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DESIGN OPTIMIZATION OF A RBCC EJECTOR MODE USING ENTROPY ANALYSIS

Abstract

The ejector mode of rocket based combined cycles RBCC which contains several irreversibility processes is a concept that has the ability to gain thrust from atmospheric air and reduce fuel consumption and thus reduce the cost of rocket launches. This paper presents the results of optimization of the ejector mode using entropy analysis which aims at important irreversibility processes. The diffusion and afterburing DAB cycle is considered in the engine model that solves the continuity, momentum and energy equations. In the rocket_ejector performance simulation, the mixture loss, shock loss and rayleigh loss are calculated. Thus, the effects of friction are ignored. The gross entropy generation of aforementioned loss is performed as the optimization objective. And the independent design parameters of RBCC engine are bounded including ejector geometry, the primary rocket flow parameters, the secondary flow parameters and the secondary fuel injection. Based on the foregoing simulation, a quick and efficient optimization procedure is established by hybird optimization algorithm and discrete variables setting. The optimized primary thruster size and optimal engine performance parameters are obtained.