

INTISARI

Belt conveyor merupakan salah satu sistem pemindah material yang banyak digunakan di berbagai sektor industri. Salah satu permasalahan yang sering terjadi pada sistem ini adalah *belt mistracking* akibat ketidaksejajaran *pulley*, yang dapat meningkatkan getaran sistem dan berpotensi menurunkan keandalan operasi. Penelitian ini bertujuan untuk merancang, memanufaktur, dan menguji sistem *belt conveyor* skala laboratorium, menganalisis pengaruh ketidaksejajaran *pulley* terhadap kondisi *belt mistracking*, serta mengevaluasi tingkat kelayakan getaran berdasarkan standar ISO 2372.

Penelitian diawali dengan proses perancangan dan manufaktur *belt conveyor* skala laboratorium, kemudian dilakukan pengujian pada tiga variasi sudut ketidaksejajaran *pulley*, yaitu 0° , $0,5^\circ$, dan 1° . Pengukuran getaran dilakukan menggunakan akselerometer tiga sumbu pada empat titik pengukuran. Data getaran dianalisis menggunakan *Fast Fourier Transform* (FFT) untuk memperoleh karakteristik spektrum frekuensi, sedangkan tingkat keparahan getaran dievaluasi berdasarkan nilai RMS *velocity* sesuai standar ISO 2372.

Hasil penelitian menunjukkan bahwa *belt conveyor* berhasil dirancang, dimanufaktur, dan beroperasi secara kontinu serta stabil sehingga layak digunakan sebagai media pengujian. Ketidaksejajaran *pulley* memengaruhi respons getaran yang berkaitan dengan kondisi *belt mistracking*. Peningkatan sudut ketidaksejajaran dari 0° menjadi $0,5^\circ$ meningkatkan rata-rata amplitudo getaran hingga 44%, sedangkan pada kondisi 1° peningkatan maksimum mencapai 25%. Namun, pada beberapa titik pengukuran terjadi penurunan amplitudo hingga 32% akibat efek *damping* yang ditimbulkan oleh kontak antara *belt* dan *trainer*. Berdasarkan evaluasi menggunakan ISO 2372, sebagian besar hasil pengukuran berada pada kategori *Still Acceptable (Class C)*, sedangkan kondisi *Not Acceptable (Class D)* hanya ditemukan pada titik A sumbu Z di sekitar *driver pulley* ketika diberikan ketidaksejajaran.

Kata kunci: *belt conveyor*, *belt mistracking*, ketidaksejajaran *pulley*, analisis getaran, *Fast Fourier Transform* (FFT), ISO 2372.

ABSTRAK

Belt conveyors are widely used in various industrial sectors as material handling systems. One of the most common operational problems is belt mistracking caused by pulley misalignment, which may increase system vibration and reduce operational reliability. This study aims to design, fabricate, and evaluate a laboratory-scale belt conveyor, investigate the effect of pulley misalignment on belt mistracking, and assess vibration severity based on the ISO 2372 standard.

The study began with the design and fabrication of a laboratory-scale belt conveyor, followed by experimental testing under three pulley misalignment conditions of 0° , 0.5° , and 1° . Vibration measurements were conducted using a three-axis accelerometer at four measurement locations. The vibration signals were analyzed using the Fast Fourier Transform (FFT) to obtain frequency characteristics, while vibration severity was evaluated using RMS velocity according to ISO 2372.

The results show that the laboratory-scale belt conveyor was successfully designed, manufactured, and operated continuously with stable performance, making it suitable as an experimental platform. Pulley misalignment affected the vibration response associated with belt mistracking. Increasing the pulley misalignment angle from 0° to 0.5° increased the average vibration amplitude by up to 44%, while the maximum increase at 1° reached 25%. However, vibration amplitudes decreased by up to 32% at several measurement points due to the damping effect caused by contact between the belt and the trainer. According to ISO 2372, most vibration measurements remained within the Still Acceptable (Class C) category, whereas the Not Acceptable (Class D) condition was only observed at Point A on the Z-axis near the driver pulley under misalignment conditions.

Keywords: *belt conveyor, belt mistracking, pulley misalignment, vibration analysis, Fast Fourier Transform (FFT), ISO 2372.*