

## Re: Shuttle engine question

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*Source:* <http://sci.tech-archive.net/Archive/sci.space.shuttle/2005-07/msg00993.html>

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- *From:* Damon Hill <[damonunoseisuno@xxxxxxxxxxxxx](mailto:damonunoseisuno@xxxxxxxxxxxxx)>
  - *Date:* Wed, 27 Jul 2005 18:21:41 -0500
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Camaronat <[Camaronat.1sunls@xxxxxxxxxxxxx](mailto:Camaronat.1sunls@xxxxxxxxxxxxx)> wrote in  
[news:Camaronat.1sunls@xxxxxxxxxxxxx](mailto:news:Camaronat.1sunls@xxxxxxxxxxxxx):

>

> Are the main engines cooled by liquid hydrogen, or by a mixture of water  
> and something else? I am pretty sure that they use hydrogen bled off  
> before injection, but a guy here at work seems to think otherwise.

As with most any liquid fuel rocket engine, the SSME is cooled by its own propellants before burning them. In this case, liquid hydrogen is pumped through the wall of tubes that form the exhaust nozzle and combustion chamber. Because it is a closed cycle design, the warmed hydrogen carries the removed heat back into the combustion chamber so no energy is lost.

Kerosene, LOX or hydrazine are used in the same way in other liquid fuel engine designs. The RS-68 used on the new Delta IV is a bit different; the nozzle has an 'ablative' lining that burns off, pretty much like any large solid fuel rocket. But the nozzle throat and combustion chamber are still cooled by the liquid hydrogen.

Smaller rocket engines that operate at somewhat lower temperatures can get away with radiation cooling of the nozzle.

A separate cooling system would require a lot of mass of water or some other coolant that would have to be dumped as it is used. This would be very heavy to carry along and would waste payload.

--Damon

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- *References:*
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    - ◇ *From:* Camaronat
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