PT. Lotus Indah Textile Industries is a company that produces textile products and uses a boiler to support the production process. This boiler has the capacity to produce 2 tons of steam per day with a working pressure of 10 bar and operates at a temperature of 140°C. The boiler, which is in operation, has dangerous potential. To operate safely, an assessment of the risk of operation and reliability of the operational system is necessary.

This research study investigates the failure risk and reliability of the boiler operational system. The failure mechanisms causing boiler explosion are analyzed using Fault Tree Analysis (FTA). The effects and causes of system failure due to component failure are analyzed using Failure Mode, Effects, and Criticality Analysis (FMECA). The reliability calculation is done at the component level using the Risk Priority Number (RPN) of high critical items.

From the research results, it is known that components able to cause failure at the boiler operational system are the safety valve, blowdown valve, fire tube, float, and pump. The risk assessment result, using the Risk Priority Number (RPN) approach, indicates that the components needing attention are the feed water boiler pump with an RPN of 288, softener water transfer pump with RPN 240, PDAM pump with RPN 240, and blowdown valve with RPN 210. The reliability value for the feed water pump component at 720 hours is 0.6500384. The reliability for the softener transfer water pump with 720 hours is 0.7437301, PDAM pump for 720 hours is 0.9274957, and blowdown valve for 720 hours is 0.8531829.

Keyword: Reliability, FMECA, FTA, RPN, boiler.