Pemodelan risiko kegagalan sistem produksi berbasis integrasi input, proses dan output = Failure risk modeling of production system based on integration of input, process and output

Arief Suwandi, author

Abstrak

Serangkaian kegiatan sistem produksi (Input-proses-output) mempunyai risiko kegagalan pada setiap tahapnya. Penanganan risiko kegagalan proses produksi selama ini berjalan sendiri-sendiri atau secara parsial, hanya pada fase input, fase proses ataupun hanya pada fase output pada sistem produksi. Tujuan dari penelitian ini adalah merancang model risiko kegagalan sistem produksi terintegrasi menggunakan sistem dinamis. Objek penelitian ini adalah empat perusahaan fabrikasi logam. Penyelesaian permasalahan dilakukan melalui perancangan model sistem produksi terintegrasi dengan cara identifikasi kegagalan menggunakan FMEA (Failure Mode Effect Analysis) dan direpresentasikan menjadi sistem dinamis yang terkuantifikasi. Berdasarkan data yang dikumpulkan di setiap perusahaan, identifikasi kegagalan sistem produksi dikategorikan menjadi 7 kategori yaitu kegagalan akibat material error (ME), material conformance (MC), material handling (MH), penyimpanan material/material deteriorated (MD), proses produksi (PP), product handling (PH) dan penyimpanan produk/product deteriorated (PD). Hasil FMEA menunjukkan nilai RPN (Risk Priority Number) yang memiliki nilai tinggi terdapat pada kategori proses produksi, material error dan material conformance dengan masing-masing nilai RPN sebesar 241, 101 dan 91. Tiga variabel tersebut dijadikan variabel yang dipentingkan dalam skenario penelitian ini. Skenario dilakukan dengan merubah parameter variabel-variabel penting untuk mengetahui kemungkinan keadaan di masa mendatang, baik secara optimis, pesimis, maupun keadaan yang rata-rata terjadi (most likely). Safety factor model sebesar 1,10 untuk skenario optimistic, 1,06 untuk most likely, dan 0,90 untuk skenario pessimistic. Rata-rata keberhasilan sistem produksi dari perusahaan fabrikasi logam pada penelitian ini sebesar 86% (14% defect). Rata-rata skenario optimistic menunjukkan keberhasilan sistem produksi sebesar 95% (5% defect), most likely sebesar 92% (8% defect) dan pesimistic sebesar 78% (22% defect). Hasil simulasi menunjukkan skenario optimistic menghasilkan kenaikan rata-rata keberhasilan sistem produksi sebesar 9% dari hasil aktual, skenario most likely naik sebesar 6% dan skenario pesimistic turun sebesar 10% dari hasil aktual. Dalam perhitungan rupiah, omzet setiap bulan hasil simulasi dibandingkan dengan kondisi actual menggambarkan kondisi optimistic naik sebesar Rp 4.1 Milyar (9.6%), kondisi most likely naik sebesar Rp 1.8 Milyar (5.9%) dan kondisi pesimistic turun sebesar Rp 7.7 Milyar (10.1%). Dari ketiga skenario ini, perusahaan bisa memperhitungkan besarnya selisih akibat adanya risiko kegagalan produk pada semua proses dari mulai incoming material hingga finished product yang siap dipasarkan. Skenario ini bisa dijadikan tolak ukur oleh perusahaan sebagai target risiko yang ditetapkan atau dipertahankan pada berapa persen tingkatannya.

.....The series of production system activities (Input-process-output) has a risk of failure at each stage. Handling the risk of failure in the production process has been running individually or partially, either in the input phase, the process phase or only at the output phase of the production system. The purpose of this study is to design a failure risk reduction model for an integrated production system using a dynamic system. The objects of this research are four metal fabrication companies. Problem solving is done by

designing an integrated production system model by identifying failures using FMEA (Failure Mode Effect Analysis) and represented as a quantifiable dynamic system. Based on the data collected in each company, the identification of production system failures is categorized into 7 categories, namely failure due to material error (ME), material suitability (MC), material handling (MH), storage of damaged material/material (MD), production process (PP), product handling (PH) and deteriorating product storage (PD). The FMEA results show that the RPN (Risk Priority Number) value which has a high value is in the category of production process, material error and material suitability with RPN values of 241, 101 and 91 respectively. These three variables are used as important variables in this research scenario. Scenarios are carried out by changing the parameters of important variables to determine possible future conditions, both optimistically, pessimistically, as well as conditions that occur on average (most likely). The safety factor model is 1.10 for the optimistic scenario, 1.06 for the most likely scenario, and 0.90 for the pessimistic scenario. The success rate of the metal fabrication company production system in this study was 86% (defect 14%). The optimistic scenario on average shows the success of the production system at 95% (5% defect), most likely 92% (8% defect) and 78% pessimist (22% defect). The simulation results show that the optimistic scenario results in an increase in the average success of the production system by 9% of actual results, the scenario most likely increases by 6% and the pessimistic scenario decreases by 10% of the actual result. In the calculation of rupiah, the monthly turnover of the simulation results compared to the actual conditions illustrates that the optimistic condition increased by Rp. 4.1 billion (9.6%), the most likely condition increased by Rp. 1.8 billion (5.9%) and the pessimistic condition decreased by Rp. 7.7 billion (10.1%). From the three scenarios, the company can calculate the difference in risk of product failure in all processes, from incoming materials to finished products that are ready to be marketed. This scenario can be used as a benchmark by the company as a risk target that is set or maintained at what percentage level.