SAFETY RISK ANALYSIS IN COMPLEX SOCIO-TECHNICAL SYSTEM USING SYSTEM DYNAMIC APPROACH
(CASE STUDY: PT DOK DAN PERKAPALAN SURABAYA)

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ABSTRACT

The risk of accidents in complex socio-technical systems is possible to evolve gradually according to the function of time through a combination of small mistakes on the social factors (man-man interaction), technical (man-machine interaction) and organizations (man-organization interaction). The shipyard industry is one of the leading industries in Indonesia which has a heavy work activity and at high risk of accidents. Research on the evaluation of the safety risk dan safety performance in the shipyard industry were still be oriented in the evaluation of the period when research is done. In this research, safety risk and safety performance evaluation conducted using system dynamic approach thas has advantages in evaluating non-linearity and system dynamics. The using of system dynamic approach is intended to help decision makers in managing safety risk, with consideration of the current and future system characteristics. The development of system dynamic models of safety risk and safety performance based on the results of the previous research and expert justification.

The results showed that most activity of the PT DPS is at medium danger, with highest risk are on the building berth and hull construction. Safety risk and safety performance model can be elaborated in four decision variables and five response variables. The result of the simulation provide a description that the level of safety risk and safety performance is fluctuating, wich suggest that safety implementation in PT DPS still not optimal. Four scenarios are formulated to repair existing condition, namely: hazard regulation policy, reward & punishment policy, safety training policy and combination betwen reward & punishment and safety training policy. The best scenario in term of safety risk and safety performance is combination betwen reward & punishment and safety training policy, that result regulated full hazard 14.26 per month, safety KSA 3.07, and accident rate 0.17 per month. However, when reviewed on safety cost parameters, reward and punishment policy is the best scenario (safety cost lower 28% than scenario 4), but accident rate lower 37% than scenario 4. Safety risk and safety performance model is expected to convince the management in implemention of safety program.

Keyword: safety risk, socio-technical, system dynamic, shipyard industry
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