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Title: Impact of Industrial Development on Industrial Safety

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ABSTRACT

Purpose
The proposed research work is with the aim of analyzing the impact of industrial development on industrial safety procedures adopted by industries and factories, measures both statutory and non-statutory provided by the government and efficacy of the controlling authorities.

Methodology
Testing of hypothesis is carried out using Z test.

Findings
Accidents are readily recognized when machinery or instruments are damaged, material is spoilt or someone is injured. It is not necessary that all accidents should result in personal injury. In fact, the accidents without personal injury outnumber those, which have resulted in an injury. On each occasion an individual is exposed to an unsafe condition, or, becomes subject to an unsafe act, there is a possibility of an injury. The monetary implications in the form of direct and indirect costs can be assumed to be quite high. The incidence rate is quite high in all types of textile factories. A gradual reduction has been noticed over years due to industrial development, technological up gradation and better implementation of industrial safety procedures. The highest figures have been observed in metal & alloy industries. While carrying out state-wise analysis of non-fatal and fatal injuries it was inferred that the industrial development as a result of globalization has contributed to better safety standards.

Research implications
The findings give an insight on to the relevance of industrial safety as a result of industrial development.

Value
The findings may serve as input in formulating a research agenda to align scholars' focus and practitioner's problems.

Key words: industrial safety, development, accidents, fatal injuries, safety standards

MANUSCRIPT

1. Introduction.

1.1. Today government, private industries, and universities acknowledge the importunate necessity for productivity improvement. What we must try to do is to put a stop to accidents as much as possible and support education in industrial safety. Every year a large number of employees get injured due to accidents. Therefore, there is an explicit need to implement necessary safety measures in the industrial organizations. The safety requirements rise and fall according to the vulnerability problems. Well-organized safety management is a necessity in any successful industrial establishment. Therefore industrial safety is an essential subject, which needs to be studied in depth and given due importance in any industrial organization. Safety has been recognized as a fundamental part of the conventional operating procedures and an unambiguous task of all decision-making personnel along with the employees. Interaction between worker and the environment leads to occupational health hazards. To minimize health hazards, there is a need to keep an eye on the worker's health and also working environment. Extensive statutory provisions have been made in India for preclusion of industrial accidents and thus enhancing safety of industrial workers. With the large-scale industrialization, the hazards faced by the industrial worker have increased manifold. Therefore the subject of industrial safety has assumed quite an importance. Absence of proper safety measures would invariably lead to avoidable accidents resulting into injuries to persons, harm to equipment and machinery, financial losses both to employers and employees. The human angle for providing safety to the industrial workers is no less principal, in fact in the present industrial environment; it is one of the major reasons for the management to undertake effective safety programs in their organizations, concerns, and factories. Industrial safety involves not only elimination of agents of injury, but also a reliable control of harm to employees. [1] A good safety program can reduce occupational injury/illness and the operating costs, which in turn contributes substantially towards increased productivity and improved profits. In view of the foregoing, it is essential that the subject of industrial safety is given due care and a proper safety program be evolved and implemented to ensure the safety of workers.

1.2. In earlier days the accidents were said to be the result of workman's carelessness, with management sharing little responsibility. Subsequently based on studies conceded by the management expert's appropriate labor legislation Workman's Compensation Act 1923, in tune with the requirement of time was adopted by industrialized nations. Other nations also adopted this Act with the aim of reducing industrial accidents. With the rapid development in industrial process new types of dangers have been introduced in increasing numbers. Mechanical, electrical, chemical and radiation hazards cause lot of problems for safety of the employees in

the industry.[2] When the safety planning and safety measures are lacking, industrial operations may not remain under full control, schedules may get disrupted and cost may increase.

1.3. The proposed research work is with the aim of analyzing the impact of industrial development on industrial safety procedures adopted by industries and factories, measures both statutory and non-statutory provided by the government and efficacy of the controlling authorities. The research topic relates to industrial safety management, which is dynamic and alive. The paper will also analyze industrial safety thinking over years including the psyche right from primordial times and discuss future the options. The study encompasses the safety management at both macro level as well as micro level.

1.4. Industrial safety is that condition of enterprise operation in which, by controlling hazards, accident free manufacture is achieved. It is not necessary that all accidents should result in personal injury. In fact, the accidents without personal injury outnumber those, which have resulted in an injury. Industrial safety has been described as the only viewpoint of industrial relations where there is no advantage to either side at the expense of the other. [3] An industrial accident may be defined as an occurrence, which interrupts or interferes with the orderly progress of work in an industrial establishment. It must arise in the course of employment in a factory or an industrial establishment. [4] An industrial injury has been defined as a personal injury to an employee, which has been caused by an accident or an occupational disease which arises out of, or in the course of employment and which would entitle such employee compensation under the Workmen's Compensation Act, 1923. Industrial safety of an organization is its prime responsibility, because workers are the soul of any progressive organization. Safety and health have great importance in industrial development and productivity. [5] Therefore utmost consideration needs to be given to maintain excellent safety and health standards at the places of work of the employees and also off the work. There is an old adage in safety that says, "Accidents do not happen! Main causes of accidents are unsafe conditions and/or unsafe actions. Though danger of accidents exists in all walks of life it is more in industries where man and machine work together". [6]

2. Literature Review

2.1. Objective of this study is to advance in to recent phenomena of industrial safety management. The subject matter is impact of industrial development on industrial safety consequent to the espousal of globalization world all over, with specific interest on employee safety. For the literature review in order to preclude duplicity and incorporate recency, attempt was made to carry out bibliometric analysis taking a sample of 110 SSCI-indexed journals which were available. The period covered was from 1991-2018, wherein the result of liberalization was felt world all over and transformed business operations from local to a global phenomenon. A total of 184 items published in these journals over the period were taken as sample with

leadership as the domain. As the study progressed it was obvious that there has been a surge in the attempt to address the topic of industrial safety from the results of person responsible, excerpt, and co-citation, factor analyses. Despite that, what was nonconforming is that the line of attack adopted was little bit biased on to the theoretical aspects of limited areas. In this discreet analysis the important topics till now attempted have been types of industrial accidents and theories on the basis of which laws have been enacted, emotional contagion, environmental challenges on industrial safety and functions of responsible managers. Hence it was noticeable that the correlation between industrial safety and industrial advancement has not been attempted whole heartedly.

2.2. Stodgill (1950) highlighted leadership as one of the world's oldest concerns, as exemplified by Homer's book the Iliad and the Greek heroes. Vibrancy of responsible leadership on the improvement of industrial safety as a research topic both in academia and in the business world cannot be wished away. The reason for such a movement is primarily the rapid progress towards a global village and connectedness in the society. Caused by this there is a growing awareness on managers and leaders' responsibilities and ethical behavior [7]. This would be supported by the observation that corporate and managerial responsiveness have been under public examination more than ever before [8]. Leadership can be considered as "the process of influencing the activities of an organized group in its efforts toward goal setting and goal achievement". [9] We are all aware that in this context safety is an important attribute. Here it has been seen that all stakeholders are striving to address mutually supporting attributes of the complex society, increasing awareness, public interest, industrial safety and concern in financial crises. Linked to this is the issue of unemployment, substantial layoffs, downsizings, environmental problems, corporate scandals and unethical misconduct in business. An added view on industrial safety considers it as a process in which specific parties appreciate the procedural aspects. It goes on to point toward the individual and collective attributes.

2.3. As we move forward, in the field of industrial safety focus has been primarily on the characteristics and behaviours that in the progression of safety management help to utilize individuals, encourage positive relationships, shore up ethical and moral standards, and fire up well-organized societal dynamics in organizations. Contrary to the idea of transactional relationship, the concept of transformational leadership invigorate interactional-based relationships between the stakeholders, attitudes, values and other personal and professional-type of stimulus, which is of utmost importance in industrial safety [10]. This presupposes that workers progress as professionals and persons, through the influencing dexterity of leaders [11]. Since globalization, dependable social interpretation has been indicating the transformation to responsible leadership, which is why it has caught considerable attention, initially implicit as "a social-relational and ethical phenomenon, occurring as social processes of interaction".[12] Hence we may contemplate that this approach may be considered to be distinctive from other

theories, for the reason that its philosophy is rooted in the necessity to maintain a multifaceted and dynamic equilibrium between elements of organization and style of leadership . For accomplishing such challenging objectives, this concept must maintain an ethical perspective, while assuring the requisites for efficiency and efficacy. [13] As a fall out, it is also likely to have a wider and deeper bearing on numerous outcomes. The voids in existing analysis on the subject suggest potential research avenues on industrial safety.

2.4. As we progressed, certain factors emerged, showing different research fields on the topic of industrial safety, ranging from legal aspects to the impact of technological development on industrial safety, so we restricted the current research on impact of industrial development on industrial safety and development of employees, organizational performance and future perspectives.

3. **Critical Issues**.

3.1. World has accepted globalization since the nineties, which has improved the economies, made technological advancement transparent and improved quality control of developing countries. A phenomenon which has caught attention along with this development is the emergence of industrial safety as a concept. As a part of the research in this paper it is intended to analyze the impact of industrial development on industrial safety by covering the driving force spearheading industrial safety, its organizational support, contribution to meeting the aspirations of the stakeholders, and how conscious are they with respect to risk management. [14]

3.2. For decades after independence, the story of India can be summarized with an unceasing invocation of one word – If- the shorthand for a saga of missed opportunities. It is not that India lacks achievements-a vibrant democracy, a large reservoir of skilled manpower, a self-confident middle class at the cutting edge of new technology and above all, a huge and growing domestic market. It is just that these achievements are not commensurate with India's acknowledged potential. The country faces an unacceptable performance-potential gap in the industrial development. India remains a large country with a small economy. It makes up 16% of world's population but its global GNP share is only 1.5 %. Another disheartening fact is that its contribution to world trade is only 0.7%. During 1960s India was at par with South Korea as far as industrial development was concerned, but now South Korea's per capita income is 20 times higher than that of India. [15] The recent spate of industrial development has brought new issues like competitive conduct of the business houses and industrial safety into limelight.

3.3. The industrial safety movement in India is of a very recent origin. So, the industrial workers in India are more vulnerable to unethical practices by owners and management. Contrary to the early stage of development of industrial safety issues in India, the developed economies have a well-debated and structural legal system for right conduct and safety system for companies.

Public policy intersects the field of industrial safety when public policy makers believe that intervention in the process or outcome of industrial policy exchanges between management and workers will benefit the society as a whole.[16] New labor policy and technological as well as industrial development that affect the industrial safety are outgrowth of management abuses brought to the attention of policy makers through the media, consumer advocacy groups or by consumers themselves and an overall public recognition of the need for economic and social welfare.

3.4. The Schools of Thought

3.4.1. Industrial safety doctrine rests on the concept of safety consciousness and safe working environment. Industrial safety in acceptable terms is the ability of a firm to increase productivity without increasing industrial accident. There are no economic interpretations of industrial safety in Indian context. Mostly industrial safety is conceived in terms of economic efficiency with laws on workers' safety largely interpreted through a concise economic thought.[17] Maximization of industrial safety standards and avoidance of accidents is considered the dominant goal of industrial safety norms, with safety system striving to achieve the highest practical level of safety norms. This analysis involves application of effect of industrial development to an understanding of firm and individual worker behaviour and the evaluation of potentially anti safety practices. The current debate in industrial safety globally centers on the pollution and environmental hazards, both natural and artificial. Some thoughts are being given to terrorist strikes.

3.4.2. There are two schools of thought on industrial development and industrial safety. Key differences in substantive thought and methodology distinguish these two schools. These differences largely centre on the working and efficiency of market mechanism and proper approach for industrial safety enforcement. On one hand is the schools of thought, which holds to the core belief that industrial development by nature, tend toward efficiency and better safety standards, the imperfections generally are transitory in nature and for the most part, self-correcting.[18] Adopting such assumptions and working from a model is one school of thought. The implications for industrial development vis-à-vis Indian context are at its rationalization and clarity. Through defining behaviour purely in terms of industrial accident, enforcement authorities and the courts are viewed to be equipped with simple and objective tests for determining the effects of industrial development on the industrial safety. Whereas industrial development lower industrial accident enhances workers welfare, restraints on these aspects do not. An important offshoot of this simplification is the ability of the firms to predict accurately and educate the workers what might be considered suspect conduct and to avoid such conduct in favor of activities leading to the enhancement of labour welfare. The practices of mid-20th century are ample evidence of such kind of a movement in Indian industry, which continued till

liberalization in Indian industrial environment. [19] In contrast to this school of thought, others believe that industrial development by nature, do not tend toward efficiency and better safety standards, they are imperfect in nature and for the most part are not necessarily self correcting. According to this view firms can and do take advantage of these imperfections resulting in industrial accidents. The resultant posture is the belief that industrial development must take a more positive and active role through heightened scrutiny of a wider range of safety devices to promote and ensure a trouble free working environment. Much of the thinking and challenge to the earlier school reflects progressive changes in the field of industrial development and more particularly in the field of industrial organization. During the 1980s, focuses within the industrial organization shifted from studies of industrial safety to focus on strategic behavior of firms within imperfectly competitive markets. [20]

3.5. The Indian Scenario

3.5.1. The government usually employs three type of intervention in the Indian context i.e. regulation, education, and the provision of incentives to encourage desired behavior. Through regulations, policy makers attempt to prohibit certain types of practices like unsafe conditions, unsafe working environment. Regulations also influence the compensation packages. [21] Through worker education government may cultivate desired worker response on industrial safety. Government also encourages certain types of firm behavior, which will be in the labor interest by giving certain incentives and awards. Owner or management abuses have become a matter of concern to policy makers at every level in the government. Some theorists complain that industrial development enables management to exploit workers in a more professional way. The amount of legislation, though inadequate cannot bring a reformation in the Indian unorganized industrial sector due to ignorance of the people and workers in specific. This is an exploitation of vulnerable and naïve workers by the practice of economic superiority. So the policy makers have recognized that it is the government's responsibility to promote and protect the labor interest and to provide for the general welfare. Of late, the legislators have enhanced the number of safety regulations in response to public outcries about dishonest and unethical industrial practices. Many independent regulatory agencies also have been established to police specific industries, to frame rules and regulations designed to prevent or eliminate abuses and to enforce industry compliance with such rules and regulations. Government policy makers and trade union leaders have increasingly recognized that *they cannot protect workers against every possible industrial abuse* and *the best defence for the worker is the knowledge*. [22]

3.5.2. Many government and non-government agencies offer workers education programs and disseminate information. One proposal in Indian academia is to develop computerized data banks containing general educational information. It is also recommended that these education programs should be made compulsory at professional courses. With Indian economy opening up

it is extremely difficult on the part of the government to have legislation to regulate the conduct in a virtual world. There is an increased cost resulting from regulations. As government officials have to weigh the cost and benefit of enacting and enforcing regulations, the global market is undergoing a complex change due to rapid technological innovation and diffusion of virtual behaviour of business. The corporations have slowly realized this phenomenon of workers and society's concern and tried to develop self-regulatory measures for a better face of their business. Organizations are involved in a social audit. [23] The analysis leads us to believe that to meet the safety needs successfully in the next millennium it will take more than simply improving the legislations.

3.5.3. Mr. Bill Clinton in his address in Mar 2003 stated that "if India continues to grow economically and get beyond some of its own difficult issues, there is no question that you will be a giant among all nations in the 21st century." But then where do we stand as for as industrial safety is concerned. We have moved towards 300-mm wafer-chip manufacturing, bio-chips, micro-electromechanical systems, chips at the nano-scale measured in the billionth of a meter. First wave in industrial development can be acknowledged as the spread of agriculture. Industrial revolution and all the educational, economic, political, technological changes that came with it can be stated as the second wave in industrial development. Now we have the great and all transforming as the industrial revolution which is global and more rapid. This third wave economy threatens the core institutions and power arrangements of the industrial age. In the light of this we will have to get our labour laws in place, improve our infrastructure. The legislations in respect of industrial safety have been found out of tune with the industrial development. We are a litigious people; almost 15 million cases are instituted every year in our country. There is acute shortage of judges. Hence it is quite evident that, judiciary as an institution have not been trained to deal with this change, be it privatization or labour-law reforms. There is a need to simplify procedures substantially if we want to expedite the process of dispensing justice. There is another view on this, as per Mr. P Chidambaram, " if we are talking about human development, undoubtedly, Indian courts have been in the forefront of defending and upholding human rights, the rights of the people on the quality of water and air. If anyone has failed the people of this country it is the executive." The Indian courts have interpreted the labor laws. The other area of concern is the accountability. The absence of transparency, the curtailment of role of the trade union and workers in general, and the absence of public gaze on the in-house mechanism of correcting whenever aberrations within an industrial set up comes up with regard to safety standards, has failed to add any confidence to the workers as far as industrial safety is concerned.

3.5.4. Industrial development is sometimes taken as an output increase concept. This is the generalized view, which hampers industrial safety. If the industrial society takes this as a process development, with, both technological development of the plants and technical expertise

improvement of the worker, then there is a room for industrial safety aspects being in-tune with the industrial development. While considering industry, as a whole it is a well-established fact that consideration should be given to the whole-assorted components of industries, which includes even the unorganized sector. In India, what we generally find is that most of the industries or factories move in to production without incorporating all safety measures. Recently the news reports that a fertilizer plant in the state of Orissa, India has turned out to be a health hazard for the population staying in adjoining areas, and causing damage to hundreds of acres of cultivated land. This only shows that the industrial safety arrangements are not keeping pace with the industrial development. Even when the public highlights these issues, it does not result into any concrete action for rectification.

4. **Methodology.**

4.1. The research topic relates to industrial safety management, which is dynamic and alive. The study encompasses the safety management at both macro level as well as micro level. By formulating a working hypothesis considerable data can be collected. The task of research is to test and establish such hypothesis. Based on the focus of study hypothesis "***The idea of industrial safety is adequate and is effectively implemented.***" was formulated. After analyzing the data the researcher was in a position to test the hypothesis. The hypothesis may be tested through various tests, such as:

- ✓ z-test;
- ✓ Chi square test;
- ✓ *t* – Test;
- ✓ *F* – Test etc, depending upon the nature and object of research enquiry.

4.2. Here we have selected z-test as it meets the technical conditions. Hypothesis testing will result in either accepting the hypothesis or rejecting it. In depth analysis and study of literature available on the subject was essential. Thereafter, formulation of questionnaire and use of questionnaire method for collection of data was carried out. Collection of secondary data was made from journals and publications. Then collation of data and its analysis was carried out.

4.3. The research is inductive and deductive. The research can be categorized also as a case study design. Primary data includes interviews, reports, and feedback from the questionnaires. The study is about industrial safety management. The study is being made to analyze the impact of industrial development on industrial safety in the current perspective so as to reduce industrial accidents. The study will be carried out in selected industries, which are major industrial unit in India. The data required is in the form of primary as well as secondary data. The required data can also be found in journals, magazines, previous research work, industrial analysis, workshops, factory floors, labor tribunals, ESI courts, trade union circulation etc. Sample design selected in

this case is multi stage cluster sampling. The techniques of collection of data will be, in depth analysis and study of literature available on the subject, formulation of questionnaire, use of questionnaire method for collection of data, Collection of secondary data from journals and publications was also carried out. This being a hypothesis testing research the aim was to the hypotheses of casual relationships between variables.

4.4. The steps adopted in this research are:

- ✓ Select factories and within selected factories the industrial safety aspects.
- ✓ Selecting the sampling unit.
- ✓ Major industrial units.
- ✓ Preparing the sources list.
- ✓ Specifying the sampling unit.
- ✓ Selecting the sampling procedure.
- ✓ Within the framework of cluster sampling, multi-stage sampling has been used. Measurement and scaling techniques

4.5. Interval scale has been used for measurement. Interval scale provides more powerful measurement than ordinal scales as interval scale also incorporates the concept of equality of interval. Measurement should be precise and unambiguous in an ideal research study. Analysis of data means computation of certain indices or measures along with searching for patterns of relationship that exist among the data groups. Analysis particularly in this case involves estimating the values of unknown parameters of the population and testing of hypothesis for drawing inferences. The important statistical measures that were used to summarize the research data are: -

- ✓ Measures of dispersion; from the measures of dispersion, variance and standard deviations are the most often used measures.
- ✓ Measure of central tendency is also known as statistical average. In order to measure this scatter; statistical devices called measures of dispersion are calculated.

4.6. To test hypothesis means to tell on the basis of data collected, whether or not the hypothesis seems to be valid. In hypothesis testing the main question is whether to accept the null hypothesis or not to accept the null hypothesis? With the assumption that Ho is true, we formulate a test statistic. A 10% level of significance was adopted for this research. Hypothesis testing determines the validity of the assumption (technically described as null hypothesis) with a view to choose between two conflicting hypotheses about the value of a population parameter. Hypothesis testing helps to decide on the basis of a sample data, whether a hypothesis about the population is likely to be true or false.

5**. Analysis**.

5.1. In the light of this an analysis was carried out taking in to account the normal belief. Industrial establishment chosen for this purpose was BHEL, Jhansi. BHEL, Jhansi, is a division of BHEL, which was established in 1937. This company being a part of 'BHEL Group of Industries', it has many years of pioneering research and rich practical experience, which has resulted in, advanced sophisticated modern technology. Innovation and cost effective production has been the key to successful existence of the company. The company is purely an Indian origin industry and now with economic liberalization of industrial sector has gone in for modernization in collaboration with foreign firms. The company is located at Jhansi and spread over in 200 acres of land with sufficient space available for further expansion.

5.2. During the financial year the Jhansi division of BHEL's production was to the tune of Rs 216 Crores which was an increase of 28% over the previous year an amount of Rs169 Crores. Among the manufacturing items, include power transformer, ESP transformer, traction transformer, ECMU transformer, DRYTYPE transformer, INSTRUMENT transformer, and DIESEL ELECTRIC LOCOMOTIVE. The Jhansi division fabricated the first diesel electric power car. For the Indian railways vehicles for rail and road, diesel electric tower car, sleeper lifting loading crane, instrument transformer, high rating dye-type transformer, fire transformer, Electra bus, have been included in the production list. BHEL Jhansi has been awarded ISO 14001 and 18001 for environment, health and safety management. In addition to this in the field of environment management the Jhansi division has been awarded Green take Foundation's award of Green take Environment Excellence Award by the Union Minister for petroleum.

5.3. Let us now consider the importance given on Safety, Health and Environment protection of the management and workers. These are:-

5.3.1. Strict implementation of legislative provisions of Industrial workers health, safety and environment;

5.3.2. Reform on industrial safety, pollution control, industrial health norms keeping with technological up gradation;

5.3.3. Creating awareness on industrial health and safety through publicity and training, Review of all industrial safety and health policies from time to time;

5.3.4. During the annual safety day functions conducted on 04 Mar, aim of achieving complete safety is reiterated;

5.3.5. Institution of incentives for safety; and

5.3.6. Creating and distributing safety badges and safety calendar through which awareness on industrial safety is enhanced.

5.4. In BHEL Jhansi a fire fighting management week under the Central Industrial Security Force is organized every year. Program-included demonstration on controlling various types of fire shown to workers and children with a view to the improve safety ethics. To move ahead with the analysis data was collected on the industrial accidents in this unit of BHEL. The compiled data shows that the industrial development process carried out in 1997 was able to bring down the industrial accidents in the subsequent two years, but this pattern did not continue for long. There after it was found that safety managers drew further deliberations and was able to reverse the pattern to some extent. Another interesting fact is that there is no repetition of accident by type or no worker can be classified as accident prone, possibly due to better management. In the state of Uttar Pradesh, India there are a total No of 16,266 registered factories which account for 5% of the All India figures. One out of every three factories, one has been inspected by the factory inspector. In UP for every factory inspector there are 508 factories to be inspected as against the All India average of 223 which is quite high and requires to be reduced. The data on All India industrial injuries indicate that there are around 2,33,100 workers working in various registered factories, and out of these 870 workers get fatal injuries every year, with the total injuries pegged around 60,000. Thus we find that out of every five workers, one gets injured every year. This is alarming and not economical also. As the data on unorganized sector is not available the figures are apparently attractive. Out of all injuries 10% of injuries are contributed by manufacture of machinery, machine tools and parts, another 10% is contributed by manufacture of transport equipment and parts. In addition 5% injuries are caused by industries involved in electricity, gas and steam generation. In order to control the major accidents in the State, factories prone to major accident hazards have been identified on the basis of the U.P. Factories (Control of Industrial Major Accident Hazard) Rules, 1996 under section 41-B of The Factories Act, 1948 (Amended 1987) and Manufacture Storage and Import of Hazardous Chemicals Rules, 1989 (amended 2000), wherein specified industrial activities are categorized as potentially hazardous and prone to major hazard, in the form of storage & use of potentially hazardous substances in five groups exceeding the threshold quantities specified for them in schedule-3 of the above said rules. On the basis of the criteria laid down in the above mentioned, so far 100 factories have been identified as Major Hazard installations in the state. The identified MAH installations are required to comply with specific provisions of the above mentioned rules. Emergency Plans has also been made essential for the factories to rehearse the

plan once in every six months, so that state of preparedness; is ascertained; in terms of men and machines when a disaster strikes. Practical exercises are, therefore, carried out creating situations, as close as possible to actual conditions. The occupiers are directed to plug the weaknesses and vulnerabilities which surface during such simulation drills. The standard of performance is judged against a set of criteria fixed for this purpose through a check list assessment by the regional officers.

5.5. **Testing of hypothesis**. Let us assume that: null hypothesis Ho = P = Po + 0.10, i.e., claimable, then alternate hypothesis is Ha = P < 0.10. Under the assumption that Ho is true, we formulate a test statistic.

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Mean (or X) = E Xi/n = (19+16+12+19+22+18+8)/7 = 16.2857

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Standard deviation = /E (Xi – X) 2 / 7 = /137.42857/7= /19.632653=4.430875.

Test of significance = z = (16.2857 –17) / (4.430875/10.677078) = (-) 0.2964269.

The critical value of z at 10% level of significance is = 1.645. Since the tabulated value z at 10% level of significance is more than the observed / calculated value of z we accept the null hypothesis Ho, it means that the claim that consequent to industrial development, the claim of progressively reducing industrial accidents in BHEL, Jhansi by sound industrial safety policy by 10% is acceptable.

5.6. The mean calculated on industrial accidents at BHEL Jhansi, over a period of seven years starting from 1997, when compared with the overall figure of 1303 for the industrial region of UP, further substantiates the test. It is thus quite reasonable to assume that the industrial development coupled with a good safety policy has in fact, ensured low industrial accident rate at BHEL Jhansi. This as a sample can lead us to a possibility that industrial development and good industrial safety policy can reduce industrial accidents. Of the total number of 297363 factories 153849 were inspected over the year. This constitutes about 50.67%, which is a very low figure. When we compare this data with the fact that the national average number of factories per inspector is 223 it may not be humanly possible to conduct proper safety audit. Even if we are to give two days per factory, with the present strength of inspectors, inspection can be done only over two years period. The remedy is to reduce the factory – inspector ratio to around 120. The fall-out of this is the aspect of industrial safety and hygiene. When factory owners resort to large-scale dilution of statutory requirements of industrial safety and hygiene, the accident rate may increase. Industrial safety is that condition of enterprise operation in which, by controlling hazards, accident free production is achieved. Accidents are readily recognized when machinery or instruments are damaged, material is spoilt or someone is injured. It is not necessary that all

accidents should result in personal injury. In fact, the accidents without personal injury outnumber those, which have resulted in an injury. On each occasion an individual is exposed to an unsafe condition, or, becomes subject to an unsafe act, there is a possibility of an injury. From the data it is inferred that out of every 75 accidents at an average one has been proved to be fatal. This by no means gives acceptability to the other 74 accidents, which would have, even though not resulted in death, but must have created sufferings to the worker as well as his family. The monetary implications in the form of direct and indirect costs can be assumed to be quite high. Even though there is no perceptible change in the fatal injuries, but overall it is encouraging to see that, over the last five years the No of accidents has reduced by over 22%. While analyzing incidence rate no clear-cut pattern emerges. The incidence rate is quite high in all types of textile factories. A gradual reduction has been noticed over years due to industrial development, technological up gradation and better implementation of industrial safety procedures. The highest figures have been observed in metal & alloy industries. Manufacturing of machinery and machine tools & parts industries had the minimum of industrial accidents. These nine groups accounted for more than 50% of accidents in 1994, this figure rose to 82% in 1998 and account for more than 66% of the total accidents in the industries. While carrying out state-wise analysis of non-fatal and fatal injuries during the years an attempt was made to study the pattern of accidents from 1994, the year in which the impact of globalization and liberalization started to have its impact on Indian economy and it was inferred that the industrial development as a result of globalization has contributed to better safety standards.

6. Conclusion

6.1. The country faces an unacceptable performance-potential gap in the industrial development. The recent spate of industrial development has brought new issues like competitive conduct of the business houses and industrial safety into limelight. The industrial safety movement in India is of a very recent origin. So, the industrial workers in India are more vulnerable to unethical practices by owners and management. Contrary to the early stage of development of industrial safety issues in India, the developed economies have a well-debated and structural legal system for right conduct and safety system for companies. Public policy intersects the field of industrial safety when policy makers believe that intervention in the process or outcome of industrial policy exchanges between management and workers will benefit the society as a whole. New labor policy and technological as well as industrial development that affect the industrial safety are outgrowth of management abuses brought to the attention of policy makers through the media, consumer advocacy groups or by consumers themselves and an overall public recognition of the need for economic and social welfare. Industrial safety doctrine rests on the concept of safety consciousness and safe working environment. Industrial safety in acceptable terms is the ability of a firm to increase productivity without increasing industrial accident. There are no economic interpretations of industrial safety in Indian context. Mostly industrial safety is

conceived in terms of economic efficiency with laws on workers' safety largely interpreted through a concise economic thought. Maximization of industrial safety standards and avoidance of accidents is considered the dominant goal of industrial safety norms, with safety system striving to achieve the highest practical level of safety norms.

6.2. This analysis involves application of effect of industrial development to an understanding of firm and individual worker behaviour and the evaluation of potentially anti safety practices. The current debate in industrial safety globally centers on the pollution and environmental hazards, both natural and artificial. There are two schools of thought on industrial development and industrial safety. Through defining behavior purely in terms of industrial accident, enforcement authorities and the courts are viewed to be equipped with simple and objective tests for determining the effects of industrial development on the industrial safety. Whereas industrial development lower industrial accident enhances workers welfare, restraints on these aspects do not. According to this view firms can and do take advantage of these imperfections resulting in industrial accidents. During the 1980s, focuses within the industrial organization shifted from studies of industrial safety to focus on strategic behavior of firms within imperfectly competitive markets.

6.3. Through regulations, policy makers attempt to prohibit certain types of practices like unsafe conditions, unsafe working environment. Regulations also influence the compensation packages. Through worker education government may cultivate desired worker response on industrial safety. Some theorists complain that industrial development enables management to exploit workers in a more professional way. Of late, the legislators have enhanced the number of safety regulations in response to public outcries about dishonest and unethical industrial practices. Government policy makers and trade union leaders have increasingly recognized that *they cannot protect workers against every possible industrial abuse* and the best defense for the worker is the knowledge. Many government and non-government agencies offer workers education programs and disseminate information. There is an increased cost resulting from regulations. Legislations in respect of industrial safety have been found out of tune with the industrial development.

6.4. Industrial development is sometimes taken as a productivity increase concept. This is the generalized view, which hampers industrial safety. If the industrial society takes this as a process development, with, both technological development of the plants and technical expertise improvement of the worker, then there is a room for industrial safety aspects being in-tune with the industrial development. In India, what we generally find is that most of the industries or factories move in to production without incorporating all safety measures. This only shows that the industrial safety arrangements are not keeping pace with the industrial development.

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