Star formation efficiency (SFE) quantifies the efficiency of giant molecular clouds (GMCs) to form new stars and is measured as a function of gravitational free-fall time and star formation rate (SFR). Observational measurements of SFE in Milky Way GMCs are in the order of a few percent, significantly lower than expected from free-fall collapse. This discrepancy is currently not understood, however there are many possible proposed explanations that disrupt gas accretion and suppress SFR (e.g. turbulence, magnetic fields, and stellar feedback). A theoretical model that encompasses all these possibilities is needed to compare modern simulations with observational data and investigate the aforementioned discrepancy. We will have compared observational measurements of SFE with mock Spitzer and Hershel observations from a STARFORGE radiation-MHD simulation that accounts for all of the key processes that regulate star formation. We use surface density maps to determine the SFE by analyzing young stellar objects (YSOs) within distinct density contours. We find that the mock-observed SFE values are in good agreement with observations on average, with a similar amount of spread. Our model reveals several evolutionary trends and correlations that may help explain observed variations, advancing our understanding of these processes' impact on SFE.