

## INTISARI

Penelitian dengan topik dinamika *multiple drive belt conveyor* untuk *starting* sudah dilakukan sebelumnya. Sebagai studi lebih lanjut, penelitian ini mempelajari perilaku dinamik *multiple drive belt conveyor* selama *loading process*, dan *stopping*. Model elemen hingga (FE) dibuat berdasarkan model pada penelitian sebelumnya, menggunakan Enerka-Becker System (E-BS) sebagai contoh struktur dan parameter. Simulasi dilakukan dengan tiga grup: *loading process*, *loaded stopping*, dan *empty stopping*. Untuk grup simulasi *stopping*, prosedur yang digunakan adalah *direct-off-line* dan profil kecepatan *reverse nordell s-curve*. Simulasi difokuskan untuk studi respons elastik aksial pada setiap kasus.

Perilaku dinamik *belt conveyor* muncul dalam bentuk gelombang tegangan. Gelombang tegangan merambat di sepanjang *belt* dan memantul pada *drive wheel* atau *tension weight*. Rambatan gelombang tersebut mempengaruhi kondisi *belt* yang terlewati. Grafik yang menunjukkan kedudukan *belt*, seperti kecepatan *node*, percepatan *node*, dan tegangan elemen dibuat dan dianalisis. Kedudukan *drive system* dan traksi juga dipelajari.

Fokus analisis pada penelitian ini adalah efektivitas penambahan jumlah *drive station* untuk menurunkan tegangan tarik maupun tegangan kompresi. Hasil simulasi *loading process* pada penelitian ini menunjukkan bahwa tegangan tarik maupun kompresi pada sistem 6 *drive station* lebih kecil dari pada sistem 4 *drive station*. Tegangan kompresi tersebut dapat dieliminasi dengan menaikkan tegangan *pretension* dengan tegangan tarik yang naik tidak melebihi tegangan ijin. Hanya konfigurasi *single drive* yang menghasilkan tegangan tarik melebihi tegangan jin yang ditentukan DIN 22101.

*Empty stopping* dan *loaded stopping* memberikan hasil yang mirip. *Stopping time* tersingkat yang mungkin dilakukan ditentukan dengan mempertimbangkan tegangan kompresi yang dihasilkan. Tegangan kompresi tertinggi yang dihasilkan selama *loading process* diambil sebagai batas tegangan kompresi selama *stopping* untuk konfigurasi yang sama.

Kata kunci: *Multiple drive belt conveyor*, *loading process*, *loaded stopping*, E-BS, metode elemen hingga, respons aksial *belt conveyor*.

## ABSTRACT

This research is a continuation of an existing research which deals with the dynamics of a multiple drive belt conveyor during starting. As a further study, this research investigates dynamics behavior of multiple drive belt conveyor during loading process and stopping. Finite element model of a belt conveyor was built based on previous research, which uses the structure and properties of the Enerka Becker System (E-BS). The simulations were carried out in three groups: loading process, loaded stopping, and empty stopping. For stopping simulation groups, direct-motor-stop and reverse nordell s-curve profile is tested. The simulations focused on the study of the axial elastic response of each cases.

The dynamic behaviour of the belt conveyor during starting appears in the form of stress waves. The stress waves travels through the belt and are reflected by tension weight or drive wheels. The propagation of the waves affects the state of the belt that it passes. The states of the belt, such as its nodal velocities, nodal accelerations, and element stresses were plotted and analyzed. The states of the drive system and traction were also studied.

The analysis focuses on the effectiveness of increasing number of drive station to reduce both positive belt stress and negative belt stress. In this research, loading process simulations for multiple drive configurations shows that tensile stress and negative stress generated in 6 drives system is blower than in 4 drives system. The negative stress can be eliminated by increasing pretension stress while the tensile stress will still be acceptable. Only single drive configurations generate unacceptable tensile stress based on DIN 22101.

Empty stopping and loaded stopping simulations give similar result. Minimum possible stopping time is determined based on negative stress generated. Maximum negative stress generated during loading process is taken as a limit for negative stress generated during stopping.

**Key words:** Multiple drive belt conveyor, loading process, loaded stopping, E-BS, finite element method, belt conveyor axial response.