

# 26th National Symposium on Cryogenics and Superconductivity

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## Numerical studies on turbine drive gas recovery at the LOX booster turbopump exit of a staged combustion cycle based rocket engine

### Content :

In a typical staged combustion cycle based cryogenic/semicryogenic rocket engine, the booster turbine is driven by either the oxidiser rich combustion products from the preburner or by the pure gaseous oxygen after cooling the nozzle section. The turbine drive gas at the exit of the booster turbopump mixes with liquid oxygen from the booster pump resulting in condensation of the hot gas. In this paper, studies have been carried out to predict the condensation process by numerical techniques. An Eulerian two fluid model has been implemented with thermal phase change model for predicting the extent of condensation in the commercial CFD package ANSYS CFX®. The effect of gas mass flux and liquid subcooling on the condensation process has been studied and suitable correlations for predicting heat transfer coefficient and dimensionless gas plume length has been developed.

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