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A Study on Effect of Risk Survey Using CATIA V5 Program for Loss Prevention

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Abstract : The present study reports on the results of a risk survey of machinery safety at a shoe factory in Qingdao, China. The aim is to decrease industrial accidents and increase worker job satisfaction by searching for a change from a trend analysis and making improvements in problem areas. The first risk survey for machinery safety was carried out in April 2005. Based on the analysis of the survey results, machinery safety devices was installed in the factory by using CATIA V5. Also, we investigated job satisfaction concerning working apparatus and work tool improvement in a questionnaire about the working environment. The second survey of machinery safety was carried out in September 2005. We are in the process of comparing the first survey results with the second survey results in order to analyze decreasing trend in industrial accidents and improvement in job satisfaction. So far the data have shown improved short-term turnover and absenteeism. It means CATIVA V5 and CFR has had positive effect regarding safety in shoe manufacture industry. The survey with CATIVA V5 and CFR will be expanded to other East-Asian countries including Vietnam. The hope is that the present approach could make a significant contribution toward improved safety.

Key words : CATIA V5 program, loss prevention, machinery safety, risk survey, shoes factory

1. Introduction

For manufacturing, it has become very important to follow industry safety standard to prevent workers from being injured and to prevent property damage. If we factor in the human conduct and psychology at work, we should consider implementing an industrial accident prevention program. There are many accidents that occur due to human errors and misbehavior.[1] In addition, most of the accidents result in death and property damage. Therefore, we should consider implementing strict safety guidelines and add more safety features on machines. If we do not accomplish the implementation of safety guidelines then we will have to face some serious consequences, which will result in law suits from the victims' family (compensation), cost of repairing damage equipment, and profit loss due to broken equipment (economic damage). In addition, the company will lose valuable experienced workers, which will cost the company more money, time, and effort to train and educate the new hires. In addition, the company will suffer the threat of losing social trust and a damaged image of the company. However, preventive action will change the company profit loss to positive gain and increase worker moral.[2]

The majority of the shoe manufacturing industry is located in Asian region (China, Indonesia, Vietnam & others). They need systematic management but do not yet have it thus those areas could face labor issues like Korea in the 1980's.

That's why this survey using the Code of Federal Regulation (CFR) was performed at Qingdao Taekwang Shoes Co., Ltd. that manufactures 20% of the running shoes for the worlds top sports brand.

The tool CATIA V5 will introduce the issues, will support management's comprehension and will lead to easier solutions through the visual explanations.

2. Mechanical Safety Research

Mechanical problems and accidents were remarkably reduced in recent days, but they still account for about 33% of all incidents. In addition, the machines have

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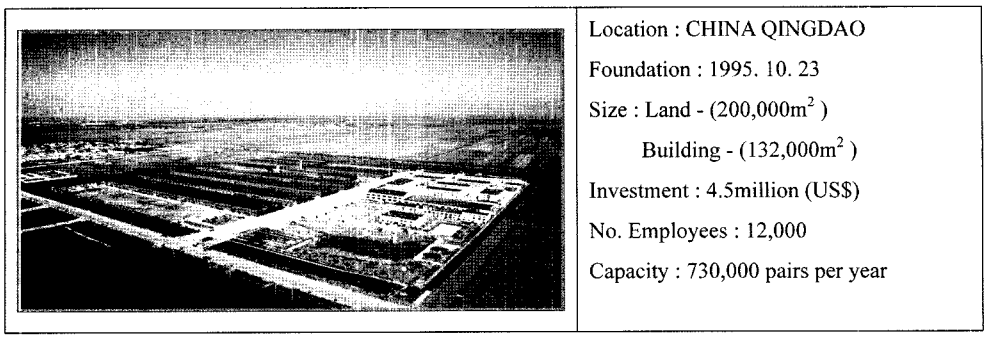

Fig. 1. Picture of QT Tae-Kwang

been reworked (bigger and faster) which contributes to bigger accidents. However, these accidents can be prevented by performing regular maintenance and having employees detect problems.

This mechanical safety research is based on the shoe manufacturing process with focus on safety of employees from all hazards. We have followed the safety regulation based on the Code of Federal Regulation (CFR), because TaeKwang is a partner of NIKE. Results are presented this through CATIA.

2.1 OSHA Regulations[3]

The President of the United States has specific powers under the federal constitution, which make federal executive orders to have the force of law. The 29 CFR was created by the Department of Labor to carry out the requirements of the OSH Act. The CFR contains specific requirements in support of the Occupational Safety and Health Act, including a safety plan, process, factory inspection, subpoenas, fines, recording, reporting, application process, and inspection of hazardous machinery.

2.2 Suggestions of Protection Measures for Equipment Using CATIA[6]

CATIA (Computer-graphics Aided Three Dimensional Interactive Application), a representative Application Program of CAD/CAM/CAE software, was developed for airplane design by Dassault which produced Mirage fighter planes in the early 1980's. Since then, it has been widely used because it can be easily applied to machine industry, shipbuilding, and electric industry because of its versatility.

CATIA, an acronym of Computer-graphics Aided Three Dimensional Interactive Application, is a practical computer software program which supports 3D. It can manage all the processes for designing and producing goods by a company. It is widely used not only in car industry but also in airplane and railroad industries.

2.2.1 General classification of application

1) CAD (Computer Aided Design) system

CAD system is programmed on theories of mathematics, geometry, and algorism so that users can design from simple diagrams to complex models such as body of cars or airplanes.

2) CAM (Computer Aided Manufacturing) system

Information for production such as channels of a section of work, APT Programming, NC(Numerical Control) Data, and a section of work simulation are made possible by models which are designed by CAD system.

3) CAE (Computer Aided Engineering) system

It provides a function of analysis of finite factors such as stress distribution and collision analysis by using CAD models

2.2.2 CATIA Application mainly used in the project

1) CATIA- part Design 1 Product

This application is very useful in designing 3D machines. Functions such as solid modeling and dynamic sketch let users move parameters while the job is being done or even after the job is finished. The operation processes are managed in tree structure, which gives a big picture to the users. This function also makes it easy for the users to make changes and understand how the change would affect the whole process as shown in Fig. 2.

2.2.3. Machine Safety Survey Result

The survey result as Fig. 3 indicates the risk and safety plan with a suggested action plan from the CATIA V5.

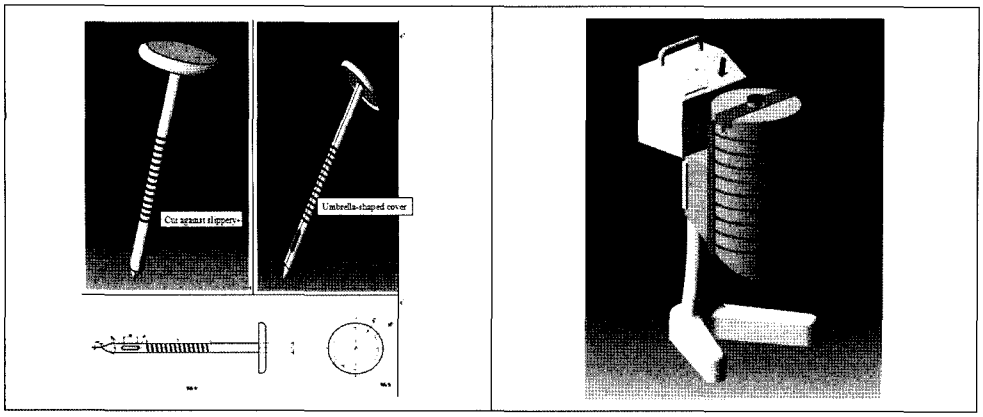

Fig. 2. Example of CATIA

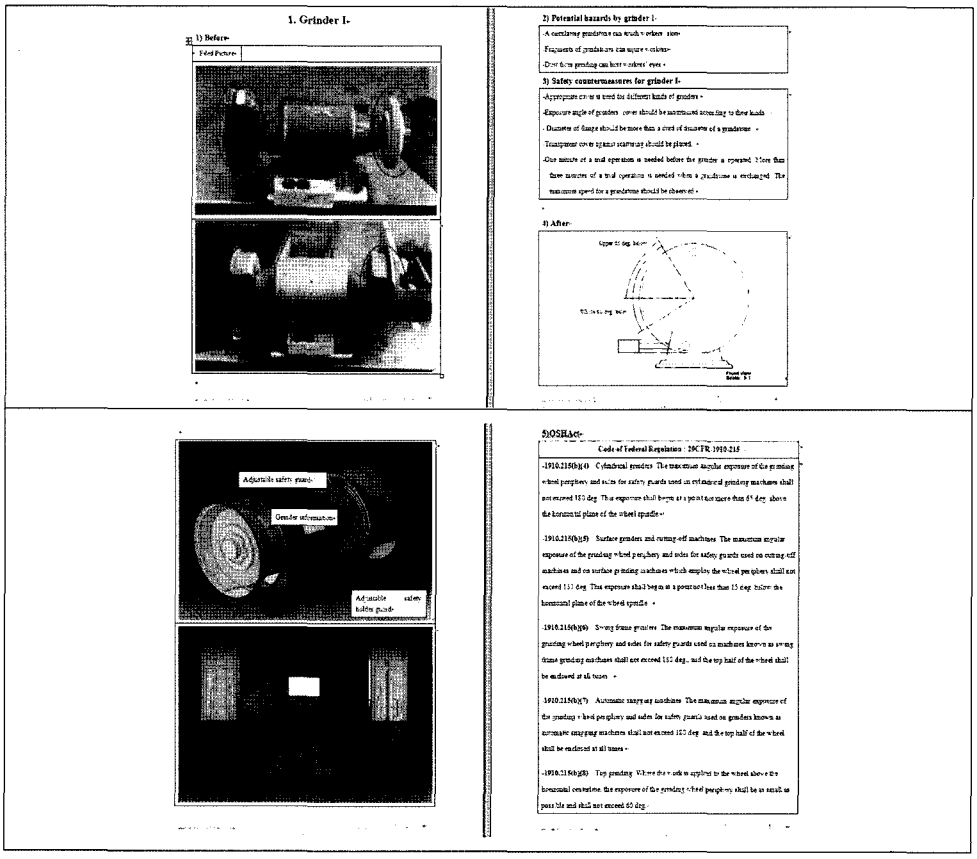

Fig. 3. Example of machine safety survey report

3. Machine Safety Survey Analysis

Often the safety survey just provides a one-time judgment with the theory. As a result the management can not assure the survey contents. This survey provides the result with 3-dimensional motion pictures. The management can fully understand the result expected after improving the worksite (Fig. 4). In addition, the standard is based on the CFR (Code of Federal Regulation), which requires top-grade implementation and including year by year management of feedback and improvement of conditions.

3.1 The Survey Effect Analysis

Generally, a minimum of 1~3 years is required to evaluate the survey effect because people need some

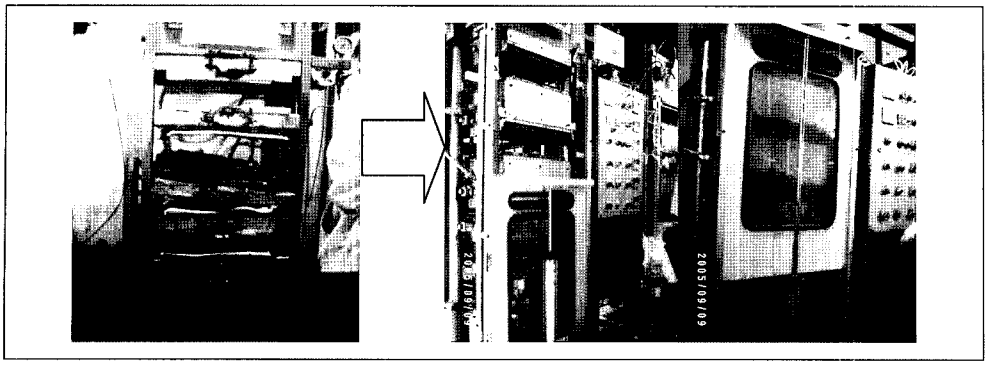

Fig. 4. Before and After countermeasure

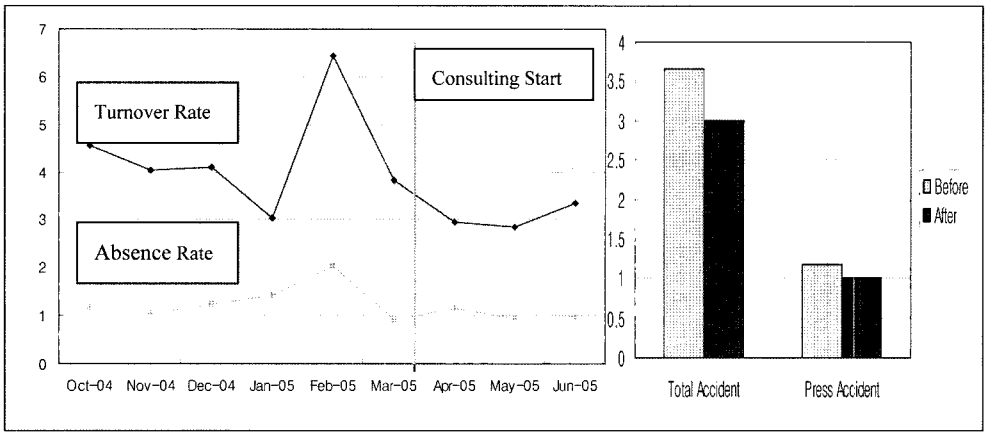

Fig. 5. The survey effect analysis

Table 1. The survey effect analysis

Items	Before	After
Total(Press) Accident	3.66(1.17)	3(1)
Turnover(Absence) Rate	4.33(1.3)	3.04(1.02)

time to become familiar with revised circumstances (or machine conditions, etc.)

However, this survey which is based on 'human psychological character'could decrease errors even in the short-term. Total (Press) Accident (3.66(1.17)⇒3(1)) and Turnover (absence) rate (4.33(1.3)⇒3.04(1.02)) show positive results as shown in Fig. 5 and Table 1. Even though the reliability is low (because of short-term calculation) it could contribute to safety related actions and we will do a survey again 1 year later.

4. Conclusions

In place of a theory-based suggestion for the client, the present work provides very practical result-oriented pictures with a 3D design program called CATIVA V5. As a result the management can easily devise an effective solution regarding the issues indicated in the study. So far the short-term turnover and the rate of absenteeism show significant improvement.

We plant to expand the survey method to the Southeast Asian region and create a database for the shoe manufacturing industry. The authors believe that these efforts will contribute towards obtaining better and more effective safety systems for the industry.

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