

## HAZARD ANALYSIS AND RISK ASSESSMENT FOR SPINNING YARN PRODUCTION PROCESS BY INTEGRATED FTA-FMEA APPROACH

J.K.M.Bharathwajan<sup>a</sup>, V.Arumugaprabu<sup>b\*</sup> and Reshmi Olayil<sup>c</sup>

<sup>a</sup> Post Graduate Student, Department of Mechanical Engineering, Kalasalingam Academy of Research and Education, Anand Nagar, Krishnankoil-626126, Tamilnadu, India

<sup>b</sup> Professor, Department of Mechanical Engineering, Kalasalingam Academy of Research and Education, Anand Nagar, Krishnankoil-626126, Tamilnadu, India

<sup>c</sup> Lecturer, Engineering Department, University of Technology and Applied Sciences-Shinas, Oman

Corresponding Author email id- [v.arumugaprabu@klu.ac.in](mailto:v.arumugaprabu@klu.ac.in)

### Background:

The hazard analysis and management is vital in textile industry to avoid accidents and wasting resources caused by the failures in production systems. Risk analysis is also very significant to decrease possible hazards and to avoid possible damage in manpower & production systems. In this study, an approach based on Failure Mode and Effects Analysis (FMEA) and Fault Tree Analysis (FTA) is proposed to analyse the ring spinning yarn production process in a textile industry. First, the possible hazards in the production line, yarn production system, in an integrated company operating in the textile sector are analysed by FTA method. Then, FMEA is applied to ring spinning yarn production process in a textile industry to rank all possible risks corresponding to hazards in descending order with respect to both occupational health and safety. It is very important to remove all possible hazards in textile industry to decrease the number of risks related to occupational health and safety. Therefore, in total of 57 hazard root causes are determined in the yarn production department. Subsequently, the faults related to the hazard root causes are examined by FTA and then risk corresponding to these hazards are prioritized by FMEA. The results obtained from the proposed FTA-FMEA approach show that decision makers and engineers can easily decrease the number of hazards and risks with respect to both occupational health and safety in practice

### Objectives:

The objectives of this research is to study the various hazards in the spinning industries like Environmental , Occupational, Ergonomics, &Various hazardous things for the improvement of safety to the employees, to study the existing safety aspects which followed in the factory for improvising the system, to study the FMEA and FTA techniques implementation for the better using of tools to solving the existing issues and to study the process which used in this industry and implement the unconventional process for the improvisation of the safety and production in the spinning industry

### Results:

A total of 57 failure root causes have been identified in the ring spinning production facility. These faults are classified in three main categories as the failures that decrease the quality of the yarn and increase the cost by adversely affecting the production process the machine failures that lead to halts in the production, and the hazardous situations that can cause a fire in the facility and causes the Severe damage to the Employees , Machineries & the Production This study is under the first objective “various hazards in the spinning industries like Environmental, Occupational, Ergonomics, &Various hazardous things for the improvement of safety to the employees” . The Existing safety system like Fire Suppression system, SOP (Standard Operating Procedure) system, OPL (One Point Lesson) system study is under the second objective “ the existing safety aspects which followed in the factory for improvising the system”

### Conclusions:

- The FMEA (Failure Mode and Effective Analysis) is the TOP-DOWN approach and the FTA (Fault Tree Analysis) is the BOTTOM-UP approach both are to be integrated and taken with the help of RPN (RISK PRIORITY NUMBER) and infer that the results increase the safety of the employees and improvised the production
- The benefit of an integrated analysis are the following: FTA is a top-down and FMEA a bottom-up analysis method and use of both deductive and inductive reasoning is regarded as a good argument for providing assurance for the completeness of an analysis;
- Safety standards often demand a single failure and, in some cases, a multiple failure analysis, the first requirement being fulfilled by FMEA. Both single and multiple failure analysis are accomplished by FTA; FMEA is also a useful method for a comprehensive identification of basic events or risks, while FTA is a practical method for causal analysis of the undesirable events or hazard