

## ABSTRAK

### SIMULASI 2D ELEMEN HINGGA PADA PIPA BAJA BERLAPIS KUNINGAN HASIL PRODUKSI *HOT CENTRIFUGAL COATING* DENGAN BEBAN INTERNAL *PRESSURE*

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Pipa baja berlapis kuningan produksi *Hot Centrifugal Coating* (HCC) memiliki keunggulan tahan korosi, namun perbedaan sifat material menimbulkan risiko kegagalan struktural. Penelitian ini bertujuan menganalisis distribusi tegangan pada pipa tersebut akibat beban tekanan internal sebesar 120 MPa menggunakan simulasi *Finite Element Method* (FEM) 2D dengan ANSYS *Static Structural*. Model geometri terdiri dari pipa baja (tebal 4,2 mm) dan kuningan (3,16 mm), dengan ikatan antarmuka dimodelkan menggunakan *Cohesive Zone Method* (CZM). Hasil simulasi menunjukkan tegangan radial tekan maksimum sebesar -119,84 MPa pada dinding dalam. Terjadi diskontinuitas signifikan pada tegangan *hoop*, di mana lapisan baja menanggung beban jauh lebih besar (812,49 MPa) dibandingkan lapisan kuningan (390,39 MPa) karena kekakuannya yang lebih tinggi. Selain itu, ditemukan konsentrasi tegangan geser pada antarmuka material (maksimum 0,2 dan -0,3 MPa). Disimpulkan bahwa antarmuka merupakan area paling kritis yang rentan terhadap delaminasi akibat ketidakcocokan regangan (*strain mismatch*).

**Kata Kunci:** *Hot Centrifugal Coating*, Pipa Berlapis, *Finite Element Method* (FEM), *Cohesive Zone Method* (CZM), Tekanan Internal.

## **ABSTRACT**

### **2D FINITE ELEMENT SIMULATION OF BRASS-LINED STEEL PIPE PRODUCED BY HOT CENTRIFUGAL COATING SUBJECTED TO INTERNAL PRESSURE**

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*Brass-lined steel pipes produced via Hot Centrifugal Coating (HCC) offer superior corrosion resistance; however, differences in material properties pose risks of structural failure due to uneven stress distribution. This study aims to analyze the stress distribution within these pipes under an internal pressure of 120 MPa using a 2D Finite Element Method (FEM) simulation in ANSYS Static Structural. The geometric model consists of a steel pipe (4.2 mm thickness) and a brass liner (3.16 mm thickness), with the bonding interface modeled using the Cohesive Zone Method (CZM). The simulation results reveal a maximum compressive radial stress of -119.84 MPa at the inner wall. A significant discontinuity is observed in the hoop stress distribution, where the steel layer bears a much higher load (812.49 MPa) compared to the brass layer (390.39 MPa) due to its higher stiffness. Furthermore, a shear stress concentration (0,2 and -0,3 MPa) was detected at the material interface. It is concluded that the interface is the most critical zone, being susceptible to delamination caused by strain mismatch.*

**Keywords:** Hot Centrifugal Coating, Lined Pipe, Finite Element Method (FEM), Cohesive Zone Method (CZM), Internal Pressure.