Monitor Values at a certain point on both sides of a Shell Conduction Zone

Problem/Description:

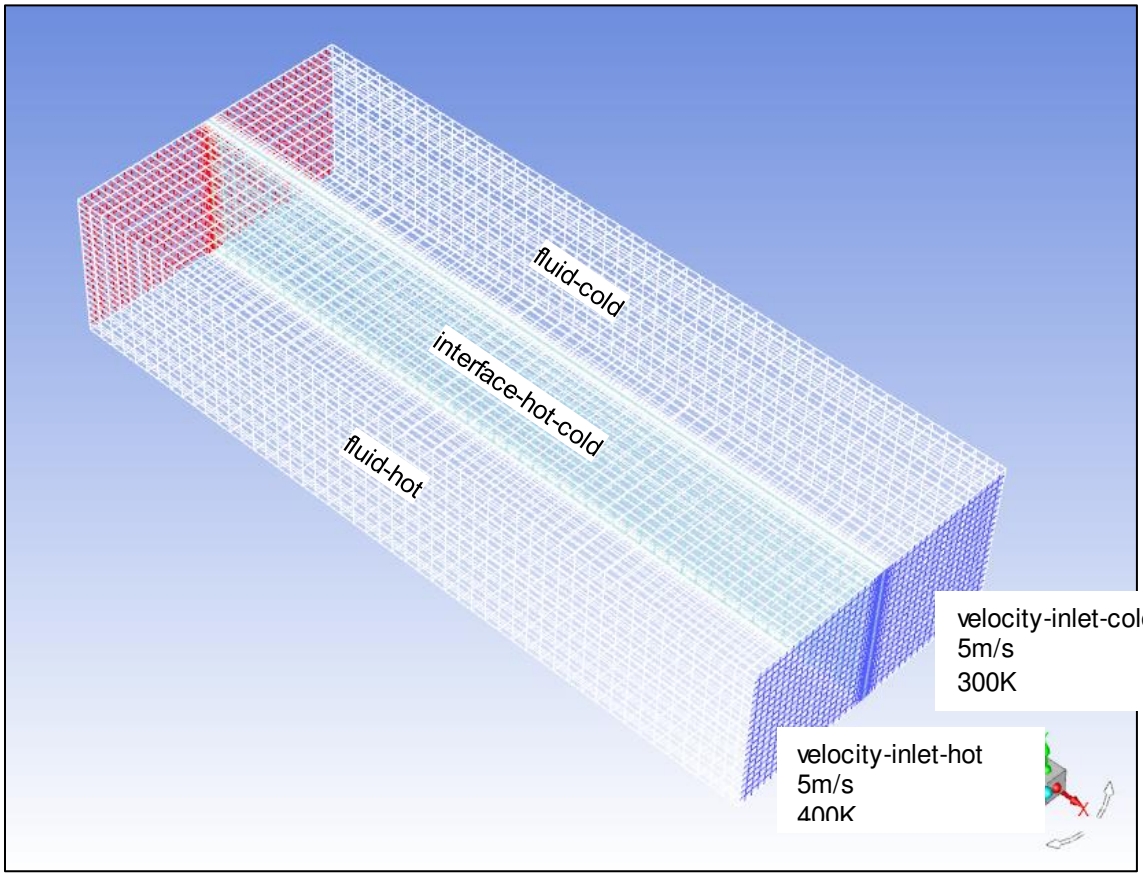
I would like to monitor the Temperature at a certain location on both sides of a shell-conduction-zone. How can this be done in Fluent since version 19.0?

Solution:

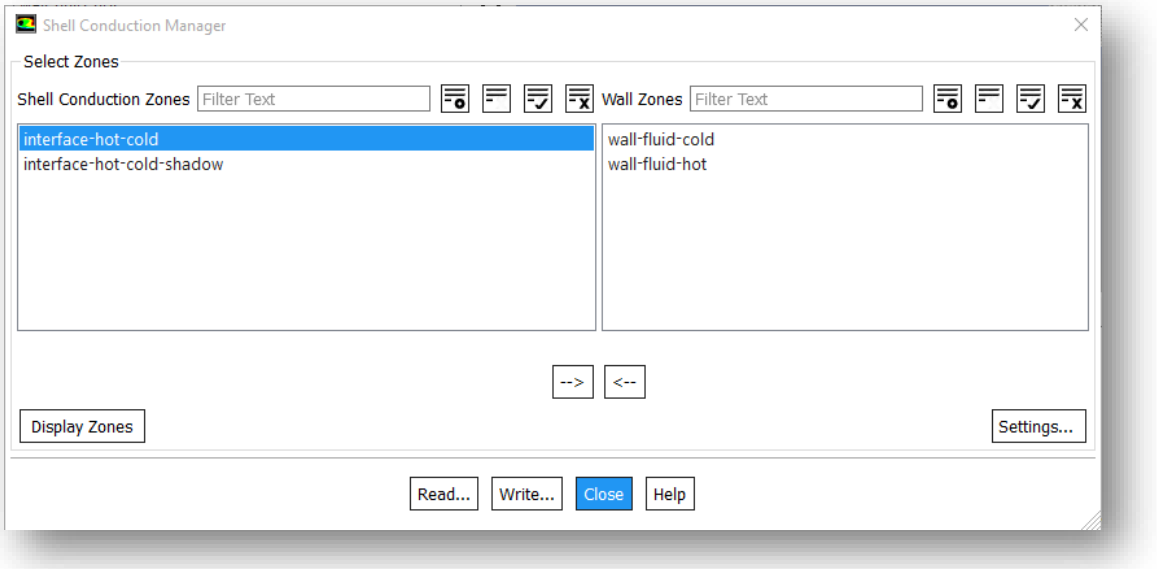
Since Version 19.0, the variables wall-temperature-inner and wall-temperature-outer for shell-conduction-zones are not available any more. Instead, all available variables can be displayed on both. A detailed description on how to setup shell conduction layers can be found in the Fluent User's Guide, 12.2.5.4, Managing Shell Conduction Walls, and the naming convention for Postprocessing Shells can be found in Chapter 12.2.5.7, Postprocessing Shells:
https://ansyshelp.ansys.com/account/secured?returnurl=/Views/Secured/corp/v191/flu_ug/flu_ug_sec_hxfer_shell_cond.html

Example:

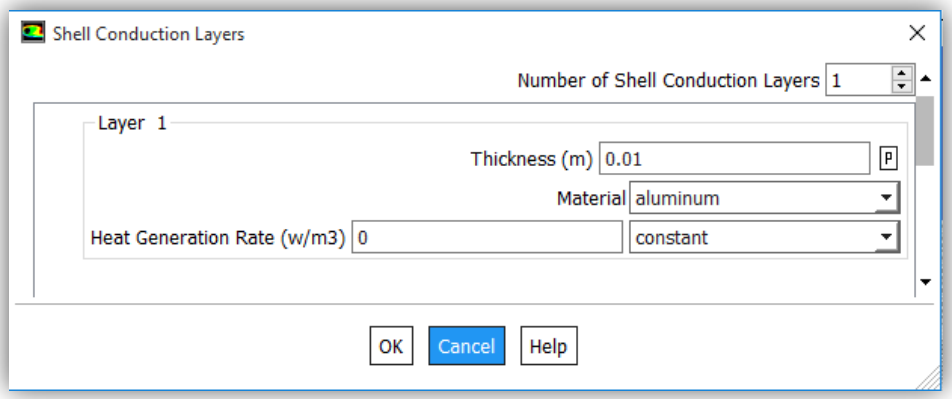
The attached example shows two channels connected by a shell conduction wall.



The “interface-hot-cold”, which is a wall between the zones “fluid-hot” and “fluid-cold” was defined with the Shell Conduction Manager as displayed in the picture below



Clicking on Settings…, the Number of Shell Conduction Layers, its thickness, material and heat generation rate can be defined:

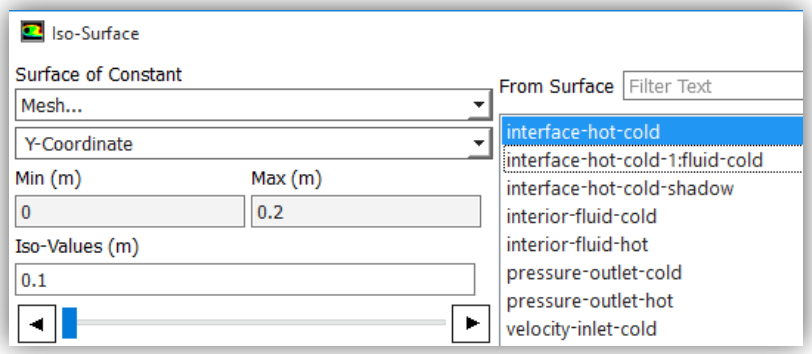


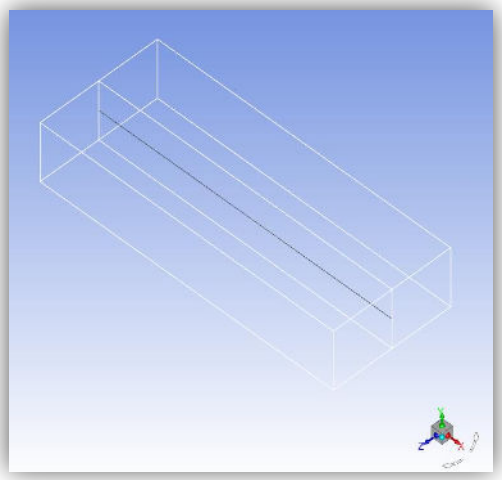
After Initializing the case, a new surface appears “interface-hot-cold-1:fluid-cold”. Please see additional information below for the naming convention or for more detailed information the Fluent User’s Guide.

The thermal conductivity of aluminium was set to 0.0001 W/(m*K) to clearly see the difference on both sides.

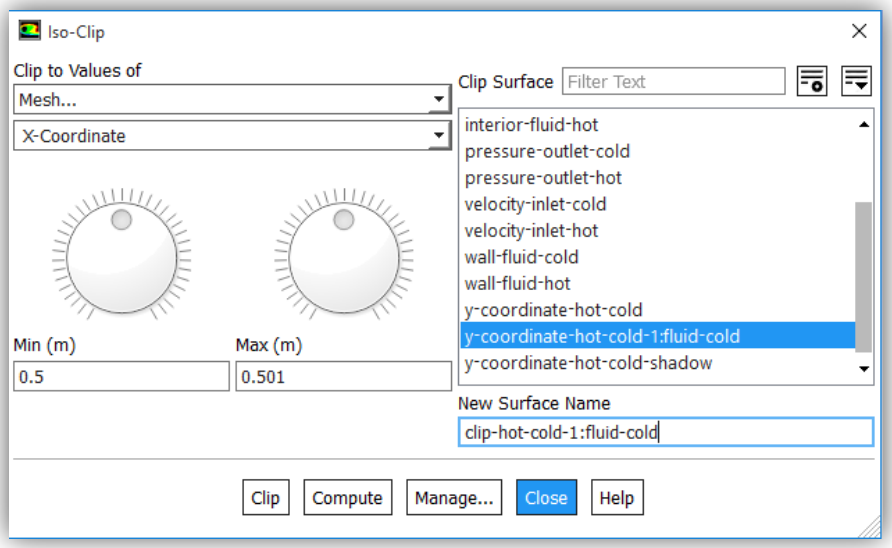
Monitor Points:

For creating a monitor point at different locations, an Iso-Surface (Postprocessing > Surface > + Create > Iso-Surface) can be created for these different locations. In the attached example, an Iso-Surface for a constant Y-Coordinate (Iso-Values (m) = 0.1) on “interface-hot-cold” on the one side and “interface-hot-cold-1:fluid-cold” and “interface-hot-cold-shadow” on the other side were created (see picture below), which results in a straight line (see black line)

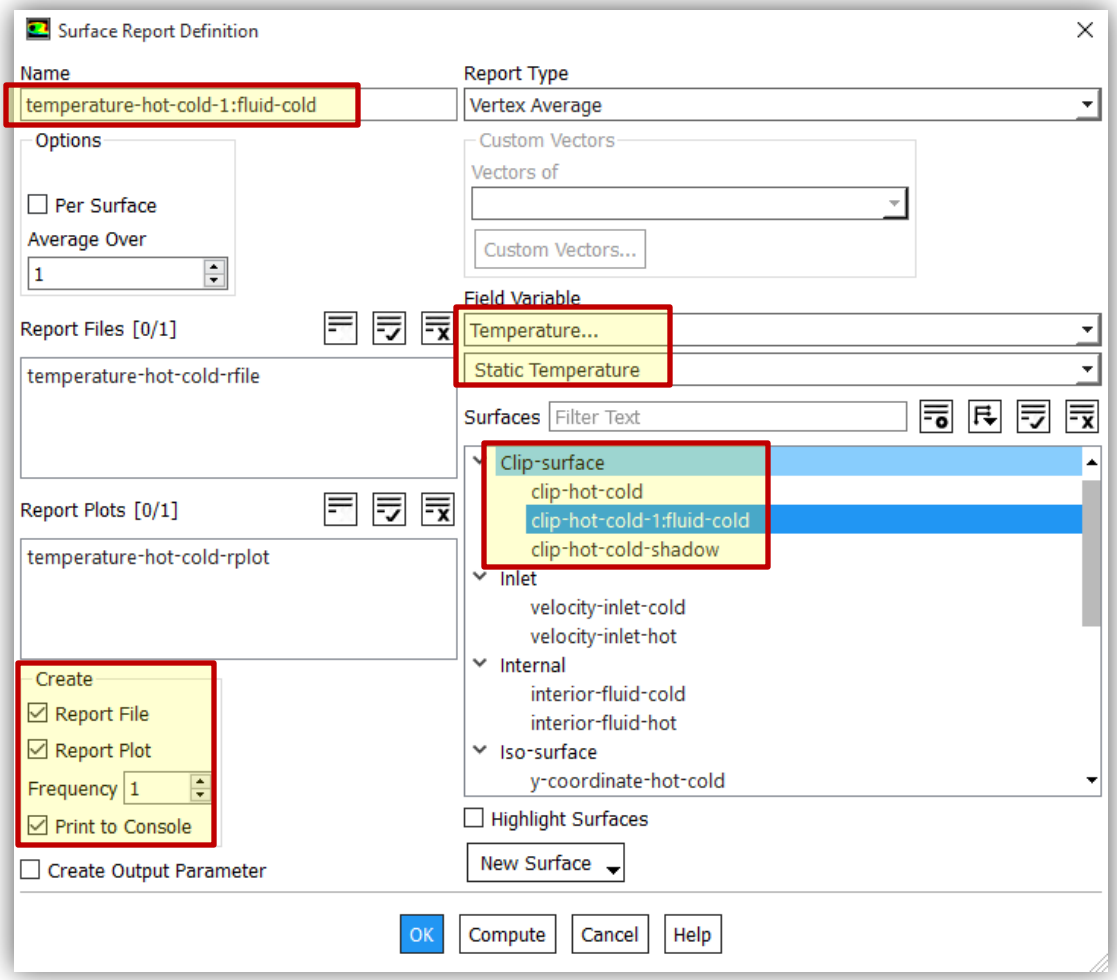




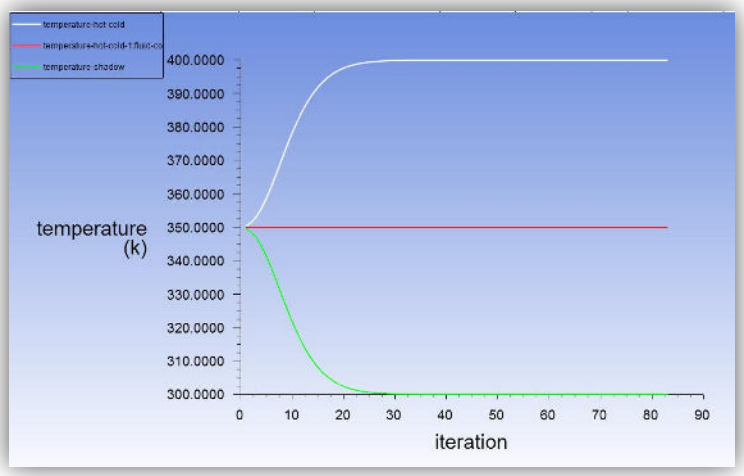
The resulting line can be clipped by an Iso-Clip (Postprocessing > Surface > + Create > Iso-Clip). In the attached example, three Iso-Clips between 0.5 m and 0.501 m were created for the three iso lines created in the step before



The resulting short lines can now be used as monitor points for the solver run. They can be defined under Solving > Reports > Definitions > New > Surface Report > Vertex Average. Select the iso clip.



The resulting monitors of the static temperature are displayed in the figure on the right. The white line shows the static temperature at the hot side (interface-hot-cold), the green line on the cold side (interface-hot-cold-shadow) on the hot side, and the red line on the shell layer (interface-hot-cold-1:fluid-cold), which is the interface to the shadow wall. For "interface-hot-cold-1:fluid-cold, the static temperature shows the cell value of the layer, and the temperature of the surface itself is stored as wall temperature (see also Appendix).

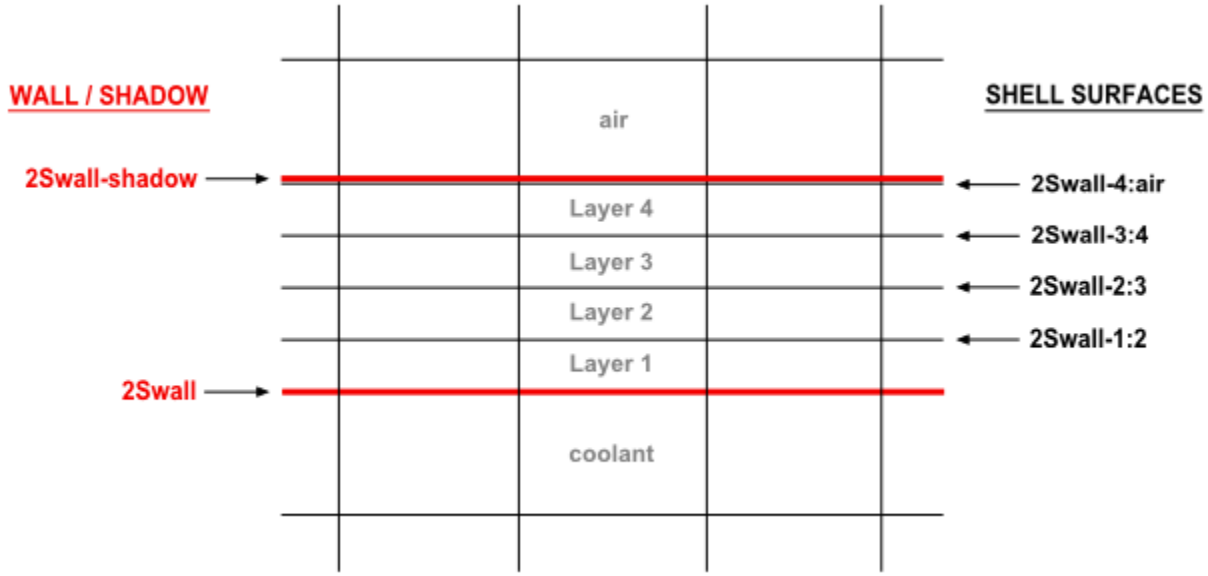


Appendix:

From Fluent User's Guide (12.2.5.7. Postprocessing Shells):

"You can use the walls, shadow walls, and shell surfaces to display the temperature of the interfaces and adjacent cells. The **Temperature...** category provides two options: the temperature of the cell on the c0 side of the surface is stored as **Static Temperature**; and the temperature of the surface itself is stored as **Wall Temperature**. If a more detailed analysis of the solid zone and surfaces is required, then you should consider creating layers of solid cells in your meshing application.

Shell Surfaces for a two-sided wall:



- The **Static Temperature** and **Wall Temperature** of **2Swall-4:air** will provide the temperature of the cells of **Layer 4** and the temperature of the interface between **Layer 4** and the shadow wall (that is, the **2Swall-4:air** shell surface), respectively.
- The **Static Temperature** and **Wall Temperature** of **2Swall-shadow** will provide the temperature of the air cells adjacent to **2Swall-shadow** and the temperature of the shadow wall, respectively."

For Shell Surface handling of a boundary wall, please refer to the Fluent User's Guide.

Contributors:
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Attachments:
1. 2056173.pdf
2. 2056173.cas.gz
3. 2056173.dat.gz