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富氧燃气发生器动态特性分析

Analysis of oxidizer-rich preburner dynamic characteristics

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中文关键词: [富氧燃气发生器](#) [频率特性](#) [流量扰动](#) [熵波](#) [声学效应](#)

英文关键词: [oxidizer-rich preburner](#) [frequency characteristics](#) [flow rate disturbance](#) [entropy wave](#) [acoustics effect](#)

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中文摘要:

建立了描述富氧燃气发生器动态特性的线性化频域模型, 以分析推进剂流量扰动对发生器室压的动态作用. 通过与文献中试验数据对比, 验证了模型和计算方法的合理性. 在低频范围内采用考虑熵波的绝热流动模型, 比较煤油和液氧流量扰动引起发生器压力振荡的频率响应, 结果显示煤油流量扰动更易引起较大的熵波幅值. 分析了燃烧温度与混合比关系的无量纲斜率、涡轮压比系数和燃烧时滞对发生器频率特性的影响规律. 在很宽的频率范围内分析发生器的动态特性, 需采用考虑声学效应的分布参数模型, 既能在低频范围内涵盖绝热流动模型, 又能反映气路的纵向声学振荡.

英文摘要:

The linearized frequency models for oxidizer-rich preburner were developed to analyze the preburner pressure dynamic response under the propellant flow rate disturbance. The validity of the models and calculation method were confirmed by comparing the results with the test data from references. Using the adiabatic flow model which considered entropy wave during the low frequency range, the frequency responses of preburner pressure under kerosene and liquid oxygen flow rate disturbance were compared respectively, and the result shows that kerosene flow rate disturbance causes higher entropy wave amplitude. The influence rules of the dimensionless slope of combustion temperature and mixture rate as well as pressure ratio of the turbo and combustion time lag on the preburner frequency characteristics were also analyzed. When the concerned frequency range is wide, the distributed parameter model considering the acoustic effect should be used, because the model not only contains the adiabatic flow model during the low frequency range, but also can reflect the longitudinal acoustic oscillation.

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