

Enhanced Casing Shoe Design with Honeycomb Structure for Improved Performance

Mohd Hanapi. Muhammad Ridha

Department of Mechanical Engineering, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia

Yunus. Nurul Azhani

Department of Mechanical Engineering, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia

Nik Mahmud. Nik Mustapha Fathil

OMNI Oil Technologies (M) Sdn Bhd, Wisma MCA, 163 Jalan Ampang, 50450 Kuala Lumpur, Malaysia

Abstract

This study presented an improved casing shoe design incorporating an internal honeycomb structure to enhance mechanical performance in wellbore applications. Finite Element Analysis (FEA) was conducted to compare the conventional solid casing shoe with the proposed honeycomb-structured casing shoe under simulated loading conditions at a specified wellbore depth. The results indicated that the honeycomb-structured casing shoe experienced lower stress and strain, enhancing its mechanical stability while maintaining structural integrity. However, increased deformation in the honeycombed model suggested a trade-off between flexibility and resistance to failure. Additionally, the honeycombed design achieved a significant weight reduction, lowering its mass to 6.9 kg compared to the conventional casing shoe's 9.3 kg. The study concluded that while the honeycomb design demonstrated significant advantages, further optimization was required to address its deformation characteristics, ensuring its practical application in wellbore environments.

Keywords

Finite Element Analysis (FEA), casing shoe, honeycomb structure, structural integrity, stress distribution, weight reduction, mechanical performance.