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). An example of suppression of wet-wall temperature of one of the fuel circuits in the injector by improved design is presented in Figure 1.
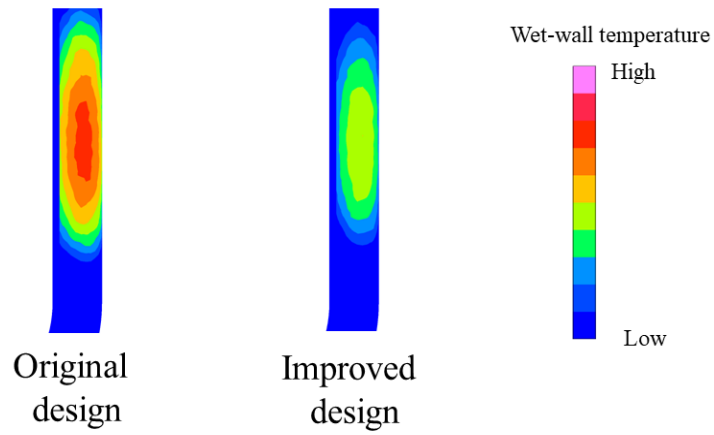
Fig. 1: Example of suppression of wet-wall temperature of fuel circuit by improved injector design.

● **Publications**

　　N/A

● **Usage of JSS**

● 　　　**Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	1024 - 4096
Elapsed Time per Case	165 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.68

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	18,516,172.72	0.81
TOKI-ST	5,554.52	0.01
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	190.32	0.17
/data and /data2	169,864.00	1.31
/ssd	228.33	0.03

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.

- **ISV Software Licenses Used**