# DETERMINATION OF PREVENTIVE REPLACEMENT AGE OF V-BELT ON THE VIBRATING FEEDER TO MINIMIZE DOWNTIME IN THE SPLIT STONE PLANT PT SEMEN PADANG

**FINAL REPORT**

*The Final Project is As One of the Requirements for Completing the Undergraduate Program in the Department of Industrial Engineering, Faculty of Engineering, Universitas Andalas*


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# *ABSTRAK*

*Perencanaan pemeliharaan penting untuk memastikan keandalan mesin dan efisiensi produksi. Lini produksi split stone PT Semen Padang terdiri atas mesin-mesin yang bekerja secara terintegrasi dan saling terhubung satu sama lain. Kondisi tersebut menyebabkan kerusakan pada satu komponen saja dapat mengganggu bahkan menghentikan seluruh rangkaian proses produksi. Salah satu komponen yang memiliki kontribusi downtime adalah V-Belt pada mesin Vibrating Feeder. Berdasarkan data historis, komponen ini mencatat total downtime sebesar 38,25 jam dengan frekuensi kegagalan sebanyak 20 kali, diantaranya terdapat 10 kali penggantian selama periode pengamatan.*

*Penelitian ini bertujuan untuk menentukan umur operasi penggantian preventif V-belt pada mesin Vibrating Feeder di lini produksi split stone PT Semen Padang agar downtime dapat diminimalkan. Data historis yang digunakan dari periode Oktober 2023 hingga Oktober 2025, mencakup jam operasi komponen serta serta durasi downtime akibat kegagalan V-belt. Penentuan umur penggantian preventif dilakukan menggunakan metode Optimal Preventive Replacement Age, yaitu pendekatan yang berfokus pada penentuan umur suatu komponen sehingga total downtime per satuan waktu mencapai nilai minimum.*

*Hasil analisis menunjukkan bahwa penggantian preventif V-belt sebaiknya dilakukan setelah komponen beroperasi selama 257 jam. Penerapan age tersebut diperkirakan mampu menurunkan total downtime sebesar 8% dibandingkan dengan praktik pemeliharaan reaktif yang saat ini diterapkan. Selain itu, tingkat ketersediaan sistem mencapai 99,35%. Dari sisi ekonomi, pemeliharaan preventif tidak secara signifikan menurunkan total biaya operasional dibandingkan dengan pemeliharaan korektif. Hal ini disebabkan oleh rendahnya tingkat downtime pada kondisi eksisting serta perbedaan waktu perawatan yang tidak terlalu besar. Namun, pemeliharaan preventif memungkinkan perencanaan alokasi sumber daya yang lebih terstruktur, sehingga mampu mengurangi variabilitas biaya operasional dan meminimalkan kejadian kerusakan tak terduga yang berpotensi meningkatkan kompleksitas perbaikan. Temuan ini menunjukkan bahwa pemeliharaan preventif V-belt efektif secara teknis dalam meningkatkan keandalan serta serta memberikan manfaat dalam pengelolaan biaya yang lebih stabil dan terencana.*

***Kata Kunci:*** *Age Replacement, Downtime, Pabrik Batu Split, Perencanaan Pemeliharaan, V-belt*

# ABSTRACT

Maintenance planning is essential to ensure machine reliability and production efficiency. The split stone production line at PT Semen Padang consists of machines that operate in an integrated and interconnected system. Under these conditions, failure of a single component can disrupt or even halt the entire production process. One component that significantly contributes to downtime is the V-belt on the Vibrating Feeder machine. Based on historical data, this component recorded a total downtime of 38.25 hours with 20 failure occurrences, including 10 replacement actions during the observation period.

This study aims to determine the optimal preventive replacement age of the V-belt on the Vibrating Feeder machine in the split stone production line at PT Semen Padang in order to minimize downtime. The historical data used in this research cover the period from October 2023 to October 2025, including component operating hours and the duration of downtime caused by V-belt failures. The determination of the preventive replacement age was conducted using the Optimal Preventive Replacement Age method, an approach that focuses on identifying the replacement age of a component such that total downtime per unit time is minimized.

The analysis results indicate that preventive replacement of the V-belt should be performed after approximately 257 operating hours. Implementing this age is estimated to reduce total downtime by 8% compared to the current reactive maintenance practice. In addition, the system availability reaches 99.35%. From an economic perspective, preventive maintenance does not significantly reduce total operational costs compared to corrective maintenance. This is due to the relatively low downtime under existing conditions and the small difference in maintenance duration. However, preventive maintenance enables better resource planning, thereby reducing cost variability and minimizing unexpected failures that may increase maintenance complexity. These findings indicate that preventive maintenance of the V-belt is technically effective in improving system reliability while also providing benefits in achieving more stable and well-controlled cost management.

**Keywords**: Age Replacement, Downtime, Maintenance Planning, Split Stone Plant, V-belt