

## ABSTRAK

Dunia industri terus mengalami perkembangan setiap tahunnya terutama pada era globalisasi saat ini, Setiap perusahaan harus meningkatkan kemampuan dan keterampilan sumber daya manusia serta mesin. PT. XYZ merupakan perusahaan manufaktur *collapsible aluminium tube* sempat mengalami kegagalan produksi. Penelitian ini menganalisis penyebab kegagalan tube pada komponen *dies and punch* mesin *impact extrusion press* tipe LJ-60 menggunakan metode *Fault Tree Analysis* (FTA). Data kegagalan dikumpulkan dari berbagai sumber, termasuk data kerusakan *sparepart* dan produksi. Penelitian ini juga mengevaluasi struktur mikro Baja KNL K110 Bohler dan menguji sensor *proximity* untuk mendeteksi jatuhnya *aluminium slugs*. Diharapkan komponen *dies and punch* dapat bekerja dengan baik, meminimalisir cacat pada tube, serta memberikan kontribusi bagi perusahaan. Pengujian menunjukkan bahwa kerusakan disebabkan oleh komponen *dies and punch*, kerusakan stampel, serta *setting punch* yang tidak *centre*. Dari analisis FTA, didapat bahwa probabilitas kegagalan utama adalah kerusakan stampel, yaitu sebesar 54%. Pengujian mikro struktur dilakukan di Lab Teknik Mesin Universitas Mercu Buana dengan menggunakan mikroskop *Meiji Techno*, analisis ini dilakukan dengan perbesaran 50x dan 100x, menggunakan campuran Asam Nitrat (HNO<sub>3</sub>) sebanyak 5 ml dan Alkohol (C<sub>2</sub>H<sub>5</sub>OH) sebanyak 95 ml (Nital 5%). Hasil uji mikro struktur *punch* menghasilkan struktur austenit dengan perbesaran hingga 100 kali. Pada perbesaran 50x dan 100x, terlihat fasa ferit dan perlit. Sistem *prototype* yang dirancang dapat mengurangi kegagalan hingga 50%. Sensor *proximity* terbukti efektif dalam mendeteksi *aluminium slugs*.

**Kata kunci:** Cetakan, *Collapsible Aluminium Tube*, Ekstrusi, *Fault Tree Analysis*, Mesin Tekan, Ekstrusi Impak, *Dies, Punch*, Stampel, Miring, Rusak, Kegagalan Tube, Baja, Sensor *Proximity*.

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## **ANALYSIS OF COLLAPSIBLE ALUMINUM TUBE FAILURE ON LJ-60 TYPE IMPACT EXTRUSION PRESS MACHINE**

### **ABSTRACT**

*The industrial world continues to experience development every year, especially in the current era of globalization. Every company must improve the capabilities and skills of human resources and machines. PT. XYZ is a collapsible aluminum tube manufacturing company that experienced production failures. This research analyzes the causes of tube failure in the die and punch components of the LJ-60 type impact extrusion press machine using the Fault Tree Analysis (FTA) method. Failure data is collected from various sources, including spare parts and production damage data. This research also solved the microstructure of KNL K110 Bohler Steel and tested the proximity sensor to detect falling aluminum slugs. It is estimated that the die and punch components can work well, minimize defects in the tube, and make a contribution to the company. Tests showed that the damage was caused by the die and punch components, stamp damage, and off-center punch settings. From the FTA analysis, it was found that the main failure probability was stamp damage, which was 54%. Microstructural testing was carried out at the Mechanical Engineering Lab at Mercu Buana University using a Meiji Techno microscope. This analysis was carried out at 50x and 100x magnification, using a mixture of 5 ml of Nitric Acid (HNO<sub>3</sub>) and 95 ml of Alcohol (C<sub>2</sub>H<sub>5</sub>OH) (5% Nital). The results of the microstructure punch test produced an austenite structure with a magnification of up to 100 times. At 50x and 100x magnification, the ferrite and pearlite phases are visible. The designed system prototype can reduce failures by up to 50%. The proximity sensor proved effective in detecting aluminum slugs.*

**Keywords:** *Mold, Collapsible Aluminum Tube, Extrusion, Fault Tree Analysis, Press Machine, Impact Extrusion, Dies, Punch, Stamp, Tilt, Damage, Tube Failure, Steel, Proximity Sensor.*

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