ABSTRACT

Zinc die-casting is a casting method of mass-producing zinc casting with near-net shape and complex thin wall by ejecting zinc metal die under high speed and high pressure. Die failure is mostly caused by thermal cracks, washout, and soldering on its surfaces which contacted with the liquid molten metals. This research examines TDAC free-cut die material after nitriding and PVD coating for actual AG40A zinc die-casting, discussing TDAC free-cut die material's surface treatment and microstructure alterations. Experimental techniques include hardness survey, weight survey, contact angle survey, soldering observation, washout observation, corrosion observation, thermal fatigue observation, and microstructure observation. Findings demonstrate that PVD coating changes least, surface zinc soldering and weight increase. However, coating and nitriding changes are not evident. Die life directly affects production costs and influences tool dimensional precision, and die material surface conduct affects soldering, washout, and thermal fatigue, directly influencing die life length. Discussion focuses on improving die material, die surface treatment (nitriding, PVD coating), and reducing machine binding force intensity, reducing surface roughness, improving lubricating ability, and seeking influencing die life fluctuation mechanisms.

Keywords: zinc alloy die-castings, AG40A zinc alloy, TDAC free-cut die material, die life, soldering, washout, thermal fatigue checking, PVD coating
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