ANALISIS *PREVENTIVE MAINTENANCE* PADA SISTEM PERAWATAN BOILER WATER TUBE DENGAN METODE *FAILURE MODE AND EFFECT ANALYSIS* (FMEA) PT.PACIFIC INDOPALM INDUSTRIES DUMAI

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ABSTRAK

Boiler *Water Tube* merupakan peralatan utama di PT. *Pacific Indopalm Industries* Dumai yang berfungsi menghasilkan uap sebagai sumber energi panas dan penggerak turbin. Kerusakan pada boiler dapat mengganggu proses produksi dan meningkatkan downtime. Penelitian ini bertujuan mengidentifikasi mode kegagalan, menentukan tingkat risiko kerusakan, serta menyusun rekomendasi preventive maintenance pada Boiler Water Tube 1 dan 2. Metode yang digunakan adalah *Failure Mode and Effect Analysis* (FMEA) untuk menentukan tingkat risiko berdasarkan nilai Severity, Occurrence, dan Detection, serta *Fishbone* Diagram untuk mengidentifikasi akar penyebab kegagalan. Data yang dianalisis merupakan data kerusakan boiler selama periode Januari–Desember 2024. Hasil penelitian menunjukkan bahwa batas kritis RPN pada Boiler 1 sebesar 233,48 dengan komponen paling kritis yaitu *Economizer* pada mode kegagalan kebocoran pipa (RPN 360). Pada Boiler 2, batas kritis RPN sebesar 242,63 dengan komponen paling kritis yaitu ID Fan pada mode kegagalan ducting blower IDF putus (RPN 450). Faktor penyebab utama kegagalan meliputi kualitas air umpan yang kurang baik, korosi, penumpukan kerak dan abu, getaran berlebih, kerusakan bearing, serta kelelahan material. Rekomendasi *Preventive Maintenance* difokuskan pada inspeksi berkala, pengendalian kualitas air umpan, pembersihan komponen, monitoring vibrasi, pelumasan, dan penggantian komponen yang mengalami keausan. Penerapan tindakan tersebut diharapkan dapat mengurangi *Downtime* dan meningkatkan keandalan sistem boiler.

Kata kunci: *Boiler Water Tube, FMEA, Fishbone* Diagram, RPN, *Preventive Maintenance.*

ANALYSIS OF PREVENTIVE MAINTENANCE IN THE BOILER WATER TUBE MAINTENANCE SYSTEM USING THE FAILURE MODE AND EFFECT ANALYSIS (FMEA) METHOD PT. PACIFIC INDOPALM INDUSTRIES DUMAI

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ABSTRACT

Water Tube Boilers are one of the main pieces of equipment at PT. Pacific Indopalm Industries Dumai, functioning to generate steam as a source of thermal energy and turbine power. Boiler failures can disrupt the production process and increase downtime. This study aims to identify failure modes, determine the level of failure risk, and develop preventive maintenance recommendations for Water Tube Boiler 1 and Water Tube Boiler 2. The methods used in this study were Failure Mode and Effect Analysis (FMEA) to assess risk levels based on Severity, Occurrence, and Detection values, and the Fishbone Diagram to identify the root causes of failures. The data analyzed consisted of boiler failure records from January to December 2024. The results showed that the critical RPN threshold for Boiler 1 was 233.48, with the most critical component being the economizer, which experienced tube leakage failure with an RPN value of 360. For Boiler 2, the critical RPN threshold was 242.63, with the most critical component being the ID Fan, which experienced ID fan blower ducting failure with an RPN value of 450. The main causes of failure included poor feedwater quality, corrosion, scale and ash accumulation, excessive vibration, bearing damage, and material fatigue. Preventive maintenance recommendations focus on periodic inspections, feedwater quality control, component cleaning, vibration monitoring, lubrication, and replacement of worn components. The implementation of these actions is expected to reduce downtime and improve boiler system reliability.

Keywords: *Water Tube Boiler, FMEA, Fishbone Diagram, RPN, Preventive Maintenance.*