USULAN JADWAL *PREVENTIVE MAINTENANCE* UNTUK MINIMASI *DOWNTIME* MESIN *RAW MILL* DI PT SEMEN PADANG

TUGAS AKHIR

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ABSTRAK

Industri Semen, berdasarkan data Asosiasi Semen Indonesia (*ASI*) *tahun 2023, terdapat sebanyak 13 perusahaan semen yang termasuk* subholding *Semen Indonesia Grup* (*SIG*). *Perkembangan industri menekankan produksi dengan respon cepat dan pencegahan kerusakan. Salah satu Industri Semen terbesar dan tertua di Indonesia ialah PT Semen Padang dengan tiga pabrik yang masih beroperasi hingga tahun 2023, yaitu Indarung IV, V, dan VI. Data produksi klinker tahun 2022 dan 2023 memperlihatkan bahwa Pabrik Indarung V tidak mencapai target produksi, hal ini karena* downtime *mesin, jumlah produksi klinker yang dicapai 1.752.337 ton dan 1.635.851 ton atau hanya 79% dan 86% dari target.* Downtime *tidak terencana terbesar pada Mesin* Raw Mill *1 dan 2 selama 449,97 dan 577,85 jam. Hal ini terjadi karena* preventive maintenance *yang digunakan belum mengatur jadwal penggantian komponen, hal ini menyebabkan* downtime *tidak terencana. Oleh karena itu, penelitian ini bertujuan memberikan usulan jadwal* preventive maintenance *untuk meminimumkan* downtime.

Maintenance *adalah kegiatan yang penting dilakukan dalam aktivitas produksi supaya keadaan mesin tetap dalam kondisi normal yang diinginkan dan bisa beroperasi dengan lancar. Usulan jadwal* maintenance *dalam penelitian ini menggunakan metode* Reliability Centered Maintenance (*RCM*) *karena cocok untuk pengendalian komponen kritis. Tahapan metode RCM, yaitu deskripsi sistem,* Funcional Block Diagram (*FBD*), Root Cause Failure Analysis (*RCFA*), Failure Mode Effect and Analysis (*FMEA*), *dan* Logic Tree Analysis (*LTA*). *Selanjutnya, penjadwalan dilakukan dengan menggunakan model* age replacement *dan inspeksi* minimization downtime *untuk dianalisis terhadap kebijakan di Pabrik Indarung V.*

Hasil penelitian menunjukkan bahwa terdapat komponen kritis pada Mesin Raw Mill *1 dan 2,* yaitu: Tyre Mill, Mill Auxiliaries, Transport Feeding, Bridge Scrapper, Clay Transport, Inner Part, Feeder Clay, *dan* Bucket Excavator. *Komponen tersebut merupakan penyebab hingga 80% risiko kegagalan Mesin* Raw Mill. *Selanjutnya, dilakukan penjadwalan penggantian dan inspeksi komponen kritis yang menghasilkan peningkatkan* availability *Mesin* Raw Mill *1 dan 2 sebesar 5,1% dan 4,65%. Selain itu,* realibility *komponen kritis juga mengalami peningkatan dengan rata-rata peningkatan setiap komponen kritis Mesin* Raw Mill *1, yaitu:* Tyre Mill *sebesar 44%,* Mill Auxiliaries *sebesar 22%,* Transport Feeding *sebesar 17%,* Bridge Scrapper *sebesar 37%,* Clay Transport *sebesar 42%,* Inner Part *sebesar 58%, dan* Feeder Clay *sebesar 14%. Sedangkan peningkatan reliability pada Mesin* Raw Mill *2, yaitu* Tyre Mill *sebesar 49%,* Transport Feeding *sebesar 30%,* Mill Auxiliaries *sebesar 31%,* Bridge Scrapper *sebesar 30%,* Inner Part *sebesar* 51%, Clay Transport *sebesar 44%, dan* Bucket Excavator *sebesar 44%, serta sistem* Raw Mill *sebesar 33,71%. Peningkatan* availability *dan* realibility *tersebut menunjukkan bahwa usulan jadwal* preventive maintenenance *dapat meminimasi* downtime dan *meningkatkan* reliability *sehingga bisa digunakan untuk perencanaan pemeliharaan Mesin* Raw Mill.

***Kata Kunci**:* Industri Semen, Downtime, Penjadwalan, Preventive Maintenance, RCM, RCFA, FMEA, Komponen Kritis.

ABSTRACT

The Cement Industry, based on data from the Indonesian Cement Association (ASI) in 2023, there are 13 cement companies which are included in the Semen Indonesia Group (SIG) subholding. Industrial development emphasizes production with fast response and damage prevention. One of Indonesia's largest and oldest Cement Industries is PT Semen Padang with three factories still operating until 2023, namely Indarung IV, V and VI. Clinker production data for 2022 and 2023 shows that the Indarung V Factory did not reach the production target, this was due to machine downtime, the amount of clinker production achieved was 1,752,337 tons and 1,635,851 tons or only 79% and 86% of the target. The largest unplanned downtime on *Raw Mill* 1 and 2 machines was 449.97 and 577.85 hours. This happens because the preventive maintenance used has not set a component replacement schedule, this causes unplanned downtime. Therefore, this research aims to provide suggestions for improving preventive maintenance policies to minimize downtime.

Maintenance is an important activity carried out in production activities so that the machine remains in the desired normal condition and can operate smoothly. The proposed maintenance policy improvement in this research uses the Reliability Centered Maintenance (RCM) method because it is suitable for controlling critical components. The stages of the RCM method, namely system description, Functional Block Diagram (FBD), Root Cause Failure Analysis (RCFA), Failure Mode Effect and Analysis (FMEA), and Logic Tree Analysis (LTA). Next, scheduling is carried out using the age replacement model and downtime minimization inspection to analyze the policies at the Indarung V Factory.

The research results show that there are critical components in the *Raw Mill* 1 and 2 machines, namely: Tyre Mill, Mill Auxiliaries, Feeding Transport, Bridge Scrapper, Clay Transport, Inner Part, Clay Feeder, and Excavator Bucket. This component is the cause of up to 80% of the risk of *Raw Mill* Machine failure. Furthermore, scheduling of replacement and inspection of critical components was carried out which resulted in increased availability of *Raw Mill* 1 and 2 machines by 5.1% and 4.65%. Apart from that, the reliability of critical components has also increased with an average increase in each critical component of *Raw Mill* machine 1, namely: Tyre Mill by 44%, Mill Auxiliaries by 22%, Transport Feeding by 17%, Bridge Scrapper by 37%, Clay Transport by 42%, Inner Part by 58%, and Feeder Clay by 14%. Meanwhile the increase in reliability on the *Raw Mill* 2 machine, namely Tire Mill by 49%, Transport Feeding by 30%, Mill Auxiliaries by 31%, Bridge Scrapper by 30%, Inner Part by 51%, Clay Transport by 44%, and Bucket Excavator by 44%, and the Raw Mill system by 33,71%. This increase in availability and reliability shows that the proposed improvement in preventive maintenance policies can minimize downtime and increase reliability so that it can be used to plan maintenance for *Raw Mill* Machines.

Keywords: Cement Industry, Downtime, Scheduling, Preventive Maintenance, RCM, RCFA, FMEA, Critical Components.