ANALISIS KEGAGALAN MEKANIS *ROLLER ENTRY GUIDE* BERBAHAN *TOOL STEEL Cr-Mo-V* MENGGUNAKAN METODE ELEMEN HINGGA

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ABSTRAK

Proses *rolling* baja sangat bergantung pada *roller entry guide* untuk mengarahkan billet ke roll berkecepatan tinggi. Data di industri baja menunjukkan kerusakan seperti retak permukaan dan keausan pada roller, terutama akibat variasi dimensi billet dan beban tumbukan berulang. Penelitian ini menganalisis kegagalan mekanis *roller entry guide* menggunakan simulasi Metode Elemen Hingga dengan pendekatan *Explicit Dynamics* pada ANSYS. Dengan geometri aktual dan material *Tool Steel Cr-Mo-V*, simulasi mengevaluasi tegangan *Von Mises*, deformasi, tekanan kontak, dan umur kelelahan. Tegangan maksimum pada billet 12,5 mm mencapai 1.135,4 MPa, mendekati batas luluh material, menunjukkan area rawan retak. Analisis *fatigue* menunjukkan roller bekerja dalam kondisi *high cycle fatigue*, di mana roller kiri mengalami tegangan lebih tinggi dan umur lebih pendek. Hasil penelitian menegaskan bahwa variasi dimensi billet dan beban dinamis sangat memengaruhi integritas roller, serta pentingnya strategi perawatan prediktif dan pemilihan material yang tahan fatigue.

Kata kunci: Roller Entry Guide; Tool Steel Cr-Mo-V; Explicit Dynamics; Fatigue

MECHANICAL FAILURE ANALYSIS OF ROLLER ENTRY GUIDE MADE OF TOOL STEEL Cr-Mo-V USING FINITE ELEMENT METHOD

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ABSTRACT

The steel rolling process relies heavily on roller entry guides to guide billets onto high-speed rolls. Data from the steel industry indicates damage such as surface cracking and wear on rollers, primarily due to billet dimensional variations and repeated impact loads. This study analyzes the mechanical failure of roller entry guides using Finite Element Method simulations with an Explicit Dynamics approach in ANSYS. With actual geometry and Tool Steel Cr-Mo-V material, the simulation evaluates Von Mises stress, deformation, contact pressure, and fatigue life. The maximum stress on a 12.5 mm billet reaches 1,135.4 MPa, approaching the yield limit of the material, indicating a crack-prone area. Fatigue analysis shows the rollers operating under high-cycle fatigue conditions, where the bottom roller experiences higher stresses and shorter life. The results confirm that billet dimensional variations and dynamic loads significantly affect roller integrity, as well as the importance of predictive maintenance strategies and fatigue-resistant material selection.

Keywords: Roller Entry Guide; Tool Steel Cr-Mo-V; Explicit Dynamics; Fatigue