

# Flash Heat Fuel Injector for Improved Combustion of Heavy Fuels

Have you ever imagined running your gasoline engine powered vehicles on diesel or jet fuel with even higher power output, lower fuel consumption and less emission? The Flash Vapor Fuel Injector can help meet these needs.

The fuel heating approach holds high promise of more complete combustion, which leads to reduced fuel consumption, higher power output and lower emission. Fuel heating has been plagued in the past by the fuel thermal decomposition, known as fuel coking. Coking happens when the high temperature fuel reacts with dissolved oxygen and

forms carbonized particle. These oxidized carbon particles deposit on the porous heater wall, which would eventually clog up fuel passage and fuel injector nozzle.

The novel flash vapor fuel injector can heat up low thermal diffusivity fuel (JP-8) from 80 F to above 300 F (vaporization temperature of JP-8) under 0.1 second.

This invention is in the application process of U.S. provisional patent and is now seeking partnership for commercialization.

## The next generation fuel injector



The developed Flash Vapor Fuel Injector with amazingly fast fuel heating capability reduces fuel thermal decomposition while achieving different fuels' vaporization temperature with ease.

[Learn more about Performance \(page 2\)](#)

Above

300<sup>F</sup>

JP-8 vaporization temperature

Under

0.1<sup>Sec</sup>

Bring JP-8 temperature from 80 F to 300 F

Above

0.4<sup>gram/sec</sup>

Fuel flow rate

### Key features

- ✓ Flexible fuel strategy without re-designing your engine
- ✓ Running low compression ratio engines with heavy fuel
- ✓ Flash heating and direct injection of heated fuel
- ✓ Vaporize heavy fuel to create easy ignitable fuel-air mixture
- ✓ Mitigate coking during fuel heating

- ✓ Equivalent ignition behavior for all fuels
- ✓ Hold the promise of reducing emission while increasing the engine efficiency

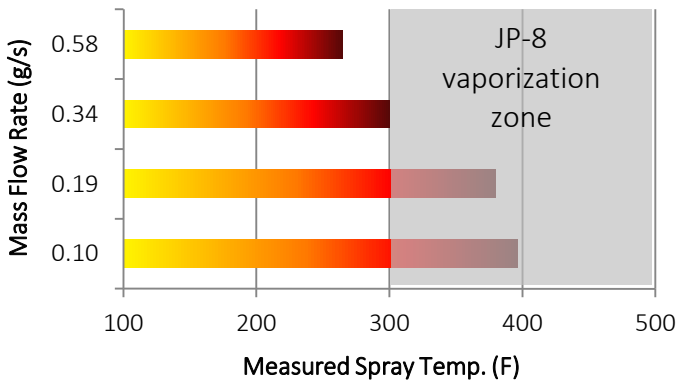
### Technical details

<b>Fast Heating</b>	<b>High Efficiency</b>	<b>Small Size</b>	<b>Easy Integration</b>	<b>High Frequency</b>	<b>Better Atomization</b>
Heat JP-8 from 80 F to 300 F under 0.1 sec at 0.4 g/s flow rate	< 0.5 kW power consumption	1" diameter 1" length	With existing direct fuel injectors, i.e. BOSCH, Delphi, etc.	> 100 Hz	Under much lower fuel rail pressure

### Performance

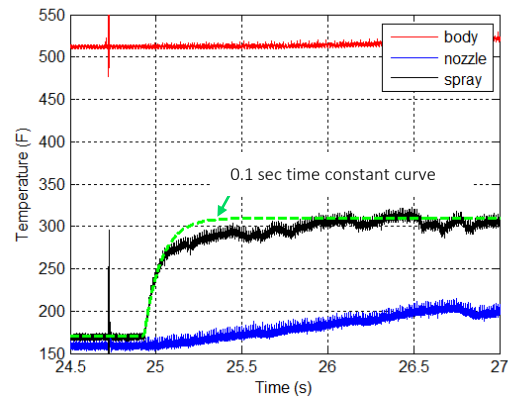
#### Steady heating

Achieve vaporization temperature of heavy fuel



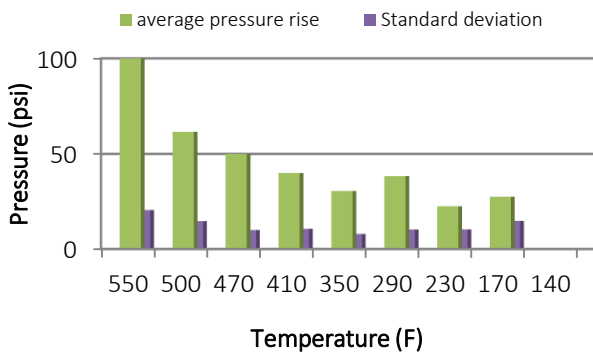
#### Transient heating (cold-start)

Instantly release vaporized fuel

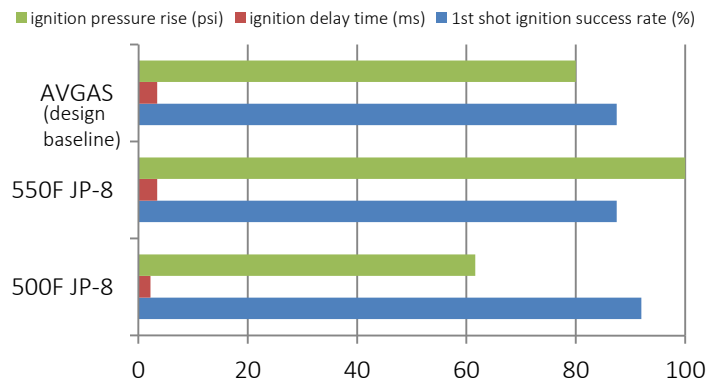


#### Ignition

Higher ignition energy release with higher preheated JP-8



Ignition characteristics superior than volatile fuel



## References

Palazzolo, A, R. Tucker, X. Zhang, E. Thomas, A. Kascak and C. Kweon, "Flash Vapor Fuel Injector," U.S. Provisional Patent 62/056,317, filed on September 26th, 2014.

Zhang, X., A. Palazzolo, R. Tucker and A. Kascak, "Flash Vapor Fuel Injector Development: Part I - Design," International Journal of Engine Research, 2014. (Under peer review)

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