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Hazards and Risks at Rotary Screen Printing (Part 3/6): Psychosocial and Mechanical exposure

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Abstract
This-study, aimed to-assess psychosocial and mechanical-hazards, at-printing-section, of textile-mill. Questionnaire, observations, and document-analysis, were main-research-instruments. The-Karasek's Job-Content-Questionnaire (JCQ), was modified, to-suit the-specifics of the-study. A-survey-questionnaire was tested-for-validity and reliability (in compliance-with the-ISO 20252:2006 (E)). The-Statistical Package for Social-Sciences (SPPS-17, version 22) was applied, to-compute the-Cronbach's coefficient. Descriptive-statistics was employed, to-analyze both; qualitative and quantitative-data. The-majority of the-respondents (sample-size 12 machine-operators, response-rate (RR=83%) pointed-out on several psychosocial-hazards, describing their-working-tasks and conditions, as: extensive, heavy, mentally- demanding, with *no* sufficient-time, given, and also as *not* a-secure/stable-job. In-addition, they were *not* able to-influence the-pace of their-work, as it was, largely, dictated by the-machine-speed. Overall, this could manifest in work-related-stress. Secondly, the-respondents were *not* satisfied with the-state of Occupational-Health and Safety (OSH), at the-company (manifested in lack of: (1) organizational-Health and Safety-Policy; (2) establishment-position of Safety-Officer, at the-mill; and (3) first-aid-box, in the-department). Mechanical-hazards were-also-reported: some-machines were with unprotected-moving- parts, allowing possible-unprotected or unintentional-start-up. Several of the-identified-hazards can lead to-serious-physical and/or psychological-damage, or, even, mental-disorders and/or fatal-injuries, for affected-workers. Knowing the-hazards is a-paramount-step on the-road, of their-eradication; hence, this-study is important (despite the-limited-sample-size, evaluated) in-increasing awareness, on the-subject matter, and also-proposing tailored-recommendations, to-improve the-current-practices (assuming that they *never* perfect). In-addition, the-following-relevant-issues were-offered: Environment-setting, under which, the-subject-industry operated, in-particular, a-brief on the-current-state of local-textile-industry, and comprehensive-document-analysis of the-legal foundation, structure, and operations of OSH, in-Kenya. This-*unfunded*-study also raised a-number of significant-issues, adding to the-existing-body of knowledge, on the-subject-matter.
Keywords: work related stress, WRS, machine guard, OSH Kenya, first aid box, textile industry.

1. Introduction.

The-term *psychosocial* underscores the-close-connection, between psychological-aspects (e.g., thoughts, emotions, and behavior) and wider-social-experience (e.g., relationships, traditions, and culture). With regard to occupational-hazards, the-EU-OSHA-report (2014) identifies the-main psychosocial-hazards as: (1) *Job-content* (lack of variety, meaningless-work, short-work-cycles, and underutilization of skills); (2) *Workload and work-pace* (both-work; under-load and overload, machine-paces, high-time-pressures, and/or tight-deadlines); (3) *Work-schedule* (shift-work, night-work, inflexibility in work-systems, unpredictable-hours, and/or long-hours); (4) *Control* (low-participation, in decision-making, and/or *no* control over-workload, pacing, or shift-work); (5) *Environment and equipment* (inadequate-equipment, and/or poor-environment e.g., noise, vibration, or poor-lighting); (6) *Organizational-culture* (poor-communication, and/or low-levels of support); (7) *Interpersonal-relationships*, at-work (social or physical-isolation, poor-relationship, with-superiors, lack of social-support, and/or interpersonal-conflict); (8) *Role, in-organization* (role-ambiguity, role-conflict, and/or responsibility, for people); (9) *Career-development* (career-stagnation, uncertainty, under-promotion, or over-promotion, poor-pay, job-insecurity, and/or low-social-value of work); and (10) *Home-work-interface* (conflicting-demands, low-support, at-home, and/or dual-career-issues).

Important emerging-psychosocial-risks, more-specifically, *work intensification,* and high-demands, at-work, were described by EP (2007), can lead to-work-related-stress (WRS). Redundancies, restructuring, budgetary-constraints, as-well-as new-forms of work-organization and employment-contracts, have brought-about increasing-intensification of work, in-Europe and the-U.S.A., since the-1990s (Boisard, *et al.,* 2003; Green & McInthos, 2001). Also, according to the-European-Foundation for the-Improvement of Living and Working-Conditions, work-intensification is, undoubtedly, one of the-most-significant recent-trends (EFILW, 2006 a). Askenazy (2005) highlights three-main-causes of work-intensification: (1) Changes and innovations, in-organizations (in-structure, technologies, procedures, aims, etc.); (2) Weakened-impact of trade-unions; and (3) Increase in-job-insecurity, combined with-fear of unemployment.

EP (2007) also-identified the-following-general-drivers, that-are-related to-emerging Occupational Safety and Health (OSH)-hazards and risks: (1) Globalization; (2) Demography; (3) Technological- innovation; and (4)

New-risk-perceptions. It-is essential, however, to-comprehend, that all-these-trends are interrelated and interact, and that there is an-overlap, in their-effects on OSH. For-more-details see EP (2007).

Work-intensification is related to the-development of stress, '*burn-out'*, fatigue, and depression, as-well-as to-Musculoskeletal-Disorders (MSDs), and cardiovascular-mortality, and it may-result in increased-injuries and accidents, from the-more rapid-work pace, and work-intensification (EFILW, 2007 b; Belkic *et al.,* 2004; Boisard *et al.,* 2003; Hoogendoorn *et al.,* 2000; Ariëns *et al.,* 2001). In-addition, work-intensification is also-associated-with violence and bullying, at-work, due-to enhanced-time-pressure (Boisard *et al.,* 2003), particularly, with-respect-to inter-individual contacts.

Moreover, EU-OSHA indicated the-consequences of WRS, including: (1) At the-organization-level: (absenteeism, high-staff-turnover, poor-time-keeping, disciplinary-problems, harassment, reduced productivity, accidents, errors, and increased-costs from compensation or health-care); and (2) At the-individual or personal-level: (*emotional-reactions* (irritability, anxiety, sleep-problems, depression, hypochondria, alienation, 'burn-out', family relationship-problems); *cognitive-reactions* (difficulty in: concentrating, remembering, learning new-things, and making-decisions); *behavioral-reactions* (abuse of drugs, alcohol, and tobacco; destructive-behavior), and *physiological-reactions* (diverse-pathologies, ranging from cardiovascular-morbidity and mortality, to-illnesses, related to-malfunctioning of the-immune system (EP, 2007), MSDs, weakened-immunity, and peptic-ulcers, among many-others).

On-the-other-hand, Babel & Wariajhs (2014) and Sarkar *et al*. (2011) reported, that *textile*-industry is labor-oriented-industry, where accidents and injuries can-take-place frequently, due-to: Improper material-handling; Improper-knowledge of the-machine, due to-lack of training; Improper mental-condition, of the-workers; and/or unsafe-conditions, including mechanical-hazards, among-others. For-example, Bhatt & Rani (2014) concluded that about 10% of accidents, in-industry, are-said to-be due-to mechanical-causes. Mechanical-hazards, are associated-with moving-machine-parts, and include: entanglement, cutting, crushing, impact, shearing, and draw-in, among-others (WHSC, 2014), which can lead to serious-body impairment, such-as amputation, and, even, fatal-injuries.

Besides, workers, exposed-to *many*-mechanical and psychosocial workplace-risk-factors, are more-likely to-report symptoms of MSDs, than workers exposed to-one or another of such-factors (Bongers *et al.,* 2006; Devereux *et al.,* 2002). It-is, therefore, only logical to-consider both; psychosocial and mechanical-exposures, in-this-study.

Moreover, working in a-manufacturing-industry is full of potential-occupational-risks and hazards (Padmini, 2012; Buskin *et al.,* 1993), particularly, working in-textile-manufacturing (see Starovoytova, 2017a; b; c). A-*hazard* is any-situation, condition, or thing, which may be-dangerous to the-safety or health, of workers (OHS Code, Part 1). According to the-Bureau of Labor-Statistics, in 2008, about one, in-seven recorded workplace-injuries, and illnesses, and one, in-thirteen-workplace-fatalities, did-occur, in-the manufacturing-sector. To-maintain the-quality and production, the-health, of a-worker, is paramount. According to Amabe (2016), however, the-importance of occupational-health and safety-practice is, often, overlooked. This is because, the-level of awareness on-Occupational Health and Safety, in-Africa, including Kenya, is low, compared with the-rest of the-world. In-Sub-Saharan-Africa, public health-problems of HIV/AIDS pandemic; child-mortality, TB, malaria, water-related-diseases, and others, have overshadowed occupational-health-problems (Gupta & Mahajan, 2003). Governments, in some-developing-countries, have apathy-towards, and lack of appreciation, of occupational-health and safety-issues, and available- solutions (Lakhan & Sharma, 2010; Khan & Manderson, 1992).

In-the-view of the-above, this-study, therefore, tried to-identify both; psychosocial and mechanical- hazards, at the-printing-section, of textile-mill. Knowing the-hazards is a-paramount-step on the-road, of their-eradication; hence, this-study is important, in-increasing awareness and comprehension, on the-subject-matter, and also-proposing tailored and practical-recommendations, to-improve the-current practices (assuming that they *never* perfect). Moreover, to-provide broader-picture, on-the environment, under which, the-subject-industry operates, a-brief on the-current-state of textile-industry, and the-legal foundation and the-structure of OSH, in-Kenya, were offered.

2. Materials and Methods.

2.1. Description of the-textile-mill, where the-study was conducted.

The-study was conducted at Rivatex-East-Africa, Limited (REAL), an-integrated textile-mill, which is fully equipped to-handle the-entire textile-processing-cycle. Raw-materials-used, by the-mill, are: cotton, and polyester/viscose. For more-details, on the-mill's history, structure, and end-products (see Starovoytova, 2017a). The-focus of the-current-study was on printing-section, of the-finishing-department, at the-mill.

2.2. Main-instruments used

The-following-instruments were used: document-analysis, a-questionnaire, and observations. Questionnaire

approach is most-frequently-applied, in-the-study of psychosocial-factors, in the-work-environment. Direct observation of working-conditions is an-alternative, or an-additional-method, for gathering data on psychosocial-factors, at-work (ILO/WHO, 1984). Combination of observational-methods and questionnaires, in-risks and hazards assessment, has-been also-recommended, in the-literature (see Descatha *et al.,* 2009; Barrero *et al.,* 2009; Barriera-Viruet *et al.,* 2006; Spielholz *et al.,* 2001).

2.3. Focus and design of the-study.

In-order to-conduct a-survey and perform a-document-analysis, the-study was divided-into 3-distinctive parts, which shown in-Figure1.

Figure1: Sequential-parts of the-study (Starovoytova & Namango, 2016).

2.4. Sample size and the-rationale for its-selection

To-evaluate psychosocial and mechanical-hazards, among machine-operators, at the-REAL, a-confidential self-report-questioner was designed and used, as the-main-instrument, for this-study, with the-sample-size of 12-subjects (representing the-entire machine-operating-staff, at the-finishing-department).

2.5. Data Analysis

As a-standard-procedure, the-questioner had-to-be pre-tested, to-ascertain its-validity. This-research complied with the ISO 20252:2006 (E): Market, Opinion and Social-Research Standard; hence a-preliminary-study was-conducted, at the-factory, using an-initial-version-questionnaire, for determining the-hazards.

To-estimate reliability, the-correlation-coefficient was used, according to Kothari (2004). The Statistical Package for Social-Sciences (SPPS-17, version 22)-computer software-program was applied, to-compute the-Cronbach's co-efficient. Descriptive-statistics was employed to-analyze both; qualitative and quantitative-data.

2.6. Terminology applied

Definitions and important-differences, between 'hazard' and 'risk' (in the-context of OSH), pointed-out, by Starovoytova (2017 b), were applied, in-this-study.

3. Results.

3.1. Validation of the-Questionnaire

The assessment of work-related-stress was performed *via* scientifically-validated-tool-- the Karasek's Job-Content-Questionnaire (JCQ), which was modified, to-suit the-specifics of the-study.

Upon-validation, the-general-recommendation made, is that the-instrument was-acceptable, with some minor-editing. Questionnaire-data was-coded, entered into-SPSS, and checked for-errors. Data was analyzed, list-wise, in SPSS, so that the-missing-values were-ignored. Cronbach's-alpha-test of internal- consistency was performed, for perceptions and self-reports, and established high-inter item-consistency (Cronbach's $a > 0.8$).

3.2. Analysis of the-questionnaire.

Analogous to-previous-study by Starovoytova (2017 b), 12 questionnaires were-administered to-the-entire staff (machine-operators) of the-finishing-department, printing-section; the-response-rate (RR), for this-study, was 83% (10 duly-completed questionnaires).

3.2.1. Analysis of part1: Demographic-Characteristics.

Table 1 shows the-demographic-characteristics of the-respondents.

Table1: Demographic-information of the-respondents (Starovoytova, 2017 b).

	Mean	S D	Range
Age (yrs)	25.375	10.23	24 - 43
Duration of Employment (yrs)	2. 75	2.18	1 - 8
Height (cm)	169.07	11.84	146 - 182
Weight (kg)	65.375	9.80	54 - 85

3.2.2. Self-reported Psychosocial-issues.
The-study identified the-following:
40% of the-respondents said their-work is normal; 30% - fast; 20% - very-fast, which forced them to-work harder, in-order to-finish the-daily-target. The-rest did *not* provide any-answer.

40% of employees reported, that they-have excessive-heavy-work, while 60% feel that their-work required is of an-average-effort.

60% of the-employees indicated, that time was *not* sufficient to-work, that is why they have-to work at-high-speed, leading to WRS; whereas only 30% stated, that the-time was adequate. The-rest did *not* provide any-answer.

80% of the-respondents indicated, that they do *not* consider their-job as-stable and secure. The-rest did *not* provide any-answer.

All the-respondents emphasized that the-job is mentally-demanding, given that it requires high-concentration, especially that they have-to-make-sure, that the-printing is correct and *no* defect is processed. Also they have-to-ensure that the-fabric-roll is correctly-placed in-the-machine.

70% of the-operators, stated, that they are given an-opportunity to-voice-out their-suggestions on how to-improve the-working-conditions, however the-given-recommendations are yet to-be-implemented, if at-all. The-rest did *not* provide any-answer.

All the-operators indicated that they *do* help their-coworkers, and also-that their-supervisor is concerned about-their-work.

70% of the-workers explained, that they might-like to-work in-teams, which potentially can-make-their-job easier, as they would-be-able to-plan-together, how to-work. The-rest 30%, however, did *not* support the-teamwork, because they feel that there could-be some-coworkers, behaving in a-team as 'passengers'.

80% of employees reported, that they are *not* satisfied with Occupational-Health and Safety, at the-company, while the-rest provided *no* answer. These *not* satisfied, complained that the-safety materials, such-as Material-Safety-Data-Sheets and PPE, were *not* provided to-them, hence, they did *not* know the-potential-dangers, they exposed to. On-the-question, if the-workers were aware about Health and Safety-Policy, of the-factory, 'No' answer was-given by 90%. Moreover, it was observed, that the-department was lacking First-aid-box.

The-study, in-addition, documented, that there-was *no* established-position of Occupational-Health and Safety-Officer, or *no*-other-employee, who was legally-responsible to-make-sure, that the-working environment is safe and healthy, leaving imminent-vacuum in-terms of such-vital-responsibility, at the-mill.

3.2. 3. Mechanical-hazards.
80 % the-employees reported, that the-work-equipment and machinery, regularly-checked, to-ensure that it works-properly, and that the-guards and other-protective-measures are in-good-condition and operating correctly. 90% stated, that the-emergency-stops, on the-work-equipment and machinery, accessible and working.

On-the-other-hand, 70% of the-workers, indicated, that some-machines were operated with unprotected-moving-parts. 70 % also-reported, that there-are some-machines, where an-unprotected or unintentional-*start-up* is possible.

4. Discussion and analysis of the-responses.

Notwithstanding positive-self-reports, given, by-the-operators, on several-operational and organizational issues, 5 particular-concerns, were-identified, such-as: (1) the-workers described their-working-tasks and conditions, as excessive, heavy, mentally-demanding, with *not* sufficient-time, given, and also as insecure-job; this could manifest in WRS; (2) the-respondents were *not* satisfied with the-state of OSH, at the-company; and (3) No-official, at the-mill, was legally-responsible, that the-working environment is safe and healthy, pointing on possible neglect of OSH-issues, at the-mill; (4) some-machines were with unprotected-moving-parts; and (5) some-machines allow possible-unprotected or unintentional start-up, exposing workers to serious-hazards.

It-is valuable, to-address these-complains in-the-context of the-environment, under which the-subject-mill operated, including: (1) the-current-state of textile-industry, in-the-country, and (2) the-Occupational-Safety and Health (OSH), in-Kenya: legal-foundation, structure and operation. These were discussed, in the-next two-sections.

4.1. Brief on Kenyan textile-industry

At 2013, Kenya has 52 textile-mills, of which only 15 are currently-operational, and they operate at-less-than 45% of total-capacity (Republic Of Kenya, 2016). The-existing-mills operate using, largely-outdated-technology, and suffer-from low-levels of skilled-labor and low-productivity (Chemengich *et al.,* 2013).

The-cost of electricity (at 20 cents, per kWh, in 2014) is a-major-contributor to the-production-cost, at textile-mills, as are the-high-maintenance, and overhead-costs, due to-old-equipment. A-further cost-driver is the-need to-either use high-cost imported-material, or low-quality local-fiber, which requires additional-

processing. According to UNIDO (2011), 93% of cotton is imported, to-meet Kenya's quantity and quality-demands.

On-the-other-hand, Kenya's minimum-wage is higher than that in: Lesotho, India, and Vietnam, and lower than that in: South-Africa and China. Existing-data for a-Kenyan-neighbor, Ethiopia, also suggests significant-disparities in labor-costs: the average-wage-rate for a-machine-operator, in-Kenya is approximately 3.7 times more, than in-Ethiopia (US$180/month and US$60/month, respectively), and generally 214% greater, than a-global-competitive wage-benchmark (Republic Of Kenya, 2016).

Overall, Kenya's business environment is *not* one, in-which it-is-easy, to-operate. It-is characterized by high-electricity-prices, limited-access to finance, poor-roads, challenging-logistics, and for non-EPZ textile-companies, complex-regulations. High-labor-costs, coupled with training-systems that are *not* fit for-purpose, render Kenyan labor-productivity the-lowest, among comparator-countries. The-industry also faces a-skills-gap, along the-entire value-chain, and a-pervasive-lack of practical-knowledge, of modern-equipment, tools, and production-methods. Managerial-staff are difficult to-find, rendering the-use of expatriates (mainly from India and Pakistan) very-common (World Bank, 2014).

Under-such-circumstances, in-order-to-boost its-competitiveness, the-company, probably, have been setting target of productivity and innovation, which exerted increased-pressure on-workers, and can-lead-to stress-related health-problems and injuries.

Knowing the-industry-background, the-next-logical-step is to-look at *Occupational-Safety and Health* (OSH), in-the-national-context.

4.2. OSH in-Kenya: legal-foundation, structure, and operation.

Kenya promulgated a-new-Constitution, in-August 2010. Although the-Constitution does *not* deal with OSH, specifically, it provides for the-rights of every-person to-fair-labor-practices, reasonable-working conditions, and a-clean and healthy-environment.

The-history of OSH, in-Kenya, dates-back-to 1950, when the-then colonial-government adopted the-British Factories-Act, of 1937. In 1990 the-Factories-Act was-amended to the-Factories and Other-Places of Work Act, in-order-to-enlarge its-scope of coverage. In 2007, this-Act was replaced by the-Occupational-Safety and Health-Act. In the-same-year, the-Work-Injury-Benefits Act was-enacted. Both-these-laws are administered by the-Directorate of Occupational-Safety and Health-Services (DOSHS). Other-legislation, which touches on OSH, includes the-Public Health-Act CAP 242, the-Environmental Management and Coordination-Act (1999), the-Radiation-Protection-Act CAP 243, and the-Pest-Control Products-Act, Cap 346. These-laws are enforced, by different-ministries and departments, of the Government.

At-international-level, the-requirements, for Occupational-Health and Safety, are outlined in the-International Occupational Health and Safety Act (OHS Act), Regulation (OHS Regulation), and Code (OHS Code).

The-OSH-services, in-Kenya are governed by two-pieces of legislation: the-Occupational-Safety and Health-Act, 2007 (OSHA, 2007a) and the-Work-Injury-Benefits-Act, 2007 (WIBA, 2007).

The-purpose of OSHA, 2007, is to-secure the-safety, health and welfare, of people at-work, and to-protect those *not* at-work, from risks to-their-safety and health, arising from, or in-connection-with, the-activities of people, at-work. The-purpose of WIBA, 2007 is to-provide-compensation, to-employees, for work-related-injuries and diseases, contracted in-the-course of their-employment, and for connected-purposes. There-are-also several-regulations and subsidiary-laws, that deal with OSH-issues.

The-regulations, formulated by DOSHS, through tripartite-collaborations are: The Factories (Woodworking Machinery) Rules, L.N. No. 431/1959; The-Factories (Docks) Rules, L.N. No. 306/1962; The-Factories (Cellulose-Solution) Rules, L.N. No. 87/1964; and The-Factories (First-Aid) Rules, L.N. No. 160/1977; The-Factories (Eye-Protection) Rules, L.N. No. 44/1978; The-Factories (Electric-Power-Special) Rules, L.N. No. 340/1979; The-Factories (Building-Operations and Works of Engineering-Construction) Rules, L.N. No. 40/1984; The-Factories and Other-Places of Work (Safety and Health-Committees) Rules, L.N. No. 31/2004; The-Factories and Other-Places of Work (Medical-Examination) Rules, L.N. No. 24/2005; The-Factories and Other-Places of Work (Noise-Prevention and Control) Rules, L.N. No. 25/2005; The-Factories and Other-Places of Work (Fire-Risk-Reduction) Rules, L.N. No. 59/2007; Factories and Other-Places of Work (Hazardous-Substances) Rules, L.N. No. 60/2007; and The-Government Financial Management (Occupational-Safety and Health-Fund) Regulations, 2011(NPOSH, Kenya, 2013).

Besides, the-laws and regulations, covering some-aspects of occupational-safety and health, include: The-Bio-safety-Act, No. 2, 2009; The-Environmental-Management and Coordination-Act, No. 8, 1999; The-Public-Health-Act, Cap. 242; The-Employment-Act, No. 11, 2007; The-Energy-Act, No. 12, 2006; The-Food, Drugs and Chemical-Substances-Act, Cap. 254; The-Mining-Act, Cap. 306; The-Pest-Control and Product-Act, Cap. 346; The-Petroleum (Exploration and Production) Act, Cap. 308; The-Radiation and Protection-Act, Cap. 243; and The-Standards-Act, Cap. 496 (NPOSH, Kenya, 2013).

Furthermore, Kenya has-ratified and adopted 49 Conventions of International-Labor-Organization (ILO); 43 are active, and ten of them, are OSH-related, namely: (1) Convention No. 17: Workmen's Compensation (Accidents) Convention, 1925, ratified on 13 January 1960; (2) Convention No. 19: Equality of Treatment (Accident-Compensation) Convention, 1925, ratified on 13 January 1964; (3) Convention No.12: Workmen's Compensation (Agriculture) Convention, 1921, ratified on 13 January 1964; (4) Convention No. 32: Protection against Accidents (Dockers) Convention (Revised), 1932, ratified on 13 January 1964; (5) Convention No. 16: Medical-Examination of Young-Persons (Sea) Convention, 1921, ratified on 9 February 1971; (6) Convention No. 27: Marking of Weight (Packages, Transported by-Vessels) Convention, 1929, ratified on 9 February 1971; (7) Convention No. 81: Labor Inspection-Convention, 1947, ratified on 13 January 1964; (8) Convention No. 129: Labor-Inspection (Agriculture) Convention, 1969, ratified on 9 April 1979; (9) Convention No. 134: Prevention of Accidents (Sea-Ferries) Convention, 1970, ratified on 6 June 1990; and (10) Convention No. 182: Worst-Forms of Child-Labor-Convention, 1999, ratified on 7 May, 2001. Besides, Conventions 155 and 187 have-been identified and prioritized, for-ratification, *but* are awaiting an-Act of Parliament, in-line with the-new-Constitution.

In-Kenya, OSH is managed by the Directorate of Occupational-Safety and Health-Services (DOSHS). DOSHS is the-designated national-authority, for collection and maintenance of a-database, and for the-analysis and investigation of occupational-accidents and diseases, and dangerous-occurrences. The-Directorate's policy and legal mandate are provided by the-National-Occupational-Safety and Health-Policy of 2012, OSHA 2007, and WIBA 2007.

The-body, responsible for reviewing national-OSH-legislation, policies and actions, is the-National Council for Occupational-Safety and Health (NACOSH), whose composition includes the-Federation of Kenya Employers (FKE) and the-Central-Organization of Trade-Unions (Kenya) (COTU-K).

The-DOSHS, with 71 professional OSH-officers, is *not* capable of inspecting the-estimated 140,000 workplaces effectively, and this leaves most-workers, exposed to-OSH-hazards, without intervention. DOSHS-representation in 29 counties leaves the-remaining 18 counties with *no* officers. Illiteracy-levels are high, in the-rural-areas, which are insufficiently-covered by DOSHS-officers, and thus, illiterate workers, in these-areas, are more-likely to-be-exposed to-OSH-hazards.

On-the-other-hand, 75 institutions, in-Kenya, do offer OSH-training, for-safety and health committee-members, and also for-awareness-creation. This, together with the-Master's degree and postgraduate-diploma-courses, offered by one-local-university, is likely to-increase-awareness-levels, and, thus, impact positively on the-national-OSH-profile. The-country has 49 active-registered safety-advisers, 30 fire-safety-auditors, 38 designated health-practitioners, and many-other-professionals, such-as plant-examiners, involved in the OSH-field (NPOSH, Kenya, 2013).

The-Directorate of Occupational-Safety and Health-Services (DOSHS), a-department within the-Ministry of Labor, is responsible for OSH-services, in the-country. It has the-mandate to-ensure compliance with the-provisions of OSHA, 2007, which promotes the-safety and health of workers, and of WIBA, 2007, through the-prompt-compensation of employees, for work-related-injuries. DOSHS offers OSH-services, in 29 of the 47 counties, nationwide. The-professionals include medical-doctors, nurses, engineers, occupational-hygienists, OSH-specialists, and other-scientists.

At the-*national-level* there is a-mechanism, for coordination and collaboration, among social-partners in implementing and managing OSH-systems. The-National-Council on Occupational-Safety and Health (NACOSH) has 22 members, derived from representatives of government-ministries and agencies, the-Federation of Kenya Employers (FKE), the-Central Organization of Trade-Unions (Kenya) (COTU-K), and appointed-practitioners in the field of OSH. NACOSH is mandated by OSHA 2007, to-manage-issues pertaining to-OSH, in the-country, by advising the-minister, in-charge of labor, on such-matters as: formulating and developing a national-OSH-policy framework; legislative-proposals on OSH, including ways and means to-give-effect to ILO Conventions, and other international-conventions and instruments, relating to-OSH, compensation and rehabilitation-services; strategic-ways, to-promote the-best OSH practices; establishing, developing and maintaining a-preventive-safety and health-culture; reviewing the-provisions of OSHA 2007, rules and regulations, standards, and industry-codes of practice; statistical-analysis of work-related-deaths and injuries; and any-other-matters, affecting OSH, as it considers desirable, in the-interests of improving the-quality of working-life, in Kenya. NACOSH-members are required to-hold a-meeting once, every-three-months, under the-chairmanship of an-appointee of the-minister, in-charge of Labor-matters.

At *enterprise-level*, a bipartite-approach is facilitated by OSHA, 2007 and the-Safety and Health Committees-Rules, made under the-Act. Under both; the-Rules and the-Act, the-occupier or employer, of every-workplace, that regularly employs 20 or more-people, is required to-have a-safety and health committee, in the-workplace. The-committee, once established, should-include equal-representation, from management and workers. The-committee may, on an *ad hoc* basis, invite to its-meetings or interview anyone, with information-relevant to-OSH-matters, being discussed. The-Director of DOSHS, or his representatives, may attend meetings

of the-committee. The-committee is required to-meet, at-least four times, a-year.

During the-period 2008–2012 the-Centre undertook the-following-activities: preparing and printing brochures on various-safety-topics; compiling and publishing safety-alert-bulletins on-general OSH-issues, with articles from OSH-practitioners around, the-country; developing an-OSH-database management system; compiling regular-performance-reports, for the-Department; updating information on approved and authorized OSH-practitioners, on the-departmental-website (www.doshs.go.ke); celebrating the-World-Day for Safety and Health, at Work (28 April), and networking and collaborating, with various-workplaces, in-marking the-Safety-Week and Day; and disseminating information on-OSH and the-World-Day for Safety and Health, at work, in the-mass-media, through advertisements and newspaper/magazine supplements. The-OSH-database will facilitate the-collection, and dissemination, of OSH-information. The-system, however, is *not* yet in use, as commissioning, data-migration and training, for effective-use of the-system, are still in-progress. During Safety-Week, workplaces organize activities, related to-the-theme of the-year, as suggested by ILO SafeWork (ILO 2013).

Besides, the-Directorate's occupational-hygiene and occupational-health-divisions are responsible for analytical and assessment-work, related to the-determination of workers' exposure to-various-occupational hazards. For the-last four-years, the-divisions have-been-refurbishing their-laboratories, with state-of-the art equipment, as all the-previous-equipment had-become obsolete. Equipment, acquired-recently, includes integrated sound-level-meters, indoor-air quality-monitors, a-hematology analyzer, a-biochemistry-analyzer, and a-laboratory-incubator. OSH-officers use occupational-hygiene-equipment, for air-sampling and noise-measurements, and physicians and nurses use the-equipment, in the-medical-laboratory, for biological-sampling, and audiometric-tests.

At-present, there-are few-designated medical-laboratories, although the-Hazardous-Substances-Rules recognize government-laboratories, such-as-that of the-Government-Chemist. Other-laboratories, where samples are taken are the-Mines and Geology-Department, in the-Ministry of Environment and Mineral Resources, and the-University of Nairobi's laboratories. Many of the-private occupational-hygiene laboratories do *not* meet the-minimum-requirements, set-out by the-Directorate, to-enable them be-approved, to-offer such-services. The Directorate's technical-capabilities are satisfactory, at-present, and with the-planned-procurement of a-gas-chromatograph and an-atomic-absorption-spectrophotometer, DOSHS will be-able to-work at the-optimum-level.

On-the-other-hand, insurance-companies provide workplace accident-insurance-schemes, but these are *not* mandated by law. The-section in WIBA (2007), that required employers to-obtain and maintain, an-insurance-policy, for their-employees, was nullified by the-court, and is due for-review. Accident statistics, from individual-insurance-companies are rather-limited, and hence, they are *not* used for analyzing, or reporting, statistics on-occupational-accidents and diseases.

The-Jomo-Kenyatta-University of Agriculture and Technology (JKUAT) offers both; Masters and postgraduate-diploma-courses, in-OSH. Other-universities offering Masters, in public-health with a-unit on OSH, include Kenyatta University and Moi-University. The-Kenya-Medical-Training-College (KMTC) offers a post-basic diploma in-OSH, and few-tertiary-colleges offer diploma-courses, that have a-unit in OSH, e.g. the-Institute of Human-Resource Management (IHRM). Figures for the-numbers of graduates, from these-universities and colleges, were *not* available, at the-this-research was conducted.

In-addition, the-Kenya Occupational-Safety and Health-Association (KOSHA) is a-registered-body, of OSH-practitioners, in-Kenya. One of its-primary-functions is to-provide training, in all-areas of OSH. However, this-organization has *not* been-active, and a-process of reactivation is under-way.

Besides, there is *only* one-poison-control-centre, in the-country, the-National-Poison-Information and Management-Centre, located at Kenyatta-National-Hospital (KNH), which has-been in-operation for the-last five-years. It functions as an-information and resource-centre, for all-hospitals, in the-country, and for-anyone, who requires information, about-poisons and their-antidotes. The-Ministry of Public-Health and Sanitation, is in the-process of establishing seven other-poison-centers, in the-country, at the-referral hospitals, *but* it faces challenges, such-as obtaining the-resources, required for-capacity-building. The-poison-centre, at KNH, is funded by the-Agrochemicals-Association of Kenya (AAK); its human resource-capacity comprises *only* two-toxicologists and one-nurse, which are paid-by the-government. Moreover, a-toll-free emergency-line are now operational, to the-public, with poison-inquiry (0800 730030 and 0800 720021).

The-institutions and laboratories, which specialize in-occupational-hazard and risk-assessment, related to-chemical-safety, epidemiology, and product-safety, are DOSHS, the-poison-control-centre, the-national public-health-laboratories, located at the-Kenyatta-National-Hospital, the-Government-Chemist, and Kenya Bureau of Standards (KEBS). DOSHS handles occupational-hazards, in-chemical-safety, the-poison control-centre handles toxicology, the-national public-health laboratories handle epidemiology, and the-Government-Chemist and KEBS, handle product-safety. There are, currently, *no* designated private bodies.

OSHA, 2007 requires, the-Director of DOSHS, to-develop and maintain, an-effective-program for collecting, compiling, and analyzing OSH-statistics, that cover all-disabling, serious or significant-injuries and

illnesses, whether or *not* they involve-loss of time from-work, other than minor-injuries, that require *only* first-aid treatment, and which do *not* involve medical-treatment, loss of consciousness, restriction of work or motion, or transfer to-another-job. At-present, there is *no* system in-place, for the-comparative analysis, and production of annual-statistics. The-DOSHS records *only* the-total-number of accidents, occurring each-year. For-example, data on-occupational-accidents, by-economic-sector, 2010–2011, indicates Manufacture of textiles, tailoring, dry-cleaning, and laundry-sector had (in-total) 441 non-fatal occupational-accidents, out of (1) 5,774 non-fatal-accidents, representing 7.6%, and (2) 6, 023 total-accidents, including fatalities, contributing 7.3% (NPOSH, Kenya, 2013).

The-section in-WIBA, 2007, that required employers to-obtain and maintain, an-insurance-policy, for employees was nullified by the-court, and is due for-review. Accident-statistics, for individual-insurance companies are *not* used, for analyzing or reporting statistics, for occupational accidents and diseases.

Overall, the-above-coverage on OSH, in Kenya, revealed that there-is, indeed, a-well-established structure, and legal-foundation, already in-place. The-practical (implementation-phase), however, is in-need of capacity-building, to-enable nationwide-coverage, including training, and provision of all-inclusive and reliable-statistics, on occupational-accidents and MSDs, in all-the 47 counties, and for-the-whole-country. This-finding is in-line with ILO (2014), stating that:

> Globally, more-than-half of all-countries do *not* provide official-statistics, for work-related occupational-diseases. There are particularly-serious data-limitations, in the-area of work-related diseases and occupational accidents, especially in-developing-countries, due to-factors, including long latency, of many diseases, before the-symptoms are detected, and the-weakness, in the-national capacity, for identification, diagnosis, and compensation of occupational-diseases.

In-the-next-sections, the-*major*-concerns, arisen from the-responses and observations, were addressed. To-comprehend and fully-appreciate the-hazards, background-coverage, was-offered-first, followed by specifics, of each-type.

4.3. Psychosocial-exposure and work-related-stress

Psychosocial-factors, at-work, refer to-interactions, between and among: work-environment, job-content, organizational-conditions, and workers'-capacities, needs, culture, personal extra-job-considerations, that may, through, perceptions and experience, influence health, work-performance, and job-satisfaction. A-negative-interaction, between occupational-conditions, and human-factors, may-lead-to WRS, which can-manifest, itself, in: emotional-disturbances; behavioral-problems; and biochemical, and neuro- hormonal-changes, presenting extra-threat of mental and physical-illness. Adverse-effects, on job-satisfaction and overall-work-performance, can also-be-expected (Alia, 2002).

4.3.1. Work-related-stress (WRS)

4.3.1.1. Definition and Concepts

There are many-definitions of stress. In-2010, a-Eurofound-report stated, that: 'Although there may *not* be an-accepted universal-definition of stress, there is broad-consensus, that it involves an-imbalance, between perceived-demands, and the-resources, to-cope with them'. This is also-consistent with the-definition by EU-OSHA (2012).

The-concept of stress, as a-*negative*-factor, differentiates the-use of the-term from other-applications, where the-term 'pressure', as a-neutral-description of the-level of the-demands, placed on-individuals, can-be more-appropriate (as in the-commonly-held-perception, that 'one needs a-little-pressure, to-work at-their-best'). Perplexity about these-two-terms lies-behind many of the-common-misconceptions and misunderstandings, regarding stress, at-work.

E-Facts (2008) defined WRS, as being-experienced, when the-demands of the-work-environment exceed the-workers' ability to-cope-with or control-them. According to the-European-Agency for Safety and Health, at Work (2007), WRS may be an-issue, in-some-areas of the-textile-sector, being-associated, for-example, with repetitive and fast-paced-work, and where the-worker has *no* influence on how-the-job is done.

The-scientific-literature, on-occupational-stress, points-out three-different, but overlapping, approaches-to the-definition and study, of stress. The-approaches are: (1) *Engineering-approach*, which conceptualizes occupational-stress, as harmful-characteristic, of the-work-environment; (2) *Physiological approach* defines occupational-stress, in-terms of the-common physiological-effects, of a-wide-range of aversive-stimuli, whereby stress is a-physiological-response, to a-threatening or damaging-environment; and (3) *Psychological-approach,* which presumes stress as the-dynamic-interaction, between the-person and their-work-environment (see Mohan, 2013; Swathappa, 2005; Knots, 1996).

Selected-examples of causes of stress, at-work, are: To-meet-out the-demands, of the-job; To-manage relationship with-colleagues; To-control staff, under, and to-report the-progress, to-staff, above; Excessive work-pressure, to meet-out deadlines; Missed-promotion; Working overtime, and on-holidays; New work-hours; Argument or heated-conversations, with co-workers, or boss; Change of the-nature of a-job; Change of job-

location; Work against will; and Harassment, including sexual-molestation. Other-causes of stress include: Uncertainty of the-future; Fear, intermittent or continuous; Threats: physical-threats, social-threats, financial-threat, other-threats; Lack of sleep; and any-misunderstanding, in a-working environment.

Not every-type of stress, however, is harmful. *Eustress*, for-example, is one of the-useful-types of stress. It-is the-type of stress one experiences, right-before one has the-need to-exert physical-force. Eustress prepares the-muscles, heart, and mind, for the-strength-needed, for whatever is about to-occur (an-athlete before they-run a marathon; artist, needed inspiration; etc.). When the-body enters the 'fight or flight' response, it will experience Eustress. The-Eustress prepares the-body to-fight-with, or flee-from, an-imposing or perceived-danger. This-type of stress will-cause the-blood to-pump to-the-major muscle-groups, and will increase the-heart-rate, and blood-pressure. If, the-event or danger passes, the-body will, eventually, return, to its-normal-state (Mohan, 2013).

4.3.1.2. Mechanism of stress and human-response, to it.

In-essence, stress sets-off an-alarm, in-the-brain, which in-turn, responds by preparing the-body for-defensive-action. The-nervous-system is aroused, and several-hormones and chemicals (such-as: *Dopamine, Epinephrine*, and *Norepinephrine*) are released, to-sharpen the-senses, quicken the-pulse, deepen-respiration, and tense the-muscles. This 'fight-or-flight' response, mentioned-earlier, is pre- programmed, biologically. It-helps defend the-individual against threatening-situations (Kitronza & Mairiaux, 2015).

The-intensification of the-presence, of such-chemicals, brings-about physiological-changes, such-as increased-heart-rate, and blood-pressure, increased cell-reproduction, and diminishing of the-immune system, affecting each-aspect of body-functioning. With-time, unmanaged-stress can-lead-to the development of ulcers, and other-digestive-problems, heart-disease, even, heart-attack, and stroke. The-immune-systems' ability to-fight-off infection and disease, is hindered, allowing for the-beginning of all-manner of illnesses, and viral-infections. Additionally, the-development of chronic-conditions, such-as Diabetes and Asthma, have-been linked to-stress. Stress is also-interconnected to-numerous-mental and emotional-disorders, such-as: Depression, Anxiety, extreme-Phobias, and panic-attacks, among-others. The 'Fight or Flight' instinct, caused in-the-brain, throughout moments of extreme-stress, is also-interconnected to-the on-set of these-chronic mental-health-issues (Milczarek *et al.,* 2009; Hsieh *et al.,* 2004).

Short-lived or infrequent-episodes of stress, pose little-risk. However, when stressful-situations continue-unresolved, over a-long-period of time, the-body is kept in a-constant state of activation, which increases the-rate of wear and tear, to the-body. Ultimately, fatigue and damage, occur, when the-body's immune-system becomes seriously-compromised. As a-result, the-risk of injury and disease, increases many-fold (Warraich *et al.,* 2014).

4.3.1.3. Causes of Work-Related Stress

According to the-National-Institute for Occupational-Safety and Health, in the-U.S.A., a-multitude of responsible factors can cause WRS. For-example: (1) *Career-related-anxieties* (job-insecurity, lack of opportunity, for advancement or promotion, little-recognition, as-well-as rapid-changes, for which workers-are-unprepared); (2) *Management-style* (that is *not* transparent, prevent participation of workers, in decision-making, and results in-poor-organization of work, and lack of family-friendly-policies, in the-company); (3) *Strained-interpersonal-relations* that are, usually, a-sign of a-poor-social-environment, lack of support, communication, and help, from-supervisors and co-workers; (4) *Conflicting and uncertain* w*ork-roles* (too-much-responsibility, 'too-many-hats to-wear', whereby individuals' need, for-role-clarity varies); (5) *Unpleasant or dangerous work-environment* (overcrowding, excessive-noise, vibration, and air-pollution, or ergonomically-inferior designed-work-places, resulting in-health-problems). In-addition, individual-differences need-consideration (what is stressful, for one-person, is *not* necessarily, stressful for-someone-else).

Besides, some-employers and managers believe, that stressful-working-conditions is a 'necessary-evil'. They assume, that to-remain-productive, and competitive, in today's world, their-companies *must*-increase pressure on workers, and set-aside health-considerations. However, according to-data from the-U.S.A. Bureau of Labor-Statistics, workers who-must take-time-off, due-to stress, anxiety, or a-related-disorder, will-be-off the-job, for an-average of 20 days, at a-time, which is huge-burden, for the-company. In a-European-study by Bejean & Sultan-Taïeb (2005), they indicated, that, in-France-alone, in one-year (2000), WRS cost society between €1,167 and €1,975 million, representing 14.4-24.2% of the-total spending, of the-social-security occupational-illnesses and work-injuries-branch.

According to EP (2007), the-ever-increasing-demands workers are-exposed-to are: (1) *quantitative* (high-speed, *no* time to-finish work, in regular-working-hours); (2) *qualitative* (increased-complexity); (3) *emotional* (need of employees to-be-friendly, in-their-contacts with others, including their-direct supervisors and coworkers); and sometimes (4) *physical* (often associated-with performing the-task quickly).

Work-overload, in-particular, is characterized-as being-either *quantitative* (having too-much-to-do) or *qualitative* (work being too-difficult). Different-types of behavioral-malfunctions have-been associated with job-overload (Paulsen *et al.,* 2005; Crawford *et al.,* 2010; Bonde, 2008; WHO/EHG, 2000; Cooper *et al.,* 1980; Kasl, 1979; Cooper & Marshall, 1976). For-example, Kroes (1985) found, that job-overload was-associated with such

stress-related-symptoms, as lowered-self-esteem, low-work-motivation, and escapist-drinking.

Other-researchers suggest that, both; qualitative and quantitative-overload, produce different symptoms of psychological and physical-strain, including: job-dissatisfaction, job-tension, feelings of threat and embarrassment, high-cholesterol-levels, increased-heart-rate, and increased-smoking (Bonde, 2008; Devereux *et al.,* 2002). Repetitive, routine, and under-stimulating work-environments are typical, in-mass-production. According to Workplace-Risk-Assessment (2011) and Cox (1980) most of the-machine operator's time, in-manufacturing, is shown to-be-spent on monotonous, rather than stimulating-tasks.

A-review of the-literature indicates that the-negative-factors, affecting stress, are relatively-well understood (European Risk Observatory, 2009).

4.3.1.4. WRS Consequences

There is adequate-evidence, to-suggest, that prolonged-exposure, to WRS, is associated-with several-types of chronic-conditions, including: cardiovascular-diseases, musculoskeletal-disorders (MSDs), and work related-injuries and psychological-disorders, such-as anxiety, and depression-disorders. Some-studies also-suggest an-association, between stressful-working-conditions and suicide, ulcers, and cancer, among-others. However, more-conclusive-research is needed, to-draw firm-conclusions (Carr *et al.,* 2011; Devereux *et al.,* 2002).

Moreover, gastric and digestive-problems**,** headaches, mood and sleep-disturbances, depression, and upset-relationships, with family and friends, are among the-*initial*-symptoms of stress. At the-same-time, the-worker becomes more-vulnerable to-infectious-diseases. There are also the-typical '*escape-behaviors'*, when the-person, under-constant-stress, make-use of all-kinds of pills (such-as: pain-killers, sleeping-pills, and other-prescription-medicines, some of which are very-dangerous, for self-medication), tobacco, alcohol, and illicit-drugs. People become used-to-their-consumption, as they belong to-the habit-forming-behaviors. Without drugs, apparently, anxiety-increases, which in-turn, further-increase the-stress-level, potentially leading to other-negative-consequences, such-as: increased-absenteeism, and decreased-efficiency, when at-work. The-most widely-accepted-model, describes performance-efficiency as-an 'inverted U' function of stress (Welford, 1973); people-perform-optimally, when under a-moderate-level of stress, and less-efficiently, when stress is either very-high, or low.

A-popular-expression *'burned-out'* describes the-debilitating-effects of a-prolonged-exposure to-stressful-conditions of employees. Hartman & Perlman (1982) defined three-components, of being 'burned-out': (1) emotional and/or physical-exhaustion; (2) lowered job-productivity, and (3) over de-personalization. Features added by other-authors, include: low-morale, and negative, and, at-times, cynical-attitudes towards: work, co-workers, supervisors, or any-other-persons, with-whom subjects had-to-deal-with, as-well-as turnover, and substance-abuse (Carr *et al.,* 2011).

For-instance, under WRS, the-affected-workers, may lose their-appetite, have-digestive-problems, and are more-likely to-catch a-cold or flu (due-to suppressed-immune-system). Fatigued-workers tend-to: React more-slowly, than usual; Fail to-respond to-things, going-on around-them, or respond-incorrectly; Show poor-logic and judgment; Be-unable to-concentrate; Be less-motivated, and more-forgetful; Have a-greater-tendency, for taking-risks; Workers commonly-cope-with their-reduced-level of function by: Working more-slowly; Checking and rechecking their-work; Relying on fellow-workers; and Choosing to-carry-out less-critical-tasks (Devereux *et al.,* 2002).

According to the-European-Risk-Observatory (2010), in-addition to health-consequences, and compensatory-behaviors (e.g. alcoholism, smoking and/or eating-disorders, etc.), occupational-stress may-have a-negative-effect on-companies, such-as: increased-absenteeism, and employee-turnover, decreased-productivity, and rising-health-care compensation-costs (EU-OSHA, 2014; Eurofound-report, 2012).

On-the-other-hand, it-is a-well-based-hypothesis that, long-term WRS-affects non-work-spheres of a-person's life. General-passivity and alienation, among factory-workers, involved in-tasks, characterized by low-skill-demands, lack of variety, repetitiveness, and low-decision-making-latitude, were among the-first-observations of the-spill-over of job-stress into-leisure (WHA, 2007). According to Brett, it has been widely-suspected that, chronic-job-stress has an-impact on-family-interactions, and this-subject, is-attracting increasing-research-interest.

Moreover, the-relation, between psychosocial-factors, at-work, and impaired-mental well-being, has been demonstrated, repeatedly, in-many-countries (EP, 2013; Paulsen *et al.,* 2005; Crawford *et al.,* 2010; Bonde, 2008; WHO, 2007), with different-level of evidential-support, such-as: (1) *Strong-evidence* of an-impact, on impaired-mental well-being was found for task-factors, including: high-demands, low-decision-latitude, lack of social-support, from peers and managers; and low-levels of control, over-work. Lower-levels of job-satisfaction were associated with increased 'burn-out', lower-self-esteem, increased-depression, and anxiety, and long-term sickness-absence. Long-term sickness-absence was found-to-be associated-with high-demand-jobs, lack of skill-discretion, lack-of manager-support, and a-perception of *not* being-welcomed-back to-work. A-lack of perceived-organizational-justice was-found to-be-linked to-poor-mental-wellbeing and depression; (2) *Moderate-evidence* existed for an-association between mental-well-being and high-emotional-demands, having

an-undervalued social-position, monotony, skill under-utilization, and poor-communication (Kieselbach *et al.,* 2010; Winefield, 2002); and (3) *Limited-evidence* was-found for the-impact on-mental-well-being of role-conflict, and ambiguity, career-stagnation, home/work conflict, tight-deadlines, poor-management-style, and remote or home-working (Winefield, 2002).

Mental-disorders, which often-benefit from clinical-treatment, tend to-involve severe-psychosocial difficulties in managing-thoughts and feelings, maintaining relationships, and functioning, in expected social-roles. However, many-psychosocial-problems do *not* require clinical-treatment, but are rooted in stigmatization, lost-hope, chronic-poverty, uprooting, inability to meet basic-needs, and inability to-fill normal-social-roles, such-as that of productive-worker, partner, parent, etc. With-regard to-the-impact on-mental health, when exposed to-these-stressors, symptoms include loss of self-esteem, anxiety, depression, apathy, irritability, and memory-disorders. In-addition, the-activation of the-adrenal-medulla, and the-adrenal-cortex, in-situations of *persistent*-stress, can result in acute-psychological-disorder, namely 'mass-psychogenic-illness' (ILO, 2013; EU-OSHA 2012; ILO/WHO, 1984).

The-next-section addressed the-response-specifics on psychosocial-exposure.

4.4. Specifics on Responses.

4.4.1. Physically and mentally-demanding-tasks and fatigue.

Majority of the-respondents, indicated, that their-work is physically and mentally-demanding, and that they often experienced fatigue and muscular-pain.

According to OSH (Guide for Printers), intensive-work (both; physically and mentally); long-work-hours and/or many-consecutive-days, of work, can fatigue workers, and result in them feeling tired, irritable, depressed, or 'scatter-brained'.

Fatigue is a-state of tiredness, leading to-reduced mental and physical-performance, that can-also-endanger workplace-safety and workplace-health. Fatigue can also-lead-to 'near-miss'-incidents, serious-injuries, and even-fatal-mistakes, due-to-reduced-concentration, and lapses in-alertness. Generally, fatigue can-be-caused by: (1) long-working-hours, without rest; (2) intense and sustained-physical-exertion; (3) intense and sustained-mental-effort; (4) working, during part of, or all, of the-natural-time, for-sleep; and (5) overall-lack of adequate-rest and sleep (EASHW, 2007). In-addition, poor-health and nutrition; lack of exercise; preexisting-conditions and injuries; and added-personal-problems (*not* directly-relevant to-work) contribute to rapid-fatigue.

Apparently, WRS and fatigue are interrelated; stress can-contribute to rapid-fatigue, and fatigue, makes a-person more-vulnerable to-extra-stress. Therefore, the-management should-ensure, that workers are well-prepared to-handle WRS, by providing necessary training on stress-management.

Besides, WRS affects sleep; most-people need 7.5 to 8.5 uninterrupted-hours of sleep, each-day; less-than-this amount can-lead to a-sleep-debt, which adds-up over-time. A-single night's shortened or disrupted-sleep, may *not* affect a-worker's-performance, immediately, but repeated-disruptions, over-days and weeks, can affect performance (EASHW, 2007). Fatigue is, further-increased-by: Dim-lighting; Limited visual-acuity (i.e. due to-weather); High-temperatures; High-noise-levels; High-discomfort; Tasks, which-must-be-sustained, for long-periods of time; Work-tasks which are long, repetitive, paced, difficult, boring, and monotonous. Employers can help reduce worker-fatigue, by-providing environments, which have good-lighting, comfortable-temperatures, and reasonable-noise-levels. Work-tasks, which provide variety, throughout a-shift, also help in-reducing fatigue.

On-the-other-hand, an-increased *mental*-workload, may in-turn, represent a-source of psychological stress (De Witte, 1999). Under-stress, complex adaptive-mechanisms are activated, and several-parts of the-endocrine-system react-simultaneously. Prolonged-activation of the-adaptive mechanisms is believed-to-be-involved in the-origin of various-chronic-diseases (cardiovascular, gastrointestinal, and musculoskeletal).

The-level of psychological-stress of piece-workers is likely to-be-greater, than that of hourly-wage-workers, due-to greater-time-pressure, which directly-increases their-mental-workload. The-mental-workload associated with a-particular-task is determined, mainly, by-the-complexity, of the-task, and its-speed. A-high-level of mental-activity, visual-attention, and precision-movement, in-which eyes, hands, and feet, must-be constantly-coordinated, is required (Carr *et al.,* 2011).

The-workers, at REAL, are paid, a-fixed-salary, for the-fixed-number of working-hours, and regardless, if they actual-did any-work, on-fabric-printing, or *not.* REAL heavily-relies on orders, and at-times, stays without any. During such-situations, machine-operators, after completing routine-check-up and cleaning, of the-machinery, just stay idol; this can-be-considered as *under*-load, which, in-turn, is also can-contribute to WRS. O'Hanlon (1981) also-concludes that, boredom, at-work, are associated-with: impairments in-attention, perception, cognitive, and motor-functions, which can-degrade performance efficiency, and is also-related-to ill-health and absenteeism.

4.4.2. Job-security.

80% of the-respondents stated, that they do *not* consider their-job as-stable and secure. This-kind of response was expected, as REAL was-being under-receivership, for many-years (see Starovoytova, 2017b for more-

details), and, up to now, is still struggling, to-operate in full-capacity. Many-workers were dismissed, during the-restructuring-processes. According to the-United-Nations Human-Development Index (HDI) 2017 report, the-rate of unemployment, in-Kenya, is the-highest, in the-East-African-region, hitting a-new-high at 39.1%. This makes it the-highest, than its-neighboring Ethiopia, Tanzania, Uganda, and Rwanda.

According to SokoDirectory (2017), individuals face many-challenges, while seeking for employment, in-Kenya. These include: few-available employment-opportunities, against a-fast-growing-pool of employment-seekers, lack of requisite-skills sought, by-industry, due to-mismatch of acquired-skills and industry-expectation, and poor-access to-information on-available-opportunities. Others-factors are: gender, cultural-biases, ethnicity, corruption, unfavorable-geographical-distribution of jobs, and limited-career guidance. The-main-obstacles, for job-seekers, were identified as: 'limited-financial-resources, lack of relevant-skills and experience'.

The-instability of employment affects workers' well-being; they are more-likely accepting work, under poor-working-conditions and low-pay. The-threat of losing the-job, adds to-the job-related-tension of workers. In-addition, responsibilities for large-families, and malnutrition (or under-nourishment), often-combined, putting workers, in a-weak-position, to-handle their-total-burden, eventually manifesting in WRS (Eurofound, 2012), which in-turn, has many negative-consequences.

Besides, restructuring-processes have an-impact, on-workers' mental-health, *not* only-for-those who-lose their-job, but also for those who-remain ('survivor-syndrome'). According to EU-OSHA (2012), the 'survivor-syndrome' is characterized by higher-anxiety and stress-levels, lack of motivation and commitment, general-dissatisfaction, with-working-conditions, and distrust, towards the-enterprise. A-lack of information, or misinformation, about the-future of the-company, may-drastically-increase job-insecurity and anxiety; for-example, at REAL, it was *not* clear whether, the-process is complete, or further-job-cuts can-be-expected.

4.4.3. Pace-controlled, by-machine, tasks, and work-monotony.

The-operators (80%) also-claimed, that they were *not* able to-influence the-pace of their-work, as it was, largely, dictated by the-machine-speed.

The-work-speed of the-printing-operation continues to-be-determined by-the-machine, on-which, the-operation is conducted. Previous-studies have demonstrated that, workers, employed in-jobs involving high-time-pressure, experience an-elevated-frequency of physiological, musculoskeletal, and psychological-symptoms (Carr *et al.,* 2011; Health and Safety Executive, 2002; De Witte, 1999).

Machine-paced, and monotonous-work-responsibility, for-workers, in-conjunction-with many-other job-factors, were shown-to-increase adrenal-hormonal-excretion, in-various-occupations. According to Branton & Oborne (1979) workers succumbed to-task-monotony, sometimes, experience lapses in-vigilance. As they become-aware of these-episodes, they experience 'mini-panics', until ascertaining, that nothing had gone-wrong, during the-lapse. The-mini-panics were reflected-in heart-rate-recordings, and also-confirmed by the-workers, afterwards.

In-such-cases, job-rotation should-be considered, by the-company.

4.4.4. First-aid-box, in the-department.

All-places of employment, particularly manufacturing, *must* have a-first-aid-kit, on-site. The-contents of first-aid-kits are standardized, and are available, at many-safety-supply-stores, and leading-pharmacies (Health and Safety Executive, 2002). To-have a-first-aid-kit, on-site, is, apparently, *not* sufficient; people need to-be-trained to-provide first-aid-assistance--to-become a-first-aider. First-aid means the-immediate and temporary-care, given-to an-injured, or ill-person, at a-work-site, using available-equipment, supplies, facilities, or services, including: treatment to-sustain-life, to-prevent a-condition, from becoming-worse, or to-promote-recovery (Health and Safety Executive, 2002).

A-first-aider can-be: an-emergency first-aider, standard-first-aider, or advanced-first-aider, designated by an-employer, to-provide first-aid, to-workers, at a-work-site (OHS Code, Part 1). First-aid-training is available in 3-levels/stages: (1) *Emergency* First-Aid (to-provide basic-first-aid, for life-threatening situations. It covers the-essentials of maintaining an-airway, effective-breathing, and cardiopulmonary resuscitation (CPR), control of bleeding, and how to-prevent further-injury, until medical-care is available); (2) *Standard* First-Aid (covers the-basic-areas of preserving-life, preventing further-injury, and providing first-aid-care, until medical-aid is available; and (3) *Advanced* First-Aid (provides a-more in-depth coverage of basic-first-aid and also includes triage, rescue, transportation of casualties, and oxygen-administration).

OSH First-aid-rules apply to-workplaces, and require the-occupier to-put in-place appropriate measures, to-ensure that those-injured, at-work; receive necessary-medical-attention, fast. The-Rules specify the-contents of the-first-aid-box, in-accordance-with the-number of workers, and the-training of first-aiders.

In-the-absence of the-first-aid-box, in every-department, time can-be lost, bringing it from the-central-station, which could pose a-danger of losing valuable-time, in attending the-affected/injured worker. The-study, hence, recommends, that first-aid-box is provided, in *every*-department.

4.4.5. Formal-training on the-job.

The-machine-operators also-reported, that they did *not* have any-formal-training, and that, they have trained, on

how-to-operate the-*new* (to-them)-machine(s), just by-observing the-veteran-machine-operator, to-whom they were attached, for a-specific-amount of time. In-that kind of situation, there is a-risk, that the-observer (beginner) will-subconsciously-repeat observed-short-cuts or, even, wrong-procedures, established by the-old-hand. It-is, hence, recommended, that *proper*-training should-be-conducted, before new-comers start operating machinery, on their-own.

On-the-other-hand, workers with low or *no* qualification, have less-autonomy, less-responsibility, and overall-experience, as-well-as lower-job satisfaction, than workers with-higher-qualifications. Most-low qualified-workers have low-paid-jobs and non-standard-forms of contractual-agreements (such-as casual-employment, common at REAL), meaning that they, often, suffer-from job-insecurity. All of these-factors, in-turn, create-stress and anxiety, and have negative-consequences, on their-health, and lifestyle.

To-come-up with the-tailored-recommendations on how to-improve current-practices, it-is reasonable, to-look at-the-established WRS-control-methods, first.

4.4.6. Control-methods of psychosocial-hazards.

Many-approaches are available, to-control the-undesirable-effects of psychosocial-factors, at-work and to-promoting a good-psychosocial-climate, within an-enterprise. Some-approaches focus-on the-content and nature, of the-work, performed, on the-work-environment, and on-the-organizational-structures. Others are directed-towards individual-workers, or towards the-interactions, between the-workers and their- environment.

These-measures may-include, in-particular (ILO 2013; ILO/WHO, 1984): (1) job-redesign (modification of the-content of work, enrichment of tasks, rotation, among different-tasks, etc.); (2) organizational-measures (modification of the-work-organization, greater-autonomy, delegation of responsibilities, etc.); (3) ergonomic-measures and improvement of the-work-environment; (4) control of occupational-hazards, improvement of the-ambient factors (temperature, lighting, noise, etc.); (5) modification of the-working-space and of working-time (arrangements to-avoid crowded workplaces, or work, in-isolation); (6) determination of periods of rest, in-consultation with the-persons-concerned; (7) information on work-processes, early-information concerning technological-changes and the-introduction of new-technologies; and (8) workers' participation, as regards organizational-measures, work-methods, etc.

Besides, to-control WRS, WHA (2007) and Barrero *et al.* (2009) recommended the-following practices: (1) Automate repetitive-tasks, wherever-possible; (2) Plan work-schedules, so that workers can take regular-breaks (breaks can-be-short, but regular); (3) Practice job-rotation (rotating workers, through different-work-activities, during their-shifts, to-reduce the-extent and duration, required for the-repetitive movement. In-addition: (4) Schedule complex-tasks, to-be-performed *only* during the-day; (5) Plan shift-schedules ahead of time, and communicate-them, to-workers; Limit shift-work to *not* more than 12 hours, including overtime; (6) Keep night-shift-work, to a-minimum; (7) Ensure, that there is sufficient-recovery-time, between shifts; (8) Provide facilities, for breaks, such-as pantry and shower-facilities; (9) Provide after-work-transportation, for employees, working long or night-shifts; and (10) Introduce shift-rotation.

On-the-other-hand, people have different-coping-abilities, and a-different-tolerance, for stress. Some, often categorized as 'Type-A' personalities, can tolerate relatively-high-stress-levels, and thrive on-the-stimulation and alertness, brought-about by stress (they perform best, when under-stress). Others ('Type-C') have very-low-tolerance-levels, thriving in-slow-moving-environments, with low-stimulation, and even, undisturbed-paced-work. Majority of people, however, belong to 'Type-B', which is intermediate, between the-two, with medium-coping-abilities. Coping-skills, however, can-be improved, through regular-training for specific-tasks; for-instance, if a-person finds speaking, in-public, stressful, increased exposure to-this, skills-training and familiarization, can-give them the-coping-skills, to-reduce their-stress, from this-experience.

Stress-management-training, increasing-self-awareness, and learning-to-react-effectively, when one becoming stressed, is important, in-helping individuals deal-with their-stress-reaction. The-occupational health-approach, in-essence, is, to-reduce the-stress, from source, initially, then reduce the-person stressor-interaction, and finally, give-protection, to-the-exposed person, when they are exposed, to-stress. The-approach usually involves the-individual, the-department/section, in which the-individual works, and the-organization, so that general and specific-stressors are reduced, or eliminated, as-far-as-possible (Workplace-Stress-Health and Safety-Authority).

Besides, two-broad-approaches are used, to-offset the-adverse-impact of job-stress, on the-worker's health, production-output, and company-efficiency, namely: (1) *Stress prevention* is the-most-direct-way, to-reduce-stress, at-work. This-approach involves the-identification of work-stressors, and the-development of strategies, to-reduce, or eliminate-them. However, managers are, at-times, uncomfortable with this-approach, as it can involve changes-in-work-routines or production-schedules, or, even, changes in the-organizational-structure; and (2) *Stress management***,** which focuses on individual-workers and ways to-help-them-cope with-demanding-conditions. Stress-management-programs teach workers about the-nature and sources of stress, the-effects of stress, on-health and personal-skills, to-reduce-stress. Such-programs may rapidly-reduce stress-symptoms, in an-individual, such-as anxiety and sleep disturbance. They are also inexpensive and easy-to-implement.

However, such-programs, also-have a-major-disadvantage; concentrating on the-worker, they, often, ignore important-root-causes of stress, which are determined by the-working-environment.

A *combination* of stress-management and stress-prevention-programs is the-most-effective-approach, for preventing stress, at-work; and therefore it was recommended, for the-company. Several-studies have-been conducted in the-U.S.A. on the-effects of stress-prevention and management-programs. Program-activities include: (1) employee and management-education, on job-stress, (2) changes in policies and procedures, to-reduce organizational-sources of stress, and (3) establishment of employee assistance-programs, such-as free-counseling (Cheng & Chan, 2008; WHA, 2007). As-evidenced, in above narrative, WRS can affect both; physical and mental-health, of the-affected-workers. It-is therefore, important to-prevent and manage WRS.

The-company should, first, identify stressors and hazards, and reduce or eliminate them. A-general stressor-audit can-be conducted by using, for-example, Workplace-Stress-Audit-tool—WorkPositiveCI, developed by the-Critical-Incident Stress-Network, Ireland (CISM). More-details can-be accessed *via* www.workpositive.ie

The-organization also-should: (1) have a-Health and Safety-Policy, in-place; (2) appoint a-Safety Officer (or add the-responsibility to already-appointed-position, say Production-Engineer), to-oversee the OSH-issues, at the-mill; and (3) provide fully-stocked-first-aid-kits, in every-department.

It-is also-essential, that the-workers be-aware of the-various-occupational-hazards, in the-industry; this necessitates training. At the-same-time, it-is essential, that the-management take the-necessary-steps to-protect workers, from potential-hazardous-situations, by offering such-training.

Learning to-deal with-stress, in-healthy-ways, which can-help limit the-chemical-changes, happening within the-brain and body, in this-manner, improving both; physical and mental-health. Established and simple-relaxation-techniques can-be performed, by workers, to-reduce WRS (see Starovoytova, 2017d).

Moreover, Psychosocial-hazards were evaluated, in-this-study, *via* self-reports and observations; both methods could-be-subjective, the-authors, hence, recommend to-analyze the-exposures to-psychosocial hazards, at-more-deeper-level, by-using, for-example, the-HSE Management-Standard Indicator-Tool, which evaluates demands, control, peer and manager-support, role, relationships, perceived WRS, and self-reported-sickness-absence, related to-stress.

4.4.2. Mechanical-hazards

Before the-actual-discussion, on-mechanical-hazards, several-terms need to-be-defined, for-this-section.

4.4.2.1. Selected-terminology

The-expression ‘hazard’ and the-term ‘risk’ (in-the-sense of hazard) may-be-qualified, in-order-to-identify the-origin (for-example: mechanical, electrical, etc.), or the-nature of the-possible-risk (for-example: electric-shock, cut, intoxication, fire, etc.). The-hazard, considered in this-definition as: (1) permanently present, during the-intended use of the-machine (for-example, movement of hazardous-moving-components, such-as rollers, on a-rotary-printing-machine; electric-arc, during a-welding-phase; awkward-posture; noise-emission; high-temperature, etc.); or (2) might-appear-unexpectedly (for-example: explosion; crushing-hazard, resulting from unintended or unexpected-start-up of machine; projection, resulting from breakage; sudden-acceleration or deceleration, etc.).

Besides, a-danger-zone is defined-here as any-space, inside or around a-machine, in-which a-worker can-be-exposed, to a-hazard.

These-definitions are based, largely, on-the-following-standards: ISO 13849-1:1999; ISO 14121:1999; ISO 12100-1:2003; EN 1010-1:2004; and ISO 11161:2007.

4.4.2. 2. Concepts

According to-WHSC (2014), most-manufacturing-machines *do* have moving-parts. Machine-parts may-move in: a-linear, reciprocating, rotary, or oscillating-motion, individually, or in-combination. In-many-instances, the-action of these-moving-parts can-exert sufficient-force, to-cause-injury to-machine operators. Machine-operators can-be-exposed to numerous-risks, associated with moving-machine-parts, such-as: (1) Entanglement (due-to such-hazards-as: rotating-shafts, sprockets, gears, etc.); (2) Crushing (hard-surfaces, moving-together); (3) Severing (scissor or shear-action); (4) Cutting or puncturing (moving or stationary-sharp-edge); and (5) Slips, trips, and falls (e.g., over cable or hose-connections), among others.

Following are the-selected illustrative-examples of common-mechanical-hazards, with their-respective sources: (1) *Entanglement* may arise in the-course of work, when a-part of a worker’s body (e.g., hand or foot), or loose-items, worn by-them (e.g., clothing, or gloves) comes-into direct-contact with a-moving-machine-part; (2) *Cutting* hazards are present in-machines used to-cut wood, metal, or other- materials, at the-point of operation (for-example: milling-cutters, circular-saws, handsaw-blades, rotary-knives, disc-blades, or the-sharp-edges of a-moving-sheet of material. Machines or tools, with moving-cutting-elements are particularly-dangerous, as they have-the-capability to-cause severe-injury (e.g., deep-cuts, or amputations) due to-its own-momentum, when they come into-contact with a-worker’s body. The-severity becomes magnified, when the-body-part is trapped, in a-stationary-position, and the-worker is unable-to-move-away from the-cutting-element. Cutting-hazards also-occur when materials are ejected from a-machine (e.g., flying-metal-chips) and strike the-

machine-operator); (3) *Crushing* occurs when a-body-part is caught: between a-fixed and moving-part of a-machine (e.g., between bed and tool of a-power-press); between a-moving-machine-part and a-fixed-structure (e.g., between a-machine counterweight and floor); and between two-moving-parts of a-machine (e.g., between support-arms of a-scissor-lift-platform); (4) *Impact* hazards relate to-objects, that strike the-human-body, but do *not* penetrate it. The-severity of an-impact-hazard depends on the-speed, force, and inertia, of the-moving-machine part(s), material(s) being-processed, during machine-operation, or upon ejection from the-machine (for-example being-struck by the-rotating-arm of a-robot, or being-exposed to a-high-pressure-jet, of air, or water. Impact-hazards, often, result in-serious-injury, such-as: abrasion and bruises; (5) *Shearing* Hazards (Parts of machines, that move past-each-other, or stationary-objects can-cause a-shear-point, resulting in a-crushing or cutting-action. In-general, shearing-hazards are present: between two-machine-parts (e.g., a-power-press-punch and die); and between a-machine and a-work-piece (e.g., transfer-mechanism, tool of a-broaching-machine and its-work-piece); and (6) *Draw-in* Hazards: Injuries can occur, when a-body-part is drawn-in by in-running nip-points, formed by two-counter rotating-parts, or between rotating and tangentially-moving-surfaces.

Regarding the-printing-machine, rotating-parts can catch loose-closing, hands, or long-hair, potentially-causing serious-injuries. Uncovered-parts may also fly-off, thereby creating additional-risk, especially for eye-injuries. Moreover, according to OSHA (2007b), with the-printing-machine, in-particular, amputations occur, when employees get their-fingers or hands, caught in the-in-going nip-points, created between two-rollers, while: Hand-feeding the-leading-edge of fabric, into the-in-running-rollers, during press set-up, while the-machine is operating; Adjusting ink-flow, on-a-press; Cleaning ink-off the-press, while it-is operating; Attempting to-free material, from the-rollers; Straightening misaligned-fabric in the-press; Jogging the-printer and making-adjustments to-the-equipment (such-as adjusting the-nip-wheel); and Using rags to-clean machinery, adjacent to unguarded-rollers. Two-specific-examples were also-provided, as-follows: (1) An-employee was-adding ink, at the-top of a-printing-press, when he spotted a-small-piece of wood, in the-area of the-moving-rollers. He caught his-hand, in the-moving-rollers, as he attempted to-remove the-wood, and had to-have his-forearm, surgically-amputated; and (2) An-offset printing-press-operator lost his-right-hand, while attempting to-remove dried-ink, on a-moving-roller, using a-rag. The-guard, covering the-lower-ink train-rollers had-been flipped-up, exposing the-rollers.

4.4.2.3. Unexpected or unintended start-up

Majority of the-respondents stated, that unexpected or unintended start-up, of some-machines, is possible.

Machine start-up, during-normal-sequence of an-automatic-cycle is *not* unintended, but can-be considered to-be unexpected, from the-worker's standpoint. Any start-up that, due-to its-*unexpected*-nature, creates a-hazard. For-example, such a-start-up can-be-caused by: (1) a-start-command, resulting from a-failure of the-control-system, or an-outside-influence, on this-system; (2) a-start-command, resulting from an-inappropriate-human-action, on a-start-up-control, or on-another-component, of the-machine, as for-example, on a-sensor, or a-power-control-element; (3) the-reestablishment of the-power-supply, after an-interruption; outside, or inside-influences (for-example, gravity, wind, auto-ignition in internal combustion-motors) on the-machine's components. In-this-case, accident prevention is based on the-application of protective-measures (see ISO 12100-2:2003, section 5).

4.4.2.4. Methods of control and protection from mechanical-hazards

A-machine/mechanical-hazard may-be significantly-reduced, through adequate-risk-control, in the-following-order of priority (Machine Safety, 2009): (1) risk-control, by inherently-safe-design measures; (2) risk-control, by safeguarding, and implementation of complementary-protective-measures; and (3) risk-control, by information, for use. These-controls were, discussed, below, in-the-stated-order.

Protective-measures, which-either eliminate hazards, or reduce the-risks, associated with hazards, by-changing the-design, or operating-characteristics, of the-machine, without the-use of guards, or protective-devices. ISO 12100-2:2003, section 4, deals with risk-reduction, by means of *inherently-safe design measures*.

When machine-related mechanical-hazards, can*not* be eliminated, through inherently-safe-design, they must, then, be-reduced-to an-acceptable-level, or the-hazards, that cause them, must-be-isolated, from the-workers, by guards, that allow the-minimum safety-distances, to-be-respected. Most of the-risks, related to-mechanical-hazards, can-be-reduced, to-acceptable-forces or energy-levels, by applying a risk-reduction strategy (see Figure 2). If this is impossible, the-hazards must-be-isolated, from people, by guards, that maintain a-safety-distance, between the-danger-zone and the-people, with the-main-result, being to-reduce access, to-the-danger-zone.

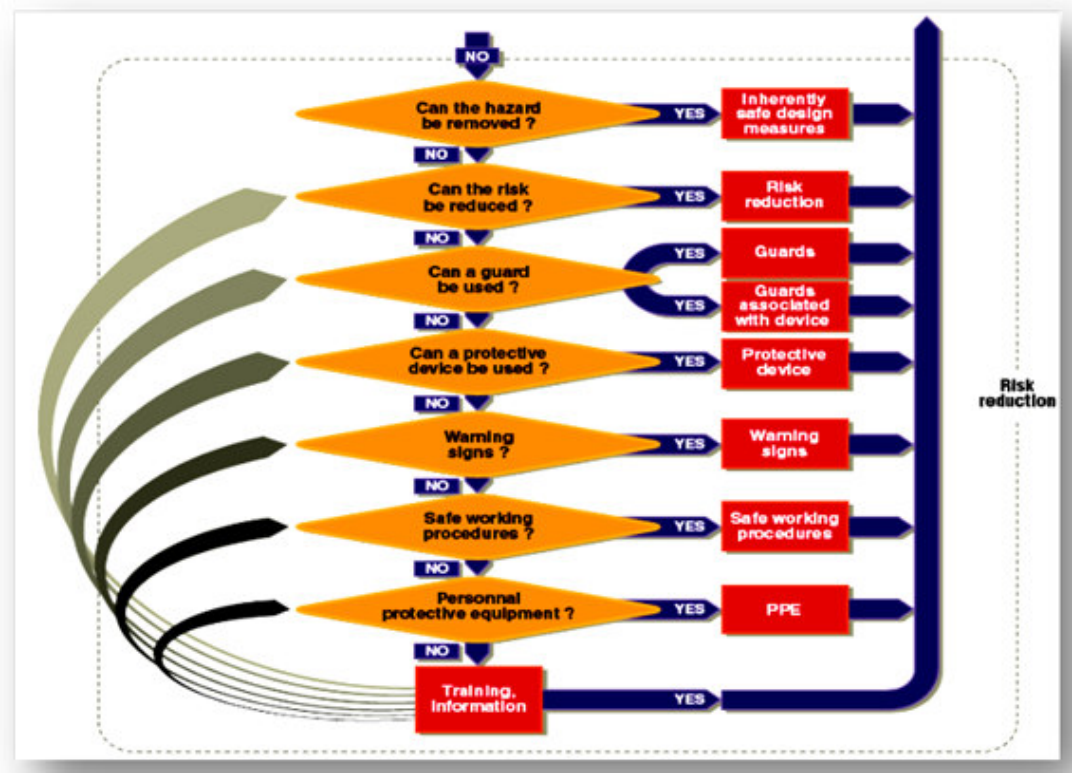

Figure 2: Risk-reduction-hierarchy (adopted from CSST, 2004).

Regarding risk-reduction, WorkSafe made-the-following general-recommendations: (1) Where exposure to-machinery and equipment-hazards can*not* be eliminated or substituted, for machinery and equipment of improved-design, *risk control* must-be-applied, to-the-hazards, that prevents or reduces the-risk (chance) of injury or harm. Health and Safety-laws require the-highest-order-control, be-applied, so-far-as is reasonably-practicable; (2) *Higher-order* machinery and equipment risk-controls are *preventative*, by-nature, are effective and durable, for the-environment it-is used in, and deal, directly, with the-hazard, at its-source; and (3) *Lower-order* machinery and equipment-risk-controls, such-as personal-protective-equipment (PPE), can prevent injuries, but are, generally, *not* as-effective-as higher-order-controls, as they rely more on: employee-behavior, maintenance-programs, and supervision. The-use of PPE and administrative-controls, are low or last-order-controls, used to-deal-with any *residual* risk, associated with the-hazard. As-such, these last-resort-controls can-be-used, in-support of higher-order-controls, that deal with a-hazard, at its-source, and should *not* be considered, as the-sole means of control. Besides, these-types of risk-controls require constant-monitoring and reinforcement.

Engineering-control (e.g., the-use of machine-guards and other-physically-implementable protective measures) is a-critical-approach to-risk-reduction. According to-OSHA (2007b), two-primary-methods are used to-safeguard machines: (1) guards; and (2) safeguarding-devices. Guards provide physical-barriers, which prevent access to-danger-areas. Safeguarding-devices either prevent, or detect, operator-contact with the-point of operation, or stop potentially-hazardous-machine-motion, if any-part of an-individual's body is within the-hazardous-portion of the-machine.

Safeguarding-methods protect employees, from-hazards, by the-physical-arrangement of distance, holding, openings, or the-positioning of the-machine-components, to-ensure, that the-operator can*not* reach the-hazard. Some-safeguarding work-methods include: safe-distance-safeguarding, safe-holding safeguarding, and safe-opening-safeguarding. Requirements for these-secondary control-measures may-be found in ANSI B11.19-2003.

4.4.2.5. Machine Guards (Protectors)

Guarding is commonly-used, with-machinery and equipment, to-prevent access-to: rotating end-drums of belt-conveyors; moving-augers of auger-conveyors; rotating-shafts; moving-parts, that do *not* require regular-adjustment; machine-transmissions, such-as: pulley and belt-drives, chain-drives, exposed-drive gears; and any-dangerous moving-parts, machines or equipment.

Guard (Protector)-is a-rigid-physical-barrier, designed as a-component, of the-machine, and that provides a-protective-function. *A-guard* can-perform several-functions: (1) it can deny bodily-access; (2) contain ejected-parts, tools, off-cuts, or swath, prevent emissions, escaping, or form-part of a-safe-working platform. A-guard can-achieve its-effect: Alone (it-is then effective, *only* when it-is held, in-place securely, if it-is a-fixed-guard); or associated-with an-interlocking-device. In-this-case, protection is ensured, regardless of the-position of the-guard. Depending on its-purpose, a-guard can-be-called: a-housing, shield, cover, screen, door, or cabinet.

Machine-guards often partially-cover the-point of operation, while allowing limited or *no*-access (WHA, 2007).

Besides, there are two-broad-types of guards: (1) *Fixed-guards*: fixed-enclosing-guard; fixed-distance-guard; fixed-nip-guard, etc.; and (2) *Movable-guards*: interlocking-guard; interlocking-guard with guard-locking; power-operated; automatic-closing, etc.

A-fixed-guard is a-physical-barrier, which is permanently-attached (e.g., with screws, nuts, or by welding) to a-machine, to-prevent-access to the-danger-zone, from *any*-direction. Fixed-guards are, typically, designed, so that they are-difficult, or impossible to-remove, without the-aid of a-specific-tool. This makes fixed-guards safer, than any-other-types of guards. In-general, fixed-guards are preferred, due to-their relative-simplicity and permanence. Fixed-guards are commonly-used to-cover power-transmission units. Specifically, *fixed-enclosing-guard* prevents access, to-the-danger-zone, from *all* directions. *Fixed-distance-guard* does *not* completely, enclose a-danger-zone, but that prevents, or reduces-access, to-it, due to its-dimensions, and its-distance from this-zone (e.g. a-peripheral-enclosure). *Fixed-nip-guard* placed near an in-running-nip, to-prevent-access to-the in-running-nip, which creates the-danger-zone. In-running-nips can-be created either: by-cylinders, in contact (or very-close) turning in opposite-directions; by two-cylinders, *not* in contact; by a-cylinder, close to a-stationary-object; and by a-cylinder, in contact with a-belt (chain) or the-worked-material. The-next-group is movable-guards.

An-adjustable-guard is one, that can-be-moved, or re-configured, to the-dimension, of the-work, at-hand. This-type of guard allow a-machine to-handle a-wide-variety of material-sizes, while protecting users, from the-danger-zone(s). It-is important, that any-manual guard-adjustment is carried-out by a-well-trained and competent-person. An-example of an-adjustable-guard is the-guard, covering the-point of operation of a-circular band-saw.

A self-adjusting-guard is one, which covers the-danger-zone, until a-work-piece is pushed-into the-point of operation, and moves the-guard. The-gap, between a self-adjusting-guard and the-danger-zone is, therefore, determined by the-movement of the-work-piece. As the-operator moves the-work-piece, into the-danger-area, the-guard is pushed-away, providing a-clearance, large-enough, to-admit *only* the-work piece. Once the-work-piece is removed, the-guard will-automatically-return to its-neutral (safe) position. An-example of a-self-adjusting-guard is the-guard, covering the-point of operation of a-radial arm-saw.

An-interlocking-guard (equivalent to-the 'interlocking-protector'), associated with an-interlocking device, which shuts-down, or disengages, the-power, to-the-machine, whenever it-is opened or pushed-out of position. Once the-interlocking-guard is disengaged, the-switch or interlock, will-automatically-stop, the-dangerous-operation, or motion. The-machine can *only* be-manually-restarted when the-interlocking guard is returned to its-original-position. ISO 14119:1998 contains detailed-information, on this-subject. Interlocking-guards are commonly-used to-protect the-operator, of a-milling-machine.

In-addition, ISO 12100-2:2003, section 5.3.2, and ISO 14120:2002 provide more-details on the-different-types of guards, and the-requirements, which apply, to-them.

A-combination of different-types of guards, may-be-useful, depending on the-configuration of the-machine (or the-integrated-manufacturing-system) and the-production and maintenance-requirements (e.g. access to-one of the-danger-zones, while the-machine is in-operation).

According to WorkSafe, where access is *not* anticipated, a fixed-guard can-be permanently-applied by bonding-agent, welding, or secured with one-way-screws. If access is generally *not* required, a-permanently fixed-barrier is the-preferred-option. Where access to-the-hazard is infrequent, the-installation of a-fitted guard**,** that can-be-removed, by use of a-tool, may be an-acceptable control, where the-tool, to-remove the-barrier, or guard, is *not* normally-available, to the-operator. Adjustable-guarding incorporates movable-sections or panels, of the-guard, and allows for-material or parts, to be-fed, into the-guarded-area, while still-preventing bodily-contact.

The-following-standards, provide more-information, on machine-guards: ISO 12100: 2010 Safety of Machinery – General Principles for Design – Risk Assessment and Risk Reduction; ISO 13855: 2010 Safety of Machinery – Positioning of safeguards with respect to the approach speeds of parts of the human body; ISO 14120: 2002 Safety of machinery -- Guards -- General requirements for the design and construction of fixed and movable guards; and ISO 14119: 2013 Safety of Machinery – Interlocking devices associated with guards – Principles for design and selection.

Machine-Guards, regardless of their-type, rank third, in the-risk-reduction-hierarchy, after inherently-safe-design and risk-reduction. Guards must therefore be chosen *only* if the-first-two-measures can*not* reasonably-be-applied.

Protective-devices, and electro-sensitive protective-devices, come next, in-hierarchy of effectiveness of risk-control-methods.

4.4.2.6. Protective-devices

A-protective-device is defined-as any-safeguard, other than a-guard. Selected-examples of the-types of safeguarding-devices are: Pullback-Devices; Restraint-Devices; Presence-Sensing-Devices; Presence Sensing

Mats; Two-Hand-Control; Two-Hand-Trip; Type "A" Gate (moveable barrier); and Type "B" Gate (moveable-barrier). For more-details on the-concept, advantages, and limitations, on any of the-methods, readers could refer-to OSHA (2007). Other-safeguarding-methods, such-as-those, described in the Performance Criteria for Safeguarding (ANSI B11.19-2003) may also-provide employees with some-protection, from machine-hazards. Following are selected-examples of most-common-types.

A presence-sensing-device will *not* prevent-access, to-dangerous-points of operation, but it can detect a-person, once any-part of their-body enters the-identified-danger-area. When-this-happens, the-machine can-be-automatically-programmed, to-raise an-alarm, reduce the-speed of its-moving-parts, or be-stopped, immediately (e.g., light-curtains and laser-scanners). The-presence of sensing-devices, alone, may *not* provide sufficient-physical-protection, from machine-hazards. Additional-safeguards (e.g., a-suitable fixed-barrier or machine-guard) may be-used, in-combination-with a-presence-sensing-device, to-offer increased-levels of protection. *Warning-Device*, on-the-other-hand, indicates that a-predefined-condition has-been-detected, or a-hazardous-situation exists. Warning-signals may-be audible (e.g., sirens), visual (e.g., flashing-lights), or a-combination of both. This-is to-ensure, that workers, in the-vicinity, are made-aware of the-situation, and can either; effect the-necessary-remedy-action, or adopt a-safe-position, away from the-machine (Machine Safety, 2009).

4.4.3. Specifics on responses

70 % of the-workers, indicated, that some-machines were operated with unprotected-moving-parts. 70 % also-reported, that there-are some-machines, where an-unprotected or unintentional-start-up is possible. There are at-least two-scenarios, for such-outcomes: either the-guard was *not* installed on a-particular-machine, or it was *not* performing-well, its-primary-objective. To-avoid machine-hazards, following is recommended: (1) guards should-be installed. For-example, Figure 3 shows the-case of rotary-printing-machine, where guard preventing bodily-access, and, hence, potential-occupational-injury; and (2) guards should-be *properly*-maintained and monitored, so they do *not* fail, in-operation.

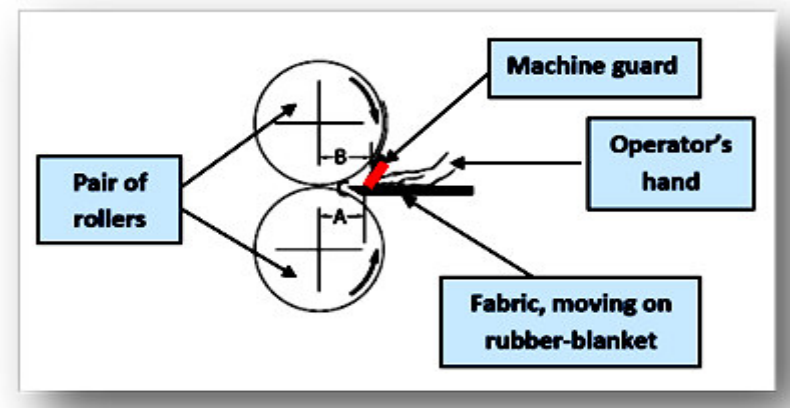

Figure 3: Guard preventing bodily-access, in rotary-printing-machine.

WHS Council (2014), offered very-practical-directions, to-ensure effective-guarding, against machine-hazards, where employers must: (1) Train operators to-verify, that machine-guards are functional, and securely-in place, *every-time*, before using the-machine; (2) Schedule supervisors, to-conduct periodic-inspections, to-verify, that workers are using the-machine-guards, as intended; (3) Assign engineers, to-verify that any-new, or modified-operation, is properly-guarded, before the-machine can-be declared ready-for-use; (4) Hold maintenance-personnel responsible, for ensuring, that machine-guards are properly-maintained, and placed on a-preventive-maintenance-program; (6) Assign the-safety-manager or safety-committee, to-audit the-effectiveness of the-machine-guarding-program, and resolve any-outstanding guarding-issues; and (7) Encourage the-plant-manager to-show-support, and give-recognition, when audits show, that the-machine-guards are properly-used.

In-addition: Access to-industrial-machines should-be-restricted to-authorized-personnel; New machine operators must-be sufficiently-trained and supervised, till they are competent, to-operate the-machine, on their-own; All-machines must-be regularly-serviced, maintained, and checked, to-ensure that they are in good-working-condition; Appropriate PPE (including overalls, head, eyes, hand, and foot-protection) must-be properly-worn, when working with-machines. As the-use of PPE does *not* eliminate, or reduce, the-hazard, the-PPE user is likely to-be-exposed to-the-hazard, should the-PPE fail. Therefore, PPE should-be-considered the-last-level of protection, when *all* other-control-measures are *not* feasible, a-PPE-program is recommended to-ensure that workers are well-protected, when PPE is used (WHS Council, 2014). Loose-clothing is *not* allowed and all-jewelry (e.g., bracelets, necklaces, and rings) must-be-removed, before starting work. Long-hair should-also be-neatly tied-up, and preferably tucked, into a-suitable-head wear, to-prevent-entanglement.

After PPE, the-next, and the-last approach, is providing training and information. In-particular, as-part of the-machine guarding-program, operators will-need to-receive training, on the-various-types of machine-guarding and their-respective-application. This-will-help operators understand the-basics of machine-guarding

and how it provides physical-protection, from machine-hazards.

5. Conclusion and Recommendations.

The-respondents pointed-out on the-possibility of several-psychosocial and mechanical-hazards, at the-department, some of which can-lead to-serious-physical and/or psychological-damage, or, even, mental-illness and/or fatal-injury, for affected-workers. In-addition, deficiencies, in the-area of Occupational-Safety and Health, at-the-department, were identified. Knowing the-hazards and deficiencies, is a-paramount-step, on the-road of their-eradication. The-author, hence, believes the-study contributed (in its-small-way) to-increasing-awareness on the-psychosocial and mechanical-hazards, in printing-section of textile-industry. This-*unfunded*-study is also, raised a-number of significant-issues, despite the-limited sample-size, evaluated, hence, adding to the-existing-body of knowledge, on the-subject-matter.

On-the-other-hand, comprehensive-coverage of Occupational-Safety and Health (OSH), in-Kenya, revealed that there-is a-well-established-structure, and legal-foundation; the-practical (implementation phase), however, is in-real-need of capacity-building, to-enable nationwide-coverage, and provision of all-inclusive and reliable-statistics on occupational-accidents and MSDs, in all-the 47 counties, and overall, in the-country.

To-deal with occupational-risks and hazards, many-approaches/methods were described, in-the previous-sections. The-company, however, should-choose and apply, *highest-order-control*, so-far-as is reasonably-practicable. For-example, regarding WRS, a-combination of stress-management and stress prevention-programs, is the-most-effective-approach. Workers should-also learn to-deal with-any residual-stress, in-healthy-ways, for-example, by simple-relaxation-techniques.

In-addition, the-following tailored-recommendations were-made:

The-company should, first, identify stressors and hazards, and eliminate or reduce them; a-general stressor-audit can-be conducted *via* WorkPositiveCI.

The-organization also-should: (1) Have a-Health and Safety-Policy, in-place; (2) Appoint a-Safety Officer (or add the-responsibility to already-appointed-position, say Production-Engineer), to-oversee the OSH-issues, at the-mill; and (3) Avail fully-stocked-first-aid-kits, in *every*-department; (4) Provide *proper*-training on: (a) the-various-occupational-hazards, in the-industry; (b) machine-operation and various-types of machine-guarding and their-respective-application, before new-comers start operating machinery, on their-own; (c) administering first-aid, to-coworkers and to-themselves.

Further-studies, should-be-conducted, to-analyze the-exposures to-psychosocial-hazards, at-more deeper-level, by-using, for-example, the-HSE Management-Standard-Indicator-Tool.

To-avoid mechanical/machine-hazards, the-company should: install machine-guards, where necessary, and properly maintain and monitor, them, so they do *not* fail, in-operation.

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