resulted in overuse and waste of raw materials and inputs. Prices of inputs must reflect the full cost of using the inputs and government policies must be restructured to reflect these costs. More reliance on market based instruments by governments is a prerequisite for better performance.

The responsibility for achieving higher levels of environmental and social performance, and thereby exploiting the opportunities for trade inherent in more stringent global standards rests jointly on three key actors: corporate managers including exporters from developing countries and buyers in developed countries; national and international policy makers; and workers. A concerted effort on the part of all is necessary for achieving sustainable production without impairing profits and competitive advantage.

Part A: The Conceptual Pillars

DESCRIPTION OF METHODOLOGICAL TOOLS

Benchmarking, life cycle analysis (LCA) and, increasingly, social assessment have become important and fashionable for industrial management and development during the 1990 s. The use of benchmarking and LCA has often resulted in considerable savings for individual firms, even though both tools are still in their infancy. The common aspect of these two approaches is that they are analytic tools focusing primarily on process inventories and assessment. In addition, the two methodologies are congruous in utilising many of the same socio-economic parameters.

Nevertheless, the analytic framework of benchmarking is broader than the predominantly quantitative LCA, and can include qualitative parameters as well. Social assessment also offers a compulsory qualitative dimension for the policy maker using the benchmarking framework.

The methodology developed in this report integrates LCA and social assessment into the benchmarking framework. The policy maker thus needs to know the advantages and the limitations of the three approaches. These, along with brief descriptions of the three approaches as they relate to the present study are presented in the following paragraphs.

A1. BENCHMARKING

Benchmarking is a systematic, continuous process to improve performance by comparing an activity to a better one or the best one, identifying reasons for performance gaps, and removing them. Whereas applications of benchmarking in the area of production process are common and obvious, the use of environmental benchmarking benchmarking concerning environmental impacts is scarce.

Benchmarking definitions

One of the first to write on benchmarking was Camp in his Benchmarking: the Search for Industry Best Practices that Lead to Superior Performance (1989), which is based on his experiences from the Xerox Corporation s benchmarking process in 1979. In his work, Camp refers to two anecdotes illustrating the historical roots of benchmarking: the ancient Chinese acknowledging the importance of knowing your enemy and knowing yourself and, the Japanese traditionally striving to be the best of the best (1989, 3).

Camp (1989), describes benchmarking to be the search for industry best practices *that lead to superior performance.* This being a working definition, he also gave a formal definition: *the continuous process of measuring products, services, and practices against the toughest competitors or those companies recognised as industry leaders* and a dictionary definition: *a surveyor s mark...of previously determined position...and used a reference point...standard by which something can be measured or judged.* (Camp 1989, 10-12).

The various definitions of benchmarking present in the literature do not differ significantly in essence. Spendolini, who has done much ground-breaking work on the creation of a framework for benchmarking analysis, has defined benchmarking to be a continuous(1), systematic(2) process(3) for evaluating(4) the products(5), services(5), and work processes(5) of organisations(6) that are recognised(7) as representing best practices(8) for the purpose of organisational improvement(9). (Spendolini 1992, 7-10). Spendolini s benchmarking model includes the following phases: Stage 1: *Determining What to Benchmark,* Stage 2: *Forming a Benchmarking Team,* Stage 3: *Identifying Benchmarking Partners,* Stage 4: *Collecting and Analysing Benchmarking Information,* and Stage 5: *Taking Action.* (Spendolini 1992).

It is generally agreed that there is no need to try to standardise the benchmarking methodology. Instead, once the benchmarking team determines the objectives of the project, the methodology is customised according to the needs of the project. In Part B of this

paper, Spendolini s model will be used, in conjunction with material balance flow techniques (based on the life cycle approach) to elaborate a framework for analysing social and environmental performance.

There are several benefits of benchmarking. Benchmarking,

- Leads to better performance and cost improvement
- Adds objectivity to goal setting and decision making
- Increases employee teamwork and participation
- Facilitates technological breakthrough
- Reduces resistance to change

APPLICATIONS OF BENCHMARKING: A FEW EXAMPLES

Benchmarking is commonly used in manufacturing industries where predominantly quantitative economic parameters, e.g. inventory turnover, set-up times, lead time, number of vendors, direct labour time or working time, market share, return on sales, return on equity and, production costs are measured (Miller et al. 1992, 212-222). Nevertheless, the importance of the "hidden factory" i.e. R&D, design, engineering and logistics is increasing in the benchmarking context (ibid. 125).

Benchmarking has also been extended to include the services of manufacturing industries and, more recently, benchmarking has been conducted in the service sector and in the public sector. Benchmarking is conquering new territory in public policy making. Application areas for benchmarking are growing: from corporate usage by individual firms, benchmarking is spreading to a national or even international level. Several governments and international organisations are starting benchmarking projects. For example, the European Commission, DG III (Industry) has listed benchmarking as one of its main activities for 1997. (European Commission 1997, 8-9). Public policy oriented benchmarking, conducted out side companies, may enlarge the definition and practices of benchmarking adding a political dimension to the process.

Environmental Benchmarking

Existing theoretical literature on environmental benchmarking is very limited, and is primarily the product of work undertaken by consultancy firms. Helminen (1994) has written a thesis on environmental benchmarking in the pulp and paper industry. Helminen s work, with modi-fications to widen its coverage to include environmental assessment, has been used as a guide in formulating the present methodology for textiles, which like the pulp and paper industry, is a process sector. Further details are provided in Part B of the paper.

Environmental benchmarking measures include, for example, discharges to air and water, solid waste, noise, vibration and comparable emissions, as well as perceived image and public relations costs. Perceived image is a function of both performance and promotional aspects. Costs required to achieve a given image reflect the company s overall environmental performance as well as the efficiency of the public relation function, both of which can be quantified.

In fact, benchmarking of environmental legislation (impacting on a single company s operations) against that of other major competitors is a topic of growing interest. It is also one more example of the application of benchmarking methodology in the manufacturing sector. Though environmental benchmarking may not be benchmarking in the most conventional sense of the concept, it is extremely relevant, as it provides solutions to cope with legislative instructions in addition to merely describing what the legislation in different countries is like.

Environmental benchmarking brings together various factors affecting a company s overall performance. Energy efficiency, for example, not only measures environmental friendliness but also production efficiency, which in turn has direct economic implications.

A2. LIFE CYCLE ASSESSMENT (LCA)

LCA, as well as other material flow models, are being increasingly used in various industrial sectors and at different decision making levels in order to seek out environmentally friendly solutions. The emphasis of environmental legislation has been shifting since the 1980s from end-of-pipeline control of emissions towards efforts to prevent pollution at source. Among the 'second generation' sets of analytical tools LCA is emerging as a means of extending the capacity of producers and regulators to understand the overall environmental consequences of production-consumption activities. (Gronow 1996).

The Life-Cycle approach reflects the principle that a manufacturer (and his/her distributor) is (are) responsible for all environmental effects of a sold product, and not only for those effects which arise at his/her production plant. In its simplest form LCA is an input-output material balance model which follows a product or a system during its entire life, i.e. from "cradle to grave". The cradle is marked as the point where a raw-material (e.g. cotton) is taken from its natural environment, and the grave is where the product or its components are returned to the natural environment as waste.

In a Life Cycle Assessment (LCA) the first step is the determination of the **goal definition and scope**, followed by the **Life Cycle Inventory (LCI)**. In this inventory all material and energy inputs and outputs, effluents and emissions produced by a product within **boundaries** established on a case by case basis, are quantified and calculated. This inventory can in the next phase serve as the basis for the **Life Cycle Impact Assessment (LCIA)**, where the contribution of various items in the inventory is estimated to establish classes of environmental problems, such as acidification or global warming. The assessment may be followed in turn by an **improvement assessment** where environmental, technical and economic improvements during the life cycle are suggested. (SETAC 1995).

It is essential to determine the beginning and end points of life cycle inventories. LCI is ideally done from cradle to grave. In reality, the boundaries of the LCI are dependent on the objectives and the resources of the project. LCI may be conducted from cradle to millgate (out) if the end product is the object of study, from millgate to millgate if the production unit is the study object, or, from mill gate to grave if the disposal option(s) are under study.

LCA APPLICATIONS: SOME EXAMPLES

In a broad context, LCA has been used as a means of developing instruments for policy interventions. LCA is now being incorporated as a basic requirement in legislation - including the European Union's Environmental Labeling Regulation (EEC 880/92, March 23, 1992), which is very relevant for the textile industry. On a national level, public authorities are increasingly using LCA as an information basis for environmental policies.

The private sector, i.e. companies, are still presently the main users of LCA. LCA is particularly useful for process industries such as the textile industry. Companies started to use LCA in their product development in the early 1980s not necessarily for environmental reasons but because of inherent material and energy intensity inventories. Companies thus attempted to improve their processes with the aid of LCA and, consequently to improve profits. The use of LCA in corporate environmental policy has spread largely for defensive reasons, especially to protect products from aggressive claims by environmental groups. Increasingly, the strategic advantages of pinpointing the environmentally sensitive spots along the life-cycle of a product can be used to favour and pilot innovation and environmental R&D investment. This path provides big incentives to firms: there have been numerous cases in which environmentally preferable solutions also happened to be the best solutions for energy and materials management within the portion of the life-cycle which falls under a firm's responsibility. Most of these studies, however, remain entirely "confidential" (estimate:95%). (OECD 1996, 13).

In this study the production unit, i.e. a woven finishing cotton factory, is the object of analysis for benchmarking, LCA and social assessment. Inventories are calculated starting at the mill gate (in) and ending at the mill gate (out). In this sense, we are really undertaking an input-output material balance analysis rather than a full scale life cycle analysis from cradle to grave.

Limitations of Life Cycle Assessment

In spite of its many advantages, LCA still remains a controversial tool for environmental policy planning. At its best, it can be a truly helpful tool for environmental policy planning, but it is not always used with full consideration. Effective LCA methodologies are needed but are currently still in the development stage. Unfortunately, LCA is not a precise tool in its current state of development. Many of its calculations and assessments are defined by and dependent on subjective decisions. It has been pointed out that often the choice of the LCA model may determine the research results (Fr hwald 1995, 9). It may be difficult to quantify input data in LCA. Boundaries, allocation rules and other system definitions may be an intransigent obstacle for LCA.

LCAs have a major methodological problem when the product under analysis is part of a recycling system. The grave of a product's life cycle in a closed system with recycling is not easily determined, and the effluent and energy inventory can not be calculated.

Development of life cycle management procedures will be required for placing LCA in its proper context and integrating it with other socio-economic priorities. Annex 1 demonstrates areas where common ground cannot be found for LCA and benchmarking methodologies.

A3. SOCIAL ASSESSMENT

Social assessment, also called social auditing, has been defined as "a process of defining, observing and reporting measures of an organisation's ethical behaviour and social impact against its objectives, with the participation of its stakeholders and wider community" (Zadek and Evans, 1993, 7). Stakeholders are individuals or groups that are directly affected by, or can affect, the activities of an organisation. In the case of an industrial enterprise the typical stakeholders would include workers, consumers, shareholders and producers.

According to Zadek and Evans (1993, 3) a social assessment should examine the social and ethical impact of the business from two perspectives. One, from the inside i.e. assessing performance against its mission statement or objectives. Second, from the outside i.e. using comparisons with other organisations behaviour and social norms, i.e. benchmarking. In this way social assessment is intended to provide information that will help people make decisions, and also enable them to increase their level and effectiveness of participation in the decision-making process.

Social assessment indicators must therefore include both internal and external objective yardsticks that permit year-on-year comparisons, external comparisons, and a subjective feedback from key stakeholders. The conclusions of a social assessment report cannot be expressed simply in terms of "profit" or "loss", but should include performance measures against both internal and external benchmarks.

It is important to define performance indicators which offer the most immediate measure of assessment. These indicators can also be used in successive reports to assess performance over time. It is also important to compare performance with that of other businesses, i.e. benchmarking. Comparative quantitative information is particularly useful for measuring wage rates, the proportion of women at different levels of the organisation, the employment of people of different ethnic origins.

Nevertheless, there is a need for some caution in the use of indicators that compare the company's performance over time against that of other businesses, as there are difficulties associated with placing numerical values on the many different social costs and benefits. Thus, although the use of numerical measures of social performance may at times be possible, there remains a need to look behind

the numbers to understand the non-quantifiable, ethical issues at stake. Performance indicators should therefore typically be a mix of qualitative and quantitative parameters.

Validating diverse perspectives is also another aspect of the social assessment process. Some social indicators, e.g. wages, may be easily comparable, whereas others are not. A key aspect of a social assessment is the fact that it is a social composition that reflects the reality of the diversity of any living community, where there will always be different perspectives. The role of the social assessment is to highlight these differences, as well as to reach more definitive positions where possible.(Zadek and Evans, 1993, 23-30).

Basic Steps in a Social Audit

1. Identify the objectives of the enterprise, particularly in terms of special considerations related to social and ethical values.
2. Identify and characterise the key stakeholders of the organisation.
3. Identify social indicators in collaboration with the key stakeholders of the organisation. In the case of a manufacturing enterprise, for example, it may be that workers are the major target group within the organisation s mission statement, and therefore relevant social indicators would relate to: the firms hiring and training practices, wage and benefit levels and structures, working conditions including health and safety, bargaining arrangements and safeguards, gender distribution of the work force etc.
4. Undertake an assessment of the identified parameters, using both quantitative (monetary and non financial) and qualitative methods.

Social Indicators for Manufacturing Enterprises

For a typical medium to small scale manufacturing company engaged in the production of final consumer goods, social and ethical values would be centered around worker welfare and consumer satisfaction, rather than social interests of the community at large. Moreover, if the company is exporting its goods, its stakeholders would also include the foreign consumer in a developed market, whose satisfaction may tend to be influenced by the social and ethical impact of the firm s production methods. In either case, the most relevant stakeholder groups for a typical manufacturing company in a developing country are its employees and consumers of its products. Given this, relevant indicators for a social assessment of the manufacturing enterprise would include measures that address consumer and worker welfare. Some of these measures are listed in the box below:

Social Indicators for Manufacturing Enterprises: Some Examples

A. Training and Communication Indicators:

- availability of entry level training for workers
- retraining to improve job performance or to transfer to other jobs with similar skills
- retraining for upgrading and promotion
- type of training, funding and availability of facilities
- communication methods with workers and enforcement of social
- policy directives

B. Non Discriminatory Indicators

- extent to which the firm has non discriminatory recruiting and training practices, particularly relating to women and racial minorities
- extent to which there is an exploitation of child labour

C. Work Security Indicators

- measures of occupational health and safety
- communication methods relating to worker security and safeguards.

Source: International Labour Office, 1996, Geneva

The above are some very basic parameters that firms should attempt to address in order to at least partially fulfill their corporate responsibility. A more comprehensive set of social practices would include equity indicators as well as measures that reflect the extent of worker involvement in decision making relating to employment and labour practices.[2]

2. See the *Human Development Enterprise : Seeking flexibility, security and efficiency*, by Guy Standing, International Labour Office, Geneva 1996.

Part B: Framework for Assessing Industrial Processes

PILOT APPLICATIONS FOR THE TEXTILE INDUSTRY IN INDIA, INDONESIA AND ZIMBABWE

This part of the paper attempts to combine the three methodological tools described above into a single framework that can be used to make an assessment of the environmental and social performance of industrial processes. The framework is described in generic terms (so that it can be adapted to different situations) as well as in the specific context of the pilot application to the textile industry in India, Indonesia and Zimbabwe. The same framework has been used as the basis for developing a software to enable wider and easy usage.

B1. SCOPE OF ASSESSMENT

In the pilot application the study is restricted to three textile units per country, engaged in woven fabric finishing of cotton materials. These textile units were selected by UNIDO teams in the respective countries (see section B2 for details on the selection criteria). Relevant pressure points (points where environmental impacts arise) in the production of one kg or one running meter of finished woven cotton fabric used for shirts and blouses were identified and assessed at the two levels. One was to assess performance against national and international standards, and the second to assess performance against other companies (benchmarking). The norms and standards relate to the following parameters (see also stage 1 below):

- *environmental:* ISO standards on air quality (ISO 146), water quality (ISO 147) and soil quality (ISO 190); national standards on air, water and soil quality; norms for energy consumption, exclusion requirements for the use of chemicals and dyes (banned amines, heavy metals, formaldehyde); ecolabelling criteria in the European Union (EU)[3] relating to energy consumption during manufacturing, consumption of water during wet treatment, waste water parameters in the manufacturing process, and detergents and complexing agents; other ecolabelling criteria such as OKEO-TEX and national schemes where relevant; World Bank guidelines on the textile industry.

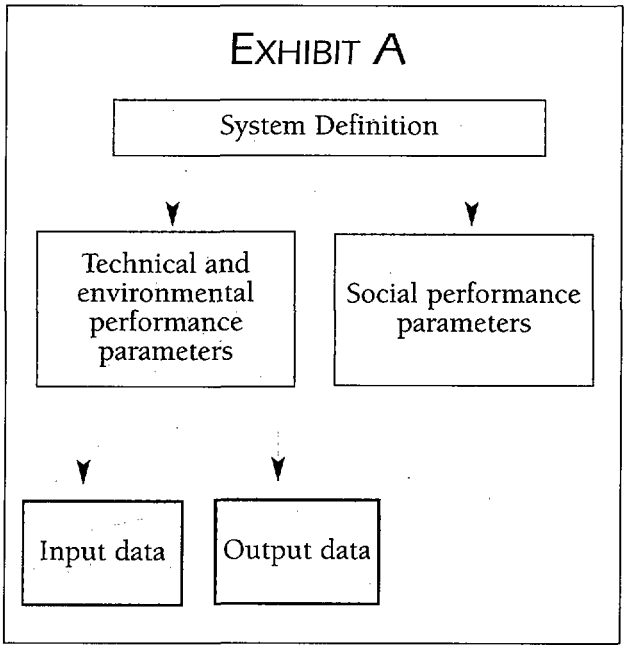
- *social:* occupational safety and health standards (using ISO and ILO norms/standard as well as corporate codes of practice); recruitment and training practices; management policies on employee working hours and work contracts; salaries, pensions and compensations; employee civil rights, employment effects, participation of women and children.

- *technical* aspects relating to exclusion criteria for quality of final product (ISO 38) and criteria relating to textile machinery (ISO 72).

B2. THE ASSESSMENT FRAMEWORK

The starting point of the assessment framework is the System Definition which defines the boundaries of the system and the time frame of the assessment. The system is

EXHIBIT A



3. The EU is mentioned explicitly since it constitutes key importing countries that have established ecolabelling criteria.

defined in terms of four basic components:

- *inputs* including materials, energy and water;

- *process* stages describing various steps in the production process;

- *outputs* including final products, by-products, emissions, effluents and solid wastes originating at various stages of the production process;

- *corporate* management and organizational activities.

The performance of the system is assessed in terms of environmental, technical and social parameters relevant to each component of the defined system.

Methodological Framework for Assessment

The recommended methodology, combining Spendolini s benchmarking model, the input output material balance flow technique, and a social assessment component, follows six stages as described below:

Stage 1: Identifying Parameters

The assessment of industrial performance should ideally cover a set of environmental, social and technical parameters, listed in Exhibit B. Typically one can choose variables in terms of inputs and outputs to get a systemic view. Material and energy inputs as well as emissions and outputs are identified according to their renewable and non renewable character and load media.

The social performance assessment focuses on in factory working conditions and skills of workers who have direct contact with the production processes. This also helps in identifying cases where higher environmental burden occurs on account of inadequate working conditions and lack of knowledge.

The inclusion of social parameters shown below, e.g. occupational safety and health standards and recruitment and training practices relating to women, requires that qualitative parameters be given due attention in the analysis[4].

Environmental and technical variables listed above need to be converted to a common

4. As the project was a pioneer effort in environmental benchmarking and benchmarking instruments, such parameters as complex market factors, trends, perceived image and pressure from non-governmental organisations (NGOs) were excluded from the present analysis.

EXHIBIT B

ENVIRONMENTAL AND SOCIAL PARAMETERS

Main Categories	Sub-categories
Raw material consumption	• Non-renewable raw materials • Renewable raw materials
Energy consumption (by source type)	• Non-renewable energy carriers (fossil energy sources) • Renewable energy carriers • Consumption of uranium ore
Consumption of water	
Emissions	• Air emissions • Water emissions • Solid wastes
Social parameters	• Employment • Education • Salary • Health & safety • Training • Gender ratio • Age • Communication

denominator in terms of tons of production for a product type.

The variables should be those which are easily measurable and which have a fairly consistent linkage with the production system. For example, water consumption is easy to assess by meter readings or by calculating from equipment size and operation. Emissions from the finishing sections on the other hand are possible to measure only in terms of concentrations, generally difficult to establish and have complex relationships with overall production.

The variable or variables should capture the environmental impacts over the life cycle. Presence or absence of a chemical in the textile product is a useful variable in this sense. If resources exist, then chemical concentrations (as specified in various ecolabelling schemes) on the textile product may also be measured.

The variables should be backed with some national or international database for the purpose of comparison. Sometimes data can be accessed from the equipment manufacturers or textile research associations.

An inquiry on whom and what to benchmark, how to connect the field studies and how to interpret the data becomes a part of the systems analysis. As an illustration of whom to and what to benchmark, a sample scheme is suggested in the box alongside.

Comparisons of the identified parameters are made with appropriate reference levels. These reference levels could be national or international standards and norms, inter company benchmarking, or ecolabelling requirements.

*Note:*An overview of the systematic framework may be observed in Exhibit C.

Stage 2: Forming a Team

In order to undertake the complex task of assessing the performance of an industrial process, in qualitative and quantitative terms, encompassing a wide variety of parameters, it is essential that the assessment team have a multi disciplinary membership.

AN ILLUSTRATION OF WHOM AND WHAT TO SELECT

Whom

Fiber: Cotton

Product: Woven fabric

Types of operation: Preparation, Dyeing, Printing and Finishing

Size of operation: 5000 kg to 12000 kg a day

Mode: Batch operations

Privately run professional unit with internal quality control and inventorization systems or family run traditional management with no formal use of management tools

Equipment age varying between say 2 years to 15 years

Market segment i.e. domestic or export, export to countries having ecolabelling related expectations

What

Inputs: Water consumption *(Overall and specific to each process stage);* Energy *(Steam and Electricity);* Chemicals *(Major chemicals such as caustic, hydrogen peroxide in terms of consumption (quantities) and use (in terms of "yes" / "no") of objectionable chemicals (especially in terms of auxiliaries, dyes and finishing agents);* Labour *(Overall manpower employed and skill level distribution)*

Outputs: Waste generated (wastewater produced and its characteristics in terms of major objectionable pollutants); Product quantity and quality.

EXHIBIT C

THE SYSTEMIC ASSESSMENT FRAMEWORK

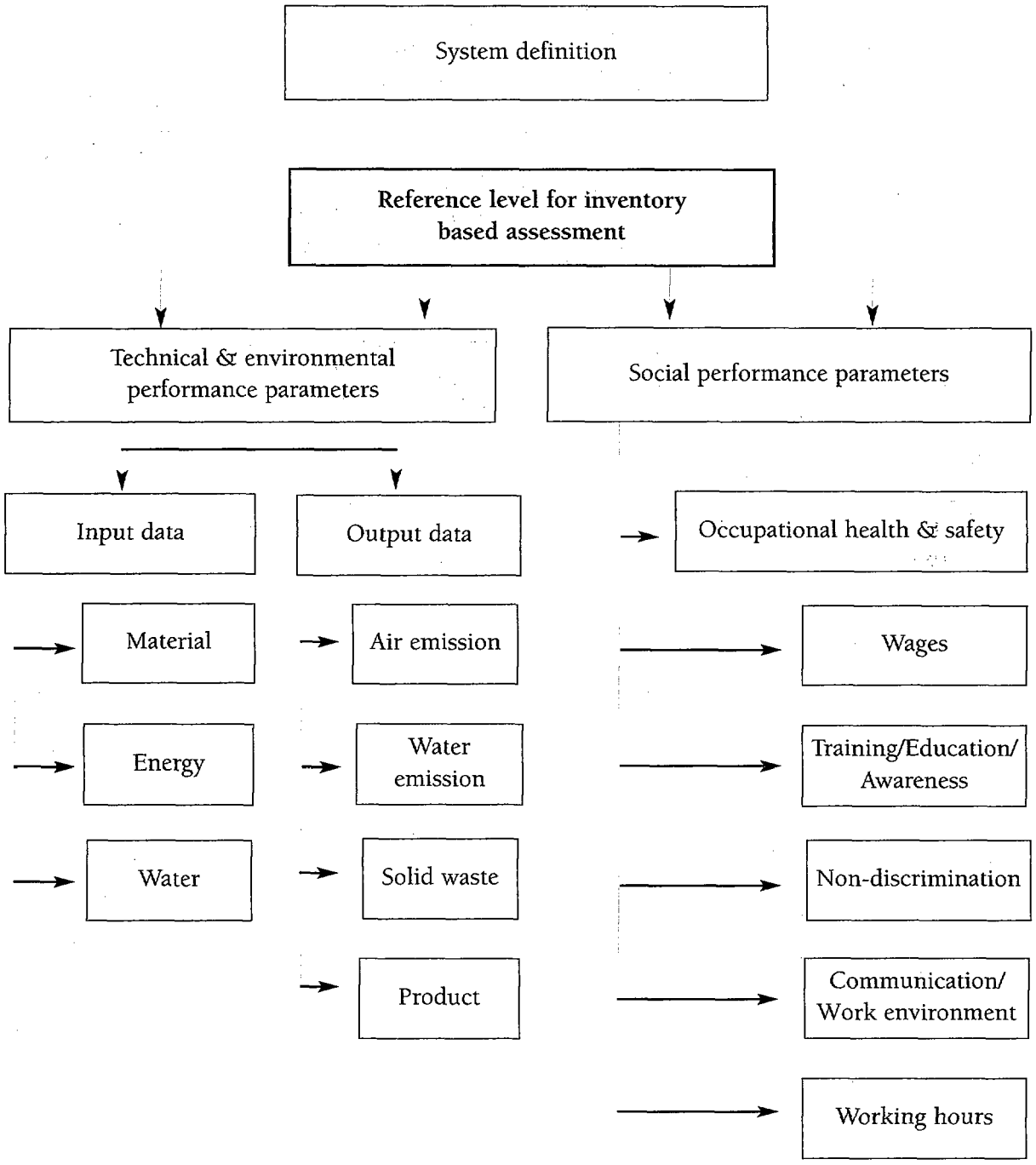


Exhibit D outlines the skill composition of the team that was put together for the present exercise.

The skills required from a team member include functional expertise, credibility, communication skills and team spirit. Even more important than mere skills is the willingness to benchmark, a characteristic close to willingness to learn (cf. benchlearning = imitating successful behaviour, by Karl f and stblom 1993: 180-187). In addition to a competent team, sufficient resources and senior management support are vital requirements.

Stage 3: Selecting Partners

It is essential to find suitable firms who are willing to take part in the assessment process. The decision about whom to

EXHIBIT D

PROJECT TEAM

Profession Expertise	External	UNIDO
Textile engineers	1	2
Expert on LCA	1	1
Industrial/environmental economist	3	3
Industrial engineer	3	1
System analyst	4	2
Data base development software analyst	1	-
Human Resource Development analyst	-	1
Peer reviewers	2	-
Total	**15**	**10**

benchmark against depends on the subject, resources available and the challenge the company is prepared to undertake. Choosing too similar a partner diminishes the likelihood of true learning, whereas choosing too dissimilar a partner hinders comparative analysis (Fitz-enz 1993: 38).

The selected sample of factories should:

1) be willing to share and provide data.

2) preferably be export oriented units.

3) at least one factory should be a market leader and/or represent world-class performance level in the industry.

For obtaining a fairly similar "statistical sample", it is also important that units in India, Indonesia and Zimbabwe are identified with similar scale of operation, fiber type and more or less similar product segment. In addition, sufficient databases must exist in the international literature to assist in a broader comparison. In its absence, no objective benchmarking is possible.[5]

Variations within a homogenous sample are possible depending on the following:

- extent of housekeeping
- type, age and maintenance of the machinery and pipework
- skill and training of the workers
- internal quality control systems
- internal inventory systems
- type of management and management commitment
- market segment i.e. domestic or export

In order to capture the variations and their effects, the units chosen may include, amongst other similarities, certain differences reflecting extent of housekeeping, upkeep, skills, management systems etc. Incorporation of such factors helps in analysing ways to effect improvements. In a large sample of companies field audited, it becomes possible to identify "which unit has the best performance and "who has the worst".

The goals of the study also dictate its scope

5. It is important therefore that the sample size of the companies needs to be high. Fifteen units across three countries, as envisaged in the first phase of this project, is indeed a limitation in this sense. Twenty units in each country may perhaps be the ideal choice.

and choice of partners: it may not be necessary to search for the best world-class practices. Instead, improvements to the current practice may be deemed sufficient. If the stars are within reach, why aim for treetops - but if they are not, treetops may suffice. In addition, as the best company may be overwhelmed by innumerable benchmarking requests, it may be advisable to consider a company near the top - especially since the best is probably not the best in every process.

Stage 4: Inventory of Input / Output Data and Social Indicators

Life cycle inventory (LCI) analysis immediately follows the goal definition stage in LCA. LCI is the core of LCA and the most time-consuming stage. LCI can be divided into four steps: 1) constructing the process flow chart, 2) collecting the data, 3) defining the final system boundaries and, finally, 4) processing the data (UNEP 1996, 52).

Data collection must fulfill requirements of benchmarking, LCA and social auditing methodologies. In addition to LCI data and social data, data concerning existing international and national environmental standards and norms relating to the textile industry should be collected at the beginning of the data collection process.

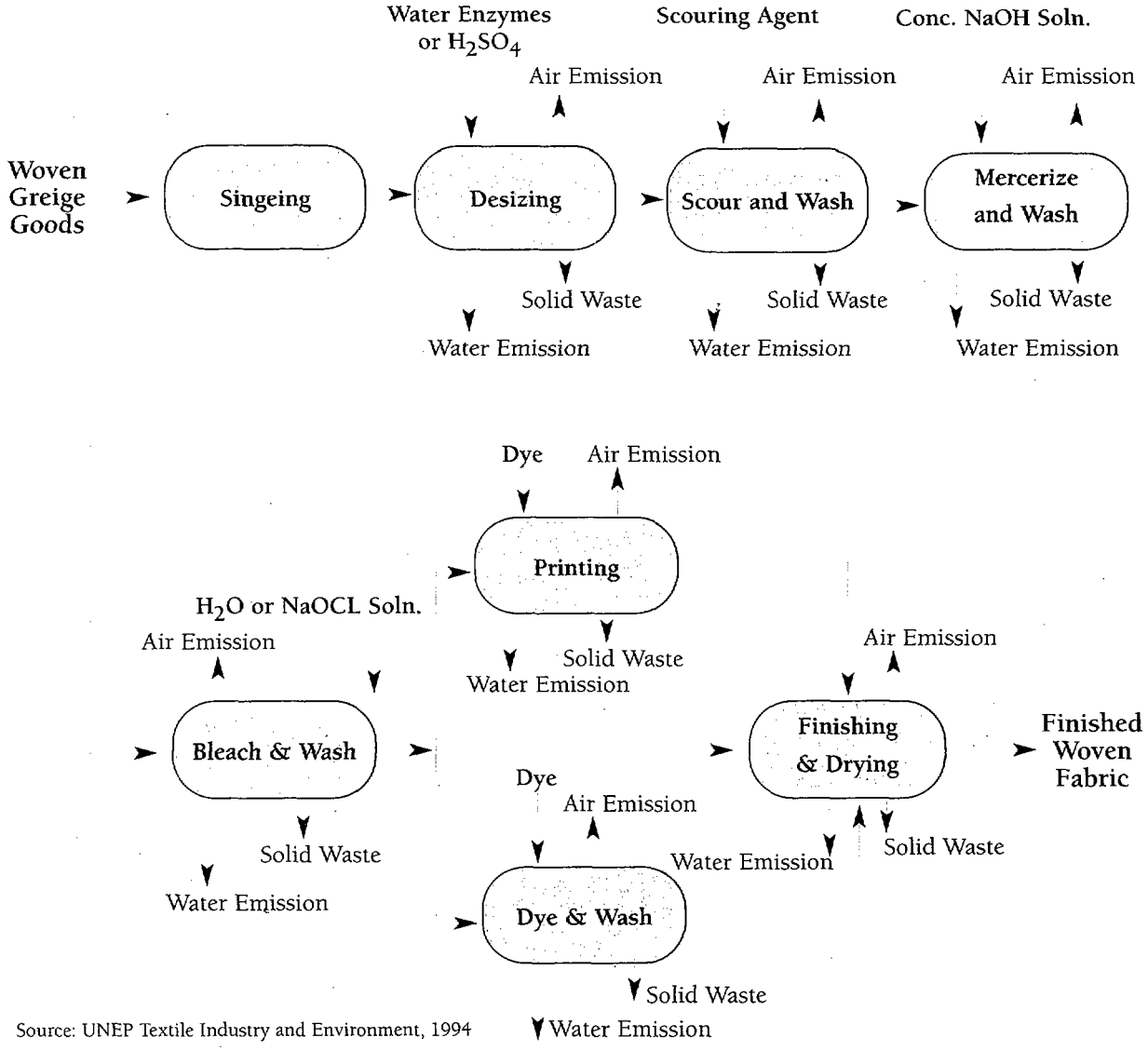
The data collection process has several steps as outlined below:

Constructing the Process Flow Chart

The process flow chart is a graphical

EXHIBIT E

WOVEN FABRIC FINISHING MILL



Source: UNEP Textile Industry and Environment, 1994

representation of all relevant processes in the life cycle of the system. Constructing a process flow chart is a learning process which may have to be repeated several times during the project (Weidema 1993, 67). It is also the simplest way to indicate the boundary of the investigated system. A preliminary flow chart for a woven fabric finishing mill is presented in Exhibit E.

Data on Environmental Parameters

Thereafter input and output data for each process stage taking into account the following requirements should be collected:

- The functional unit is 1 kg of finished woven cotton fabric.
- Environmental pressures and expenditures arising from acquisition, processing and transportation of energy carriers and raw materials should be excluded. This is a practical consideration since the present exercise is restricted to a mill gate to mill gate analysis. However, it should be borne in mind that activities within the factory can lead to environmental and social pressures outside the factory. Such external effects should be described in the analysis to the extent possible.
- Environmental pressures arising from installation of production machinery and equipment, other infrastructure, as well as maintenance should be excluded.
- Recycling and re-use of material are included only as far as possible.
- Small quantities of input material (<5% in most cases, except for hazardous substances) are assumed not to be relevant for the environmental impact.
- Environmental impacts of co-products are allocated in proportion to mass of the output.

For purposes of the present study, the variables listed below are analysed.

ENVIRONMENTAL PARAMETERS

1. Consumption of water
2. Consumption of energy
3. Waste water
4. Air emission (VOC)
5. Water emission (COD, BOD)

The questionnaire in Annex II gives detailed specifications on the above parameters.

Data on Social Parameters

The following preliminary tasks should be undertaken prior to collecting data for the social assessment:

1. Identifying the mission objectives of the enterprise
2. Identifying key stakeholders
3. Based on this, identifying relevant social parameters (see Part A)
4. Identifying relevant national and/or international rules on basic safeguards for workers, labour standards, safety and health standards.

In undertaking the above tasks, the investigators should keep in mind the following aspects cited by Zadek and Evans (1993, 27):

- It is necessary to make use of a range of qualitative and quantitative indicators of performance and associated measurement techniques.
- Quantitative indicators are used, in particular, to enable comparisons over time, with other factories and, where possible with social norms relevant to the activities being considered.
- Comparisons are not presented in monetary terms unless the indicator relates directly to financial transactions.
- Qualitative information is used where appropriate.
- There is no attempt to add-up the various indicators to obtain an overall conclusion as to the social or ethical dimension of a factorys impact or behaviour.
- In addition to the above, an attempt is also made to assess the relationship between environmental protection, workplace conditions, and trade aspects on the basis of:

(i) Fair and human conditions of labour not only in their own country but in all countries with which firms have commercial and industrial relations (agreement to forbid import, at the behest of property holders,

when certain workers rights are violated).

(ii) Laws that restrict trade with countries having inadequate environmental protection practices.

For purposes of this pilot study, the social parameters listed below were analysed.

SOCIAL INDICATORS

1. Work Security: occupational health and safety conditions
2. Training and Communication Practices
3. Non Discriminatory Practices: gender, age
4. Work schedule/shift

The questionnaire in Annex II provides detailed specifications on the above mentioned parameters.

Collection Sources and Limitations

Data collection is often time-consuming and the data needed is not always available. There are, nevertheless, several sources which may be used in data collection. Exhibit F presents some potential data sources.

Considerable cost savings may be obtained if information is collected from secondary sources. Original research does tend to involve substantial costs for data collection. However given the pioneering nature of this study, it's primary data was collected through questionnaires and interviews.

From the LCA vantage point it is of importance that a consensus reign on the data collection method. The variation in the data quality may be very large if the measuring instruments are not well defined. Data obtained by measuring, data simulating and estimating is excessively difficult if not impossible to be compared. It is recommended that input and output data be measured with well-defined instruments on site as far as possible.

EXHIBIT F

INFORMATION SOURCES AND COLLECTION METHODS

INTERNAL
- Databases, Archives
- Publications
- Employees

EXTERNAL
- Publications
- Electronic Networks
- Experts
- Trade Organisations
- Professional Organisations
- Benchmarking Partners
- Seminars
- Advertisements
- Government

ORIGINAL RESEARCH
- Customer Feedback, Surveys, Telephone Interviews
- Supplier Feedback, Surveys
- Queries in Personal Networks
- Consultants
- Meetings, Site Visits

Source: (Camp 1989: 76, Spendolini 1992: 126-127).

Stage 5: Analysing Data and Assessing Performance

Information Processing and Verification

The first set of activities in the analytic phase relate to information processing: the sorting, organising, and quality-control of data and information. The next step is the correction of non-comparable factors and the collection of missing data. Only when the quality and quantity of information is sufficient, the magnitude of and reasons for the performance gap between the company and the benchmark company is analyzed. Finally, decisions are made about the actions needed. (Karlöf and Östblom 1993, 149).

Exhibit G gives a list of air and water emissions that may be analyzed. These have been compiled from various sources including effluent and emission parameters for Indian and Indonesian textile industries (World Bank 1994: 23), as well as ecolabelling requirements.

EXHIBIT G

ENVIRONMENTAL OUTPUT VARIABLES FOR THE TEXTILE DYEING AND FINISHING SECTOR

Production process	Air emissions				Water emissions							
	CO2	NO_x	SO_2	VOC	AOX	BOD	COD	TSS	O&G	Cr	Susp. Solids	S	Phenol
Singeing													
Desizing													
Bleaching													
Mercerising													
Dyeing													
Wet finishing													
Drying													
Dry finishing													
Cloth inspection													
Packing, baling													

As mentioned earlier, the present study will concentrate on VOC, BOD and COD.

Inventory based assessment

Exhibit H suggests a framework for undertaking an assessment of the environmental, social and technical performance of companies. The framework presented here lists some of the key parameters that are critical to the assessment of companies. There are of course many other factors of interest as well which, in theory, could be included in the analysis framework. However this would make the model unwieldy and difficult to implement. We therefore restrict ourselves to the elements detailed in this paper.

EXHIBIT H

FRAMEWORK FOR ASSESSING PERFORMANCE

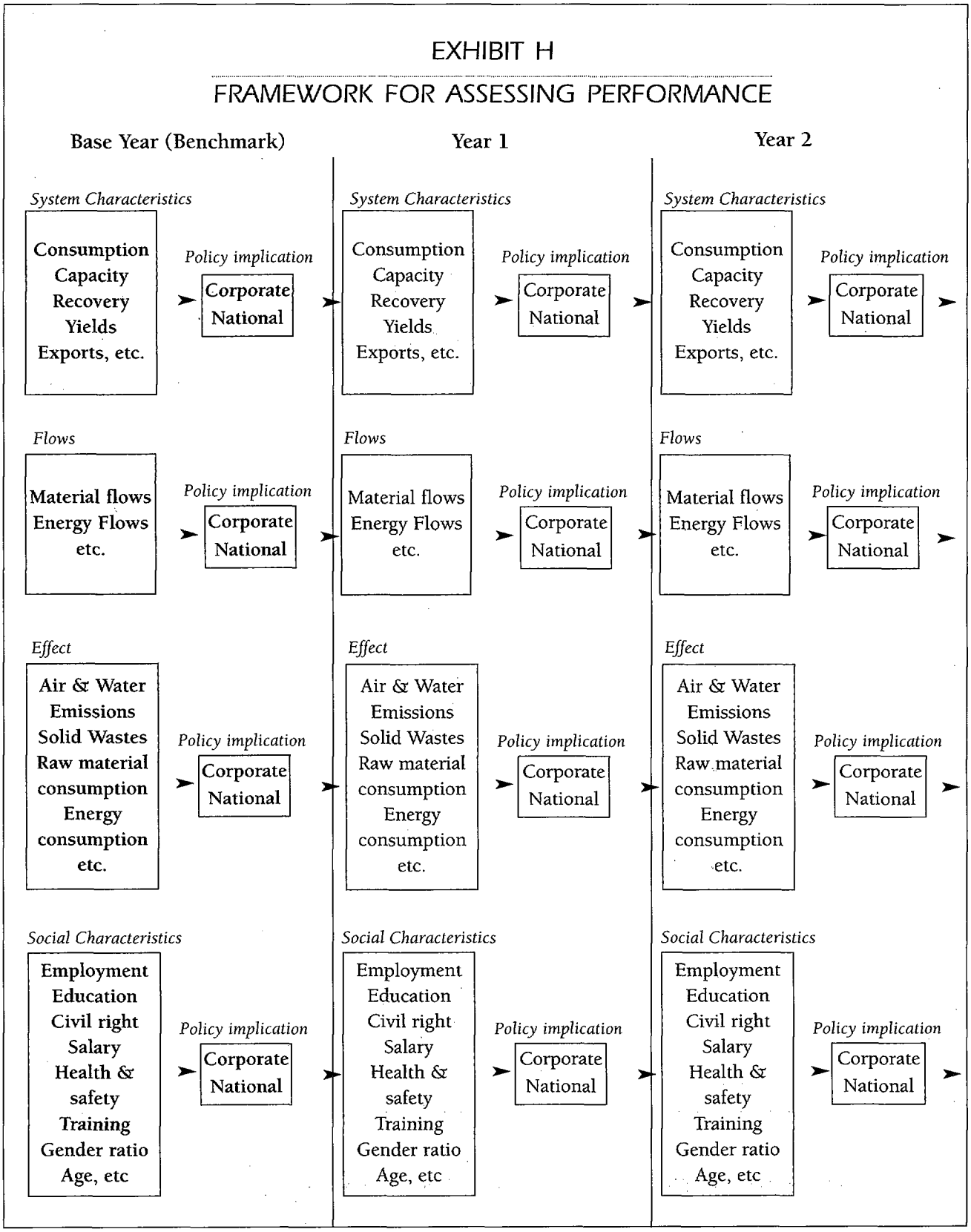


EXHIBIT I

SUMMARY TABLE: ENVIRONMENTAL ASSESSMENT

Technical and environmental parameters	Unit	Observed levels 1997	1998	Reference level	Variation
Raw material consumption					
Chemicals	kg/Fu[1]				
Dyes	kg/Fu				
Energy carriers consumption					
Coal	kg/Fu				
Crude oil	kg/Fu				
Natural gas	kg/Fu				
Wood	kg/Fu				
Energy consumption					
Electrical energy	kWh/Fu				
Thermal energy[2]	MJ/Fu				
Air emission from process					
VOC	g/Fu				
Water emission from process					
COD	g/Fu				
BOD					
Solid waste from process					
Hazardous	kg/Fu				
Non hazardous					

Fu[1] = Functional unit
Thermal energy[2]= Heat and steam generated from coal, crude oil, natural gas and wood from the factory

The results of the technical and environmental assessment can be presented in the form of a summary table, as shown in Exhibit I.

Combining the various elements of the analysis into one framework makes them commensurate with one another when planning different policy alternatives. This is true for both corporate and national level policy options. Corporate and national level policy makers will make their respective assessments and decide, for example, if they prefer to reduce air emissions or water emissions or save energy. The policy maker at the corporate level will probably be more concerned with the competitive aspects vis-à-vis real competitors, and therefore the effects of an environmental policy on investment and operating costs. The policy maker at a national level, on the other hand, might focus on the fulfillment of international agreements on CO2 emissions or employment. In both cases the policy maker will find the inventory calculation of invaluable use. In particular they would benefit from the integration of social parameters into the assessment framework as a basis for policy making. This would enable them to find policy options which fulfill environmental, social and other legal requirements and at the same time offer maximum profit. At the corporate level, the

industry or industry association may wish to use the inventory analysis to develop a voluntary *"social code of practice"* that could in the future be used as a marketing strategy for exports as well as domestic sales.

The above framework also suggests a method for undertaking continuous assessment using benchmarking, LCA and social assessment methodologies. This is crucial since in environmental benchmarking and life cycle management, parameters do not remain constant if one of them is altered. Continuous assessment is therefore essential.

Making the international comparison
The above framework may be used to assess performance against existing standards. National and international standards can be used as reference points to assess the extent to which an individual company is able to meet the requirements inherent in them. International standards (which are quite often voluntary) are especially relevant for exporters. In many cases if these are met, national standards are also adhered to.

Making the inter company comparison
Depending on data quality the environmental performance of the different companies may be compared with each other on a national level or even on an international level. Whichever route is chosen, benchmarking begins inside the company. If the analysis is over a longer time period the first data collection would serve as the base year for the benchmarking. Potential improvements could then be compared with the base year, as is depicted in Exhibit H.

Stage 6: Taking Action
The final stage of the assessment process concerns implementation of best practices. Implementation includes (1) communicating the results to the organisation, (2) establishing functional goals, (3) developing action plans at the corporate level, the level of the industry association, and the governmental level (4) implementing specific actions, and thereafter (5) monitoring progress and (6) recalibrating (Camp 1989: vii).

Results of such an exercise can also serve as a basis for making new investments by companies in order to improve their environmental, social and financial performance. Improvement may be defined in terms of:

- reduced consumption of resources *(such as water, steam, electricity, chemicals)*
- reduced generation of waste *(in reduced quantities and characteristics)*
- reduced processing times *(in terms of reduced number of processing stages)*
- ability to meet the ecolabelling related expectations
- increased customer satisfaction in the most effective manner
- better working conditions and non discriminatory practices, embodied in a social code of practice.

B3. COMPARE: A SOFTWARE FOR BENCHMARKING PERFORMANCE
UNIDO has developed a software along the lines of the methodology elaborated in this report. COMPARE (Cleaner Operations and Manufacturing for Productivity and Resource Efficiency) is a knowledge-based tool structured to obtain information about the various aspects of the cotton textile industry, as well as to assess an organisation's performance vis-à-vis national, corporate and international norms and standards. The knowledge base has been developed using Microsoft's Multimedia Viewer 2.0a as the principal software-engineering platform which allows for dexterous management of large volumes of text and graphics.

The software provides the user with information related to:

- the process, chemicals (dyes, pigments, auxiliaries etc.) and equipment used in cotton textile processing;
- safety precautions to be adopted through Material Safety Data Sheets (MSDS);
- social welfare issues related to the textile

industry in terms of conventions prescribed by the International Labour Organization (ILO), national legislation of India, Indonesia and Zimbabwe, the SA 8000 standards on social accountability developed by the Council on Economic Priority Accreditation Agency, as well as those inherent in various ecolabelling criteria;

code of ethics prescribed by some of the large multinational corporations in the cotton textile sector;

pollution prevention measures to achieve the norms and guidelines or meet the standards prescribed by national and international agencies, together with case studies to illustrate the techno-economic feasibility of these measures.

This will enable assessment of an organisation's performance vis-à-vis national, international and corporate norms and standards for cotton textile production.The system thus attempts to assist the user in the process of benchmarking and on how to achieve the norms and standards.

Part C: Case Studies

ASSESSING AND BENCHMARKING PERFORMANCE

This part of the report uses the framework described in part B to assess the performance of nine factories producing woven cotton fabric for shirting and blouses. These factories operate in three different countries: India, Indonesia and Zimbabwe. For purposes of illustration the results of only three factories are reported here. To maintain confidentiality, the names of the companies have not been disclosed and they are referred to as factories A, B and C.

Following the methodology presented in this report, data and information collected from the factories was used to assess environmental and social performance according to selected parameters as described in part B, and then compared with international and national norms. The analysis is presented in a way that facilitates benchmarking between companies as well. The following steps, corresponding to the stages outlined in part B, were carried out in making the assessment and comparison:

- establishing an input/output inventory table for each factory
- selecting international, national and best available technology (BAT) reference levels
- comparing the inventory data with the selected reference levels
- interpreting and analysing results.

C1. SCOPE OF INVESTIGATION

The investigation takes as its starting point the process flow chart presented in Exhibit E of this paper. The flow chart was tailored to the specific production patterns in each factory and used as the basis for making the inventory of input output data. Primary data collected from the factories has been used to calculate the environmental loads at each process stage. Wherever necessary secondary information has been used to supplement and facilitate calculations.

In addition to assumptions stated in Part B, the analysis assumes the functional unit for calculating environmental loads to be 1kg of finished woven cotton fabric, and, restricts the inventory analysis to the factory gate.

The presentation of results and analysis is organised as follows:

- profiles of three factories A, B and C;
- summary results, analysis and benchmarking of performance relating to environmental parameters; and,
- summary results, analysis and benchmarking of performance relating to social parameters.

Detailed information on each process stage is presented in Annexe IV. Questionnaires and interviews formed the basis for assessing in-factory working conditions. Questionnaires for eliciting environmental and social information may be found in Annexe II. Annexe III provides definitions, assumptions and explanations used in the calculations and assessments. Responses and detailed assessments thereof are given in Annexe IV and V.

C2. FACTORY PROFILES

Table 1 presents the production profile of three factories A, B and C. Factories A and C are medium scale factories whereas factory B is a large one. All data are reported for the year 1996-97. All three factories export between 40 to 50 per cent of their annual production. In this respect the three factories are fairly similar, yet they do have differences associated with housekeeping practices, management systems etc. that allow sufficient variation to make the comparisons interesting.

It is important to note that the production and employment figures reported in Table 1 relate to the respective factories' entire operations, and are not limited to the dyeing and finishing stages displayed in Exhibit E. The analysis of

TABLE 1

PRODUCTION PROFILES OF FACTORIES A, B AND C

CHARACTERISTICS	FACTORY A	FACTORY B	FACTORY C
1. Market	50% Export 50% Local	30% Local 70% Export	50% Local 50% Export
2. Ownership	Domestic private	Domestic private	Domestic private
3. Annual turnover	28.6 Mil. US$/year	200.00 Mil. US$/year	3.0 Mil. US$/year
4. Annual product	2,640 ton/year	10,992 ton/year	1,100 ton/year
5. No of employees	Male = 1,773 Female = 28 Total = 1801	Male = 3,882 Female = 1,225 Total = 5,107	Male = 375 Female = 11 Total = 386
6. Production Time	Hours / shift = 8 Shift / day = 3 Av.330 days/year	Hours / shift = 8 Shift / day = 3 Av. 330 days /year	Hours / shift = 8 Shift / day = 3 Av. 330 days /year

environmental and social performance that follows, however, is confined to the latter i.e. to the system boundary relating to dyeing and finishing as depicted in Exhibit E. As such, any conclusions regarding the relationship between "productivity" (defined either as dollars per tonne of product or tonnes of product per person employed) on the one hand and environmental and social performance on the other, must be interpreted with caution. For example, available data indicates that factory C is the most productive of the three, yet the environmental and social assessment described in the following pages reveals that it has the least satisfactory performance, whereas factory B which appears to be the least productive has the best performance. To conclude from this that the achievement of high levels of performance is at the expense of productivity would be erroneous, since the boundaries of investigation are different. On the contrary, there are definite indications that factory B's good record on corporate responsibility has contributed to securing larger market shares and increasing export sales over the years.[6]

C3. ASSESSING AND BENCHMARKING ENVIRONMENTAL PERFORMANCE

This section presents the results of assessing the environmental performance of factories A, B and C for six parameters:

- water consumption;
- energy consumption (thermal and electrical);
- waste water;
- biological oxygen demand;
- chemical oxygen demand;
- volatile organic compounds.

The inventory of inputs and outputs for each process stage is presented in summary tables for all three factories. Following the assessment, performance may be compared to international, national and corporate requirements depending on the interest of the company. Firms may also benchmark their performance vis-à-vis each other. In the illustrations that follow, the inventory results are presented first, followed by a comparative analysis for the six parameters listed above.

6. According to published figures in factory B's Annual Report, export sales have increased by 76% between 1992 and 1996, with export sales accounting for 67% of total sales.

INVENTORY RESULTS

FACTORY A

						OUTPUT					
Processes	Energy Consumption		Material Consumption		Water Consumption	Waste Water	Water Emission		Air Emission	Solid Waste	Total Product
	Electrical energy kWh/kg-product	Thermal energy MJ/kg-product	Chemicals g/kg-product	Dye Stuff g/kg-product	liter/kg-product	Total liter/kg-product	COD mg/kg-product	BOD mg/kg-product	VOC g/kg-product	g/kg-product	kg-product/hour
Singeing	0.07	0.21									248.29
Desizing + Scouring	0.18	1.93	16.50		4.00				59.01		248.29
Sizing			data not available								40.60
Bleaching	0.49	0.00	81.00		19.00						0.86
Mercerizing	3.6	2.56	300.00		25.00				78.17		10.71
Dyeing (continuous)	5.31	11.61	430.00	26.27	9.00				739.27		37.93
Dyeing (discontinuous)											
Wet finishing	2.92	3.15	244.44		1.98				103.93		40.60
Drying	0.65	7.03							246.42		40.60
Dry finishing	0.64	0.65									174.65
Cloth inspection	0.01										8.77
Printing	11.49	8.07	450.82	36.91	100.00						174.65
Packing, Baling									487.06		
Other Purposes	0.10				207.00						
TOTAL	25.46	35.21	1,523.32	63.17	365.98	310.00	83,700.00	33,480.00	1,713.88		

INVENTORY RESULTS

FACTORY B

Processes	Energy Consumption		Material Consumption		Water Consumption	Waste Water	Water Emission		Air Emission	Solid Waste	Total Product
	Electrical energy kWh/kg-product	Thermal energy MJ/kg-product	Chemicals g/kg-product	Dye Stuff g/kg-product	liter/kg-product	Total liter/kg-product	COD mg/kg-product	BOD mg/kg-product	VOC g/kg-product	g/kg-product	kg-product/hour
Singeing	0.81	3.64							1.96		942.14
Sizing											
Desizing + Scouring	0.55	2.27	79.32		20.17	16.84	8,975.79	4,142.67	31.04		942.14
Bleaching	0.53	2.15	42.10		16.45	8.89	4,116.49	1,538.13	28.89		942.14
Mercerizing	0.65	2.04	565.34		25.18	16.10	2,720.22	933.57	22.28		675.26
Dyeing (continuous)	2.14	8.49	764.81	7.15	29.94	19.20	3,244.80	1,113.60	86.73		810.20
Dyeing (discontinuous)											
Wet finishing	0.57	2.31	5.39		5.39	00			2.05		742.68
Drying	1.32	5.94							85.33		810.20
Dry finishing	0.21	0.88							13.60		1,079.97
Cloth inspection	0.00								00		2,018.88
Printing											
Packing, Baling											2,848.36
Other Purposes	0.00				200.37	135.97					
TOTAL	6.78	27.73	1,456.96	7.15	297.50	197.00	19,057.29	7,727.93	271.88		

INVENTORY RESULTS

FACTORY C

	INPUT					OUTPUT					
Processes	Energy Consumption		Material Consumption		Water Consumption	Waste Water	Water Emission		Air Emission	Solid Waste	Total Product
	Electrical energy kWh/kg-product	Thermal energy MJ/kg-product	Chemicals g/kg-product	Dye Stuff g/kg-product	liter/kg-product	Total liter/kg-product	COD mg/kg-product	BOD mg/kg-product	VOC g/kg-product	g/kg-product	kg-product/hour
Singeing + Desizing	0.03	0.30	3.64		0.80				33.46		953.33
Sizing	0.03	0.01	87.41		1.10	0.06			96.50		913.61
Bleaching + Scouring	0.05	16.96	24.08		27.50	19.25			289.50		733.33
Mercerizing	0.65		331.65								46.85
Dyeing (continuous)	0.41	6.79	319.90	89.67	30.00	22.50			115.80		352.00
Dyeing (discontinuous)	5.95	4.52	213.27	59.78	215.00	173.00			77.20		234.67
Wet finishing + Drying	0.06	22.62							386.00		571.43
Dry finishing	0.16										523.81
Cloth inspection	0.01										
Printing											1,548.15
Packing, Baling											1,548.15
Other Purposes		8.07	450.82	36.91	100.00						
TOTAL	7.36	51.20	979.95	149.44	274.40	214.84	239,608.21	22,857.07	998.46		

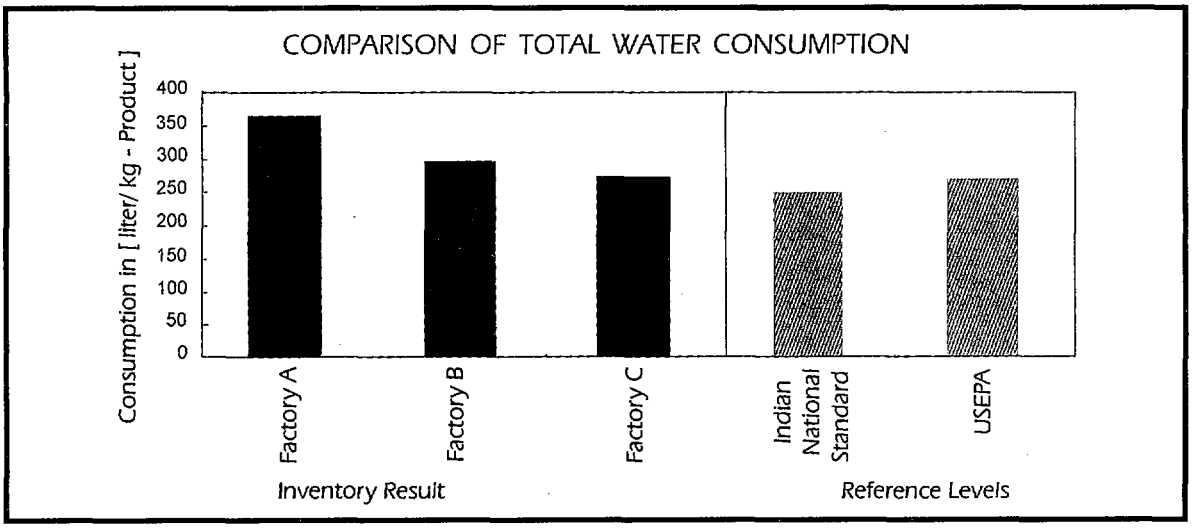
The inventory results presented have been used in assessing environmental performance of the three factories for each parameter separately. Comparisons have been made between companies, as well as with appropriate national and international standards or best available technologies (BAT). Although not part of the illustrations here, it is possible for companies to use the assessments and compare their environmental (and social) performance to codes of conduct set out by their corporate clients in other countries. A number of these corporate codes are included in the knowledge base of the software (COMPARE) described in Part B3 of this report. Such comparisons are especially relevant for exporting firms in developing countries who must increasingly conform with social and environmental requirements of their buyers in developed countries.

The remainder of this section presents the results of the assessment and comparisons for: water consumption; energy consumption; volume of waste water; biological oxygen demand; chemical oxygen demand; and, volatile organic compounds.

1. WATER CONSUMPTION

ASSESSMENT AND COMPARISON WITH SELECTED REFERENCE LEVELS

Process stages	National standards in [liter/kg-Product]	International standards in [liter/kg-Product]	Inventory result in [liter/kg-Product]		
	India	US EPA	Factory A	Factory B	Factory C
Desizing + Scouring + Bleaching	27.00		23.00	36.12	29.40
Mercerizing	20.00		25.00	25.18	NA
Dyeing (continuous)	25.00		9.00	29.94	30.00
Dyeing (discontinuous)	100.00		NA	NA	215.00[7]
Wet finishing + Drying			1.98	5.39	
Printing	80.00		100.00	NA	NA
Other Purposes[8]			207.00	200.37	NA
TOTAL	252.00	276.9	365.98	297.50	274.40



INFERENCE

- Factories B and C do not engage in printing and therefore have lower levels of water consumption.
- Factories A and B use large quantities of water for non-process related purposes.
- Water use by industry is heavily subsidised in the countries in which factories A & B operate thus providing little incentive for industry to invest in good housekeeping, conservation, or reuse and recycling measures.

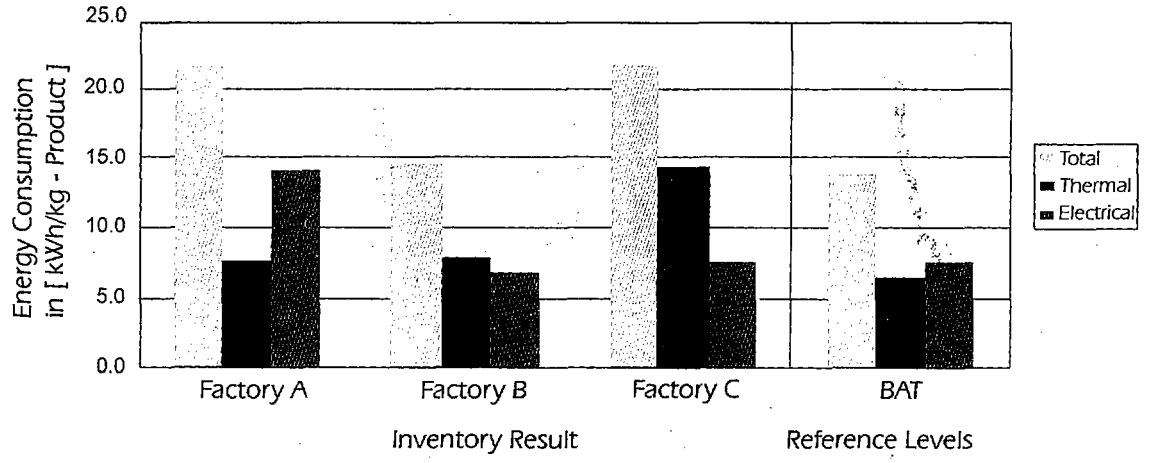
7. Includes water used for "other purposes"
8. Includes water used for purposes not directly related to the process stages

2. ENERGY CONSUMPTION

ASSESSMENT AND COMPARISON WITH SELECTED REFERENCE LEVELS

Factory	Total Energy in [kWh/kg-Product]	Thermal Energy[9] in [kWh_{th}/kg-Product]	Electrical Energy in [kWh_{el}/kg-Product]
Factory A	21.5	7.5	14.0[10]
Factory B	14.4	7.7	6.7
Factory C	21.6	14.2	7.4
BAT	13.7	6.3	7.5

COMPARISON OF TOTAL ENERGY CONSUMPTION



INFERENCE

- Factories A and C exceed energy consumption inherent in BAT by more than 80 per cent. In factory A this is on account of excessive electricity consumption, most of which arises in the mercerizing, wet finishing and drying stages of the production process. There is a clear need to reduce energy usage either through a change in technology and/or through better housekeeping.

- Factory Cs consumption of thermal energy is almost double that of BAT due mainly to losses in steam generated for drying and wet processing.

- There is a need for factories A and C to consider changes in technologies in their energy intensive stages of production and to move closer to best available technologies.

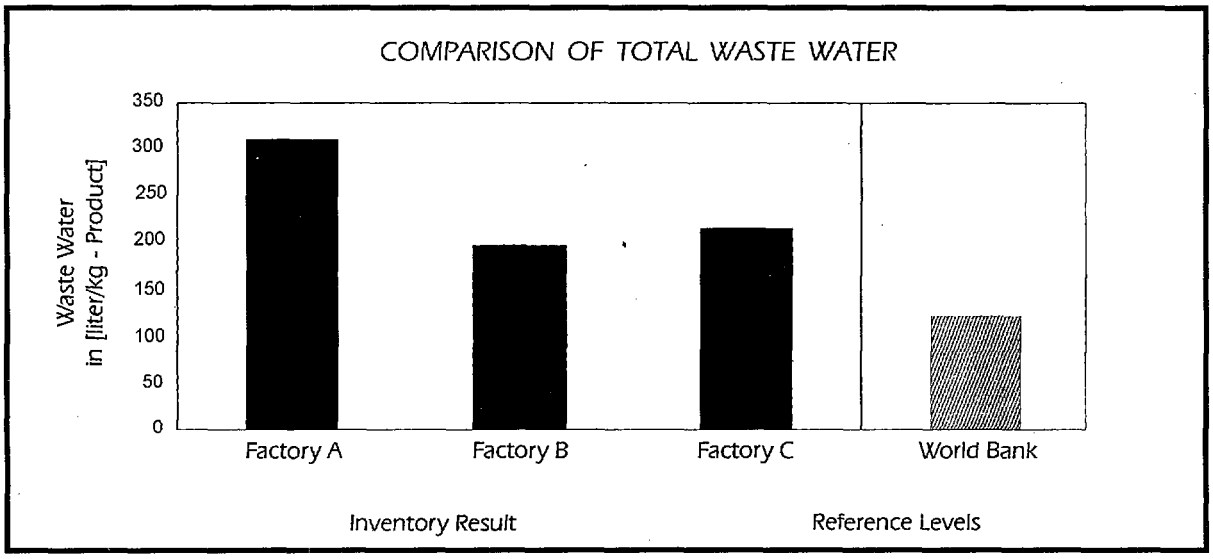
- Countries in which factories A and C operate also happen to be those where energy supplies are heavily subsidised. Removal of price subsidies for energy in these countries is essential for better utilisation of energy.

9. Breakdown of thermal energy consumption by process can be found in Annexe IV
10. Excluding electrical energy used for printing

3. WASTE WATER

ASSESSMENT AND COMPARISON WITH SELECTED REFERENCE LEVELS

Process stages	International reference levels in [liter/kg-Product]	Inventory result in [liter/kg-Product]		
	World Bank (Aver.)	Factory A	Factory B	Factory C
TOTAL	125.00	310.00	197.00	215.00



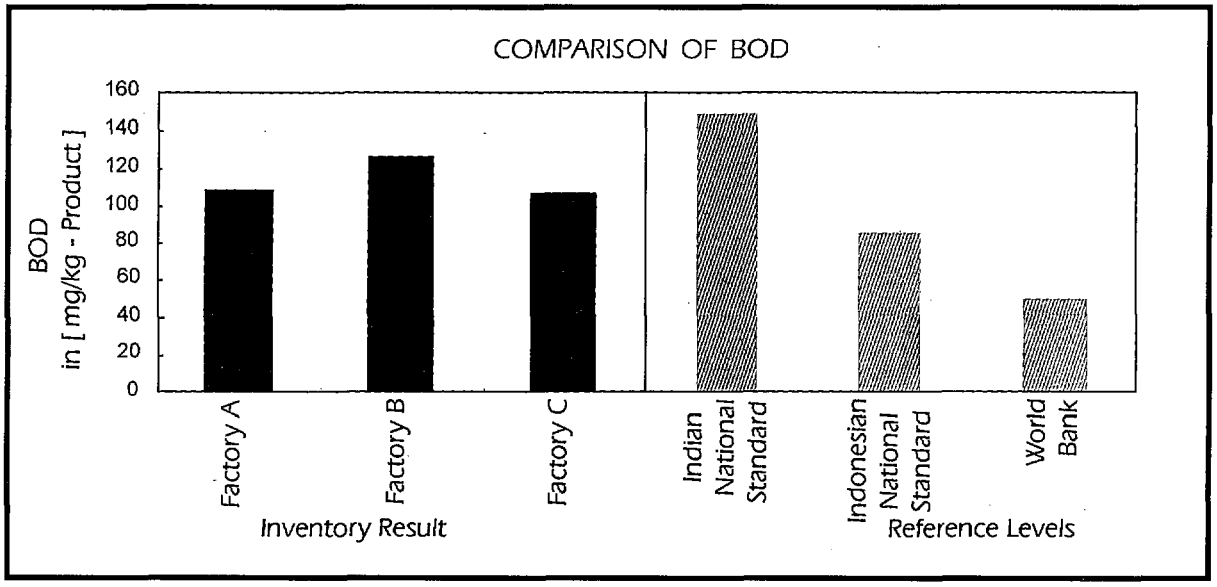
INFERENCE

- Factories A and B produce large quantities of waste water arising from non-process related activities such as machine cleaning and boiler treatment.
- The main source of excessive discharge of waste water in factory C is the process of discontinuous dyeing which accounts for 40 percent of total waste water.
- The volume of waste water produced is a function of the water consumed which is also in excess of prescribed norms for factories A and C.
- Regulatory policies in the countries in which these countries operate provide few economic incentives for limiting and recycling waste water discharged.

4. WASTE EMISSIONS: BIOLOGICAL OXYGEN DEMAND (BOD)

ASSESSMENT AND COMPARISON WITH SELECTED REFERENCE LEVELS

Inventory result/Reference levels	BOD in [mg/liter]
Inventory Results	
Factory A	108.00
Factory B	126.00
Factory C	106.00
National Standards	
Indian standard	**150.00**
Indonesian standard	**85.00**
International Standards	
World Bank	**50.00**



INFERENCE

- Indian standards for BOD effluent are much higher than the norms set by the Indonesians and the World Bank. This may be to allow for greater effluent discharge resulting from mercerizing in order to improve the quality of cloth. All three factories are able to meet the Indian standard but not the more stringent Indonesian and Bank prescriptions.

- In addition to the use of chemical inputs in process related operations, a substantial amount of BOD (and COD) is released from non-process related activities such as machine cleaning and cleaning of areas where dyeing and mercerizing take place. The latter are more difficult to control than process related chemical inputs.

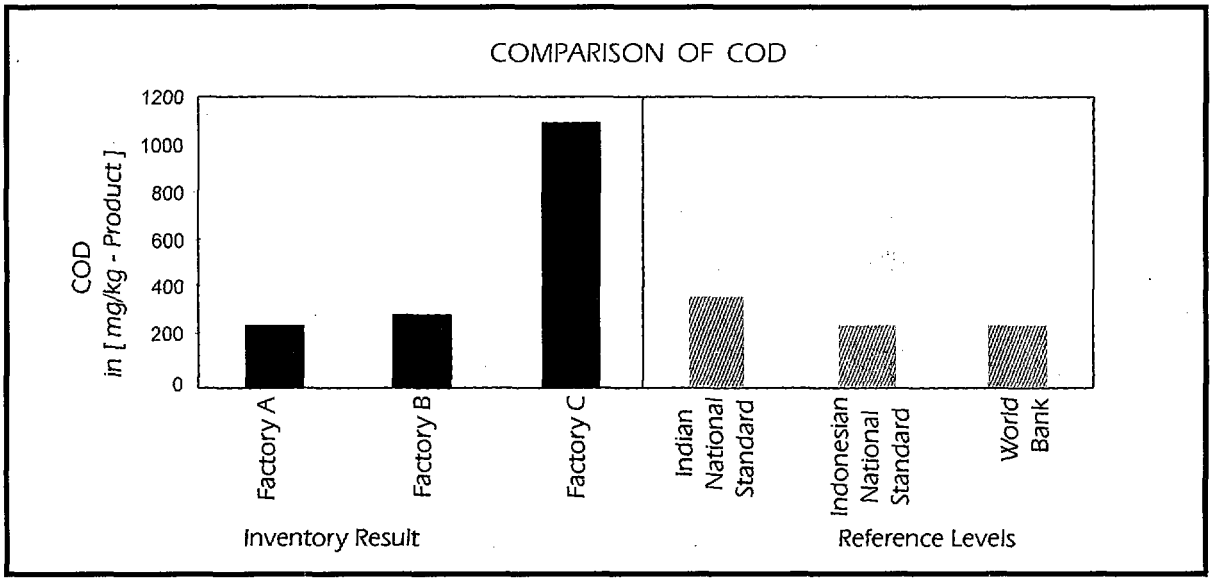
- The main source of BOD release in factories B and C are the processes of desizing and scouring and the consequent use of starch, caustic soda, soda ash etc which account for more than 50% of BOD discharge. A proper utilisation of chemical inputs at these stages of production would result in lower deviation from norms .

- Although factory C uses aeration ponds to reduce BOD levels in waste water, their discharge levels are still higher than prescribed levels.

5. WATER EMISSIONS: CHEMICAL OXYGEN DEMAND (COD)

ASSESSMENT AND COMPARISON WITH SELECTED REFERENCE LEVELS

Inventory result/Reference levels	COD in [mg/liter]
Inventory Results	
Factory A	270.00
Factory B	312.00
Factory C	1,115.28
National Standards	
Indian standard	**375.00**
Indonesian standard	**250.00**
International Standards	
World Bank	**250.00**



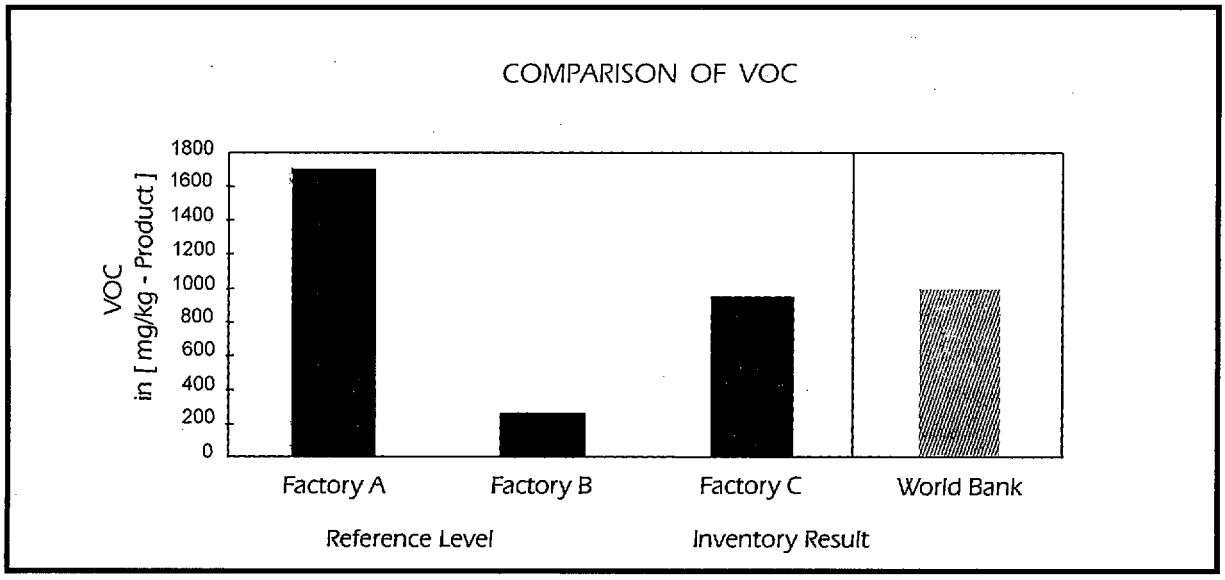
INFERENCE

- The performance of factories A and B with respect to COD is quite satisfactory and the ratio between BOD and COD lies in the acceptable range of 1:2 and 1:3 for most textile effluents.
- Factory C has very high levels of COD discharge since no treatment at all is undertaken.
- Factory C also has a very high BOD/COD ratio of 10.5 on account of the fact that waste water is discharged without treatment to aeration ponds to decrease the BOD load. This combined with high COD levels, increases the ratio substantially.
- As in the case of BOD, desizing and scouring are mainly responsible for the large amounts of COD discharged, indicating that a careful utilization of chemical inputs at these stages may be effective in bringing down COD loads.

6. VOLATILE ORGANIC COMPOUND (VOC)

ASSESSMENT AND COMPARISON WITH SELECTED REFERENCE LEVELS

Inventory result/Reference levels	VOC in [mg/kg-product]
Inventory Results	
Factory A	1,713.88
Factory B	271.88
Factory C	998.46
International Standards	
World Bank	**1000.00**



INFERENCE

- VOC emissions in factory A are significantly higher than World Bank norms on account of coal burning to produce steam and gas burning to burn loose surface fibers. Coal used by factory A has a low calorific value and therefore results in excessive emissions of VOC.

- Although factory C uses more thermal energy per kg of product than factory A, its VOC releases are less, mainly because of quality coal with high calorific value.

- Factory B uses oil as its main energy carrier which results in lower VOC emissions than coal and gas burning.

C4. ASSESSING AND BENCHMARKING SOCIAL PERFORMANCE

This section presents results of assessing the performance of factories A, B and C with respect to a set of in-factory social parameters relating to:

- occupational safety and health conditions;
- non-discrimination practices;
- communication and the work environment;
- working hours;
- wages;
- corporate training, education and awareness programmes for workers.

These indicators of social performance reflect the extent of corporate responsibility towards the social well being of workers. Details of the items covered under each category can be found in Table 2 on Social Performance Indicators. The majority of items under each category are covered by various International Labor Organization (ILO) Conventions, however, additional items have been included under occupational safety and health conditions and communication/work environment. This extended listing reflects a better social condition in the factory and if fully met corresponds to what has been termed an IDEAL situation. The IDEAL therefore includes ILO norms as well as additional requirements as set out in Table 2. The IDEAL is also compared with SA 8000, a series of social accountability standards developed by the non-profit Council on Economic Priorities Accreditation Agency (CEPAA)[11]. The SA 8000 is modeled after the ISO 9000 and ISO 14000 standards for quality control and environmental management systems. In addition it has performance based provisions.

Companies are free to choose their points of reference: ILO, SA 8000 or the IDEAL as defined in Table 2 on Social Performance Indicators for the six indicator categories. As an illustration, the performance of three factories (A, B, and C) is compared to conditions set out in ILO norms. The following sets of results are presented:

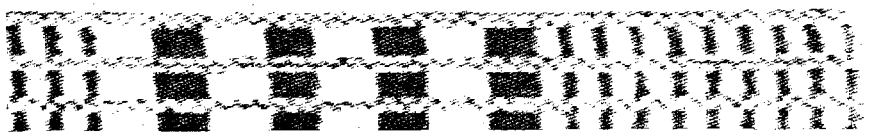
- A comparison of ILO norms with those of an IDEAL situation[12];
- A comparison of SA 8000 standards on Social Accountability with those of the IDEAL;
- A comparison of national legislation in India, Indonesia and Zimbabwe with those of the ILO;
- Comparisons of social performance of factories A, B, and C with respect to ILO norms.

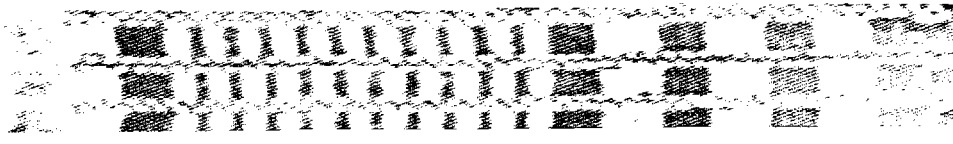
The social performance assessment focuses on in-factory working conditions and skills of workers who have direct contact with the production process. This helps in identifying cases where higher environmental burden occurs on account of inadequate working conditions and lack of knowledge.

11. CEPAA, 138 Buckingham Palace Road, London SW1 W9SA
12. See Annexe III and V for methodology and calculation procedures for making comparisons

TABLE2: SOCIAL PERFORMANCE INDICATORS

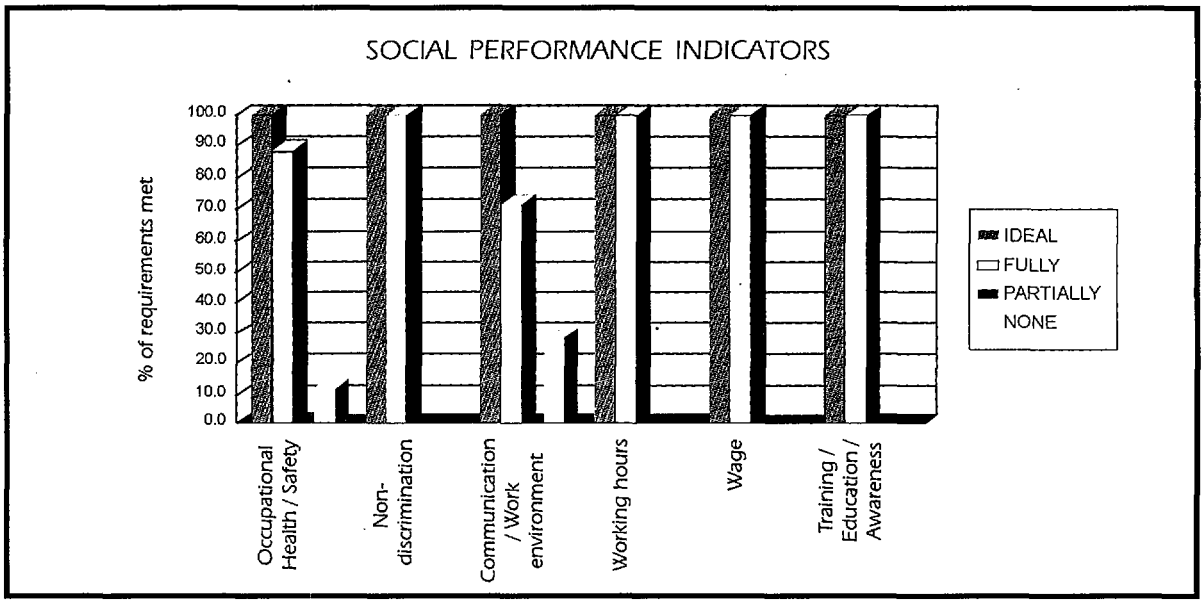
Occupational Safety / Health Conditions	Non-discrimination Practices	Communication / Work environment	Working hours	Wage	Training / Education / Awareness
ILO NORMS					
1. Night work of women and young persons, (ILO conv. No 4, 1919; conv. No 6, 1919; conv. No 14, 1934; conv. No 89, 1948; conv. No 90, 1948; conv. No 171, 1990) 2. Minimum Weekly rest, (ILO conv. No 14, 1921) 3. Sickness insurance, (ILO conv. No 24,1927) 4. Medical examination of young persons, (ILO conv. No 277, 1944) 5. Social security, (ILO conv. No 102, 1952) 6. Employment injury benefits, (ILO conv. No 121, 1964) 7. Medical care and sickness benefits, (ILO conv. conv. No 130, 1969) 8. Occupational cancer, (ILO conv. No 139, 1974) 9. Vocational rehabilitation and employ ment (disabled persons), (ILO conv. No 159, 1983) 10. Occupational health service, (ILO conv. No 161, 1985) 11. Measures for Chemical handling, (ILO conv. No 170 , 1990) 12. Prevention of major industrial accidents, (ILO conv. No 174, 1993) 13. Workmen s accident compensation, (ILO conv. No 17, 1919) 14. Workmen s compensation (industrial disease), (ILO conv. No 18, 1919; conv. No 42, 1934)	1. Maternity protection, (ILO conv. No 3, 1919; conv. No 103, 1952) 2. Minimum age, (ILO conv. No 5, 1919; conv. No 59, 1937; conv. No 138, 1973) 3. Workmen s accident compensation,(ILO conv. No 17, 1919) 4. Workmen s compensation (industrial disease), (ILO conv. No 18, 1919; conv. No 42, 1934) 5. Equality of treatment (accident compensation), (ILO conv. No 19, 1925; conv. No 118, 1962) 6. Equal remuneration (ILO conv. No 100, 1951) 7. Freedom of association and protection of the right to organize (ILO conv. No 87, 1948) 8. Right to organize and collective bargaining (ILO conv. No 98 1949)	1. Labor inspection (ILO conv. No 81, 1947) 2. Freedom of association and protection of the right to organize (ILO conv. No 87, 1948) 3. Right to organize and collective bargaining (ILO conv. No 98, 1949) 4. Working environment (Air pollution, noise, and vibration) (ILO conv. No 148, 1977) 5. Labor administration (ILO conv. No 150, 1978)	1. Hours of work (ILO conv. No 1, 1919) 2. forty hours work (ILO conv. No 47, 1935) 3. Holiday with pay (ILO conv. No 52, 1936; conv. No 132, 1970) 4. Part time work (ILO conv. No 175, 1994)	1. Protection of wage (ILO conv. No 95, 1949) 2. Fixing minimum wage (ILO conv. No 131, 1970)	1. Paid education leave (ILO conv. No 140, 1975) 2. Human resource Development (ILO conv. No 142, 1975)
ADDITIONAL REQUIREMENTS FOR AN IDEAL SITUATION					
1. Internal mechanism to set up safety and health procedures, particularly in the context of having to meet foreign standards. 2. Provisions and measures for dealing with industrial accidents, disease and infections, exposure to hazardous/ toxic chemicals, (e.g. keeping emergency truck)		1. In factory environmental policy 2. Enforcement of the environmental policy 3. Communication of environmental policy to staff and workers 4. Communication procedure of international requirements to the staff and workers	For details of conventions listed here, please refer to respective ILO Convention numbers and/or see Annexe V.		





ILO NORMS COMPARED TO IDEAL

Social Performance Indicators	ILO NORMS COMPARED TO IDEAL-% of requirements met			
	IDEAL	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	88.2	0.0	11.8
Non-discrimination	100.0	100.0	0.0	0.0
Communication / Work environment	100.0	71.4	0.0	28.6
Working hours	100.0	100.0	0.0	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	100.0	0.0	0.0

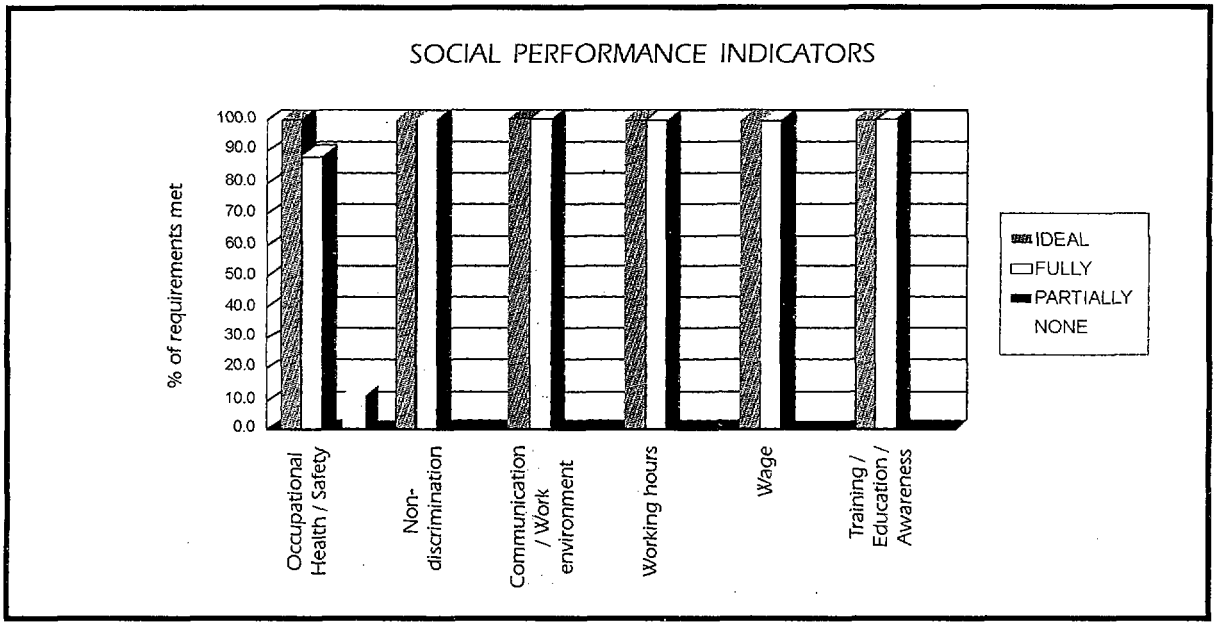


INFERENCE

- Except for conditions relating to occupational safety and health, and, communications and the work environment, ILO conventions cover all aspects listed under IDEAL.
- ILO norms meet 88 percent of the requirements of IDEAL safety and health conditions that should prevail within the factory premises.
- With respect to communication policies and work environment within the factory, ILO norms address only 77 percent of what has been considered IDEAL in this exercise.
- Please refer to Table 2 on Social Performance Indicators for detailed conditions and requirements under ILO and IDEAL respectively.

SA 8000 COMPARED TO IDEAL

Social Performance Indicators	SA 8000 COMPARED TO IDEAL-% of requirements met			
	IDEAL	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	88.2	0.0	11.8
Non-discrimination	100.0	100.0	0.0	0.0
Communication / Work environment	100.0	100.0	0.0	0.0
Working hours	100.0	100.0	0.0	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	100.0	0.0	0.0



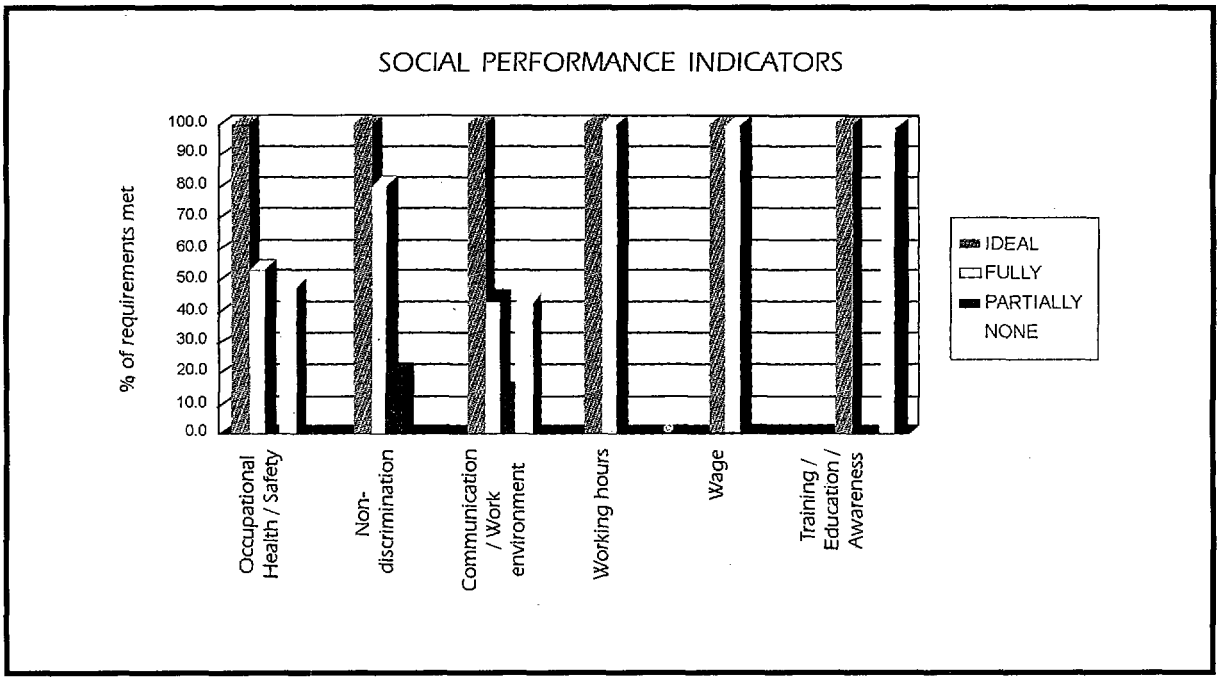
Inference

- SA 8000 standards on Social Accountability of corporations meet all requirements of the IDEAL except for 12 percent of occupational safety and health conditions. Details of the SA 8000 requirements may be obtained from the Council on Economic Priorities Accreditation Agency, UK or from the knowledge base of the software COMPARE developed by UNIDO.

- SA 8000 standards also have performance based provisions that can be verified and certified through third party audits conducted by qualified certification firms around the world.

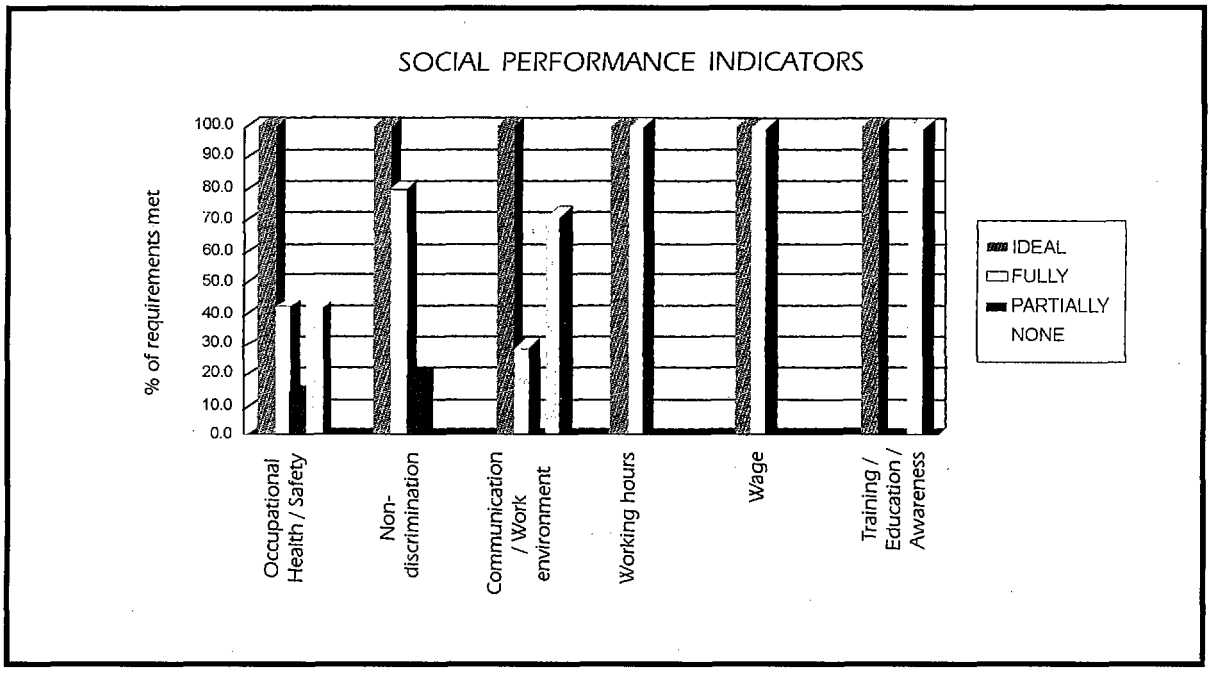
INDIAN LEGISLATION COMPARED TO ILO NORMS

Social Performance Indicators	INDIAN LEGISLATION COMPARED TO ILO NORMS -% of requirements met			
	ILO	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	52.9	0.0	47.1
Non-discrimination	100.0	80.0	20.0	0.0
Communication / Work environment	100.0	42.9	14.3	42.8
Working hours	100.0	100.0	0.0	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	0.0	0.0	100.0



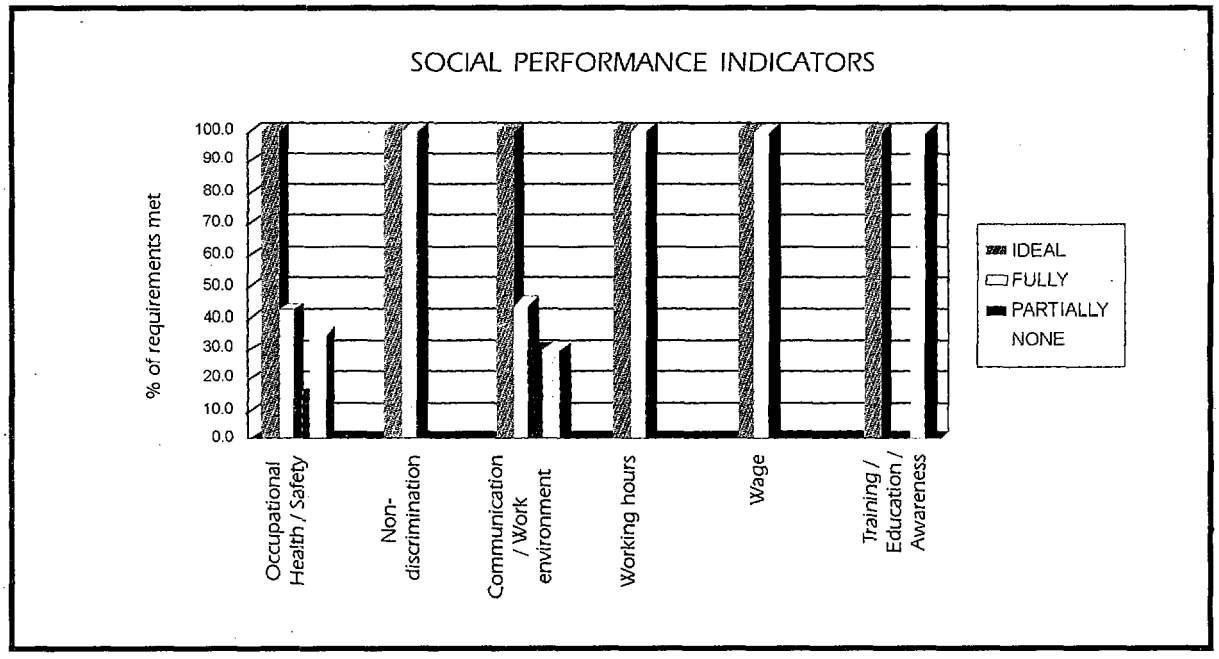
INDONESIAN NATIONAL LEGISLATION COMPARED TO ILO NORMS

Social Performance Indicators	INDONESIAN LEGISLATION COMPARED TO ILO NORMS-% of requirements met			
	ILO	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	41.2	17.6	41.2
Non-discrimination	100.0	80.0	20.0	0.0
Communication / Work environment	100.0	28.6	0.0	71.4
Working hours	100.0	100.0	0.0	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	0.0	0.0	100.0



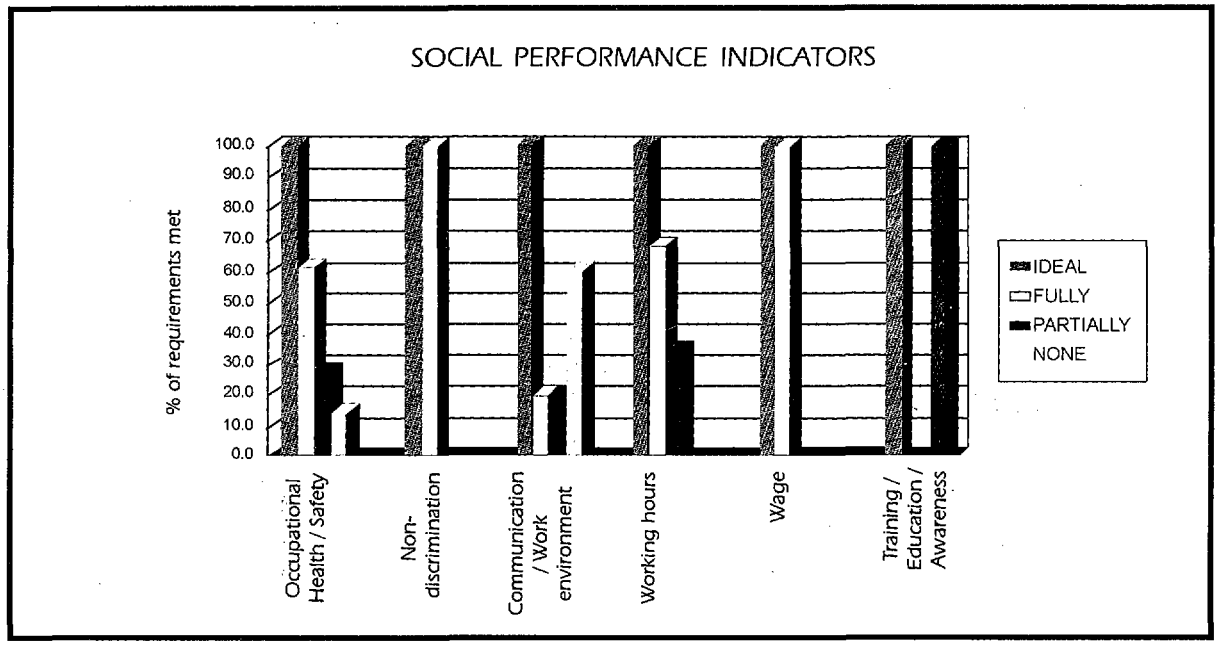
ZIMBABWEAN NATIONAL LEGISLATION COMPARED TO ILO NORMS

Social Performance Indicators	ZIMBABWEAN LEGISLATION COMPARED TO ILO NORMS-% of requirements met			
	ILO	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	52.9	11.8	35.3
Non-discrimination	100.0	100.0	0.0	0.0
Communication / Work environment	100.0	42.8	28.6	28.6
Working hours	100.0	100.0	0.0	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	0.0	0.0	100.0



FACTORY A SOCIAL PERFORMANCE WITH RESPECT TO ILO NORMS

Social Performance Indicators	FACTORY A-% of ILO requirements met			
	ILO	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	60.0	26.6	13.3
Non-discrimination	100.0	100.0	0.0	0.0
Communication / Work environment	100.0	20.0	20.0	60.0
Working hours	100.0	66.7	33.3	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	0.0	0.0	100.0



INFERENCE

- Factory A complies fully with 60 per cent of ILO conditions relating to occupational health and safety. The rest are either adhered to only partially or not at all. It may be noted that factory A also has very high levels of VOC emissions. This combined with inadequate emphasis on safety and health conditions within the factory can cause severe distress for workers. Presently there is no system of monitoring air pollution within the factory and consequently management and workers are not directly aware of the high levels of VOC in the work place.

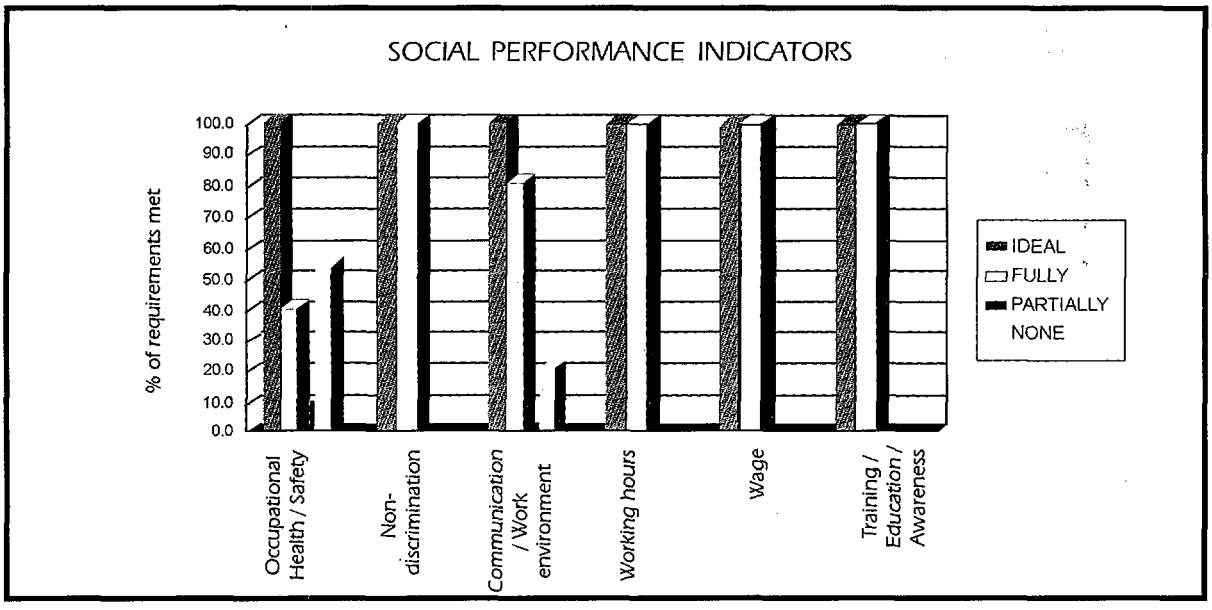
- There is no violation of non-discriminatory practices in terms of gender, age or other aspects. However the female to male ratio of employment in the factory is extremely low, with only 28 women employees as opposed to 1,773 male (1.5 per cent).

- The communication policy within the factory is poor. There is no corporate environmental policy and workers are consequently unaware of the importance of conserving resources such as water, which is used excessively in factory A.

- Training, education and awareness programmes are non-existent and skills upgradation is lacking. If workers are made aware and trained on the proper usage of chemicals, it would be possible to reduce water consumption levels and also to reduce BOD levels in waste water discharged.

FACTORY B SOCIAL PERFORMANCE WITH RESPECT TO ILO NORMS

Social Performance Indicators	FACTORY B-% of ILO requirements met			
	ILO	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	40.0	6.7	53.3
Non-discrimination	100.0	100.0	0.0	0.0
Communication / Work environment	100.0	80.0	0.0	20.0
Working hours	100.0	100.0	0.0	0.0
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	100.0	0.0	0.0



INFERENCE

- Factory B's performance is quite satisfactory on the social front, except for conditions relating to occupational health and safety. They do not have any provisions for training temporary workers on health and safety procedures. Moreover the company, despite being a relatively large one, lacks a safety committee and internal procedures for safety and health.

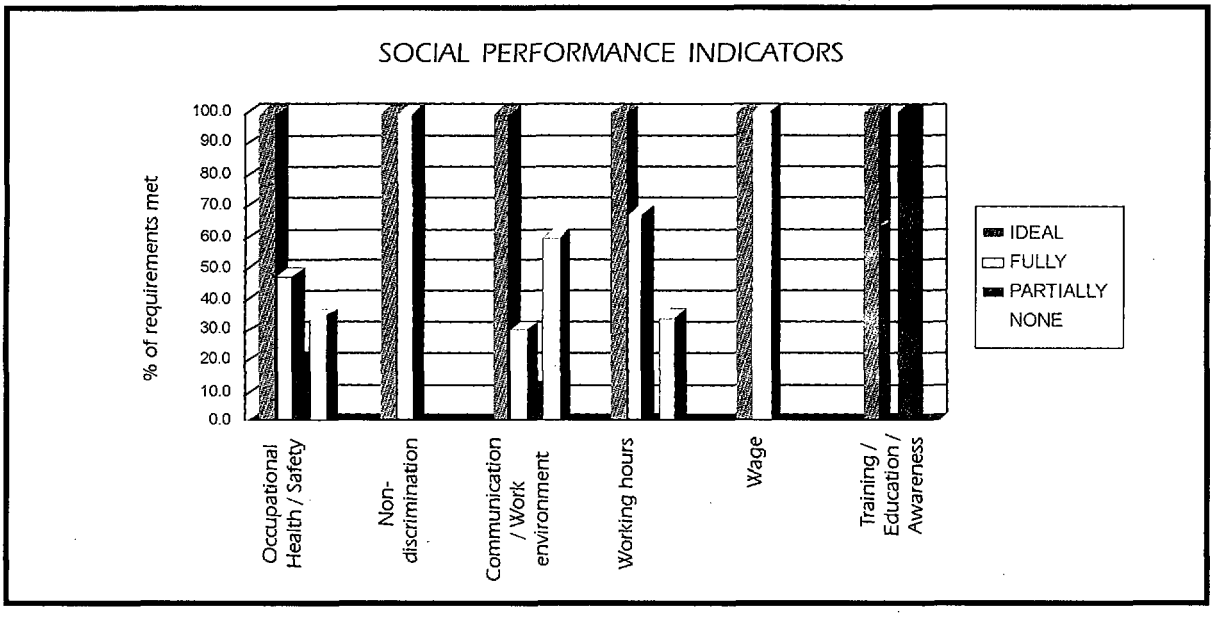
- No overt discriminatory practices are followed and the company employs a relatively large number of women (approximately 32 per cent of total work force is female).

- Factory B has a good communication policy and training programmes for workers. This is may be one reason for low levels of COD discharge as workers are given training on the proper usage of chemicals.

- Factory B adheres to corporate codes of conduct on environment and social practices set out by their European buyers. This may well account for the overall good performance of the company on social and environmental factors. It also makes economic and financial sense for the company.

FACTORY C SOCIAL PERFORMANCE WITH RESPECT TO ILO NORMS

Social Performance Indicators	FACTORY C-% of ILO requirements met			
	ILO	FULLY	PARTIALLY	NONE
Occupational Health / Safety	100.0	46.7	20.0	33.3
Non-discrimination	100.0	100.0	0.0	0.0
Communication / Work environment	100.0	30.0	10.0	60.0
Working hours	100.0	66.7	0.0	33.3
Wage	100.0	100.0	0.0	0.0
Training / Education / Awareness	100.0	0.0	100.0	0.0



INFERENCE

- As in the other two factories, factory C's provisions on health and safety conditions are inadequate. The company provides only partial services for first aid, fire prevention, cleaning etc. Workers are given no training on safety and health issues.

- Non discriminatory practices are adhered to. However like factory A, this company also has a low ratio of female to male employment: only 3% of the work force is female.

- There are no organised training and awareness programmes for workers and consequently workers are not trained on proper utilisation of chemicals, resulting in high levels of COD discharged.

- Waste water from discontinuous dyeing could be reduced by skills upgradation of workers, currently lacking in the factory.

- Training and skills upgradation are also important for reducing steam losses and conserving thermal energy. This could help the company adhere to established international norms for energy consumption.

Part D: Conclusions

D1. LESSONS LEARNED

Global concerns with environmental and social conditions in industries is forcing manufacturing enterprises in developing countries to conform to standards set by national and international agencies as well as by corporate buyers in export markets. The question remains whether developing country firms can do this without undue financial burden and more importantly, whether they can exploit the opportunities for trade inherent in rising environmental and social welfare expectations in their export markets. A recent report on *Unlocking Trade Opportunities* by the International Institute for Environment and Development, UK presents case studies where developing country enterprises have turned "tightening environmental regulations, new corporate practices and changes in consumer values to their advantage. These cases also show that the benefits of higher social and environmental performance of exports are many and diverse, including economic gains (such as premium prices and increased sales), social benefits (such as job creation) and environmental improvements, as well as enhanced security through longer term trading relations".[13]

Given that tighter environmental and social accountability standards are becoming a reality in developing countries and that this can present opportunities for enhanced trade and productivity, *Responding to Global Standards*, presents a framework for self assessment of environmental and social conditions that companies in developing countries can use to benchmark their performance against international, national, corporate and ecolabelling requirements. The report also presents the results of applying this framework to selected developing country companies engaged in the manufacture of woven cotton fabric for shirts and blouses.

The implications and lessons learned from this analysis are useful for policy makers in the national and international arena, and, for corporate managers in developing and developed countries. Key points include:

• *Responding to Global Standards* demonstrates the usefulness of assessing and benchmarking environmental and social performance of enterprises, especially those competing in global markets. The assessment was found particularly useful for identifying areas for improvement in the adoption of cleaner technologies and in corporate practices relating to occupational health and safety provisions, training, education and awareness of workers.

• The case studies described in the previous section show that improvements in environmental protection can be achieved faster and would be more sustainable if accompanied by improvements in social aspects of the production process. An important though often neglected link exists between training and skills upgradation of workers, and, conservation of inputs such as water and energy. It was also found that in companies that had a formal environmental policy, well communicated to workers, the environmental performance was far superior. In addition, factories that had high levels of in-factory air pollution levels were also those with inadequate occupational health and safety conditions. This suggests that if a company were to reduce VOC emissions through investments in cleaner technologies, it could also reduce its expenditures on occupational health and safety measures and at the same time meet international requirements or specific requirements of buyers, thereby improving it's export potential.

• The case studies highlight the fact that for export oriented firms, corporate codes of ethic of large international buyers are more instrumental in bringing about improvements

13. See *Unlocking Trade Opportunities: Case Studies of Export Success from Developing Countries*, by the International Institute for Environment and Development, UK, 1997.

in social and environmental performance than guidelines recommended by international agencies such as the International Labour Organization, World Bank, WHO etc. This does not always mean that corporate codes are better designed than other international guidelines[14]. Nor does it undermine the important role of international organisations in formulating guidelines and inducing multinational corporations to adapt these to their own needs. But, it is clear that environmental and social performance is increasingly being driven more by the market than by international guidelines. Consequently firms that cater to corporate codes of practice of their foreign clients may be in a better position to exploit trade opportunities inherent in the demand for sustainably produced goods. This leads eventually to increasing market shares, export sales, as well as better environmental and working conditions. It also places responsibility on multinational corporations that do have their own codes of conduct to ensure that these codes are adequate, just, and encourage trade in sustainably produced goods between developed and developing countries.

•The case studies underline the importance of an adequate policy framework for achieving better environmental and social performance. In many countries the non existence of policy incentives has led to overuse and waste of raw materials and inputs. A glaring example is the excessive use of water and energy in the textile production process. Water and energy are heavily subsidised, even for industrial users, thus providing little incentive for industry to invest in conservation measures, good housekeeping or training workers in better handling of inputs. Prices of inputs must reflect the full cost of using the inputs and government policies must be restructured to reflect these costs. More reliance on market based instruments is a prerequisite for better performance.

D2. WAYS FORWARD

Manufacturing firms that are required to meet environmental and social conditionalities need a systematic framework to assess and analyse their performance against established norms. *Responding to Global Standards* illustrates how this may be done by combining social and environmental analysis and integrating concepts borrowed from the life cycle approach with benchmarking and social auditing. However the usefulness of this tool can only be fully realised if lessons learned are implemented by the key actors: corporate managers including exporters from developing countries and buyers in developed countries; national and international policy makers; and workers. Some suggestions for immediate and medium term action include:

• Assisting and familiarising enterprises in using this framework to assess their performance vis-à-vis global standards. Assistance should especially be targeted at small and medium enterprises to provide them with the necessary information, resources and capability to undertake such assessments. Governments and industry associations can play a lead role in this.

• Broadening the assessment framework to include additional environment and social parameters, and following the cradle to grave approach in defining the system boundary. The assessment framework elaborated in this report uses the life cycle approach to define a system boundary restricted to the factory gate. However a more thorough investigation of the industrial process should ideally include the entire industrial system, following the cradle to grave approach. Such an analysis would be especially helpful for companies interested in determining whether or not they meet ecolabelling criteria for specific products.

• Developing systems similar to COMPARE for other polluting industrial sectors. Manufacturing enterprises competing in global markets would benefit from a knowledge-based tool such as COMPARE, structured to be used both to obtain information about various aspects of an industrial process, as well as to conduct an assessment of an organisation s performance vis-à-vis national, corporate and international norms, and, ecolabelling requirements.

14 See *International Clean Clothes Campaign, Permanent Peoples' Tribunal* session on *Workers and Consumers Rights in the Garment Industry*, May 1998 (http://www.cleanclothes.org)

• Updating the information and knowledge base. Technological developments in the textile and other manufacturing sectors are fast moving and necessitate continuos updating. Continuos and effective utilisation of COMPARE would therefore require frequent updating. Industry associations in developing countries or individual enterprises may find it worthwhile to do this on a regular basis.

• Removing subsidies and implementing policy regimes that rely on market based instruments for pollution prevention. Policy makers in developing countries should make use of incentive schemes that promote eco-efficiency and cleaner technologies and at the same time remove subsidies on scarce resources and raw materials.

• Formulating and implementing effective national legislation. Policy makers in developing countries need to ensure that environmental protection regulation and social legislation is kept updated and conforms with local conditions as well as international developments.

• Improving corporate practices and policies on in-factory occupational health and safety conditions, work environment and communication. Governments, development assistance agencies as well corporate buyers in developed countries may provide advice and assistance to developing country exporters, especially the small and medium scale enterprises.

• Training and upgrading skills to ensure that workers are equipped to handle cleaner, improved technologies and are also aware of the importance of conserving inputs. Skills upgradation of workers has not received due attention in most manufacturing enterprises. Workers hired to do a particular job seldom have the opportunity for lateral or upward mobility. It would be in the interest of the enterprise to ensure that workers receive technical training and are educated and made aware of the importance of conserving raw materials and resource use.

Abbreviations

AOX	Absorbed Organic Halogen Compounds
BOD	Biological Oxygen Demand
CO2	Carbon dioxide
COD	Chemical Oxygen Demand
Cr	Chromium
EEC	European Economic Commission
ILO	International Labour Organization
ISO	International Standards Organisation
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
NGO	Non-governmental Organisation
NOx	Nitrogen oxide
O&G	Oil and Grease
S	Sulphur
SETAC	Society of Environmental Toxicology and Chemistry
SO2	Sulphur oxide
Susp.solids	Suspended Solids
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UNEP	United Nations Environmental Program
UNIDO	United Nations Industrial Development Organization
VOC	Volatile Organic Compound
WHO	World Health Organization

kg	Kilogram
g	Gram
mg	Milligram
km	Kilometer
m	Meter
mm	Millimeter
m2	Square meter
m3	Cubic meter
a	Annum
hr.	hour
min.	Minute
s	Second
kW	Kilowatt
kWh	Kilowatt-hour
kWhel	Kilowatt-hour electrical energy
kWhth	Kilowatt-hour thermal energy
J	Joule
MJ	Mega Joule

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Responding to Global Standards

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Case Study of the Textile Industry in India, Indonesia and Zimbabwe

Annexes

United Nations Industrial Development Organisation, Vienna, Austria

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tables

Annexe 1

Comparison of Benchmarking and LCA Methodologies

Annexe 1

COMPARISON OF BENCHMARKING AND LCA METHODOLOGIES*

In order to obtain reliable results and avoid validity and predictability problems in the project, it is essential to identify the areas where benchmarking and LCA methodologies overlap as well as the areas where common ground can not be found. The following box presents a comparison of some of the key areas of benchmarking and LCA methodologies.

At first glance there seems to exist a dichotomy between benchmarking and LCA. This dichotomy is emphasised if benchmarking and LCA are perceived to be static, inflexible methodologies. This is not necessarily the case when the methodologies are applied. Both benchmarking and LCA are, from a theoretical viewpoint, emerging methodologies within which much developmental change may yet take place.

It is possible to observe several areas where the two methodologies converge. The ground for these similarities exists in both the real-life applications of the two methodologies and in the current work being done on their further development.

Dynamic vs. Static

In principle, benchmarking is a continuous, dynamic process, whereas LCA is a static tool used to describe an existing situation or process at a certain given time. In practice, in the corporate use of LCA ,process improvements are often done by performing several consequent LCA analyses, for otherwise the changes that are based on LCA superannuate the framework of the analysis. Thus, LCA methodology is developing into a more dynamic framework. In addition, researchers (Pento 1992 &1997, Kärnä 1996) are currently developing dynamic attributes within LCA frameworks.

Holistic vs. one of many socio-economic tools

Benchmarking is a flexible tool that in practice may be utilised in considerably broad, holistic research, yet at the same time it is possible to use it for the study of smaller, functional entities. LCA, on the other hand, is only one of many tools that are used in the decision-making process. In reality, LCA or material flow models in general are becoming more holistic through the expansion of the

* This annexe draws from the work of Titi Gronow, Unido Consultant

COMPARISON OF BENCHMARKING AND LCA

Benchmarking	LCA
• Dynamic	• Static
• Holistic tool	• One among other socio-economic tools
• Quantitative and qualitative	• Quantitative
• Process, product and service oriented	• Process and product oriented
• Exactitude desirable	• Exactitude required
• Many different methods	• Many different methods
• No need for standardisation	• Need for standardisation
• Strategic tool	• Environment tool
• Offensive	• Defensive
• Comparison with other companies	• Inside own company
• Objective analysis	• Objective synthesis
• Use in public policy planning starting	• Established in public policy planning

analytic framework (Ayres 1989, Baccini and Brunner 1994, Gronow and Pento 1995, Kallio & al. 1987, Schmidt-Bleeck 1994, Zang & al. 1993)

Quantitative & qualitative vs. Quantitative

LCA's are quantitative, mathematical models, whereas benchmarking may combine both quantitative and qualitative aspects. LCA and benchmarking overlap on several quantitative venues. It may also be noted that whereas the Life Cycle Inventory (LCI) inherent in LCA is quantitative, the assessment itself may be primarily qualitative.

Process, product and service oriented vs. process and product oriented

Due to the quantitative nature of the LCI, LCA is process or product centered. Benchmarking, in contrast, may include services. The inclusion of services is one domain in which LCA and benchmarking share no or very little common ground.

Exactitude desirable vs. exactitude required

A certain level of exactitude is a prerequisite of both LCA and benchmarking, with the underlying difference of LCA requiring a significantly higher level of exactitude in its measurements.

No need for standardization vs. need for standardization

Since the beginning of the 1980's there has been an emphasis on the standardization of LCA methodology in order to obtain comparable research results. In the standardization process SETAC (Society of Environmental Toxicology and Chemistry) and ISO (the International Standards Organization) played the most significant role. In benchmarking the methodology is formed for each individual project. Yet the two methodologies can meet if LCA is incorporated within a more flexible and larger benchmarking framework.

Strategic tool vs. environmental tool

The basis of benchmarking is that it is a broad strategic tool, whereas LCA is an environmental tool. But if environmental planning is perceived as a vital element of strategic planning, the two methodologies share many parameters.

Offensive vs. defensive

Benchmarking has traditionally been an offensive tool, and LCA in contrast has been defensive. Nevertheless, the use of LCA in the product development process has also brought forth the possible offensive nature of LCA. In general, benchmarking is done via comparisons with other companies, and LCA is done internally within a company to improve processes in the company in question. The two methodologies do converge in the area of the benchmarking process' start-up, where internal benchmarking, i.e. within the company itself, is performed. LCA is also becoming more offensive in that it may be utilised in comparative assertions i.e. comparisons between different products and even in finding fault with competitive products, an area where LCA may be deemed offensive. (ISO standardization is slowly working on the issue of comparative assertions. The final standards should come out 1998-99.)

Analysis vs. synthesis

The objective of benchmarking is an analysis where very differing areas may be under comparison. The focus is on a very small point within the company being compared to, for example, the leading company. LCA starts with LCI, which is detailed, but in general LCA strives to be a synthesis.

Use in public policy planning emerging vs. use in public policy planning established

LCA use in public policy planning is an established fact, as LCA is incorporated in national and European legislation. The use of benchmarking in public policy planning is just starting but its development in this area is of interest. Nevertheless, both LCA and benchmarking may be increasingly used in public policy planning.

Annexe 2

Questionnaire

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

A. Background Corporate Information

A I. General

1. Company name		Shift/day	Hours/shift
2. Market	Local	Export	
3. Ownership	State	Domestic private	Joint venture
4. Annual turnover			
5. Annual product			

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

A. Background Corporate Information

A II. Employee Information

1. Number of employees separated during the last 2 years		M =	F =
2.	Reason for separation (salaried only)		
Retirement	ill health	Termination of contract	Disciplinary measures
Budgetary problems	Change of employer	Other	
3.	Salary scale in accordance with nature of work		
Manual M = F =	Machine operator M = F =	Supervisor M = F =	Managerial M = F =
Others M = F =			
4. Number of employees	Hourly M = F =	Salaried M = F =	Temporary M = F =
5. Age group of employees	Under 13 M = F =	13 - 15 M = F =	16 - 30 M = F =
	31 - 50 M = F =	51 - 65 M = F =	Over 65 M = F =

M = Male F= Female

UNIDO - Project XP/GLO/96/060 Questionnaire	Date Acquisition

B. Technical and Environmental Performance

B I. Process stage

Processing step Kind	Production [kg] or [m]/shift	Production [kg] or [m]/day	Total [kg] or [m]/year
1. Singeing			
2. Desizing			
3. Bleaching			
4. Mercerizing			
5. Dyeing (continuous)			
6. Dyeing (discontinuous)			
7. Printing			
6. Wet finishing			
7. Drying			
8. Dry finishing			
9. Cloth inspection			
10. Packing, baling			

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B II. Thermal energy

Thermal energy Kind	Consumption Average [Unit/day]	Energy content [MJ/kg]	Total [MJ/kg] (annual)
1. Oil			
2. Gas			
3. Firewood			
4. Coal			
5. Steam			
6. electricity			

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B III. Electric energy

Electric energy By source	Consumption Average [kWh/day]	Average price [US$/kWh]	Total [kWh] (annual)
1. Own power production 1.1. Heat energy 1.2. Gas heater 1.3. Steam energy 1.4. Electricity from gen set			
2. Electricity from Regional power net			

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

B IV. Water Usage

Water Kind	Consumption Average [m3/day]	Average price [US$/m3]	Total Annual [m3]
1. Hard water			
2. Soft water			
3. Process water			
4. Cooling water			
5. Total			

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

B V. Waste Water Discharge

	Quantity [m3/year]
1. Total	
2. Partial to	
a. municipal ETP	
b. in plant ETP	
c. direct into surface waters	

Note : ETP = Effluent Treatment Plant

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B VI. Quality of Waste Water

Existing average quality of waste water effluents		
Main Parameters	Unit	Outlet ETP
1. Temperature (°C)	°C	
2. pH	PH	
3. COD	mg 02/liter	
4. BOD	mg 02/liter	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

B VII. Waste Water Treatment

	In plant	Exercised waste water effluent	Treatment
Method		Unit	
1. No treatment		m^3/year	
2. Equalization tank		m^3/year	
3. pH - neutralization		m^3/year	
4. Chemical/physical flocculation		m^3/year	
5. Biological treatment		m^3/year	
6. **Others (specify below)**			
7. Sludge disposal		ton/year	

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B VIII. Voluntary Information

Hot-Waste-Water	Heat recovery	Average Temp.	Total [m3]
Temp. °C	Average MJ/day	°C(after heat recovery)	(annual)

Steam boiler	Condasate recovery	Total [m3]
Max. pressure [bar]	Average [m3/day]	(annual)

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C I. Detailed Process Information

C I. Singeing

Table C I. 1

Company	Specification	Annual production [kg] or [m]
PT. Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C I. 2

Type of machinery (ies) Available for singeing Existing (brand)	Year Of construction	Working with Max. [mm]	Electric Power [kWh]	Gas Consumption [Nm3/h]	Thermal Energy Steam energy [MJ/h]	 Oil heater [MJ/h]	Speed Max. [m/min]
a.							
b.							
c.							

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisi tion

Table C I. 3

Automatic degree	Manual	Automatic
(machinery control conditions)		

Table C I. 4.

Total number of workers involved for Singeing- Desizing-Scour-Bleach process step	M =	F =

Table C I. 5.

Average production conditions - singeing

Type of machinery (ies) Available for singeing Existing (brand)	Annual Working hours	Working with Max. [mm]	Electric Power [kWh]	Gas Consumption [Nm3/h]	Thermal Steam energy [MJ/h]	Energy Oil heater [MJ/h]	Speed Max. [m/min]
a.							
b.							
c.							

Table C I. 6.

Air emissions during singeing	g/kg-woven fabric
VOC	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of
	Acquisi tion

C II. Desizing and Scouring

Table C II. 1.

Company	Specification	Annual production [kg] or [m]
Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C II. 2.

Type of material for sizing	Starch	PVA	CMC	Others

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	Acquisi tion

Table C II. 3.

Type of machinery (ies) Available for desizing & scouring Existing (brand)	Year of construction	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Oil Heater [MJ/h]	Speed Max. [m/min]
a.						
b.						
c.						

Table C II. 4.

Automation degree	Manual	Automatic
(control conditions)		

Table C II. 5.

Total number of workers involved at Singeing-Desizing-Scour-Bleach process step		M =	F =

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Table C II. 6.

Average production conditions – desizing & scouring

Type of machinery (ies) Available for desizing Existing (brand)	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Thermal Energy Oil Heater [MJ/h]	Water Consumption [m3/h]
a.						
b.						
c.						

Table C II. 7.

	Waste water		Going to
Quantity			

List of Chemicals/Auxiliaries

Please attach on separate sheet (s) a list with annual consumption of mainly used products for sizing, desizing and scouring :

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisi tion

Table C.II.8.

Existing average quality of waste water effluents		
Main Parameters	Unit	Outlet ETP
1. Temperature (°C)	°C	
2. pH	PH	
3. COD	mg 02/liter	
4. BOD	mg 02/liter	

Table C II. 9.

Air emissions	G/kg-woven fabric
VOC	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisi tion

C III. Bleaching

Table C III. 1.

Company	Specification	Annual production [kg] or [m]
PT.Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C III. 2.

Type of machinery (ies) Available for bleaching Existing (brand)	Year of construction	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Oil Heater [MJ/h]	Speed Max. [m/min]
a.						
b.						
c.						

Table C III.3.

Automation degree	Manual	Automatic
(control conditions)	V	

Table C III. 4.

Total number of workers involved at Singeing-Desizing-Scour-Bleach process step		M =	F =

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of
	Acquisi tion

Table C III.5.

Average production conditions - bleaching

Type of machinery (ies) Available for bleaching Existing (brand)	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Oil Heater [MJ/h]	Water Comsumption [m3/h]
a.						
b.						
c.						

Table C III. 6.

Waste water effluents coming from bleaching			Going to
Quantity	M3/year		

List of Chemicals/Auxiliaries

Please attach on separate sheet (s) a list with annual consumption of mainly used products for bleaching :

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C.III.7.

Existing average quality of waste water effluents		
Main Parameters	Unit	Outlet ETP
1. Temperature (°C)	°C	
2. pH	PH	
3. COD	mg 02/liter	
4. BOD	mg 02/liter	

Table C III. 8.

Air emissions during bleachingg	g/kg-woven fabric
VOC	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C IV. Mercerizing

Table C IV. 1.

Company	Specification	Annual production [kg] or [m]
Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C IV. 2.

Type of machinery (ies) Available for mercerizing Existing (brand)	Year of construction	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	 Oil Heater [MJ/h]	Speed Max. [m/min]
a.						
b.						
c.						

Table C IV..3.

Automation degree	Manual	Automatic
(control conditions)		

Table C IV. 4.

Total number of workers involved at mercerizing process step		M =	F =

UNIDO – Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C IV..5.

Average production conditions - mercerizing

Type of machinery (ies) Available for mercerizing Existing (brand)	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	 Oil Heater [MJ/h]	Water Comsumption [m3/h]
a.						
b.						
c.						

Table C III. 6.

Waste water effluents coming from mercerizing			Going to
Quantity	M3/year		

List of Chemicals/Auxiliaries

Please attach on separate sheet (s) a list with annual consumption of mainly used products for mercerizing :

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C.IV.7.

Existing average quality of waste water effluents		
Main Parameters	Unit	Outlet ETP
1. Temperature (°C)	°C	
2. pH	PH	
3. COD	mg 02/liter	
4. BOD	mg 02/liter	

Table C III. 8.

Air emissions during mercerizing	g/kg-woven fabric
VOC	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C V. Dyeing

Table C V. 1.

Company	Specification	Annual production [kg] or [m]
Argo Pantes	100% cotton	
	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C V. 2.

Type of machinery (ies) Available for dyeing 1. Continous	Year of construction	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	 Oil Heater [MJ/h]	Speed Max. [m/min]
a.						
b.						

Table C V..3.

Automation degree	Manual	Automatic
(control conditions)		

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C V. 4.

Total number of workers involved at dyeing process		M =	F =
		M =	F =

Table C V. 5.

Type of machinery (ies) Available for dyeing 1. Discontinous	Year of construction	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Oil Heater [MJ/h]	Speed Max. [m/min]
a.						
b.						
c.						

Table C V.6.

Automation degree	Manual	Automatic
(control conditions)		

Table C V. 7

Total number of workers involved at dyeing process step		M	F

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C V.8.

Type of machinery (ies) Available for dyeing 1. Continous	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Oil Heater [MJ/h]	Water Consumption [m3/h]
a.						
b.						

Table C V. 9

Type of machinery (ies) Available for dyeing 1. Discontinous	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy Steam Energy [MJ/h]	Oil Heater [MJ/h]	Water Consumption [m3/h]
a.						
b.						
c.						

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C V. 10

Dye stuff groups used	[kg/kg-woven fabric]	shades Applied (percentage)		
		Light (<1%)	Med. (1-3%)	Dark (>3%)
a.				
b.				
c.				
d.				
e.				
f.				

Table C V. 11.

Key indicators		
a. Average shade matching [g] /color		Number/batch
b. Redyes (wrong shade/uneven)		
c. Average quantity [kg] /color		
d. Average maintenance [h]/machinery		

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C V.10.

Waste water effluents coming from dyeing			Going to
Quantity	M3/year		

List of Chemicals/Auxiliaries

Please attach on separate sheet (s) a list with annual consumption of mainly used products for dyeing :

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C.V.11.

Existing average quality of waste water effluents		
Main Parameters	Unit	Outlet ETP
1. Temperature (°C)	°C	
2. pH	PH	
3. COD	mg 02/liter	
4. BOD	mg 02/liter	

Table C V.12.

Air emissions during dyeing	g/kg-woven fabric
VOC	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C VI. Printing *)

Table C VI. 1.

Company	Specification	Annual production [kg] or [m]
	100% cotton	
	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C VI. 2.

Type of machinery (ies) Available for printing 1) flat bed	Year Of construction	Working width Max. [mm]	Electric Power [kWh]	Thermal Energy [MJ/h]	Repeat Max. [mm]
a.					
b.					
c.					

Table C VI. 3.

Automation degree	Manual	Automatic
(control conditions)		

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C VI. 4.

Type of machinery (ies) Available for printing 2) rotary	Year Of construction	Total Loading Capacity [kg]	Electric Power [kWh]	Thermal Energy [MJ/h]	Repeat Max. [mm]
a.					
b.					
c.					
d.					

Table C VI. 5.

Automation degree	Manual	Automatic
(control conditions)		

Table C VI. 6.

Total no. workers involved for this process step	M =	F =

Table C VI. 7.

Dye stuff groups used	kg/kg-woven fabric
a. Direct dyes	
b. Reactive dyes	
c. Vat dyes	
d. Pigments	

Table C VI. 8.

Waste water	Effluents coming	From printing	Going to
Quantity	m3/year		Waste water treatment

Table C VI. 9.

Key indicators	Unit	
a. Average quantity [kg] /color	Kg	
b. Average maintenance [h]/machinery	h/year	

List of Dyestuffs/Chemicals/Auxiliaries

Please attach on separate sheet (s) a list with annual consumption of mainly used products for printing.

UNIDO - Project XP/GLO/96/060 Questionnaire For textile processing in PT. ARGOPANTES	Date of Acquisition 17 - 9 - 1997

C VII. Wet finishing

Table C VII. 1.

Company	Specification	Annual production [kg] or [m]
PT. Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C VII. 2.

Kind of Wet Finishing	In [%] from the Total Wet Finishing Production
a.	
b.	
c.	
d.	

Table C. VII.3.

Type of machinery (ies) Available for wet finishing Existing (brand)	Year Of construction	Working with Max. [mm]	Electric Power [kWh]	Thermal Energy Steam energy [MJ/h]	 Oil heater [MJ/h]	Speed Max. [m/min]
a.						
b.						
c.						

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of
	Acquition
	17 – 9 – 1997

Table C VII.4.

Average production conditions - wet finishing

Type of machinery (ies) Available for wet finishing Existing (brand)	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Thermal Steam Energy [MJ/h]	Energy Oil Heater [MJ/h]	Water Consumption [m3/h]
a.						
b.						
c.						

Table C VII.5.

Automation degree	Manual	Automatic
(control conditions)		

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C VII.6.

Total number of workers involved at wet finishing process step		M =	F =

Table C VII. 7.

Air emissions during wet finishing	G/kg-woven fabric
VOC	

List of Chemicals/Auxiliaries

Please attach on separate sheet (s) a list with annual consumption of mainly used products for wet finishing :

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C VIII. Drying

Table C VIII. 1.

Company	Specific	Annual production [kg] or [m]
PT Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C VIII. 2.

Type of machinery (ies) Available for drying Existing (brand)	Year Of construction	Working with Max. [mm]	Electric Power [kWh]	Thermal Energy Steam energy [MJ/h]	 Oil heater [MJ/h]	Speed Max. [m/min]
a.						

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C VIII.2

Automatic degree	Manual	Automatic
(machinery control conditions)		

Table C VIII.3.

Total number of workers involved for drying process step after bleaching, mercerizing and dyeing	M =	F =

Table C VIII. 4.

Average production conditions - drying

Type of machinery (ies) Available for drying Existing (brand)	Annual Working hours	Working with Max. [mm]	Electric Power [kWh]	Thermal Energy Steam energy [MJ/h]	 Oil heater [MJ/h]	Speed Max. [m/min]
a.						

Table C VIII.5.

Air emissions during singeing VOC	g/kg-woven fabric

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C IX. Dry Finishing

Table C IX. 1.

Company	Specification	Annual production [kg] or [m]
PT. Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C IX. 2.

Used Dry Finishing Method	Finishing Production
a.	
b.	
c.	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C IX. 3.

Average production conditions - dry finishing

Type of machinery (ies) Available for singeing Existing (brand)	Year of construction	Annual Working hours	Working with Max. [mm]	Electric Power [kWh]	Thermal Steam energy [MJ/h]	Energy Oil heater [MJ/h]	Speed Max. [m/min]
a.							
b.							
c.							

Table C. IX.4.

Automation degree	Manual	Automatic
(machinery control conditions)		

Table C IX. 5.

Total no. of workers involved for this process step	M =	F =

Table C. X. 6.

Air emissions	g/kg-woven fabric
VOC	

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C X. Cloth Inspection

Table C X. 1.

Company	Specification	Annual production [kg] or [m]
PT. Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C X. 2.

Type of machinery (ies) Available for inspection Existing (brand)	Year Of construction	Working width Max. [mm]	Electric Power [kWh]	Speed Max. [m/min]
a.				
b.				
c.				
d.				
e.				
f.				

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C X. 3.

Automation degree	Manual	Automatic
(machinery control conditions)		

Table C X. 4.

Total number of workers involved for this process step	M =	F =

Table C X. 5.

Average production conditions - cloth inspection

Type of machinery (ies) Existing (brand)	Annual Working hours	Working width Average [mm]	Electric Power [kWh]	Speed [m/min]
a.				
b.				
c.				
d.				
e.				
f.				

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

C XI. Packing, Baling

Table C XI. 1.

Company	Specific	Annual production [kg] or [m]
PT. Argo Pantes	100% cotton	
Woven	Woven fabric	
Construction	Plain cloth	
Greige fabric weight		
Greige fabric width		
Weight per running m		

Table C XI. 2.

How is this step done?	Manual	Automatic

Table C XI. 3.

Total number of workers involved for this process step	M =	F =

UNIDO - Project XP/GLO/96/060 Questionnaire	Date of Acquisition

Table C XI. 4.

Type of machinery (ies) Available for packing Existing (brand)	Year Of construction	Annual Working hours	Working width Max. [mm]	Electric Power [kWh]	Speed Max. [m/min]
a.					
b.					
c.					

Table C XI. 5.

Packing material used during packing/baling	Unit kg/year	Amount
Papers		
Plastics		
Cartons		
Woods		
Metals		
Textile fabrics natural fibers		
Textile fabrics synthetic fibers		

Health and Safety

	Yes	No	Remarks
1. a. Are issues on health and			
safety reported through a			
health and safety focal point?			
b. If "Yes", how is the informat-			
ion used?			
c. Are hourly and temporary			
workers also covered?			
2. a. Is there permanent health			
and safety training?			
b. Is this available also for			
temporary workers			
3. Are first aid, fire prevention,			
cleaning, lighting, building			
inspection, health and safety			
provisions provided by the			
company?			
4. Does the enterprise provide			
protective gear against dust,			
airborne particles and noise?			
5. Does the company provide			
protective gear to workers			
handling and exposed to			
chemicals?			

	Yes	No	Remarks
6. Is it mandatory to wear or			
operate protective gear during			
operation?			
7. In question 4 - 6, is the			
protection assured by:			
a. Personal protective equipment			
b. Factory wide equipment			
c. Other			
8. Do you keep track of the number of			
'incident of:			
a. Accident			
b. Disease and infection, and			
c. exposure to hazadous / toxic chemicals			
9. When you receive a new chemicals to			
used according to the specification of			
your foreign client, do you have training			
and educate your staff on procedures			
for safe handling and dispose of he client?			
10. Are all of your workers covered under			
workers compensation?			
11. What internal mechanism do you			
have to set up your own safety and health			
procedures - particularly in the context of			
having to meet foreign standards recogniz-			
ed and prescribed by your client?			

	Yes	No	Remarks
12. What requirements, if any, do you have for			
workers to access a doctor or nurse, free			
of charge, for work related health			
examination?			
13. When a worker is injured, is there a			
'rehabilitation programme which he/she			
can participate sponsored by the employer?			
14. Do you have a system for monitoring air pollut-			
'ion, noise, and vibration?			
15. Do you conduct periodic medical examination			
of your workers?			
16. Do you have an in-house chemical safety			
procedure?			

Non-Discrimination

	Yes	No	Remark
1. How do workers realize their rights			
as employees?			
Are special provision given to pregnant			
women or 'those who recently gave birth			
to a child or expereinced miscarriage?			
2. Are code of conduct/ethics for operating			
your business prescribed by your principal			
clients, such as child labour, remuneration,			
minimum wage, etc.?			
3. Are these codes in line with national			
standards?			
4. Do you have a system of self inspection			
'to help comply with standards and norms			
'prescribed by your clients?			
5. Does your clinet assist or intervene in the			
inspection?			

Communication/ Work environment

	Yes	No	Remark
1. a. Is there an environmental policy in the factory?			
b. Has the environmental policy been communicated to the staff?			
c. 'If 'Yes', how are these circulated?			
d. How is the policy enforced?			
2 a. Are there safeguards to ensure its enforcement?			
3. a. Are policy directives/guidelines on environment,			
health and social issues include health and safety			
provisions?			
b. If 'Yes' , how are they circulated?			
4. a. Is information of international requirements			
(if applicable) being communicated to staff?			
b. If 'Yes', how are these circulated?			
5. a. Is there a training program on skill up gradetion?			
6. a. What salary level groups receive training?			
7. a. Do you have an in-house safety and health			
awareness program?			

Working Hours

	Yes	No '	Remark
1. a. Do you have night shift?			
2. a. What guidelines do you follow for			
'night work for women and young			
women?			
3. a. What is the maximum number of			
hours of overtime that you allow			
your workers?			
4. a. What is your sick leave and holiday			
leave practices? Are there exceptions			
to this rule?			

Wages

	Yes	No	Recmarks
1.a. Are your youngest and newest and			
'least experienced workers paid a min-			
imum wage?			

Training/ Education/ Awareness

	Yes	No	Recmarks
1. a. Do you seek the services of			
training providers (locally) to			
help up grade the skills of your			
workers?			
2. a. Do you have an in-house safety			
and health awareness programme?			
3. a. What role does the safety and health			
committee play in your enterprise? Does			
it organize training courses?			

Annexe 3

Definitions and Explanatory Notes

Annexe 3

DEFINITIONS AND EXPLANATORY NOTES

A. Environmental Parameters

1. Consumption of water

- Total water consumption in liters/kg-product is the sum of water consumed for direct production at each process stage and for indirect production activities, i.e. not directly related to the product.

- Part C gives total water consumption from the inventory of the three factories in parallel with water consumption norms for the textile industry provided by USEPA and Indian standards.

- The data provided by USEPA is not broken down by water usage at each process stage. The comparison has therefore been carried out on the basis of total water consumption. However, since the Indian national standard does prescribe water usage at each process stage, it has been used as a reference for comparison.

- Discontinuous dyeing and printing are the two process stages which consume much more water compared to the other process stages (if they are performed in the factory). From the inventory results, it could be seen that discontinuous dyeing and printing are carried out in factory A and C respectively. In both cases, water consumption by these two process stages is higher than the Indian standard.

2. Consumption of energy

Minimizing of energy use in industrial processes is one way of reducing environmental impacts that arise as a result of energy generation. Best Available Technology (BAT) which minimize energy use (electrical and thermal) has been used as one of the reference levels for comparing inventory data. In addition, the Indian national standard for thermal energy has been applied for comparing energy consumption.

a. Electrical Energy

- In some factories, electricity is produced by using diesel generators to meet electrical energy needs for production processes. Fossil energy carriers which are used as sources of energy for in-house electricity generation have been included under thermal energy utilization. The assessment of energy consumption has been carried out under two scenarios: first, electrical energy in kWh/kg-product and thermal energy in MJ/kg-product separately; and second, the total energy consumption, i.e. the electrical energy and the thermal energy consumption together by converting both energy types to one common unit in kWh/kg-product using a conversion factor 1MJ=0.278kWh.

- Electrical energy required by the BAT for the production of 1 kg-product in kWh is used as a reference for comparison.

- Consumption of electrical energy reflects the actual amounts consumed by the production process, and, not the installed capacity of the machinery.

b. Thermal Energy

- Thermal energy in the textile industry is usually used to generate steam, heat, and to some extent electricity as well as to burn off loose surface fibers at the singeing process stage. Hard coal, lignite, natural gas and diesel oil are the source of thermal energy for steam production. Natural gas and diesel oil are used for steam production as well as to burn off loose surface fibers.

- Of the three factories, factory A and C use electrical energy directly from public electrical nets for their production process, whereas, factory B, uses a diesel generator

with an efficiency of 33% to meet 43.45% of its electrical demand and the rest (56.55%) from public nets.

- The amount of thermal energy liberated from coal to generate 1 kg-steam has been calculated by using a 92.5% boiler efficiency level and 14.70 MJ/kg-coal energy content of coal. On this basis, the total thermal energy obtained from coal for 1 kg-product amounts to 20.46 MJ.

- In factory A, petroleum is used to burn off loose surface fibers at the singeing process stage. The energy content of petroleum is assumed to be 42.50 MJ/kg-product. Steam for different production processes is generated from hard coal and lignite in the proportion of 60% and 40% respectively. It has been assumed that 3.5 kg and 2.2 kg of steam is generated by using 1 kg of hard coal of an energy content of 14.70 MJ/kg and 1 kg of lignite of an energy content of 12.74 MJ/kg respectively. It is assumed that the operating efficiency of the boiler is 92.5%.

- Thermal energy utilization in factory B is computed in four ways depending on its application:

  1. Thermal energy from natural gas with energy content (Hu-gas) 36.6 MJ/m^3 during singeing for burning off loose fibers in MJ/kg-product.

  2. Thermal energy using oil in MJ/kg-product to generate steam as per the following technical parameters:

     - boiler efficiency 92.5%
     - steam temperature 160.0%
     - steam pressure 6.0 bar
     - steam energy 1,260.0 MJ/kg-steam

  3. Thermal energy using oil for electricity generation in MJ/kg-product as per the following technical parameters:

- diesel generator efficiency 33.0%
- Energy content of oil (Hu-oil) 41.0 MJ/ Kg-oil

  4. Thermal energy using oil for oil heater in MJ/kg-product with a heat exchange efficiency of 95%.

- In factory C natural gas with an energy content of 46.0 MJ/kg is used to burn off loose surface fibers at the singeing stage. Steam is generated by using coal with a boiler having an efficiency of 92.5%. The total thermal energy consumption is higher with 30.77 MJ/kg-product and 24.89 MJ/kg-product compared to the Indian norm and BAT thermal energy utilization level.

3. Waste water

- In addition to process waste water, a large amount of waste water arises as a result of non-production related processes, such as machine cleaning, boiler treatment, etc. The assessment covers only the volume of waste water generated and not the quality of waste water.

- The total production related waste water prescribed by the World Bank (125 liter/kg-product) has been taken as a reference level for the comparison of the amount of waste water discharged from the factories.

- It was not possible to calculate the amount of waste water arising from each stage of the production process in factory A. However, 310 liter/ kg-product of total waste water evolves out of 157 liter/kg-product water input into direct production process, and, 207 liter/ kg-product water input into non-production related activities. Under the assumption that 95% of water input into production related processes comes out as waste water, this amounts to 149.15 liter/kg-product. The rest (160.86 liter/kg-product) is accounted for by non-production related activities.

  On this basis, the amount of waste water coming out of production related processes from factory A is higher by 24.15 liter/kg-product than the World Bank norm. Similarly total waste water is higher by 185 liter/kg-product. Therefore, the amount of waste water from non- production related activities constitutes a very high proportion of the total waste water.

- As in factory A, large amounts of waste water arise as a result of non- production related activities in factory B as well. Of the total amount of waste water, 197.00 liter/kg-product, only 61.03 liter/kg-product comes out of production related processes, and the rest, 135.97 liter/kg-product of waste water comes out of non-production related activities. The amount of waste water coming from production related processes is lower by 63.97 liter/kg-product compared to the norms recommended by the World Bank. However, the total waste water of the factory compared to the amount of waste water recommended by the World Bank is higher by 72 liter/kg-product. Here again, the amount of waste water from non-production related activities increases the total waste water coming from the factory by a significant proportion.

- In factory C, the process of discontinuous dyeing is the main source of waste water. It accounts for 173 liter/kg-product of 274.00 liter /kg product of total waste water, and is 45 liter/kg-product in excess World Bank norms.

4. Water emissions

- Woven fabric finishing produces various effluent streams (see Exhibit G, Part A) of which only Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) have been considered in this study.

- The formation of BOD and COD from textile factories vary, depending on the type of chemical inputs. In addition to the BOD and COD that arise as a result of chemicals used for production processes, BOD and COD are also emitted from several non-process chemicals, such as machine cleaners, cleaning of chemical stores and dyeing and printing areas, which are rarely as well controlled as process chemicals. These have also been included in the present analysis.

- The ratio between BOD and COD generally represents the degree to which the wastes are refractory or difficult to biodegrade. Ratios ranging between 1:2 and 1:3 would imply good potential biodegradability. For most textile effluents the ratio lies in this range.

- BOD and COD emissions from the three factories are compared with the BOD and COD values as stated in effluent standards for the textile industry in India and Indonesia, as well as effluent requirements for direct discharge to surface water as prescribed in the Prevention and Abatement Handbook III of the World Bank.

- It was not possible to compute the values of BOD and COD from each process stage of the assessed factories. The comparison was only possible on the basis of the total value of BOD and COD in the discharged effluent.

a. BOD_5

- On the basis of the theoretical knowledge of the interrelation between BOD and COD, as described above, the ratio of BOD to COD in factory A is assumed to be 1:2.5. However, it is important to note that this does not mean that this optimal condition exist in reality. Nevertheless, under this optimal assumption, the BOD value in the effluent from factory A is still higher by 23 mg/kg-product and 58 mg/kg-product than the value prescribed by effluent standards for the textile industry in Indonesia, and, in Handbook III of the World Bank respectively. Therefore, a definite improvement measure should be taken to decrease the BOD load from the effluent. Unfortunately, it was not able to get the values of BOD from each process stage of this factory. This makes it difficult to trace the reason for higher BOD loads in the effluent.

- In factory B, the main sources of BOD are the desizing and scouring processes. Because of the desizing and scouring chemical agents, such as starch, caustic soda, soda ash etc., these processes are the main source of BOD in textile factories.

- The BOD load from factory C, is derived from the test result of waste water emission

undertaken by the factory in 1997. Factory C decreases BOD load by discharging the effluent directly into an open pond. The BOD test result given in this study, therefore, reflects the BOD load in the pond.

b. COD

- As mentioned above, the ratio between BOD and COD lies between 1:2 and 1:3 for most textile effluents. Like BOD, COD also depends strongly on the chemical agents used in production. It was not possible to get the COD value for each process stage for factories A and C. However, a comparison between the total COD load of these factories and the COD value given in the effluent standard for textile industry in India and Indonesia as well as effluent requirement for direct discharge to surface water in Prevention and Abatement Handbook III of the World Bank was undertaken.

- COD load in the effluent from factory B evolved mainly at desizing and scouring process stages. It has been observed that the ratio of BOD to COD (1:2.4) is in the range of the optimal ratio of BOD and COD.

- In order to decrease the BOD as well as to sediment the sludge and solid substances in the effluent by simple mechanism, waste water from factory C is discharged without any additional mechanical waste water treatment to the pond. Therefore, the chemical substances which sediment in the pond increase the COD load in the pond. This could be one of the reasons for the high ratio of BOD to COD of 1:10.5.

Air emissions / VOC

- Although VOC arises at different stages of the production process, because of non-availability of data from factory A and C, it was only possible to consider the amount of VOC emission that arises as a result of: burning thermal energy carrier for steam production; and, burning loose surface fibers during singeing through calculation based on emission factors as indicated in Annexe IV.

- With respect to VOC from factory B, the VOC arising from production related activities, burning of natural gas to burn off loose surface fibers during singeing, and burning of oil for electricity generation have been considered.

- Inventory results of factory B show that the largest VOC emissions are emitted from the dyeing and drying processes.

- On the basis of above mentioned assumptions, VOC from factory A, resulting from coal burning to produce the necessary amount of steam for 1 kg - product as well as gas burning to burn off loose surface fiber of 1 kg of product during singeing, have been included.

- In factory C, the VOC emitted by coal burning for steam generation and gas burning to burn off loose surface fibers has been included. If other sources of VOC were to be included, the total emissions would be much higher than the amount prescribed by World Bank guidelines.

B. Social Parameters

As described in Part B and C of the report, the social performance of three factories are assessed under the following heads: Occupational safety/health; Non-discrimination; Communication/work environment; Working hours; Wage; and Training/Education/Awareness. For each category, selected parameters were used to assess performance, based on responses to questionnaires and interviews with relevant personnel of the factories.

Illustrating the result of the social assessment on a graphic form makes the interpretation of the result easier. Therefore, the qualitative results of the assessment have been quantified on the basis of the questionnaire response in percentage terms as described below.

IDEAL is defined as an utopian state where all questions are answered positively and with 100% fulfilment. The ILO law, Social Accountability 8000 standards, and national

labour legislations are rated relative to the IDEAL. Subsequently, the results of the questionnaire, which correspond to the actual performance of the factories are compared to the ILO norms. Thereafter, an evaluation note, 1 or 0, is given (see Annexe V). These evaluation points have been added and calculated in percentage terms with respect to the reference levels. The evaluation was ranked at three levels "Fully, Partially, and None" as defined below:

1. *Fully*: when the ILO norms or national legislation or the actual performance of the factories fulfills the IDEAL requirements, fully and positively

   or

   when the actual performance of the factories fulfills the requirements of ILO or national legislation, fully and positively.

2. *Partially*: when the ILO norms or national legislation or the actual performance of factories partially fulfill the requirements of IDEAL, positively

   or

   when the actual performance of factories partially fulfill the requirements of ILO or national legislation, positively

3. *None*: when none of the requirements of IDEAL are met by the ILO norms or national legislation or the actual existing performance of the factories

   or

   when none of the requirements of ILO or national legislation are met by the actual performance of the factories.

Annexe 4

Environmental Data Analysis

Abbreviation of Used Measurement Units

kg	:	Kilogram
g	:	Gram
mg	:	Milligram
Km	:	Kilometer
m	:	Meter
mm	:	Millimeter
m2	:	Square meter
m3	:	Cubic meter
a	:	Annum / year
hour	:	hour
min.	:	Minute
s	:	Second
kW	:	Kilowatt
kWh	:	Kilowatt-hour
J	:	Joule
MJ	:	Mega Joule

Table 1.

Singeing				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	112.40	
	Greige fabric width	mm	890.00	
	Weight per running-m	g	100.04	
	speed	m/min.	41.38	singeing speed
Production time	Working hour/ year	hr.	1,056.00	11 shifts/ 88 hours or 1 month
	working day/ year	day	44.00	132 shifts/year
	working hour/ day	hr.	24.00	
INPUT				
Woven Greige Goods		kg/year	262,191.60	
		kg/day	5,958.90	
		kg/hour	248.29	
Energy	Electrical energy			
	electrical energy per kg product	kWh / kg-product	0.07	
	thermal energy			Energy used for the production of steam
	kg-thermal energy carrier/kg-product	kg/kg-product	0.01	Petroleum is used as energy carrier
	thermal energy per kg product	MJ/kg-product	0.21	Hu petroleum in MJ/kg = 42.50
OUTPUT				
Singed Woven Greige Goods		kg/year	262,191.60	
		kg/day	5,958.90	
		kg/hour	248.29	
Air emission	VOC	mg/kg-product	1.68	VOC emitted by burning petroleum, 8 mg-VOC/MJ petroleum

Table 2.

Desizing + Scouring				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.04	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	1,056.00 44.00 24.00	11 shifts/ 88 hours or 1 month 132 shifts/year
Sizing	speed	m/min.	41.38	
Rope washing	speed	m/min.	37.24	10% less speed than the speed of sizing
INPUT				
Singed Woven Greige Goods		kg/year kg/day kg/hour	262,191.60 5,958.90 248.29	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 0.18 0.14 1.93	 Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
Water	Sizing Rope washing	liter/kg-product liter/kg-product	2.00 2.00	
Chemical input	Sizing Starch PVA CMC Acrylic Desizing Anilozyme Scouring Common salt Acetic acid Wetting agent	 g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product	 Not available Not available Not available Not available 10.00 5.00 0.50 1.00	

Cont. Table 2.

		Unit		Remark
OUTPUT				
Desized + Scoured Woven Greige Goods		kg/year kg/day kg/hour	262,191.60 5,958.90 248.29	
Waste Water		liter/kg-product	(see Table 12)	Only total waste water from the factory is available
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	Only total BOD from the factory is available Only total COD from the factory is available
Air emission	VOC	mg/kg-product	59.01	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 3.

Bleaching				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.04	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	7,920.00 330.00 24.00	11 shifts/ 88 hours or 1 month 132 shifts/year
Kiers 2 nos	speed	m/min.	3.38	50% of the product is bleached by Kierse 2 nos
JT 10 Harish	speed	m/min.	3.38	50% of the product is bleached by JT 10 Harish
INPUT				
Desized + Scoured Woven Greige Goods		kg/year kg/day kg/hour	321,558.00 974.42 40.60	
Energy	Electrical energy electrical energy per kg product	 kWh / kg-product	 0.49	
Water	Kiers 2 nos JT 10 Harish	liter/kg-product liter/kg-product	4.00 15.00	
Chemical inputs	$CaCO_3$ NaOH 48 Be HCl Sodiumhypochlorite H_2O_2 Solving FC	g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product	20.00 20.00 20.00 15.00 5.00 1.00	
OUTPUT				
Bleached Woven Greige Goods		kg/year kg/day kg/hour	321,558.00 974.42 40.60	
Waste Water		liter/kg-product	(see Table 12)	Only total waste water from the factory is available
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	Only total BOD from the factory is available Only total COD from the factory is available

Table 4.

Mercerising				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	7,920.00 330.00 24.00	
Maneklal Beningers	speed	m/min.	1.71	
INPUT				
Bleached Woven Greige Goods		kg/year kg/day kg/hour	81,477.60 246.90 10.29	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 3.60 0.53 2.56	 Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
Water	Maneklal Beningers	liter/kg-product	25.00	
Chemical input	NaOH 48 Be	g/kg-product	300.00	
OUTPUT				
Mercerised Woven Greige Goods		kg/year kg/day kg/hour	81,477.60 246.90 10.29	
Waste Water		liter/kg-product	(see Table 12)	Only total waste water from the factory is available
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	Only total BOD from the factory is available Only total COD from the factory is available
Air emission	VOC	mg/kg-product	78.17	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 5.

Dyeing (Continuous)				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	3,960.00 330.00 12.00	
Flow dyer (with padding)	speed	m/min.	1.43	
Hot flue (with padding)	speed	m/min.	1.43	
Padding	speed	m/min.	0.71	
Flow dyer (with padding)	average loading	m/shift	12,000.00	
Hot flue (with padding)	average loading	m/shift	12,000.00	
Padding	average loading	m/shift	8,000.00	
INPUT				
Mercerised/ Bleached Woven Greige Goods		kg/year kg/day kg/hour	84,840.00 257.09 21.42	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 5.31 1.70 11.61	 Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
Water	Flow dyer (with padding)	liter/kg-product	3.00	
	Hot flue (with padding)	liter/kg-product	3.00	
	Padding	liter/kg-product	3.00	

Cont. Table 5.

		Unit		Remark
Chemical inputs	Acetic acid	g/kg-product	63.13	
	Binder FKLM	g/kg-product	12.63	
	Catalyst LCP	g/kg-product	12.63	
	EL 40	g/kg-product	1.26	
	Sodium alginate	g/kg-product	6.31	
	NaCl	g/kg-product	126.26	
	Soda ash	g/kg-product	12.63	
	NaOH	g/kg-product	6.31	
	Sodium silicate	g/kg-product	63.13	
	Urea	g/kg-product	126.26	
Dyes	Imeron blue KCB		2.53	
	Yellow KCRM	g/kg-product	1.26	
	Red KCGR	g/kg-product	0.51	
	Green KCG	g/kg-product	0.51	
	Reactive red M5B		3.79	
	Yellow MGR	g/kg-product	2.53	
	Blue MR	g/kg-product	1.26	
	Violet C2R	g/kg-product	2.53	
	Navective turquoise blue 2G		6.31	
	Yellow G	g/kg-product	2.53	
	Black B	g/kg-product	2.53	
	Orange 3R	g/kg-product	2.53	
OUTPUT				
Dyed Woven Greige Goods		kg/year kg/day kg/hour	84,840.00 257.09 21.42	
Waste Water		liter/kg-product	(see Table 12)	Only total waste water from the factory is available
Water emission	BOD	mg/kg-product	(see Table 12)	Only total BOD from the factory is available
	COD	mg/kg-product	(see Table 12)	Only total COD from the factory is available
Air emission	VOC	mg/kg-product	739.27	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 6.

Wet Finishing				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	112.40	
	Greige fabric width	mm	890.00	
	Weight per running-m	g	100.00	
Production time	Working hour/ year	hr.	7,920.00	
	working day/ year	day	330.00	
	working hour/ day	hr.	24.00	
INPUT				
Dyed Woven Greige Goods		kg/year	300,367.29	
		kg/day	910.20	
		kg/hour	37.93	
Energy	Electrical energy			
	electrical energy per kg product	kWh / kg-product	2.92	
	thermal energy			Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
	kg-thermal energy carrier/kg-product	kg/kg-product	0.24	
	thermal energy per kg product	MJ/kg-product	3.15	
Water		liter/kg-product	1.98	
Chemical inputs	Starch (Maize)	g/kg-product	82.07	
	Ploy ethane emulsion	g/kg-product	55.68	
	Silicon	g/kg-product	38.51	
	Polyvinyl alcohol	g/kg-product	2.27	
	Urea	g/kg-product	2.02	
	Wetting agent (Dipitex)	g/kg-product	4.67	
	Glycerine	g/kg-product	1.77	
	Tinopal B2	g/kg-product	8.21	
	Polyvinyl acetone	g/kg-product	14.77	
	Tinopal BVN	g/kg-product	1.64	
	Non-ionic softener	g/kg-product	5.68	
	Ran 2000 (Dilute resin)	g/kg-product	7.20	
	Durafil	g/kg-product	4.17	
	Norgen EL 40 (Wetting agent)	g/kg-product	2.78	
	Ludox DLRDRS (Softener)	g/kg-product	13.01	

Cont. Table 6.

		Unit		Remark
OUTPUT				
Wet Finished Woven Greige Goods		kg/year kg/day kg/hour	300,367.29 910.20 37.93	
Waste Water		liter/kg-product	(see Table 12)	Only total waste water from the factory is available
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	Only total BOD from the factory is available Only total COD from the factory is available
Air emission	VOC	mg/kg-product	103.93	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 7.

Drying				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	7,920.00 330.00 24.00	
Japan 2 ends	speed	m/min.	6.77	
Bharat 1 end	speed	m/min.	6.77	
INPUT				
Wet Finished Woven Greige Goods		kg/year kg/day kg/hour	321,558.00 974.42 40.60	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 0.65 0.06 7.03	 Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
OUTPUT				
Dried Woven Greige Goods		kg/year kg/day kg/hour	321,558.00 974.42 40.60	
Air emission	VOC	mg/kg-product	246.42	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 8.

Dry Finishing				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	7,920.00 330.00 24.00	
Saniforizing	speed	m/min.	6.77	
Calendering	speed	m/min.	6.77	
INPUT				
Dried Woven Greige Goods		kg/year kg/day kg/hour	321,558.00 974.42 40.60	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 0.64 0.5 0.65	 Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
OUTPUT				
Dry Finished Woven Greige Goods		kg/year kg/day kg/hour	321,558.00 974.42 40.60	
Air emission	VOC	mg/kg-product	10.61	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 9.

Cloth Inspection				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	2,640.00 330.00 8.00	
Folding machine	speed	m/min.	23.29	
Roll folding machine	speed	m/min.	5.82	
INPUT				
Dry Finished Woven Greige Goods		kg/year kg/day kg/hour	461,072.40 1,397.19 174.65	
Energy	Electrical energy electrical energy per kg product	kWh / kg-product	0.01	
OUTPUT				
Inspected Woven Greige Goods		kg/year kg/day kg/hour	461,072.40 1,397.19 174.65	

Table 10.

Packing, Baling				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	112.40 890.00 100.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	2,640.00 330.00 8.00	
INPUT				
Inspected Woven Greige Goods		kg/year kg/day kg/hour	461,072.40 1,397.19 174.65	
Energy	Electrical energy electrical energy per kg product	 kWh / kg-product	 0.09	
OUTPUT				
Packed, Baled Woven Greige Goods		kg/year kg/day kg/hour	461,072.40 1,397.19 174.65	

Table 11.

Printing (Rotary)				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	112.40	
	Greige fabric width	mm	890.00	
	Weight per running-m	g	100.00	
Production time	Working hour/ year	hr.	2,640.00	
	working day/ year	day	330.00	
	working hour/ day	hr.	8.00	
Stormac Holland	speed	m/min.	1.46	
	Average loading	m/shift	8,000.00	
INPUT				
Mercerised/ Bleached Woven Greige Goods		kg/year	23,160.00	
		kg/day	70.18	
		kg/hour	8.77	
Energy	Electrical energy			
	electrical energy per kg product	kWh / kg-product	11.49	
	thermal energy			Thermal energy for the production of steam; 60% coal & 40% lignite is used ;1 kg coal produces 3.5 kg steam & 1 kg lignite produces 2.2 kg steam; Efficiency of boiler = 92.5% Hu coal = 14.70 MJ/kg & Hu lignite = 12.74 MJ/kg
	kg-thermal energy carrier/kg-product	kg/kg-product	0.58	
	thermal energy per kg product	MJ/kg-product	8.07	
Water		liter/kg-product	100.00	
Chemical inputs	Catalyst LCP	g/kg-product	11.68	
	Urea	g/kg-product	11.68	
	Fixer CCT	g/kg-product	7.01	
	Kerosene	g/kg-product	373.74	
	Binder SLN	g/kg-product	46.72	

Cont. Table 11.

		Unit		Remark
Dyes	Imperon yellow KC5R	g/kg-product	3.27	
	Red KC4R	g/kg-product	1.87	
	Green KC4	g/kg-product	3.74	
	Yellow KCRM	g/kg-product	3.74	
	Blue KCB	g/kg-product	7.01	
	Orange KC4	g/kg-product	2.80	
	Blue KCBN	g/kg-product	2.34	
	Blue KCPV	g/kg-product	7.01	
	Brown KCGR	g/kg-product	3.74	
	Violet KCN	g/kg-product	1.40	
OUTPUT				
Printed Woven Greige Goods		kg/year kg/day kg/hour	23,160.00 70.18 8.77	
Waste Water		liter/kg-product	(see Table 12)	Only total waste water from the factory is available
Water emission	BOD	mg/kg-product	(see Table 12)	Only total BOD from the factory is available
	COD	mg/kg-product	(see Table 12)	Only total COD from the factory is available
Air emission	VOC	mg/kg-product	487.06	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 12: SUMMARY INVENTORY RESULTS

Processes	INPUT					OUTPUT					
	Energy Consumption		Material Consumption		Water Consumption	Waste Water	Water Emission		Air Emission	Solid Waste	Total Product
	Electrical energy kWh/kg-product	Thermal energy MJ/kg-product	Chemicals g/kg-product	Dye Stuff g/kg-product	liter/kg-product	Total liter/kg-product	COD mg/kg-product	BOD mg/kg-product	VOC mg/kg-product	g/kg-product	kg-product/hour
Singeing	0.07	0.21									248.29
Desizing+ Scouring	0.18	1.93	16.50		4.00				59.01		248.29
Sizing			data not available								40.60
Bleaching	0.49	0.00	81.00		19.00						0.86
Mercerising	3.6	2.56	300.00		25.00				78.17		10.71
Dyeing (continuous)	5.31	11.61	430.00	26.27	9.00				739.27		37.93
Dyeing (discontinuous)											
Wet Finishing	2.92	3.15	244.44		1.98				103.93		40.60
Drying	0.65	7.03							246.42		40.60
Dry finishing	0.64	0.65									174.65
Cloth Inspection	0.01										8.77
Printing	11.49	8.07	450.82	36.91	100.00				487.06		174.65
Packing, Baling											
Other Purposes	0.10				207.00						
TOTAL	25.46	35.21	1,523.32	63.17	365.98	310.00	83,700.00	33,480.00	1,713.88		

Table 1.

Singeing				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	138.50	
	Greige fabric width	mm	1,625.00	
	Weight per running-m	g	225.00	
Production time	Working hour/ year	hr.	3,150.00	
	working day/ year	day	300.00	
	working hour/ day	hr.	10.50	
Kyoto	speed	m/min.	69.79	
Sanjet	speed	m/min.	69.79	
INPUT				
Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	942.14	
Energy	Electrical energy			
	electrical energy per kg product (from public nets)	kWh / kg-product	0.46	
	electrical energy per kg product (In-house generated)	kWh / kg-product	0.35	
	Oil input for generator	kg-oil/kg-product	0.09	efficiency of diesel generator = 33%
	thermal energy			Hu Natural gas
	kg-thermal energy carrier/kg-product			efficiency of boiler = 92.5%
	Natural gas	m^3/kg-product	0.06	oil is used for the production of steam
	Oil	kg/kg-product	0.05	oil is used as energy carrier
	thermal energy per kg product			Hu oil in MJ/kg = 41.00
	direct burning	MJ/kg-product	1.85	Steam pressure = 6 bar
	oil for boiler	MJ/kg-product	1.78	steam temperature 160 °c
OUTPUT				
Singed Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	942.14	
Air emission	VOC	mg/kg-product	1.96	

Table 2.

Desizing + Scouring				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	138.50 1,625.00 225.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	3,150.00 300.00 10.50	
L.Box (L-3) Super	speed	m/min.	69.79	
L.Box (L-3) Super	speed	m/min.	69.79	
INPUT				
Singed Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 942.14	
Energy	Electrical energy electrical energy per kg product (from public nets) electrical energy per kg product (In-house generated) Oil input for generator thermal energy kg-thermal energy carrier/kg-product Oil thermal energy per kg product oil for boiler	 kWh / kg-product kWh / kg-product kg-oil/kg-product kg/kg-product MJ/kg-product	 0.24 0.31 0.06 0.06 2.27	 efficiency of diesel generator = 33% Hu Natural gas efficiency of boiler = 92.5% oil is used as energy carrier for the production of steam Hu oil in MJ/kg = 41.00 Steam pressure = 6 bar steam temperature 160 °c
Water		liter/ kg-product	20.17	

Cont. Table 2.

		Unit		Remark
Chemical input	Sizing			
	Starch	g/kg-product	26.55	
	PVA	g/kg-product	10.71	
	Wax	g/kg-product	1.86	
	Acrylic	g/kg-product	7.45	
	Desizing			
	Rucolase	g/kg-product	2.58	
	Scouring			
	NaOH 46 °Be	g/kg-product	29.75	
	Primasox	g/kg-product	0.17	
	Ultravon	g/kg-product	0.24	
OUTPUT				
Desized + Scoured Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 942.14	
Waste Water		liter/kg-product	16.84	
Water emission	BOD	mg/kg-product	4,142.67	
	COD	mg/kg-product	8,975.79	
Air emission	VOC from the process	mg/kg-product	0.19	330 mg-VOC/kg-oil;
	VOC from steam production	mg/kg-product	30.62	
	VOC from electricity production	mg/kg-product	0.23	

Table 3.

Bleaching				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	138.50 1,625.00 225.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	3,150.00 300.00 10.50	11 shifts/ 88 hours or 1 month 132 shifts/year
L.Box (L-3) Super	speed	m/min.	69.79	
L.Box (L-3) Super	speed	m/min.	69.79	
INPUT				
Desized + Scoured Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 942.14	
Energy	Electrical energy electrical energy per kg product (from public nets) electrical energy per kg product (In-house generated) Oil input for generator thermal energy kg-thermal energy carrier/kg-product Oil thermal energy per kg product oil for boiler	 kWh / kg-product kWh / kg-product kg-oil/kg-product kg/kg-product MJ/kg-product	 0.30 0.23 0.06 0.06 2.15	 efficiency of diesel generator = 33% Hu Natural gas efficiency of boiler = 92.5% oil is used as energy carrier for the production of steam Hu oil in MJ/kg = 41.00 Steam pressure = 6 bar steam temperature 160 °c
Water		liter/kg-product	16.45	
Chemical inputs	Tino Chlorite CBB NaOH 48 Be Kieralon Leonil H_2O_2	g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product	0.17 40.94 0.11 0.04 0.84	

Cont. Table 3.

		Unit		Remark
OUTPUT				
Bleached Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 942.14	
Waste Water		liter/kg-product	8.89	
Water emission	BOD COD	mg/kg-product mg/kg-product	1,538.13 4,116.49	
Air emission	VOC from the process VOC from steam production VOC from electricity production	mg/kg-product mg/kg-product mg/kg-product	0.19 28.39 0.31	330 mg-VOC/kg-oil;

Table 4.

Mercerising				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	138.50 1,625.00 225.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	4,395.00 300.00 14.65	
Clip	speed	m/min.	50.02	
KYOTO	speed	m/min.	50.02	
INPUT				
Bleached Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 675.26	
Energy	Electrical energy electrical energy per kg product (from public nets) electrical energy per kg product (In-house generated) Oil input for generator thermal energy kg-thermal energy carrier/kg-product Oil thermal energy per kg product oil for boiler	 kWh / kg-product kWh / kg-product kg-oil/kg-product kg/kg-product MJ/kg-product	 0.37 0.28 0.08 0.05 2.04	 efficiency of diesel generator = 33% Hu Natural gas efficiency of boiler = 92.5% oil is used as energy carrier for the production of steam Hu oil in MJ/kg = 41.00 Steam pressure = 6 bar steam temperature 160 °c
Water	Maneklal Beningers	liter/kg-product	25.18	
Chemical input	NaOH 48 °Be Glacial acetic acid	g/kg-product g/kg-product	565.09 0.25	

Cont. Table 4.

		Unit		Remark
OUTPUT				
Mercerised Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 675.26	
Waste Water		liter/kg-product	16.10	
Water emission	BOD COD	mg/kg-product mg/kg-product	933.57 2,720.22	
Air emission	VOC from steam production VOC from electricity production	mg/kg-product mg/kg-product	21.29 0.99	330 mg-VOC/kg-oil;

Table 5.

Dyeing (Continuous)				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	138.50	
	Greige fabric width	mm	1,625.00	
	Weight per running-m	g	225.00	
Production time	Working hour/ year	hr.	3,663.00	
	working day/ year	day	300.00	
	working hour/ day	hr.	12.21	
Pad - dry/Kyoto	speed	m/min.	60.01	
Pad - dry/Kyoto	speed	m/min.	1.4360.01	
INPUT				
Mercerised/ Bleached Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	810.20	
Energy	Electrical energy			
	electrical energy per kg product (from public nets)	kWh / kg-product	1.21	
	electrical energy per kg product (In-house generated)	kWh / kg-product	0.93	efficiency of diesel generator = 33%
	Oil input for generator	kg-oil/kg-product	0.25	Hu Natural gas
	thermal energy			efficiency of boiler = 92.5%
	kg-thermal energy carrier/kg-product			efficiency of heater = 95%
	Oil for oil heater	kg/kg-product	0.05	oil is used as energy carrier for the production of steam and
	Oil for boiler	kg/kg-product	0.17	heater
	thermal energy per kg product			Hu oil in MJ/kg = 41.00
	heater	MJ/kg-product	1.89	Steam pressure = 6 bar
	boiler	MJ/kg-product	6.60	steam temperature 160 °c

Cont. Table 5.

		Unit		Remark
Water		liter/kg-product	29.94	
Chemical inputs	Acetic acid	g/kg-product	3.93	
	Na2CO3	g/kg-product	117.87	
	Trinil	g/kg-product	0.89	
	Reducol	g/kg-product	9.82	
	Marutexil wash	g/kg-product	1.96	
	NaCl	g/kg-product	559.35	
	Mautex RS	g/kg-product	2.98	
	NaOH	g/kg-product	67.93	
Dyes	Reactive dyes (VS)	g/kg-product	4.95	
	Reactive dyes (MCT)	g/kg-product	0.64	
	Vat dyes	g/kg-product	1.23	
	Pigment dyes	g/kg-product	0.33	
OUTPUT				
Dyed Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	810.20	
Waste Water		liter/kg-product	19.20	
Water emission	BOD	mg/kg-product	1,113.60	
	COD	mg/kg-product	3,244.80	
Air emission	VOC from the process	mg/kg-product	0.48	330 mg-VOC/kg-oil;
	VOC from steam production	mg/kg-product	83.02	
	VOC from electricity production	mg/kg-product	3.23	

Table 6.

Wet Finishing				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	138.50	
	Greige fabric width	mm	1,625.00	
	Weight per running-m	g	225..00	
Production time	Working hour/ year	hr.	3,996.00	
	working day/ year	day	300.00	
	working hour/ day	hr.	13.32	
Stenter		m/min.	55.01	
INPUT				
Dyed Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	742.68	
Energy	Electrical energy			
	electrical energy per kg product (from public nets)	kWh / kg-product	0.32	
	electrical energy per kg product (In-house generated)	kWh / kg-product	0.25	efficiency of diesel generator = 33%
	Oil input for generator	kg-oil/kg-product	0.07	Hu Natural gas
	thermal energy			efficiency of boiler = 92.5%
	kg-thermal energy carrier/kg-product			efficiency of heater = 95%
	Oil for oil heater	kg/kg-product	0.06	
	thermal energy per kg product heater	MJ/kg-product	2.31	oil is used as energy carrier for the production of heat Hu oil in MJ/kg = 41.00
Water		liter/kg-product	5.39	
Chemical inputs	Resin: Silicon ARS	g/kg-product	5.39	

Cont. Table 6.

		Unit		Remark
OUTPUT				
Wet Finished Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 742.68	
Waste Water		liter/kg-product	0.00	
Water emission	BOD COD	mg/kg-product mg/kg-product	0.00 0.00	
Air emission	VOC from the process VOC from electricity production	mg/kg-product mg/kg-product	0.87 1.18	330 mg-VOC/kg-oil;

Table 7.

Drying				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	138.50 1,625.00 225.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	3,663.00 300.00 12.12	
Cylinder drier (after bleaching)	speed	m/min.	60.01	
Cylinder drier (after mercerising)	speed	m/min.	60.01	
Cylinder dryer (after dyeing)	speed	m/min.	60.01	
INPUT				
Wet Finished Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 810.20	
Energy	Electrical energy electrical energy per kg product (from public nets) electrical energy per kg product (In-house generated) Oil input for generator thermal energy kg-thermal energy carrier/kg-product Oil for boiler thermal energy per kg product heater	 kWh / kg-product kWh / kg-product kg-oil/kg-product kg/kg-product MJ/kg-product	 0.75 0.57 0.15 0.16 5.94	 efficiency of diesel generator = 33% Hu Natural gas efficiency of boiler = 92.5% efficiency of heater = 95% oil is used as energy carrier for the production of boiler Hu oil in MJ/kg = 41.00

Cont. Table 7.

		Unit		Remark
OUTPUT				
Dried Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 810.20	
Air emission	VOC from the process VOC from steam production VOC from electricity production	mg/kg-product mg/kg-product mg/kg-product	0.83 84.39 0.11	330 mg-VOC/kg-oil;

Table 8.

Dry Finishing				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	138.50 1,625.00 225.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	2,748.00 300.00 9.16	
Saniforizing (2 X)	speed	m/min.	40.00	
INPUT				
Dried Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 1,079.97	
Energy	Electrical energy electrical energy per kg product (from public nets) electrical energy per kg product (In-house generated) Oil input for generator thermal energy kg-thermal energy carrier/kg-product Oil for boiler thermal energy per kg product boiler	 kWh / kg-product kWh / kg-product kg-oil/kg-product kg/kg-product MJ/kg-product	 0.12 0.09 0.02 0.02 0.88	 efficiency of diesel generator = 33% Hu Natural gas efficiency of boiler = 92.5% efficiency of heater = 95% oil is used as energy carrier for the production of boiler Hu oil in MJ/kg = 41.00
OUTPUT				
Dry Finished Woven Greige Goods		kg/year kg/day kg/hour	2,967,750.00 9,892.50 1,079.97	
Air emission	VOC from the process VOC from steam production VOC from electricity production	mg/kg-product mg/kg-product mg/kg-product	1.45 12.09 0.07	330 mg-VOC/kg-oil;

Table 9.

Cloth Inspection				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	138.50	
	Greige fabric width	mm	1,625.00	
	Weight per running-m	g	225.00	
Production time	Working hour/ year	hr.	1,470.00	
	working day/ year	day	300.00	
	working hour/ day	hr.	4.90	
CK-3F/Kominami (3 X)	speed	m/min.	29.91	
SD-103/ Sunrise (2 X)	speed	m/min.	29.91	
INPUT				
Dry Finished Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	2,018.88	
Energy	Electrical energy			
	electrical energy per kg product (from public nets)	kWh / kg-product	0.00	
	electrical energy per kg product (In-house generated)	kWh / kg-product	0.00	efficiency of diesel generator = 33%
	Oil input for generator	kg-oil/kg-product	0.00	
OUTPUT				
Inspected Woven Greige Goods		kg/year	2,967,750.00	
		kg/day	9,892.50	
		kg/hour	2,018.88	

Table 10.

Packing, Baling				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	138.50 1,625.00 225.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	1,098.00 300.00 3.66	
W-30/ Kominami (4 X)	speed	m/min.	52.75	
INPUT				
Inspected Woven Greige Goods		kg/year kg/day kg/hour	3,127,500 10,425.00 2,848.36	
Energy	Electrical energy electrical energy per kg product (from public nets) electrical energy per kg product (In-house generated) Oil input for generator	 kWh / kg-product kWh / kg-product kg-oil/kg-product	 0.00 0.00 0.00	Amount of electrical energy used at this step is so small that can be neglected.
OUTPUT				
Packed, Baled Woven Greige Goods		kg/year kg/day kg/hour	3,127,500 10,425.00 2,848.36	

Table 11: SUMMARY INVENTORY RESULTS

	INPUT					OUTPUT					
Processes	**Energy Consumption**		**Material Consumption**		**Water Consumption**	**Waste Water**	**Water Emission**		**Air Emission**	**Solid Waste**	**Total Product**
	Electrical energy kWh/kg-product	**Thermal energy MJ/kg-product**	**Chemicals g/kg-product**	**Dye Stuff g/kg-product**	**liter/kg-product**	**Total liter/kg-product**	**COD mg/kg-product**	**BOD mg/kg-product**	**VOC g/kg-product**	**g/kg-product**	**kg-product/hour**
Singeing	0.81	3.64							1.96		942.14
Sizing											
Desizing+ Scouring	0.55	2.27	79.32		20.17	16.84	8,975.79	4,142.67	31.04		942.14
Bleaching	0.53	2.15	42.10		16.45	8.89	4,116.49	1,538.13	28.89		942.14
Mercerising	0.65	2.04	565.34		25.18	16.10	2,720.22	933.57	22.28		675.26
Dyeing (continuous)	2.14	8.49	764.81	7.15	29.94	19.20	3,244.80	1,113.60	86.73		810.20
Dyeing (discontinuous)											
Wet Finishing	0.57	2.31	5.39		5.39	00			2.05		742.68
Drying	1.32	5.94							85.33		810.20
Dry finishing	0.21	0.88							13.60		1,079.97
Cloth Inspection	0.00								0.00		2,018.88
Printing											
Packing, Baling	0.00										2,848.36
Other Purposes					200.37	135.97					
TOTAL	6.78	27.73	1,456.96	7.15	297.50	197.00	19,057.29	7,727.93	271.88		

Table 1.

Singeing + Desizing				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,600.00 352.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	2,880.00 240.00 12.00	
Voller Voider	speed	m/min.	45.14	singeing speed
INPUT				
Woven Greige Goods		kg/year kg/day kg/hour	2,745,600.00 11,440.00 953.33	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	kWh / kg-product kg/kg-product MJ/kg-product	0.03 0.01 0.32	 Natural gas is used as energy carrier for singeing Hu natural gas in MJ/kg = 46.00
Chemical consumption : Desizing	Enzyme	g/kg-product	3.64	
Water : Desizing		liter / kg-product	0.80	
OUTPUT				
Singed + Desized Woven Greige Goods		kg/year kg/day kg/hour	2,745,600.00 11,440.00 953.33	
Air emission	VOC	mg/kg-product	33.46	VOC emitted by burning natural gas, 380 mg-VOC/m^3 natural gas

Table 2.

Sizing				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,600.00 352.00	
Production time (West point)	Working hour/ year working day/ year working hour/ day	hr. day hr.	6,912.00 288.00 24.00	
Production time (Sucker)	Working hour/ year working day/ year working hour/ day	hr. day hr.	1,920.00 240.00 8.00	
West point	speed	m/min.	9.40	
Sucker	speed	m/min.	33.85	
INPUT				
Singed + Desized Woven Greige Goods		kg/year kg/day kg/hour	2,745,600.00 10,486.67 913.61	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 0.03 0.19 0.01	 Thermal energy for the production of steam; coal is used for steam production Hu coal = 29.30 MJ/kg
Water	West point Sucker	liter/kg-product liter/kg-product	0.4 0.7	
Chemical input	Sizing Starch PVA CMC Acrylic	 g/kg-product g/kg-product g/kg-product g/kg-product	 90.00 Not available Not available Not available	

Cont. Table 2.

		Unit		Remark
OUTPUT				
Sized Woven Greige Goods		kg/year kg/day kg/hour	2,745,600.00 10,486.67 913.61	
Waste Water		liter/kg-product	0.06	
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	Only total BOD from the factory is available Only total COD from the factory is available
Air emission	VOC	mg/kg-product	0.10	0.50g-VOC/kg-coal; Efficiency of boiler = 92.5%

Table 3.

Bleaching + Scouring				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,600.00 352.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	3,840.00 240.00 16.00	
Kuster range	speed	m/min.	17.36	
Jigs	speed	m/min.	17.36	
INPUT				
Sized Woven Greige Goods		kg/year kg/day kg/hour	2,816,000.00 11,733..33 733.33	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 0.05 0.58 16.96	
Water	Kuster range Jigs	liter/kg-product liter/kg-product	13.75 13.75	
Chemical inputs	Bleaching H_2O_2 NaOH 48 Be Stabiliser Scouring Leonil Wetting agents Acetic acid HCl	 g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product g/kg-product	 0.01 0.01 2.00 1.40 13.30 4.70 2.70	

Cont. Table 3.

		Unit		Remark
OUTPUT				
Bleached + Scoured Woven Greige Goods		kg/year kg/day kg/hour	2,816,000.00 11,733..33 733.33	
Waste Water		liter/kg-product	19.25	
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	Only total BOD from the factory is available Only total COD from the factory is available
Air emission	VOC	mg/kg-product	289.50	

Table 4.

Mercerising				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,600.00 352.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	6,912.00 288.00 24.00	
Klein Wefers	speed	m/min.	2.22	
INPUT				
Bleached + Scoured Woven Greige Goods		kg/year kg/day kg/hour	323,840.00 1,124.44 46.85	
Energy	Electrical energy electrical energy per kg product	 kWh / kg-product	 0.65	
Water	Maneklal Beningers	liter/kg-product	25.00	
Chemical input	NaOH 48 Be	g/kg-product	331.65	
OUTPUT				
Mercerised Woven Greige Goods		kg/year kg/day kg/hour	323,840.00 1,124.44 46.85	

Table 5.

Dyeing (Continuous)				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	220.00	
	Greige fabric width	mm	1,600.00	
	Weight per running-m	g	352.00	
Production time	Working hour/ year	hr.	5,760.00	
	working day/ year	day	240.00	
	working hour/ day	hr.	24.00	
Pad-dryer	speed	m/min.	16.67	
Hot flue (with padding)	speed	m/min.	16.67	
Padding	speed	m/min.	16.67	
INPUT				
Mercerised/ Bleached Woven Greige Goods		kg/year	2,027,520.00	
		kg/day	8,448.00	
		kg/hour	352.00	
Energy	Electrical energy			
	electrical energy per kg product	kWh / kg-product	0.41	
	thermal energy			Thermal energy for the production of steam;
	kg-thermal energy carrier/kg-product	kg/kg-product	0.23	coal is used as energy carrier ;
	thermal energy per kg product	MJ/kg-product	6.79	Efficiency of boiler = 92.5% ;Hu coal = 29.30 MJ/kg
Water	Flow dyer (with padding)	liter/kg-product	30.00	

Cont. Table 5.

		Unit		Remark
Chemical inputs	Acetic acid	g/kg-product	13.00	
	Binder FKLM	g/kg-product	1.80	
	Catalyst LCP	g/kg-product	1.50	
	Sodium sulphate	g/kg-product	50.60	
	NaCl	g/kg-product	7.40	
	Soda ash	g/kg-product	10.90	
	NaOH	g/kg-product	91.40	
	Sodium silicate	g/kg-product	17.20	
	Urea	g/kg-product	9.50	
	Hydrogen peroxide	g/kg-product	47.30	
	Stabiliser	g/kg-product	4.40	
	Wetting agent	g/kg-product	37.00	
	Hydrogen sulphide	g/kg-product	22.20	
	Sodium sulphide	g/kg-product	3.80	
	Softening	g/kg-product	1.80	
Dyes	Vats	g/kg-product	6.51	
	Reactive	g/kg-product	71.91	
	Sulphate	g/kg-product	8.58	
	Pigment	g/kg-product	2.66	
OUTPUT				
Dyed Woven Greige Goods		kg/year kg/day kg/hour	2,027,520.00 8,448.00 352.00	
Waste Water		liter/kg-product	22.50	
Water emission	BOD	mg/kg-product	(see Table 12)	Only total BOD from the factory is available
	COD	mg/kg-product	(see Table 12)	Only total COD from the factory is available
Air emission	VOC	mg/kg-product	115.80	0.50g-VOC/kg-coal;

Table 6.

Dyeing (Discontinuous)				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	220.00	
	Greige fabric width	mm	1,600.00	
	Weight per running-m	g	352.00	
Production time	Working hour/ year	hr.	5,760.00	
	working day/ year	day	240.00	
	working hour/ day	hr.	24.00	
Jigs	speed	m/min.	11.11	
Tihes	speed	m/min.	11.11	
Cone dyeing	speed	m/min.	11.11	
INPUT				
Mercerised/ Bleached Woven Greige Goods		kg/year	1,351,680.00	
		kg/day	5,632.00	
		kg/hour	234.67	
Energy	Electrical energy			
	electrical energy per kg product	kWh / kg-product	5.95	
	thermal energy			Thermal energy for the production of steam;
	kg-thermal energy carrier/kg-product	kg/kg-product	0.15	coal is used as energy carrier ;
	thermal energy per kg product	MJ/kg-product	4.52	Efficiency of boiler = 92.5% ;Hu coal = 29.30 MJ/kg
Water	Jigs	liter/kg-product	24.00	
	Tihes	liter/kg-product	24.00	
	Cone dyeing	liter/kg-product	167.00	

Cont. Table 6.

		Unit		Remark
Chemical inputs	Acetic acid	g/kg-product	8.70	
	Binder FKLM	g/kg-product	1.20	
	Catalyst LCP	g/kg-product	1.00	
	Sodium sulphate	g/kg-product	33.70	
	NaCl	g/kg-product	4.90	
	Soda ash	g/kg-product	7.30	
	NaOH	g/kg-product	61.00	
	Sodium silicate	g/kg-product	11.40	
	Urea	g/kg-product	6.30	
	Hydrogen peroxide	g/kg-product	31.60	
	Stabiliser	g/kg-product	3.00	
	Wetting agent	g/kg-product	24.70	
	Hydrogen sulphide	g/kg-product	14.80	
	Sodium sulphide	g/kg-product	2.60	
	Softening	g/kg-product	1.20	
Dyes	Vats	g/kg-product	4.34	
	Reactive	g/kg-product	47.94	
	Sulphate	g/kg-product	5.72	
	Pigment	g/kg-product	1.78	
OUTPUT				
Dyed Woven Greige Goods		kg/year	1,351,680.00	
		kg/day	5,632.00	
		kg/hour	234.67	
Waste Water	Jigs	liter/kg-product	24.00	
	Tihes	liter/kg-product	24.00	
	Cone dyeing	liter/kg-product	125.00	
Water emission	BOD	mg/kg-product	(see Table 12)	Only total BOD from the factory is available
	COD	mg/kg-product	(see Table 12)	Only total COD from the factory is available
Air emission	VOC	mg/kg-product	80.00	0.50g-VOC/kg-coal;

Table 7.

Wet Finishing + Drying				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,600.00 352.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	7,392.00 336.00 22.00	
Stenter	speed	m/min.	27.06	
INPUT				
Dyed Woven Greige Goods		kg/year kg/day kg/hour	4,224,000.00 12,571.43 571.43	
Energy	Electrical energy electrical energy per kg product thermal energy kg-thermal energy carrier/kg-product thermal energy per kg product	 kWh / kg-product kg/kg-product MJ/kg-product	 0.06 0.77 22.62	 Thermal energy used for the production of steam is coal; Efficiency of boiler = 92.5%; Hu coal = 29.30 MJ/kg
Water		liter/kg-product	0.02	
OUTPUT				
Wet Finished + **Dried** Woven Greige Goods		kg/year kg/day kg/hour	4,224,000.00 12,571.43 571.43	
Waste Water		liter/kg-product	0.39	
Water emission	BOD COD	mg/kg-product mg/kg-product	(see Table 12) (see Table 12)	
Air emission	VOC	mg/kg-product	103.93	0.50g-VOC/kg-coal; 0.34g-VOC/kg-lignite

Table 8.

Dry finishing				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,600.00 352.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	7,392.00 336.00 22.00	
Saniforizing	speed	m/min.	24.80	
Raising	speed	m/min.	24.80	
Coating	speed	m/min.	24.80	
INPUT				
Wet Finished + **Dried** Woven Greige Goods		kg/year kg/day kg/hour	3,872,000.00 11,523.81 523.81	
Energy	Electrical energy electrical energy per kg product	 kWh / kg-product	 0.16	
OUTPUT				
Dry finished Woven Greige Goods		kg/year kg/day kg/hour	3,872,000.00 11,523.81 523.81	

Table 9.

Cloth Inspection				
		Unit		Remark
Product specification	Greige fabric weight Greige fabric width Weight per running-m	g/m2 mm g	220.00 1,6000.00 352.00	
Production time	Working hour/ year working day/ year working hour/ day	hr. day hr.	2,160.00 240.00 9.00	
Insp., Machines	speed	m/min.	73.30	
INPUT				
Dry Finished Woven Greige Goods		kg/year kg/day kg/hour	3,344,000.00 13,933.33 1,548.15	
Energy	Electrical energy electrical energy per kg product	 kWh / kg-product	 0.07	
OUTPUT				
Inspected Woven Greige Goods		kg/year kg/day kg/hour	3,344,000.00 13,933.33 1,548.15	

Table 10.

Packing, Baling				
		Unit		Remark
Product specification	Greige fabric weight	g/m2	220.00	
	Greige fabric width	mm	1,600.00	
	Weight per running-m	g	352.00	
Production time	Working hour/ year	hr.	2,160.00	
	working day/ year	day	240.00	
	working hour/ day	hr.	9.00	
INPUT				
Inspected Woven Greige Goods		kg/year	3,344,000.00	
		kg/day	13,933.33	
		kg/hour	1,548.15	
OUTPUT				
Packed, Baled Woven Greige Goods		kg/year	3,344,000.00	
		kg/day	13,933.33	
		kg/hour	1,548.15	

Table 11: SUMMARY INVENTORY RESULTS

	INPUT					OUTPUT					
Processes	**Energy Consumption**		**Material Consumption**		**Water Consumption**	**Waste Water**	**Water Emission**		**Air Emission**	**Solid Waste**	**Total Product**
	Electrical energy kWh/kg-product	**Thermal energy MJ/kg-product**	**Chemicals g/kg-product**	**Dye Stuff g/kg-product**	**liter/kg-product**	**Total liter/kg-product**	**COD mg/kg-product**	**BOD mg/kg-product**	**VOC mg/kg-product**	**g/kg-product**	**kg-product/hour**
Singeing + Desizing	0.03	0.30	3.64		0.80				33.46		953.33
Sizing	0.03	0.01	87.41		1.10	0.06			96.50		913.61
Bleaching + Scouring	0.05	16.96	24.08		27.50	19.25			289.50		733.33
Mercerising	0.65		331.65								46.85
Dyeing (continuous)	0.41	6.79	319.90	89.67	30.00	22.50			115.80		352.00
Dyeing (discontinuous)	5.95	4.52	213.27	59.78	215.00	173.00			77.20		234.67
Wet Finishing + Drying	0.06	22.62							386.00		571.43
Dry finishing	0.16										523.81
Cloth Inspection	0.01										
Printing											1,548.15
Packing, Baling											1,548.15
Other Purposes											
TOTAL	7.36	51.20	979.95	149.44	274.40	214.84	239,608.21	22,857.07	998.46		

Annexe 5

Social Data Analysis

Table 1.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	Social Accountability 8000 <<SA8000>>	Fully	Partially	None
			Occupational Health / Safety								
1	Are issues on health and safety reported through a health and safety focal point?	155 4.1.	*Each member* shall formulate implement *and periodically review a coherent national policy on occupational safety / health and the working environment.*	1	0	0	6.1 -SA 8000 3.1.	The company, bearing in mind the prevailing knowledge of the industries and of any specific hazards, shall provide a safe and health working environment and shall take adequate steps to prevent accident and injury to health arising out of associated with or occurring in the course of work, by minimizing, so far as is reasonably predictable, the causes of hazards inherent in the working environment;	1	0	0
2	If "Yes", how is the information used?	**161.**	**Functions**	1	0	0	6.1 - SA 8000 3.2.	The company shall appoint a senior management representative responsable for the health and safety of all personnel, and accountable for the implementation of health and safety element of this standards.	1	0	0
		161.5.	***Occupational health service*** shall have the following functions								
		161.5.a.	***identification*** and ***assessment*** of the ***risk from health hazards***								
		161.5.b.	***surveillance of the factors*** in the ***working environment*** and ***working practice*** which may ***affect workers' health*** including ***sanitary installations, canteens and housing*** where these ***facilities*** are ***provided by the employer.***								
		161.5.c.	***advice on planning*** and ***organization of work,*** including the ***design of workplace,*** on the ***choice, maintenance*** and ***condition of machinery*** and ***equipment*** and ***substance*** used in work.								
		161.5.d.	***participation*** in the ***development of programs*** for the : ***improvement of working practices*** as well as ***testing*** and ***evaluation of health*** aspects of new equipment								
		161.5.e	***advice on occupational health, safety and hygiene*** and on ***ergonomics*** and individual and collective ***protective equipment***								
		161.5.f.	***surveillance of workers' health*** in relation to work:								
		161.5.g.	***promoting the adaptation*** of work to the workers;								
		161.5.h.	***contribution to measures of vocational rehabilitation;***								
		161.5.i.	***collaboration in providing information, training*** and ***education 'in the fields of occupational health and hygiene*** and ***ergonomics;***								
		161.5.j.	organizing of ***first aid*** and ***emergency treatment;***								
		161.5.k.	participation in ***analysis of occupational accidents*** and								

Table 1. Cont.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	Social Accountability 8000 <<SA8000>>	Fully	Partially	None
3	Are hourly and temporary workers also covered?	161.13.	All workers shall be ***informed of health hazards involved*** in ***their work.***	1	0	0		SA 800 ratified convention N°. 161 without denunciation	1	0	0
4	Is there permanent health and safety training	155.5.c.	***training, including necessary further training, qualifications and motivations of persons involved,*** in one capacity or another, in the achievement of adequate levels of safety and health;	1	0	0	6.1 - SA 8000 3.3.	The company shall ensure that all personnel receive regular and recorded health and safety training, and that such training is repeated for new and reassigned personnel	1	0	0
		155.19.d.	***workers*** and their ***representative*** in the undertaking are ***given appropriate training*** in ***occupational safety and health;***								
5	Are first aid, fir prevention, cleaning, lighting, building inspection, health and safety provisions provided by the company?	155.16.3.	***Employers*** shall be required ***to provide,*** where necessary, ***adequate protective clothing*** and ***protective equipment to prevent,*** so far is ***reasonably practicable, risk of accident or*** of adverse ***effects on health.***	1	0	0	6.2.a.	Adequate first aid supplies are available and trained first aid personnel are available on site.	1	0	0
		155.18.	***Employers*** shall be required to ***provide,*** where necessary, for ***measures to deal*** with ***emergencies and accidents*** including adequate ***first-aid arrangements.***								
6	Does the enterprise provide protective gear against dust, airborne particles and noise?	148.7.1.	Workers shall be ***required to comply with safety procedures*** relating to the ***prevention and control of, and protection against, occupational hazards*** due to ***air pollution, noise and vibration*** in the working environment.	1	0	0	6.2.g.	Protective gear is available free of charge and is in use throughout the facility.	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	International Labor Organization (II.O) Convention	Fully	Partially	None	conv.#	Social Accountability 8000 <<SA8000>>	Fully	Partially	None
7	Does the company provide gears to workers handle-ing and exposed to chemicals?	170.13.1. 170.13.1.a. 170.13.1.b. 170.13.1.c. 170.13.1.d. 170.13.1.e. 170.13.1.f.	***Employers*** shall ***make an assessment*** of the ***risks arising from the use of chemicals at work*** and shall ***protect workers against such risks*** by appropriate means: the ***choice of chemicals*** that ***eliminate or minimize the risk*** the ***choice of technology*** that ***eliminates or minimize the risk;*** the ***use of adequate engineering control measures;*** the ***adoption of working systems*** and ***practice that eliminate*** or minimize the risk; the ***adoption of adequate occupational hygiene measures*** where recourse to the above measures does not suffice. the ***provision and proper maintenance of personal protective equipment*** and ***clothing at no cost*** to the worker, and the implementation of measures to ensure their use.	1	0	0		SA8000 ratified the Convention No. 170 without denunciations.	1	0	0
8	Is it mandatory to wear or operate protective gear during operation?	170.17.1. 170.17.2.	***Workers*** shall ***co-operate*** as closely as possible with their employers in the ***dishrag by the employers of thei responsibilities*** and comply with all ***procedures and practices relating to safety*** in the ***use of chemicals at work.*** ***Workers*** shall take all ***responsible steps to eliminate or*** minimize risk to themselves and to others from the ***use of chemicals at work.***	1	0	0		SA 800 ratified convention N°. 170 without denunciation	1	0	0
9	Do you keep track of the number of incidents of: a. accident b. disease and infections; and c. exposure to hazardous / toxic chemicals			0	0	1	6.2.j.	Medically competent personnel can be reached in case of emergencies and employees are trained to contact appropriate medical and emergency serve providers.	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	Social Accountability 8000 <<SA8000>>	Fully	Partially	None
10	When you receive a new chemicals to be used to the specification of your foreign client, do you have training and educate your staff on procedures for safe handling and dispose of the client?	170.15.a. 170.15 b. 170.15.c. 170.15.d.	***inform the workers*** of the ***hazards associated*** with ***exposure to chemicals*** used at the ***workplace;*** ***instruct the workers*** how to obtain and ***use the information specific*** to ***the workplace***, as a basic for the preparation of ***instruction to workers***, which should be written ***safety data*** sheet: ***use the chemical safety data sheet*** along with ***information specific to the workplace;*** ***train the workers*** on a continuing basis in the practices and procedures to be followed for safety in the ***use of chemicals at work.***	1	0	0		SA 800 ratified convention N°. 170 without denunciation	1	0	0
11	Are all of your workers covered under workers compensation?	17.1. 17.5.	***Workmen*** who suffer ***personal injury due to industrial accident,*** or their dependent ***shall be compensated.*** The ***compensation payable*** to the ***injured workman***, or his ***dependents***, where ***permanent incapacity*** or ***death*** results ***from the injury***, shall be in the form of ***periodical payment*** wholly or ***partial payment in a lump sum.***	1	0	0		SA 800 ratified convention N°. 17 without denunciation	1	0	0
12	What internal mechanism do you have to set up your own safety and health procedures - particularly in the context of having to meet foreign standards recognized and prescribed by your clients?			0	0	1			0	0	1
13	What requirements, if any, do you have for workers to access a doctor or nurse, free of charge, for work related health examination?	130.9. 130.13. 130.13.a. 130.13. b. 130.13. c. 130.13.d. 130.13.e 130.13. f.	The ***medical care*** shall be afforded with a view ***to maintaining, restoring or improving the health of the person protected*** and his ability to work and to attend to his personal needs. The ***medical care shall comprise at least:*** ***general practitioner care*** including ***domiciliary visiting,*** ***specialist care at hospital*** for ***in-patients*** and ***out-patients,*** and such specialist care as may ***be available outside hospitals;*** the necessary ***pharmaceutical supplies*** on prescription by ***medical*** or other ***qualified practitioners;*** ***hospitalization*** where necessary ***dental care***, as prescribed; ***medical rehabilitation***, including the supply, maintenance and ***renewal of prosthetic*** and ***orthopedic appliances***, as prescribed.	1	0	0		SA 800 ratified convention N°. 130 without denunciation	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	Social Accountability 8000 <<SA8000>>	Fully	Partially	None
14	When a worker is injured, is there a rehabilitation program which he/she can participate sponsored by the employer?	159.2. 159.3. 159.4.	***Each Member*** shall ***practice and possibilities, formulate, implement*** and ***periodically review*** a **"national policy"** on ***vocational rehabilitation*** and ***employment of disable persons*** The said policy shall aim at ***ensuring*** that appropriate ***vocational rehabilitation measures*** are made available to all categories ***of disabled persons*** and at ***promotion employment opportunities for disable persons*** in the open labor market. The said policy shall be based on the principle of ***equal opportunity between disabled workers and workers generally.***	1	0	0		The company shall respect the principles of ILO Convention 159 (Vocational Rehabilitation and Employment /Disabled Person)	1	0	0
15	Do you have a system for monitoring air pollution, noise, and vibration?	148.8. 148.9. 148.9.a. 148.9.b.	The competent authority shall ***establish criteria for determining*** the ***hazards of exposure to air pollution, noise and vibration*** in the working environment and, shall specify ***exposure limits*** on the basis of these criteria. The ***working environment*** shall be kept ***free from any hazard*** due to ***air pollution, noise or vibration:*** by ***technical measures*** applied to ***new plant or processes in design or installation***, or added to existing plant or processes by supplementary ***organizational measures***	1	0	0	6.1 - As 8000 3.4	The company shall establish systems to detect, avoid or respond to potential threats to the health and safety of all personnel.	1	0	0
16	Do you conduct periodic medical examination of your workers?	130.16.1.	The ***medical care*** shall be ***provided throughout the contingency.***	1	0	0		SA 800 ratified convention N°. 130 without denunciation	1	0	0
17	Do you have an in-house chemical safety procedure?	170.7.1. 170.7.2. **170.8.** 170.8.1. 170.8.2. 170.8.3.	All ***chemicals*** shall be ***marked*** so as to ***indicate their identity.*** ***Hazardous chemicals*** shall in ***addition be labeled***, in a way easily understandable to the workers, so as to provide essential ***information regarding their classification, the hazards*** they present and the safety precaution to be observed. **Chemical Safety Data Sheets** For ***hazardous chemicals, chemical safety data sheets*** containing ***detailed essential information*** regarding their identity, supplier, classification, hazards, safety precautions and emergency procedures ***shall be provided.*** ***Criteria for the preparation of chemical safety data sheets shall be established,*** in accordance with national standards. The ***chemical or common name*** used to ***identify the chemical*** on the ***chemical safety data sheet shall be the same as that used on the label.***	1	0	0		SA 800 ratified convention N°.170 without denunciation	1	0	0
	"Total"			15	0	2			16	0	1

Table 2.

	Questionnaire	conv.#	International Labor Convention	Fully	Partially	None	conv.#	Social Accountability 8000 <<SA8000>>	Fully	Partially	None
							Non-Discrimination				
1	How do workers realize their rights as employees?	87. 87.2.	**Freedom of Association** ***Workers and employers***, without distinction whatsoever, shall have ***the right to establish and, subject only the rules of the organizations*** concerned, to join organizations of then ***own choosing without previous authorization.***	1	0	0	7.1 - SA8000 4.1. 7. 1 - SA8000 4.2	The company shall respect the right of all personnel to form and join trade unions of their choice and to bargain collectively; The company shall, in those situations in which the right to freedom of association and collective bargaining are restricted under law, facilitate parallel means of independent and free association and bargaining for all such personnel:	1	0	0
		87.3. 87.4. 87.5.	***Workers' and employers' organizations*** shall ***have the right to draw up their constitutions and rules.*** ***Workers' and employers' organizations*** shall ***not be liable to be dissolved or suspended by administrative authority.*** ***Workers' and employers' organizations*** shall have ***the right to establish and join federations and confederations.***				7.1. - SA8000 4.3.	The company shall ensure representatives of such personnel are not the subject of discrimination and that such representatives have access to their members in the work place.			
2	Are special provision given to pregnant women or those who recently gave birth to a child or experienced miscarriage?	111 111.2.	**Discrimination (Employment and Occupation) Convention, 1958** ***Each Member*** for which this Convention is ***in force undertakes*** to ***declare and pursue, equality of opportunity and treatment*** in respect of ***employment and occupation***, with a view to ***eliminating any discrimination*** in respect thereof.	1	0	0	8.1 - SA 8000 4.1. 8.3 SA 8000 Background on Discrimination	The company shall not engaged in or support discrimination in hiring, compensation, access to training, promotion, termination or retirement base on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, or political affiliation. Requiring women to be tested for pregnancy, forcing them to use contraception as conditions for employment, or forcing them out when their pregnancy comes to the attention of management, violets SA8000.	1	0	0
	Total No of Questionnaires = 2			2	0	0			2	0	0

Table 3.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
								Communication/Work Environment			
1	Is there an environmental policy in the factory? Has the environmental policy been communicated to the staff? If 'Yes', how are these circulated? How is the policy enforced?			0	0	1		AS 8000 addresses the environmental issues.	1	0	0
2	Are there safeguards to ensure its enforcement?	81.2.1.	The ***system of labor inspection*** in industrial workplace shall apply to all workplaces in respect of which legal provisions relating to conditions of work and the protection of workers while engaged in the work are enforceable by labor inspectors.	1	0	0		SA8000 ratified the Convention No. 81 of ILO without 'denunciations.	1	0	0
3	Are policy directives/guidelines on environment, health and social issues include health and safety provisions? If 'Yes' , how are they circulated?	81.3.1. 81.3.1.a. 81.3.1.b. 81.3.1.c.	The ***function of the system of labor inspection*** shall be: to ***secure*** the enforcement of the ***legal provisions*** relating to conditions of work and the ***protection*** of workers while engaged in their work. to ***supply technical information*** and advice to employers and workers concerning the most effective means of complying with the legal provisions; to ***bring to the notice of the competent authority*** defects or abuses 'not specifically covered by existing legal provisions.	1	0	0		SA8000 ratified the Convention No. 81 of ILO without 'denunciations.	1	0	0
4	Is information of international requirements (if applicable) being communicated to staff? If 'Yes', how are these circulated?			0	0	1		AS 8000 addresses environmental issues.	1	0	0
5	Is there a training program on skill up gradation?	140.2. 140.2.a. 140.2.b. 140.2.c. 140.3. 140.3.a. 140.3.b. 140.3.c. 140.3.d.	Each member shall formulate and apply a ***policy*** designed to promote, by ***methods*** appropriate to national condition and practice and by stages as necessary, the granting of paid educational leave for the purpose of : ***training at any level,*** ***general, social and civic education*** ***trade union education*** The policy shall be designed to contribute, on differing terms as necessary: to the ***acquisition, improvement*** and ***adaptation of occupational and functional skills***, and ***the*** promotion of employment and job security in conditions of scientific and technological d envelopment and economic and structural change. the competent and achieve *participation of* workers and their representatives in the ***life of the*** undertaking and of the community; to the ***human, social and cultural advancement*** of workers; and generally, to the ***promotion of appropriate continuing education and training,*** helping ***workers to adjust to contemporary requirements.***	1	0	0		SA8000 ratified the Convention No. 140 of ILO without 'denunciations.	1	0	0

Table 3. Cont.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
6	What salary level groups receive training?	142.1.1.	***Each member*** shall adopt and ***develop comprehensive and coordinated policies*** and programs of vocational guidance and vocational training, closely linked with employment, in particular through public employment service.	1	0	0		SA8000 ratified the Convention No. 142 of ILO without 'denunciations.	1	0	0
		142.1.5.	the ***policies and program*** shall be ***encourage*** and ***enable all persons, on an equal basis*** and ***without any discrimination whatsoever, to develop and*** use their capabilities for work in their own best interests and in accordance with their own aspiration, account being taken of the needs of society.								
7	Do you have an in-house safety and health awareness program?	155.5.	***The policy referred to in*** "Article 4" ***of this convention shall take account*** of the following main spheres of action so far as they affect occupational safety and health and the working environment:	1	0	0	12. 1. - SA800	The company shall ensure that the requirements of this standards are understood and implemented at all levels of the organization;	1	0	0
		155.5.a.	***design, testing, choice, substitution, installation,*** arrangement, use and maintenance of the material elements of work (workplace, working environment, tools, machinery and equipment, chemicals, physical and biological substances, work processes);				SA8000 9.5. b	periodical training and awareness programs for existing employees.			
		155.5.b.	***relationship between the material elements of work and the persons*** who carry out or supervise the work, and adaptation on machinery, equipment, working time, organization of work and work processes to the physical and mental capacity of the workers;								
		155.5.c.	***training, including necessary further training, qualifications and motivations of persons involved,*** in one capacity or another, in the achievement of adequate levels of safety and health;								
		155.5.d.	***Communication and co-operation at the levels of the working group and the undertaking and at all other appropriate levels up to and including the*** national level;								
		155.5.e.	***the protection of workers and their representatives from disciplinary measures as a result of action*** properly taken by them in conformity with the policy referred to "Article 4" of this Convention.								
	Total (No of Questionnaires = 7)			5	0	2			7	0	0

Table 4.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
							Working Hours				
	Do you have night shift?										
1	What guidelines do you follow for night work for women and young women?	89	**Night Work (Women) Convention, 1948**	1	0	0	SA 8000 - 4.2.h.	Children and young workers are not employed at night ILO Convention No. 89 ratified, Comments to art. 66 SA8000 ratified the Convention No. 89 of ILO without denunciations. (ILO Chart of 1 January 1991)	1	0	0
		89.2.	***Night signifies a period*** of at least ***eleven consecutive hours, including ten o'clock in the evening and seven o'clock in the morning.***								
		89.3.	***Women*** without distinction of age shall ***not employed during the night.***								
		89.4.	**'Paragraph 89.3" *shall not apply:***								
		89.4.a.	***in case of force major***, an ***interruption of work***								
		89.4.b.	*when night work is necessary preserve the raw material from loss.*								
		89.6.	In industrial undertaking which are ***influenced by the season the night period*** may be ***reduced to ten hours in sixty days of the year.***								
		89.7.	In countries where ***climate renders work*** by day particularly trying, the ***night period may be shorter*** than prescribed in the above Article.								
		90	**Night Work of Young Persons Convention (Revised), 1948**								
		90.2.1.	***Night signifies*** at least ***twelve consecutive hours***.								
		90.2.2.	In the case of ***young persons under sixteen years of age***, this period shall include the ***interval between ten o'clock in the evening and six o'clock in the morning.***								
		90.2.3.	In the case of ***young persons*** who have attained ***the age of sixteen years*** but are ***under the age of eighteen years, the night period*** shall be at least ***seven consecutive hours including ten o'clock in the velning and seven o'clock in the morning.***								
		90.3.1.	***Young person under eighteen years of age*** shall ***not be employed or work during the night.***								
		90.3.3.	***Young person employed in night work*** in virtue of the 'preceding paragraph" shall be ***granted a rest period*** of at least ***thirteen consecutive hours between two working period***.								
		90.4.1.	In country where ***climate renders work*** by day particularly ***trying the night period*** and barred interval may be ***shorter than prescribed in the above Articles*** if compensatory rest is according the day.								
		90.4.2.	The provision of **"Article 90.2.1. and 2. as well as 90.3.1. and 3"** shall ***not apply to the night work of young person between the age of sixteen and eighteen years.***								

Table 4. Cont.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
2	What is the maximum number of hours of overtime that you allow your workers?	14	**Weekly Rest Convention**	1	0	0	10.1 SA8000 7.1.	The company shall comply with applicable laws and industry standards on working hours, in any event, personnel not on a regular basis, be required to work in excess of 48 hours per week and shall be provided with at least one day off for every seven day period.	1	0	0
		14.2.1.	In ***every seven days*** : at least ***twenty-four hours rest***.								
		14.2.3.	***Weekly rest*** be fixed with the days established by the ***tradition or customs*** of the country or district.								
		14.4.1.	Each member is ***authorized total or partial exceptions*** from the provision of ***weekly rest***.				10.1 SA8000 7.2.	The company shall ensure that overtime work (more than 48 hours per week) does not exceed 12 hours per employee per week, is not demanded other than in exceptional and short -term business circumstances, and is always remunerated at a premium rate.			
3	What is your sick leave and holiday leave practices? Are there exceptions to this rule?	52.2.5.	The ***duration of the annual holiday*** with pay shall increase with the length of service under conditions to be prescribed by ""national laws"".	1	0	0	10.2. SA8000 . a.	Workers are given at least one day off for every seven -day period.	1	0	0
		52.3.	***Every person taking a holiday*** in virtue of Article 2" of this convention shall receive in respect of the full period of the holiday either:								
		52.3.a.	***his usual remuneration, calculated in a manner*** which shall be prescribed by "national laws", including the cash equivalent 'of his remuneration in kind, if any;								
		52.3.b.	the ***remuneration determined*** by ***collective*** agreement.								
		132	**Holidays with Pay Convention (Revised), 1970**								
		132.3.1.	***Every person*** shall be ***entitled to an annual paid*** holiday of a specified minimum length 'the period of his annual holiday with pay.								
		132.3.2.	***Each Member*** shall ***specify the length of the*** holiday in a declaration appended to its ratification.								
	Total No of Questionnaires = 4			3	0	0			3	0	0

Table 5.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
1						Wage					
	Are your youngest and newest and least experienced workers paid a minimum wage?	95.10.1.	***Wage*** may be attached or assigned only in a mannered within limits prescribed by national laws.	1 -	0	0		'SA8000 ratified the Convention No. 95 without denunciations	1	0	0
	Total (No of Questionnaires = 1)			1	0	0			1	0	0

Table 6.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
			Training/ Education/ Awareness: Factory A								
1	Do you seek the services of training providers (locally) to help up grade the skills of your workers?	140	**Paid Educational Leave Convention, 1974**	1	0	0		SA8000 ratified the Convention No. 95 without denunciations	1	0	0
		140.2.	Each member shall formulate and apply a ***policy*** designed to promote, by ***methods*** appropriate to national condition and practice and by stages as necessary, the granting of paid educational leave for the purpose of :								
		140.2.a.	***training at any level,***								
		140.2.b.	***general, social and civic education***								
		140.2.c.	***trade union education***								
		140.3.	The policy shall be designed to contribute, on differing terms as necessary:								
		140.3.a.	to the ***acquisition, improvement*** and ***adaptation of occupational and functional skills***, and the promotion of employment and job security in conditions of scientific and technological development and economic and structural change.								
		140.3.b.	the competent and achieve *participation of workers* and their representatives in the ***life of the undertaking*** and of the community;								
		140.3.c.	to the ***human, social and cultural advancement*** of workers; and								
		140.3.d.	generally, to the ***promotion of appropriate continuing education and training,*** helping workers to adjust to contemporary requirements.								
		140.7.	The ***financing*** of arrangement for paid ***educational leave shall be on a regular and adequate basis*** and in accordance with national practice.								
		140.8.	***Paid educational level*** shall not be ***denied to workers on the ground of race, color religion, political opinion, national extraction or social origin.***								

Table 6. Cont.

	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
	Questionnaire	conv.#	International Labor Organization (ILO) Convention	Fully	Partially	None	conv.#	'Social Accountability 8000 <<SA8000>>	Fully	Partially	None
2	Do you have an in-house safety and health awareness program?	142	**Human Resources Development Convention, 1975**	1	0	0	12 - SA 8000 9.5.	The company shall ensure that the requirements of this standard are understood and implemented at all levels of the organization; methods shall include, but are not limited to:	1	0	0
		142.1.1.	***Each member*** shall adopt and ***develop comprehensive and coordinated policies*** and ***programs*** of vocational guidance and vocational training, closely linked with employment, in particular through public employment service.				12 - SA 8000 9.5.a.	clear definition of roles, responsibilities, and authority;			
							12 - SA 8000 9.5.b.	training of new and/or temporary employees upon hiring;			
		142.1.2.	These policies and programs shall take due account of:				12 - SA 8000 9.5.c.	periodic training and awareness programs for existing employees,			
		142.1.2.a.	***employment needs, opportunities and problems, both regional and national;***				12 - SA 8000 9.5.d.	continuous monitoring of activities and results to demonstrate the effectiveness of systems implemented to meet the company's policy and the requirements of this standards.			
		142.1.2.b.	the stage and ***level of economic, social and*** culture development; and								
		142.1.2.c.	the ***mutual relationship*** between ***human resources development and other economic,*** social and cultural objectives.								
		142.1.3.	The ***policies and programs*** shall be ***pursued by*** methods that are ***appropriate to national*** condition.								
		142.1.4.	the ***policies and programs*** shall be ***designed to improve the ability of the 'individual to*** understand and, individually and collectively, to influence the working and social environment.								
		142.1.5.	the ***policies and program*** shall be ***encourage and enable all persons, on an equal basis*** and ***without any discrimination whatsoever, to*** develop and use their capabilities for work in their own best interests and in accordance with their own aspiration, account being taken of the needs of society.								
		142.2.	***each Member*** shall establish and ***develop open, flexible and complementary systems*** of general, technical and 'vocational 'training, whether these activities take place within the system of formal education or outside it.								
		142.5.	***Policies and programs*** of ***vocational guidance*** and vocational training shall be ***formulated*** and implemented in co-operation with employers and workers organizations and as appropriate and in accordance with national law and practice" with other interested bodies.								
	Total (No of Questionnaires = 2)			2	0	0			2	0	0

Table 1.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - India	Fully	Partially	None	conv.#	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)				Occupational Safety / Health									
1	Are issues on health and safety reported through a health and safety focal point?	155.4.1.	1	0	0	40 - B 40.B.1. 40.B.1.i. 40.B.1.ii.	*Safety officer:* every factory Wherein *one thousand or more workers* are ordinarily employed; or Wherein, in the *opinion of the State Government* any manufacturing process or operation is carried on, which process or operation involves any risk of bodily injury, poisoning or disease, or any other hazard to health, to the person employed in the factory; the occupier shall, if so required by the State Government by notification in the Official Gazette, *employ such number of Safety Officers* as may be specified in that notification.	1	0	0	1.a.	Yes, accidents are reported.	1	0	0
2	If "Yes", how is the information used?	161. 161.5. 161.5.a. 161.5.b. 161.5.c. 161.5.d. 161.5.e. 161.5.f. 161.5.g. 161.5.h. 161.5.i. 161.5.j. 161.5.k.	1	0	0	68-O-3. 68-O-3.a. 68-O-3.b. 68-O-3.c. 68-O-4. 68-O-4.a. 68-O-4.b. 68-O-4.c 68-O-4.d. 68-O-4.e. 68-O-4.f. 68-O-4.g.	The health and safety should contain or deal with: declared intention and commitment of the top management to health, safety and environment and compliance with all the relevant statutory requirements; Organizational set up to carry out the declared policy assigning the responsibility at different levels; and Arrangements for making the policy effective. In particular, the policy shall specify the following: Arrangement for involving the workers; Intention of taking account the health and safety performance of individuals at different level while considering their career advancement; Fixing the responsibility of the contractors, sub-contractors, transports and other agencies entering the premises; Providing a resume of health and safety performance of the factory in its annual report; Relevant techniques and methods such as safety audits and risk assessment for periodical assessment at least once in every two years of the status on health, safety and environment and taking all the remedial measures; Stating its intention to integrate health and safety, in all decision including these dealing with purchase of plant, equipment, machinery and material as well as selection and placement of personnel; Arrangements for informing, educating and training and retraining its own employees at different levels and the public, wherever required.	1	0	0	1.b.	There is a safety officer. Information is exercised through the safety officer.	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - India	Fully	Partially	None	conv.#	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)													
3	Are hourly and temporary workers also covered?	161.13.	1	0	0	68-O-6. 68-O-6.a. 68-O-6.b. 68-O-6.c.	The policy shall be made widely known by: making copies available to all workers including contract workers, apprentices, transport workers suppliers, etc. displaying copies of the policy at conspicuous places, and any other means of communication; in a language understood by majority of workers.	1	0	0	1.c.	Yes, all employees are covered under employee *State Insurance Scheme.*	1	0	0
4	Is there permanent health and safety training	155.5.c. 155.19.d.	1	0	0			0	0	1	2.a.	No, there is no health and safety training.	0	0	1
5	Are first aid, fir prevention, cleaning, lighting, building inspection, health and safety provisions provided by the company?	155.16.3. 155.18.	1	0	0	35 35.a. 35.b. 38 38.1 38.1.a. 38.1.b. 40	***Protection of eye***: In respect of any such manufacturing process carried on any factory as may be prescribed, being a process which involves: ***risk of injury to the eyes*** from ***particles or fragments*** thrown off in the course of the process; or ***risk to the eyes*** by ***reason of exposure to excessive light***, the ***State Government*** my by rules require that effective screens or suitable goggles shall be provided for the protection of persons employed on, or in the immediate vicinity of, the process. ***Precautions in case of fire*** In any factory, all practicable measures shall be taken to prevent outbreak of fire and its spread, both internally and externally, and to provide and maintain; safe means of escape for all persons in the event of a fire, and the necessary equipment and facilities for extinguishing fire. ***Safety of building and machinery***:	1	0	0	3.0	To certain extent	0	1	0.
6	Does the enterprise provide protective gear against dust, airborne particles and noise?	148.7.1.	1	0	0			0	0	1	4.0	Yes	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - India	Fully	Partially	None	conv.#	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)													
7	Does the company provide gears to workers handleing and exposed to chemicals?	170.13.1. 170.13.1.a. 170.13.1.b. 170.13.1.c. 170.13.1.d. 170.13.1.e. 170.13.1.f.	1	0	0		The occupier shall, at the time of registering the factory involving a hazardous process, lay own a detailed policy with respect to the health and safety of theworkers employed therein.	1	0	0	5	Yes, it provides	1	0	0
8	Is it mandatory to wear or operate protective gear during operation?	170.17.1. 170.17.2.	1	0	0	41-G.1 40 - B 40.B.1 40.B.1.i 40.B.1.ii	The occupier shall, in every factory where a hazardous process takes place, or where hazardous substances are use or handled, set up a ***Safety Committee*** consisting of ***equal number of representatives of workers and management*** to promote co-operation between the workers and the management in maintaining ***proper safety and health at work***(...)., ***Safety officer:*** every factory Wherein ***one thousand or more workers*** are ordinarily employed; or Wherein, in the ***opinion of the State Government*** any manufacturing process or operation is carried on, which process or operation involves any risk of bodily injury, poisoning or disease, or any other hazard to health, to the person employed in the factory; the occupier shall, if so required by the State Government by notification in the Official Gazette, ***employ such number of Safety Officers*** as may be specified in that notification.	1	0	0	6	Yes, it is mandatory to wear protective gear during opera	1	0	0
9	Do you keep track of the number of incidents of: a. accident b. disease and infections, and c. exposure to hazardous / toxic chemicals		0	0	1			0	0	1	8.a. 8 b. 8.c.	Yes, to certain extent Yes, to certain extent Yes, to certain extent	0	1	0

Table 1. Cont

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - India	Fully	Partially	None	conv.#	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)													
10	When you receive a new chemicals to be used to the specification of your foreign client, do you have training and educate your staff on procedures for safe handling and dispose of the client?	170.15.a. 170.15.b. 170.15.c. 170.15.d.	1	0	0			0	0	1	9.0	No	0	0	1
11	Are all of your workers covered under workers compensation?	17.1. 17.5.	1	0	0	87-A 87-4 87-5	Power or prohibit employment on account of serious hazard . Any person whose employment has been affected by an order issued under sub-s (1), shall be entitled to wages and other benefits and it shall be the dutyof the occupier to provide alternative employment to him wherever possibleand in the manner prescribed. The provisions shall be without prejudice to the rights of the parties underthe industrial Disputes Act. 1947.94 of 1947.	1	0	0	10.0	Yes, except workers mentioned under 2b.	0	1	0
12	What internal mechanism do you have to set up your own safety and health procedures - particlearly in the context of having to meet foreign standards recognized and prescribed by your clients?		0	0	1			0	0	1	12.0	Not available	0	0	1
13	What requirements, if any, do you have for workers to access a doctor or nurse, free of charge, for work related health examination?	130.9. 130.13. 130.13.a. 130.13. b. 130.13. c. 130.13.d. 130.13.e. 130.13. f.	1	0	0			0	0	1	17	Under EIS scheme employees get medical benefits like treatment for self and family	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - India	Fully	Partially	None	conv.#	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)													
14	When a worker is injured, is there a rehabilitation program which he/she can participate sponsored by the employer?	159.2. 159.3. 159.4.	1	0	0			0	0	1	18	Compensation for accidents commensurate with the loss including loss of limbs, loss due to abstainingfrom work, etc.	1	0	0
15	Do you have a system for monitoring air pollution, noise, and vibration?	148.8. 148.9. 148.9.a. 148.9.b.	1	0	0	15.1 11.1 12.1	In respect of all factories in which the humidity of the air is artificially increased, the State Government may make rules. Every factory shall be kept clean and free from effluvia arising from any drain, privy or other nuisance. Effective arrangements shall be make in every factory for the treatments of waste and effluent.	1	0	0	19	No	0	0	1
16	Do you conduct periodic medical examination of your workers?	130 16.1.	1	0	0			0	0	1		Yes, there is medical examination.	1	0	0
17	Do you have an in-house chemical safety procedure?	170.7.1. 170.7.2. 170.8. 170.8.1. 170.8.2. 170.8.3.	1	0	0	68 - Q 68 - Q. 2. 68 - Q. 2.a. 68 - Q. 2 b. 68 - Q. 2.c. 68 - Q. 2.b.	**Labeling** Every container of hazardous substance shall be clearly labeled or marked to identify: the content of the container; the name and address of the manufacturer or import of hazardous substances; the physical and health hazards; and the recommended personal protective equipment needed to work safely with the hazardous substance.	1	0	0		There is but not clearly mentioned.	0	1	0
			15	0	2			9	0	8			9	4	4

Table 2.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	conv.#	Existing Social Performance -Factory A	Fully	Partially	None
		(ILO Convention)				**Non-Discrimination**									
1	How do workers realize their rights as employees?	87. 87.2. 87.3. 87.4. 87.5.	1	0	0			1	0	0	1.a	through free labor association	1	0	0
2	Are special provision given to pregnant women or those who recently gave birth to a child or experienced miscarriage?	111 111.2.	1	0	0			0	1	0	2.a.	Women have the right to take their maternity leave. Women have equal right to be hired.	1	0	0

Table 2. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	conv.#	Existing Social Performance -Factory A	Fully	Partially	None
		(ILO Convention)													
4	Are codes of conduct/ethics for operating your business prescribed by your principal clients, such as child labor, remuneration, minimum wage, etc.?			specific question for the considered company					specific question for the considered company				0	0	1
5	Are these codes in line with national standards?			specific question for the considered company					specific question for the considered company				0	0	1
6	Do you have a system of self -inspection to help comply with standards and norms prescribed by your clients?			specific question for the considered company					specific question for the considered company				0	0	1
7	Does your client assist or intervene in the inspection process?			specific question for the considered company					specific question for the considered company				0	0	1
			2	0	0			1	1	0			2	0	4

Table 3.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance- Factory A	Fully	Partially	None
		(ILO Convention)				**Communication/Work Environment**									
1	Is there an environmental policy in the factory? Has the environmental policy been communicated to the staff? If 'Yes', how are these circulated? How is the policy enforced?		0	0	1			0	1		1.a.	No	0	0	1
2	Are there safeguards to ensure its enforcement?	81.2.1.	1	0	0		**India ratified this Convention No. 81 without denunciations (ILO Chart of 1 January 1991)** **Constitution of Site Appraisal Committee**	1	0	0	1.e.	No	0	0	1
3	Are policy directives/guidelines on environment, health and social issues include health and safety provisions? If 'Yes' , how are they circulated?	81.3.1. 81.3.1.a. 81.3.1.b. 81.3.1.c.	1	0	0	41-A 41.1.	The State Government may, for purposes of advising it to consider application for grant of permission for the initial location of a factory involving a hazardous process or for the expansion of any such factory.	1	0	0	2.a.	No	0	0	1
4	Is information of international requirements how are these circulated? (if applicable) being communicated to staff? If 'Yes',		0	0	1			0	0	1	3.a.	No	0	0	1

Table 3. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance- Factory A	Fully	Partially	None
		(ILO Convention)													
5	Is there a training program on skill up gradation?	140.2.	1	0	0			0	0	1	4.a.	There is no official program , but training is carried out where necessary.	0	1	0
		140.2.a.													
		140.2.b.													
		140.2.c.													
		140.3.													
		140.3.a.													
		140.3.b.													
		140.3.c.													
		140.3.d.													

Table 3. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance- Factory A	Fully	Partially	None
6	What salary level groups receive training?	142.1.1. 142.1.5.	1	0	0			0	0	1	4.c.	All	1	0	0
7	Do you have an in-house safety and health awareness program?	155.5. 155.5.a. 155.5.b. 155.5.c. 155.5.d. 155.5.e.	1	0	0	**68 - O** 68-O-1. 68-O-2.	**Health and Safety Policy** The occupier of every factory covered under the first schedule under section 2(b) or carrying out processes or operations declared to be dangerous under section 87 of the Act shall prepare a written statement of his policy in respect of health and safety of workers at work. Notwithstanding anything contained in sub -rule (1) the Chief Inspector may requires the occupiers of any of the factories or class or description of factories to comply with the requirements of sub-rule (1), if , in his opinion, it is expedite to do so.	1	0	0	4.d	Not applicable	0	0	1
			5	0	2			3	1	3			1	1	5

Table 4.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance - Factory A	Yes	Partially	NO
		(ILO Convention)				Working Hours									
	Do you have night shift?										1.a	Yes, there is night shift.			
1	What guidelines do you follow for night work for women and young women?	**89**	1	0	0		**ILO Convention No. 89 ratified, Comments**	1	0	0	2.a	There is no night shift work for women and young persons.	1	0	0
		89.2					**to art. 66 India ratified this Convention No. 89**								
							without denunciations (ILO Chart of 1								
							January 1991)								
		89.3.													
		89.4.													
		89.4.a.													
		89.4.b.													
		89.6.													
		89.7.													
		90					**ILO Convention No. 90 ratified, Comments to art. 66**								
		90.2.1.					**India ratified this Convention No. 90 without**								
		90.2.2.					**denunciations (ILO Chart of 1 January 1991)**								
		90.2.3.													
		90.3.1.													
		90.3.3.													
		90.4.1.													
		90.4.2.													

Table 4. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance - Factory A	Yes	Partially	NO
			(ILO Convention)												
2	What is the maximum number of hours of overtime that you allow your workers?	**14** 14.2.1. 14.2.3. 14.4.1.	1	0	0	**52** 52.1. 52.1.a. 52.1.b. 52.1.b.i. 52.1.b.ii.	**Weekly Holidays** No adult worker shall be required or allowed to work in factory on the first day of the week unless; he has or will have a holiday for a whole day on one of the three days immediately before or after the said day; the manager of the factory has, before the said day or the substituted day under clause (a) whichever is earlier,- delivered a noticed at the office of the Inspector of his intention to require the worker to work on the said and of the day which is to be substituted, and displayed a notice to that effect in the factory.	1	0	0	3.a.	8 hours - 'Max. overtime work	1	0	0
3	What is your sick leave and holiday leave practices? Are there exceptions to this rule?	52.2.5. 52.3. 52.3.a. 52.3.b. **132** 132.3.1. 132.3.2.	1	0	0	**53** 79.1 80.1 53.1. 53.2.	**Compensatory Holiday** Every ***worker*** who has worked for a ***period of 240 days*** or more in factory during a calendar year shall be allowed during the subsequent calendar year, ***leave with wages*** for a number of days calculated at the rate of : i) if an adult , one day for every day for every twenty days of work performed by him during the previous calendar year: ii) if a child, one day for every fifteen days of work performed by him . during the previous calendar year for the ***leave*** allowed to him (...) a worker shall be entitled to ***wages*** at a rate equal to the ***daily average of his total full time earnings*** for the days on which (...) during the month immediately preceding his leave. Where, as a result of the passing of an order or the making of a rule under the provision of this Act exempting a factory or the workers therein from the provisions of s. 52, a worker is deprived of any of the weekly holidays for which provision is made in sub-s (1) of that section, he shall be allowed, within the month in which the holidays were due to him or within the two months immediately following that month, compensatory holidays of equal number to the holidays so lost. The state government may prescribe the manner in which the holidays for which provision is made in sub-s (1) shall be allowed.	1	0	0	4.a.	There is sick and holidays leave.	0	1	0
			3	0	0			3	0	0			2	1	0

Table 5.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)				Wage									
1	Are your youngest and newest and least experienced workers paid a minimum wage?	95.10.1.	1	0	0			0	0	1	1.a.	Yes, Min. wage Rs. 282.88	1	0	0
			1	0	0			0	0	1			1	0	0

Table 6.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)				Training/ Education/ Awareness: Factory A									
1	Do you seek the services of training providers (locally) to help up grade the skills of your workers?	140	1	0	0			0	0	1	6.12	No staff awareness of policy	0	0	1
		140.2.													
											6.41	No regular training program			
		140.2.a.									6.42	No access to training			
		140.2.b.													
		140.2.c.									6.13	No active awareness program			
		140.3.									6.14	No active enforcement program			
		140.3.a.													
		140.3.b.													
		140.3.c.									6.3	No active aware of provision			
		140.3.d.													
		140.7.													
		140.8.													

Table 6. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indian	Fully	Partially	None	Conv #	Existing Social Performance - Factory A	Fully	Partially	None
		(ILO Convention)													
2	Do you have an in-house safety and health awareness program?	142						0	0	1	6.43	No training to improve quality standards	0	0	1
		142.1.1.	1	0	0										
		142.1.2.									6.44	No special training for women			
		142.1.2.a.													
		142.1.2.b.													
		142.1.2.c.													
		142.1.3.													
		142.1.4.													
		142.1.5.													
		142.2.													
		142.5.													
			2	0	0			0	0	2			0	0	2

Table 1.

	Questionnaire	conv #	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance -Factory B	Fully	Partially	None
		ILO Convention				Occupational Safety / Health									
1	Are issues on health and safety reported through a health and safety focal point?	155.4.1.	1	0	0			0	0	1	1.a.	SPSI committee meets regularly with supervisors to report incidents of injury/ accidents/illness.	1	0	0
2	If "Yes", how is the information used?	161.	1	0	0						1.b.	Committee report is past on to the personnel depa	1	0	0
		161.5.				Reg. No. Per-03/Men/1982.3.1	Every worker shall be entitled to medical service.	0	1	0		reports to the Min.			
		161.5.a.				Reg No. per-03/Men/1982. 1..a.	Medical service means health activity performed with the purpose of:								
		161.5.b.					1. Assisting the workers in the adjustment of their employment								
							2. Protecting workers against every health defect caused by the employment of work environment.								
							3. Improving health, mental condition and physical attitude								
		161.5.c.					4. Providing medical treatment, medical care and rehabilitation to workers suffering from disease.								
						Reg. No. Per-03/Men?1982. 5.	The arrangement of medical service shall be conducted and performed by a doctor who has been approved by the director.								
		161.5.d.													
		161.5.e.													
		161.5.f.													
		161.5.g.													
		161.5.h.													
		161.5.i.													
		161.5.j.													
		161.5.k.													

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance -Factory B	Fully	Partially	None
		ILO Convention													
3	covered?	161.13.	1	0	0			0	0	1	1.c.	No	0	0	1
4	Is there permanent health and safety training	155.5.c.	1	0	0			0	1	0	2.a.	New employees required to undergo 3 day training. Additional 'training provided by the supply of chemicals.	1	0	0
		155.19.d.				Reg.No. PER.01/Men/1976. SZ. 1.	Every undertaking is required to send its company doctor to take training in the field of industrial hygiene, occupational health and safety.								
5	lighting, provisions provided by the company?	155.16.3.	1	0	0	Act. No. 1 of 1970 on Safety , SGNo. 1.12.b.	Legislative regulations shall lay down the obligation and rights workers to; use obligatory personal protective equipment	1	0	0	3.0	In-house doctors/nurses and clinic available. Manual steam release valve and automated sprinklers available above high temp operating machines.	1	0	0
		155.18.				Act No. 1 of 1970 on Safety SG No. 1., 9.1	A manager shall demonstrate and explain to every worker:								
						Act No. 1 of 1970 on Safety SG No. 1., 9.1.a	the ***conditions and dangers*** which may occur in his ***workplace***								
						Act No. 1 of 1970 on Safety SG No. 1., 9.1.b	all ***safety devices and protective equipment*** which is obligatory								
6	against dust, airborne particles and noise?	148.7.1.	1	0	0	Act No. 1 of 1970 on Safety SG No. 1., 9.1.a	the ***conditions and dangers*** which may occur in his ***workplace*** all ***safety devices and protective equipment*** which is obligatory	1	0	0	4	Comply with buyer stipulated conditions and in-house policy.	1	0	0
						Act No. 1 of 1970 on Safety SG No. 1., 9.1.b	***occupational hazards*** due to ***air pollution, noise and vibration*** in the working environment.								

Table I. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance -Factory B	Fully	Partially	None
		ILO Convention													
7	handle- ing and exposed to chemicals?	170.13.1. 170.13.1.a. 170.13.1.b. 170.13.1.c. 170.13.1.d. 170.13.1.e. 170.13.1.f.	1	0	0			1	0	0	5	Yes, it provides	1	0	0
8	gear during operation?	170.17.1. 170.17.2.	1	0	0	Act No 1. 1970, 12 Act No 1. 1970, 12.a Act No 1. 1970, 12.b Act No 1. 1970, 12.c Act No 1. 1970, 12.d	*Legislative regulations* shall lay down the *obligations and rights* of workers to: *provide accurate information* upon request by a Safety Inspector or Safety Expert; use obligatory personal *protective equipment;* *fulfill and obey obligatory safety and healthy condition;* *request* the manager to carry out all *obligatory safety and health* condition;	1	0	0	6	Spot check conducted on periodic basis. Warnings are issued for non-compliance.	1	0	0
9	of: a. accident b. disease and infections; and c. exposure to hazardous / toxic chemicals		0	0	1			0	0	1	 8.a. 8.b. 8.c.	 Yes, No No	0	1	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance -Factory B	Fully	Partially	None
		ILO Convention													
10	used you procedures for safe handling and dispose of the client?	170.15.a. 170.15.b. 170.15.c. 170.15.d.	1	0	0	9	No	0	0	1	9.0	No	0	0	1
11	workers compensation?	17.1. 17.5.	1	0	0	10	Yes, except the workers mentioned under 2b	1	0	0	10.0	Yes, except the workers mentioned under 2b.	0	1	0
12	What internal mechanism do you have to set particle- arly in the context of having to meet foreign clients?		0	0	1	12	'Not available	0	0	1	12.0	'Not available	0	0	1
13	workers to work related health examination?	130.9. 130.13. 130.13.a. 130.13. b. 130.13. c. 130.13.d. 130.13.e. 130.13. f.	1	0	0	17	Clinics are available	1	0	0	17	Under EIS scheme employees get medical benefitslike treatment for self and family	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance -Factory B	Fully	Partially	None
		ILO Convention													
14	*rehabilitation* sponsored by the employer?	159.2. 159.3 159.4.	1	0	0		No	0	0	1	18	Compensation for accidents commensurate with the loss including loss of limbs, loss due to abstainingwith from work, etc.	1	0	0
15	pollution, noise, and vibration?	148.8. 148.9. 148.9.a. 148.9.b.	1	0	0		No	0	0	1	19	No	0	0	1
16	examination of your workers?	130.16.1.	1	0	0		Not available	0	0	1		Yes, there is medical examination.	1	0	0
17	procedure?	170.7.1. 170.7.2 **170.8.** 170.8.1. 170.8.2. 170.8.3.	1	0	0		No	0	0	1		There is but not clearly mentioned.	0	1	0
			15	0	2			6	2	9			10	3	4

Table 2.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance - Factory B	Fully	Partially	None
		ILO Convention				Non-Discrimination									
1	How do workers realize their rights as employees?	**87.** 87.2. 87.3. 87.4. 87.5.	1	0	0			0	0	1	1.a.	through free labor association	1	0	0
2	Are special provision given to pregnant women or those who recently gave birth to a child or experienced miscarriage?	**111** 111.2.	1	0	0			0	0	1	2.a.	Hiring based on merit and no provision made specifically to hire women. 3 months offered with option to return to the same job.	1	0	0

Table 2. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	conv.#	Existing Social Performance - Factory B	Fully	Partially	None
				ILO Convention											
4	Are codes of conduct/ethics for operating your business prescribed by your principal clients, such as child labor, remuneration, minimum wage, etc.?			specific question for the considered company					specific question for the considered company				0	0	1
5	Are these codes in line with national standards?			specific question for the considered company					specific question for the considered company				0	0	1
6	Do you have a system of self-inspection to help comply with standards and norms prescribed by your clients?			specific question for the considered company					specific question for the considered company				0	0	1
7	Does your client assist or intervene in the inspection process?			specific question for the considered company					specific question for the considered company				0	0	1
			2	0	0			0	0	2			2	0	4

Table 3. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	Conv #	Existing Social Performance - Factory B	Fully	Partially	None
		ILO Convention					**Communication/Work Environment**								
1	Is there an environmental policy in the factory? Has the environmental policy been communicated to the staff? If 'Yes', how are these circulated? How is the policy enforced?		0	0	1			0	0	1	1.a	Follow national policy. Environmental group under utility department respond to specific issue, but no distinct in-house 'policy. Supervisors tasked with communicating changes in policy/other policy issues. In-house training provided by SPSI SPSI conducts monthly unscheduled checks for S/H policy compliance.	1	0	0
2	Are there safeguards to ensure its enforcement?	81.2.1.	1	0	0	Act No. 1 of SG No. 1., Act No. 1 of	that every worker is entitled to ***protection of his safety*** in performing work for his well-being and an increase in national production and productivity (...) ***Safety Inspection and Safety Experts*** have the duty of directly supervising the observance of this Act and assisting in its implementation	1	0	0	2.a.	Self inspection by SPSI and monthly check by regional branch of Min. of Manpower. Offer company-financed community center /training program for local residence.	1	0	0
3	Are policy directives/guidelines on environment, health and social issues include health and safety provisions? If 'Yes' , how are they circulated?	81.3.1. 81.3.1.a. 81.3.1.b. 81.3.1.c.	1	0	0	Act No. 1 of on Safety, SG No. 1., 5.2 Act No 1	(...) the implementation of this act, shall be laid down by legislative regulation. The officials of the ***Labor Inspection Service*** appointed by the Minister charged with labor affairs are entitled to give ***instructions regarding the maintenance of cleanliness and health in any work-place and*** employees' accommodation provided by the employer.	1	0	0			1	0	0
4	Is information of international requirements (if applicable) being communicated to staff? If 'Yes', how are these circulated?		0	0	1			0 0	0 0	1 1	3.a.	No specific awareness program, but part of in-house standard.	0	0	1

Table 3. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	Conv #	Existing Social Performance - Factory B	Fully	Partially	None
		ILO Convention													
5	Is there a training program on skill up gradation?	140.2. 140.2.a. 140.2.b. 140.2.c. 140.3. 140.3.a. 140.3.b. 140.3.c. 140.3.d.	1	0	0							All employees receive 3 day inception training. In addition, 80% of the total work force trained in one form or another each year.	1	0	0
6	What salary level groups receive training?	142.1.1. 142.1.5.	1	0	0			0	0	1		Merit basis as prescribed by immediate supervisor. Out soured training of trainers available.	1	0	0
7	Do you have an in-house safety and health awareness program?	155.5. 155.5.a. 155.5.b. 155.5.c. 155.5.d. 155.5.e.	1	0	0			0	0	1		Committee work with supervisor to correct any errors, report is provided to management for action.	1	0	0
			5	0	2			2	0	5			6	0	1

Table 4.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislauon - Indonesia	Fully	Partially	None	Conv #	Existing Social Performance - Factory B	Fully	Partially	None
		(ILO Convention)				Working Hours									
	Do you have night shift?											Yes			
1	What guidelines do you follow for night work for women and young women?	89	1	0	0										
		89.2				ORD 17 Dec. 1925 on 'SG No 647 of 1925. 3.	***A woman*** may ***not perform work between 10 p.m. and 5 a.m, (...)*** unless such is permitted by or under a decision of the Governor General	1	0	0		Comply with national policy	1	0	0
		89.3.													
		89.4.													
		89.4.a.													
		89.4.b.													
		89.6.													
		89.7.													
		90													
		90.2.1.				Act No. 1. 1951. SZ 1.1.c	***Young persons*** means a male or female person over the age								
		90.2.2.				not brought into force Act No. 1. 1951. SZ 4.1	of 14 years but under the age of 18 years. ***Young persons*** shall not be ***permitted to perform work*** during								
		90.2.3.				brought not into force Act No. 1. 1951. SZ 4.2 brought not into force	***night time***. Exceptions to the prohibition in (1) above may be permitted where the ***employment of young persons during night*** cannot be avoided for reasons of public interest or welfare.								
		90.3.1.													
		90.3.3.													
		90.4.1.													
		90.4.2.													

Table 4. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	Conv #	Existing Social Performance - Factory B	Fully	Partially	None
		ILO Convention													
2	What is the maximum number of hours of overtime that you allow your workers?	14 14.2.1. 14.2.3. 14.4.1.	1	0	0	Act No 1. 1951. SZ No 10.3. Act No 1. 1951. SZ No 10.1.	In ***every week*** at least ***one day of rest*** shall be granted. Employees shall ***not be permitted*** to work for ***more than 7 hours a day or 40 hours a week.*** When work is performed ***during night-time or is dangerous*** to ***the health or safety of the employees*** the work time shall ***not exceed 6 hours a day or 35 hours a week.***	1	0	0		Comply with national policy	1	0	0
3	What is your sick leave and holiday leave practices? Are there exceptions to this rule?	52.2.5. 52.3. 52.3.a. 52.3.b. 132 132.3.1. 132.3.2.	1	0	0	GR No 21 of 1954 on SG No. 37 2.1. GR No 21 of 1954 on SG No. 37 2.2. GR No 21 of 1954 on SG No. 37, 4. 1. GR No 21 of 1954 on SG No. 37, 4.3. GR No 21 of 1954 on SG No. 37 4.3. GR No 21 of 1954 on SG No. 37 2.2. 	***A worker*** shall ***be entitled to annual leave*** after every period of ***twelve successive months.*** The ***duration of the annual leave*** shall be calculated on the basis of ***one day's leave for every 23 working days*** with in the service period referred to in paragraph 1 above, ***up to a maximum of 12 working days.*** During ***annual leave*** a worker shall ***be entitled to full wage.*** ***Annual leave*** shall be ***uninterrupted.*** ***For daily workers vacation wages*** shall ***be paid before*** the ***beginning*** of the ***annual leave.*** The ***duration of the annual leave*** shall be calculated on the basis of ***one day's leave for every 23 working days (...) up to a*** maximum of 12 working days.	1	0	0		Comply with national policy. but extended leave recognized without threat to job security.	1	0	0
			3	0	0			3	0	0			3	0	0

Table 6.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	Conv #	Existing Social Performance - Factory B	Fully	Partially	None
		ILO Convention													
1	Do you seek the services of training providers (locally) to help up grade the skills of your workers?	**140**	1	0	0			0	0	1		'In-house training provided by SPSI	1	0	0
		140.2.													
		140.2.a.													
		140.2.b.													
		140.2.c.													
		140.3.													
		140.3.a.													
		140.3.b.													
		140.3.c.													
		140.3.d.													
		140.7.													
		140.8.													

Table 6. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Indonesia	Fully	Partially	None	Conv #	Existing Social Performance - Factory B	Fully	Partially	None
		ILO Convention													
2	Do you have an in-house safety and health awareness program?	**142**						0	0	1		SPSI conducts monthly unscheduled checks for safety and health policy compliance.	1	0	0
		142.1.1.	1	0	0										
		142.1.2.													
		142.1.2.a.													
		142.1.2.b.													
		142.1.2.c.													
		142.1.3.													
		142.1.4.													
		142.1.5.													
		142.2.													
		142.5.													
			2	0	0			0	0	2			2	0	0

Table 1.

	Questionnaire	conv #	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)					**Occupational Safety / Health**								
1	Are issues on health and safety reported through a health and safety focal point?	155.4.1.	1	0	0	17.3.g	the Minister may make regulations in terms of that subsection providing for the implementation of any national and international standards of employment, including those related to the rights and obligations of employers and employees as to safety, health and compensation for occupational disablement	1	0	0	1.a	Yes, accidents are reported.	1	0	0
2	If "Yes", how is the information used?	**161.** 161.5. 161.5.a. 161.5.b. 161.5.c. 161.5.d. 161.5.e. 161.5.f. 161.5.g. 161.5.h. 161.5.i. 161.5.j. 161.5.k.	1	0	0	FA 14.4	Every medical practitioner who attains any patient whom he believes to be suffering from lead, phosphorus, arsenic or mercurial poisoning or anthrax which may have been contracted as a result of his employment in a factory shall forthwith report the matter in writing to an inspector.	0	1	0	1.b	Not explained	0	0	1

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)													
3	covered?	161.13.	1	0	0			0	0	1	1.c.	Yes, all employees are covered under employee State Insurance Scheme.	1	0	0
4	Is there permanent health and safety training	155.5.c.	1	0	0	7.2.	Every employer shall permit a labor relations officer or a representative of the appropriate trade union or employment board, if *any, to have reasonable access to his employees at their place of work* during working hours for the purpose of:	1	0	0	2.a	No, there is no health and safety training.	0	0	1
		155.19.d.				7.2.a	advising the employees on the law relating to their employment								
						7.2. c	ensuring that the rights and interests of the employees are protected								
5	Are first aid, fir prevention, cleaning, lighting, provisions provided by the company?	155.16 3	1	0	0			0	0	1	3	To some extent	0	1	0
		155.18.													
6	against dust, airborne particles and noise?	148.7.1.	1	0	0	FA. 30.1	No person shall a) willfully or negligently injure or interfere with; or b) misuse; or c) in a negligent manner use; any means, appliance, convenience or other thing provided in pursuance of this Act for securing health, safety or welfare of employees in any factory (...)	1	0	0	4	Yes	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)													
7	handle- ing and exposed to chemicals?	170.13.1. 170.13.1.a. 170.13.1.b. 170.13.1.c. 170.13.1.d. 170.13.1.e. 170.13.1.f.	1	0	0			0	0	1	5	Yes, it provides	1	0	0
8	gear during operation?	170.17.1. 170.17.2.	1	0	0	FA 30.1 FA 30.2	No person shall (...) any means, appliance, convenience or other thing provided in pursuance of this Act for securing the health, safety or welfare of employees in any factory or place where structural work is being performed Where any means. appliance or other thing for securing health or safety is provided (...) for the use of an employee engaged in any process, he shall use such means, appliance or other thing while so engaged	1	0	0	6	Yes, it is mandatory to wear protective gear during operation.	1	0	0
9	of: a. accident b. disease and infections, and c. exposure to hazardous / toxic chemicals		0	0	1			0	0	1	 8.a. 8.b. 8.c.	 Yes, No No	0	1	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)													
10	used you procedures for safe handling and dispose of the client?	170.15.a. 170.15.b. 170.15.c. 170.15.d.	1	0	0	7.2. 7.2.a 7.2. c	Every employer shall permit a labor relations officer or a representative of the appropriate trade union or employment board, if any, to have reasonable access to his employees at their place of work during working hours for the purpose of: advising the employees on the law relating to their employment ensuring that the rights and interests of the employees are protected and advanced	1	0	0	9	Yes, there is .	1	0	0
11	workers compensation?	17.1. 17.5.	1	0	0	**14**	**Incapacitation of worker by illness or accident** Except where more favorable conditions have otherwise been provided for in the contract of employment concerned or in terms of any relevant enactment - 14.a where an employee becomes temporarily incapacitated by reason of illness or accident not selfinflicted he shall (...) be entitled to receive his wages and all other benefits provided expressly or impliedly in his employment contract for a period of not less than, in any one year of service, twenty-two working days in relation to a five-day working week, or a twenty-six working days in relation to a six-day working week 14.b where, owing to illness or accident, an employee is unable for a period exceeding one month to fulfill the conditions of his employment contract, the employer shall be entitle to terminate the contract on due notice, and in such event the employee shall be entitled to all the benefits provided for expressly or impliedly in his employment contract up to the ate of termination.	1	0	0	5.37.3.	Yes, there is worker's compensation.	1	0	0
12	What internal mechanism do you have to set particle- arly in the context of having to meet foreign clients?		0	0	1			0	0	1	12	'Not available	0	0	1
13	workers to work related health examination?	130.9. 130.13. 130.13.a. 130.13. b. 130.13. c. 130.13.d. 130.13.e. 130.13. f.	1	0	0	17.3.g	the Minister may make regulations in terms of that subsection providing for the establishment of pension, social security, sick, medical, holiday, provident, insurance, and other funds of employees, and the levying of contribution thereto by employers and employees	0	1	0	17	Workers have the right to visit a doctor or a nurse, free of charge for work related health examination	1	0	0

Table 1. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)													
14	rehabilitation sponsored by the employer?	159.2. 159.3. 159.4.	1	0	0	17.3.g 17.3.h 17.3.k	the Minister may make regulations in terms of that subsection providing for the establishment of pension, social security, sick, medical, holiday, provident, insurance, and other funds of employees, and the levying of contribution thereto by employers and employees the Minister may make regulations in terms of that subsection providing for the special conditions that shall be applicable to female, juvenile and disabled employees, including the prohibition of employment of persons below the age of sixteen. the Minister may make regulations in terms of that subsection providing for the encouragement of employment of disabled persons and the remuneration and allowances payable to, and the facilities which should provide for such persons	1	0	0	18	Only work compensation	0	1	0
15	pollution, noise, and vibration?	148.8. 148.9. 148.9.a. 148.9.b.	1	0	0			0	0	0	19	No	0	0	1
16	of your workers?	130.16.1.	1	0	0			0	0	1	21	Yes, there is medical examination.	1	0	0
17	procedure?	170.7.1. 170.7.2. **170.8.** 170.8.1. 170.8.2. 170.8.3.	1	0	0	3.3.c.1.	All ***advertisement and labeling*** of products is ***complete, fair*** and ***honest.*** Only claims which can be substantiated and full filled are made by the company, its employees and its agent.	1	0	0	22	There is chemical safety data sheet containing detailed essential information regarding their identity.	1	0	0
			15	0	2			8	2	6			10	3	4

Table 2.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)					**Non-Discrimination**								
1	How do workers realize their rights as employees?	87. 87.2. 87.3. 87.4. 87.5.	1	0	0	7 7.1.a '4.1.c 27.1 27.2 27.3	Protection of employees' right to democracy in the work place No person shall hinder, obstruct or prevent any employee from forming 'or conducting any workers committee for the purpose of airing any grievance, negotiating any matter or advancing or protecting rights or interests of employees (...) every employee shall, (...) have the right to take part in formation and registration or certification of a trade union Subject to this act, any group of employees may form a Subject to this act, any group of employers may form an organization. Subject to this act, any group trade unions or employers may form a federation	1	0	0		through free labor association	1	0	0
2	Are special provision given to pregnant women or those who recently gave birth to a child or experienced miscarriage?	111 111.2.	1	0	0	5 5.1	**Protection of employees against discrimination** No employer shall discriminate against any employee or prospective employee on grounds of race,tribe, place of origin, political opinion, color, creed or sex.	1	0	0		No	0	0	1

Table 2. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	conv.#	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)													
3	Are codes of conduct/ethics for operating your business prescribed by your principal clients, such as child labor, remuneration, minimum wage, etc.?		specific question for the considered company					specific question for the considered company					0	0	1
4	Are these codes in line with national standards?		specific question for the considered company					specific question for the considered company					0	0	1
5	Do you have a system of self -inspection to help comply with standards and norms prescribed by your clients?		specific question for the considered company					specific question for the considered company					0	0	1
6	Does your client assist or intervene in the inspection process?		specific question for the considered company						specific question for the considered company				0	0	1
			2	0	0			2	0	0			1	0	5

Table 3.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	Conv #	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)				Communication/Work Environment									
1	Is there an environmental policy in the factory? Has the environmental policy been communicated to the staff? If 'Yes', how are these circulated? How is the policy enforced?		0	0	1			0	0		1.a.	No	0	0	1
2	Are there safeguards to ensure its enforcement?	81.2.1.	1	0	0	FA 5.1.a	Any inspector may (...),without previous notice, at any reasonable time enter any factory or any premises where structural work is performed '(..) and make such examination and inquiry as he deems necessary.	1	0	0	2.a.	No	0	0	1
3	Are policy directives/guidelines on environment, health and social issues include health and safety provisions? If 'Yes' , how are they circulated?	81.3.1. 81.3.1.a. 81.3.1.b. 81.3.1.c.	1	0	0	FA 6.1 FA 6.2 FA 7.	Where an inspector finds any act or default in relation to any drain , sanitary convenience, water supply, lighting, ventilation, nuisance or other matter in factory which is liable to be dealt with by a local authority under ***any enactment relating to public health he shall give*** notice (...) When an inspector finds any such act or default as foresaid he may take with him into the factory a medical officer of health, health or sanitary inspector or other officer of the local authority. Any inspector exercising any power or performing any duty conferred or imposed upon him by this act shall, on demand, procedure furnished to him in terms of subsection (4) of section four.	1	0	0	2.b	No	0	0	1
4	Is information of international requirements (if applicable) being communicated to staff? If 'Yes', how are these circulated?		0	0	1			0	0	1	3.a.	No	0	0	1

Table 3. Cont.

	Questionnaire	conv.# (ILO Convention)	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	Conv #	Existing Social Performance - Factory C	Fully	Partially	None
5	Is there a training program on skill up gradation?	140.2. 140.2.a. 140.2.b. 140.2.c. 140.3. 140.3.a. 140.3.b. 140.3.c. 140.3.d.	1	0	0	17.3.e	the Minister may make regulations in terms of that subsection providing for leave, including sick leave, maternity leave, and bereavement leave, that shall be granted to employees and the remuneration and allowances that shall be payable in respect thereof.	0	1	0	4.a.	There is no official program , but training is carried out where necessary.	0	1	0
6	What salary level groups receive training?	142.1.1. 142.1.5.	1	0	0	7.2. 7.2.a 7.2. c	Every employer shall permit a labor relations officer or a representative of the appropriate trade union or employment board, ifany, to have reasonable access to his employees at their place of work during working hours for the purpose of: advising the employees on the law relating to their empl. ensuring that the rights and interests of the employees are protected and advanced	1	0	0	5.a.	All	1	0	0
7	Do you have an in-house safety and health awareness program?	155.5. 155.5.a. 155.5.b. 155.5.c. 155.5.d. 155.5.e.	1	0	0	 7.2. 7.2.a 7.2. c	 Every employer shall permit a labor relations officer or a representative of the appropriate trade union or employment any, to have reasonable access to his employees at their place during working hours for the purpose of: advising the employees on the law relating to their employment ensuring that the rights and interests of the employees are advanced	0	1	0	6.a.	Yes, there is an in-house safety and health awareness program.	1	0	0
			5	0	2			3	2	1			2	1	4

Table 4.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	Conv #	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)				Working Hours									
	Do you have night shift?											Yes			
1	What guidelines do you follow for night work for women and young women?	**89**	1	0	0	17.3.c	the Minister may make regulations in terms of that subsection providing for - the hours of work of employees, including overtime, night and shift work and the remuneration therefor.	0	1	0		Women are not allowed to work shifts.	1	0	0
		89.2													
		89.3.													
		89.4.													
		89.4.a.													
		89.4.b.													
		89.6.													
		89.7.													
		90													
		90.2.1.				17.3.c	the Minister may make regulations in terms of that subsection providing for - the hours of work of employees, including overtime, night and shift work and the remuneration therefor.								
		90.2.2.													
		90.2.3.													
		90.3.1.													
		90.3.3.													
		90.4.1.				17.3.g	the Minister may make regulations in terms of that subsection providing for the establishment of pension, social security, sick, medical, holiday, provident, insurance, and other funds of and the levying of contribution thereto by employers and employees								
		90.4.2.													

Table 4. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	Conv #	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)													
2	What is the maximum number of hours of overtime that you allow your workers?	**14** 14.2.1. 14.2.3. 14.4.1.	1	0	0			0	0	1		Not described	0	0	1
3	What is your sick leave and holiday leave practices? Are there exceptions to this rule?	52.2.5. 52.3. 52.3.a. 52.3.b. **132** 132.3.1. 132.3.2.	1	0	0	17.3.e	the Minister may make regulations in terms of that subsection providing for leave, including sick leave, maternity leave, and bereavement leave, that shall be granted to employees and the remuneration and allowances that shall be payable in respect thereof.	0	1	0		'6 weeks paid sick leave, and 3 weeks paid holidays. There is no any exceptions.	1	0	0
			3	0	0			0	2	1			2	0	1

Table 5.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Fully	Partially	None	Conv #	Existing Social Performance - Factory C	Fully	Partially	None
		(ILO Convention)				Wage									
1	Are your youngest and newest and least experienced workers paid a minimum wage?	95.10.1.	1	0	0	**20**	**Minimum wage notices**	1	0	0		Yes, 'All grades in one industry have stationary wage levels.	1	0	0
						20.1.a	*The Minister may, by statutory instrument*								
						20.1.a	in respect of any class of employees in any undertaking or industry (i) specify the minimum wage and benefits in respect of such class employees (ii) require employers to grant or negotiate increments on annual income of such minimum amount or percentage as he may specify: an prohibit the payment of less than such specified minimum wage, benefits or increments to such class of employees								
			1	0	0			1	0	0			1	0	0

Table 6.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Yes	Partially	NO	Conv #	Existing Social Performance - Factory C	Yes	Partially	NO
		(ILO Convention)				Training/ Education/ Awareness									
1	Do you seek the services of training providers (locally) to help up grade the skills of your workers?	**140**	1	0	0	17.3.e	the Minister may make regulations in terms of that subsection providing for leave, including sick leave, maternity leave, and bereavement leave, that shall be granted to employees and theremuneration and allowances that shall be payable in respect thereof.	0	1	0		There are some unscheduled training	0	1	0
		140.2.													
		140.2.a.													
		140.2.b.													
		140.2.c.													
		140.3.													
		140.3.a.													
		140.3.b.													
		140.3.c.													
		140.3.d.													
		140.7.													
		140.8.													

Table 6. Cont.

	Questionnaire	conv.#	Fully	Partially	None	conv.#	National Labor Legislation - Zimbabwe	Yes	Partially	NO	Conv #	Existing Social Performance - Factory C	Yes	Partially	NO
		(ILO Convention)													
2	Do you have an in-house safety and health awareness program?	142 142.1.1.	1	0	0	7.2.	Every employer shall permit a labor relations officer or a representative of the appropriate trade union or employment board, if any, to have reasonable access to his employees at their place of work during working hours for the purpose of:	1	0	0		Yes, but not explained	0	1	0
		142.1.2. 142.1.2.a.				7.2.a	advising the employees on the law relating to their employment								
		142.1.2.b. 142.1.2.c.				7.2. c	ensuring that the rights and interests of the employees are protected and advanced								
		142.1.3.													
		142.1.4.													
		142.1.5.													
		142.2.													
		142.5.													
			2	0	0			1	1	0			0	2	0