Numerical analysis on fuel injector design

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Abstract

Numerical simulations of thermofluid dynamics are performed to optimize fuel injector design.

Reasons and benefits of using JAXA Supercomputer System

The use of supercomputer is necessary due to high computational load of thermofluid analysis on fuel injectors in complex design.

Achievements of the Year

In order to avoid fuel coking in fuel circuits of a coaxially-staged lean-burn fuel injector, development cycle of thermal-protection design and its numerical evaluation were carried out. As a result, thermal-protection performance of the injector was improved (at least in numerical space). Schematic drawing of the injector, and an example of suppression of wet-wall temperature near the exit of the pilot fuel circuit are presented in Figure 1 and 2, respectively.

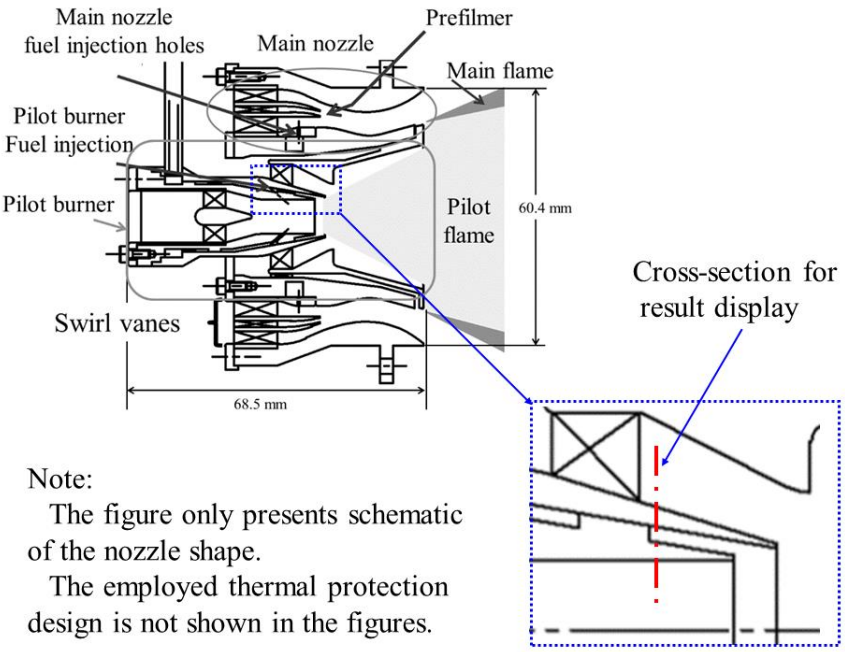

Fig. 1: Schematic drawing of the fuel injector.

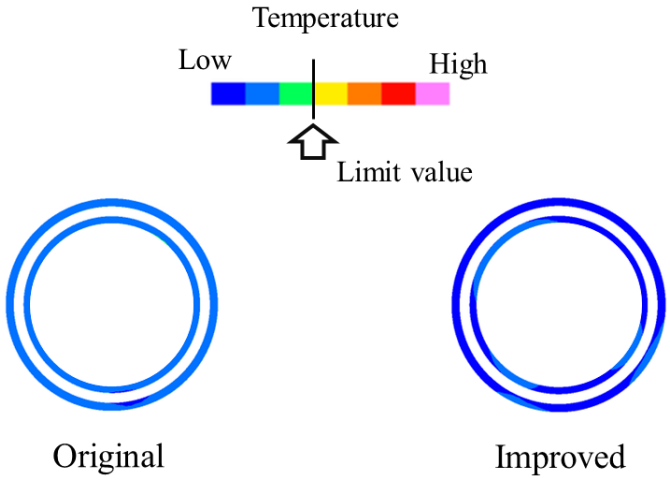

Fig. 2: Example of suppression of wet-wall temperature of fuel circuit by improved injector design.

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	1024
Elapsed Time per Case	144 Hour(s)

JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 0.66

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	18,042,433.00	0.81
TOKI-ST	38.21	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	167.08	0.14
/data and /data2	168,615.00	1.04
/ssd	0.00	0.00

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	0.00	0.00

*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

*2: Fraction of Usage：Percentage of usage relative to each resource used in one year.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage*2 (%)
ISV Software Licenses (Total)	0.00	0.00

*2: Fraction of Usage：Percentage of usage relative to each resource used in one year.