Sage Model Notes

RadShieldStacked.scfn

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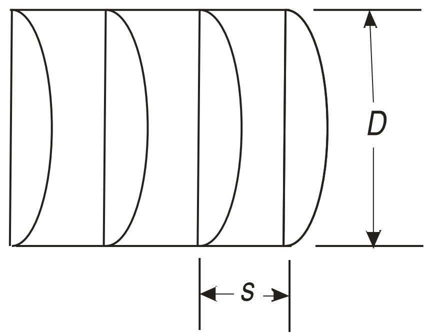
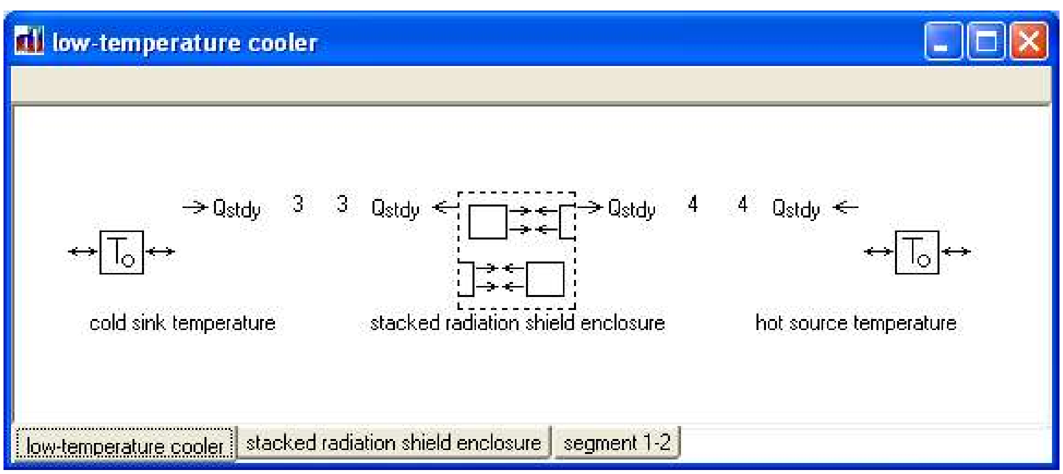
A right circular cylinder cylinder of diameter *D* with spaced radiation shield disks normal to the central axis. A stack of three radiation enclosures actually. Sectioned view like this:



Displacers of stirling machines often contain radiation shields when not serving as a regenerator housing. This model simulates only the radiation heat transfer within such a displacer, not the thermal conduction within solid walls.

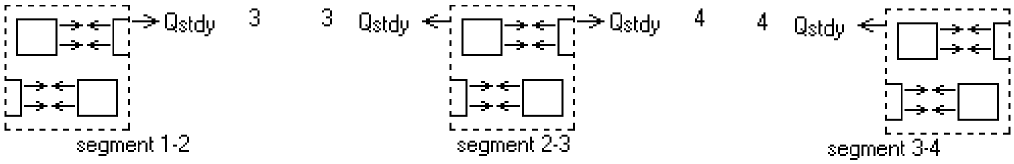
The model is similar to the nested radiation shield model RadShieldNested.ltc (*see* RadShieldNested.pdf) except radiation exchange also includes the inner wall of a cylinder. The end disks at the far left and far right are anchored to external fixed temperatures. All other temperatures float with the solution. Of interest is the net radiation heat transfer between far right and far left ends.

This is the top level Sage model:

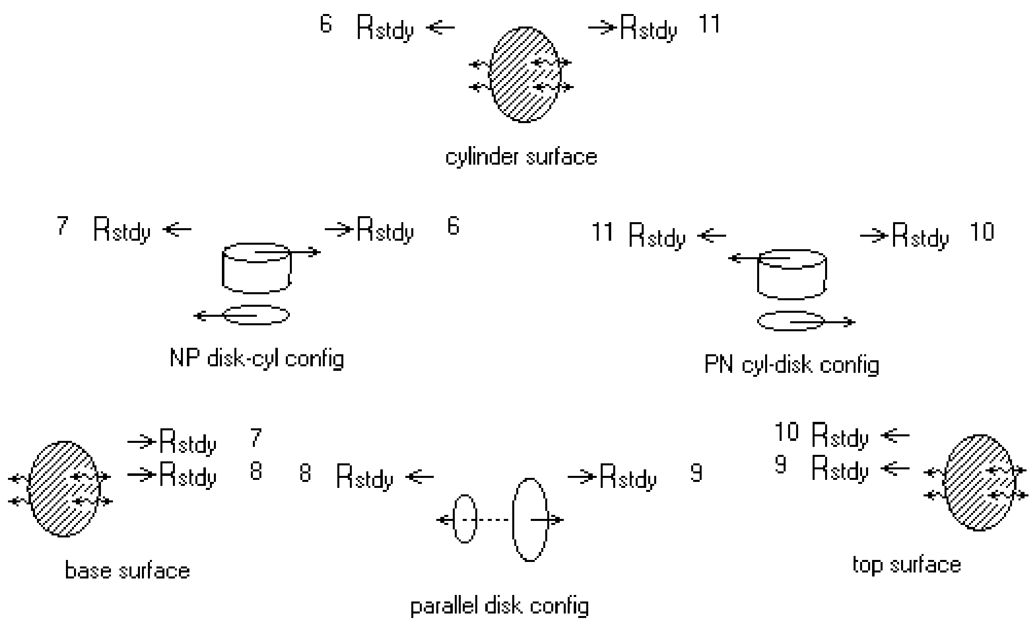


The *cold sink temperature* and *hot source temperature* anchor the two ends of the radiation shields located within the *stacked radiation shield enclosure* submodel.

Inside the *nested radiation shield enclosure* submodel are a number of additional submodels each representing the radiation enclosure formed by two adjacent shields:



Each of these was cut and pasted from the can-enclosure submodel in RadCanEncl.ltc (*see* RadCanEncl.pdf). The radiation exchange components within any one of the *segments* submodels are shown here:



The *base surface* and *top surface* have ordinary (conductive) heat flow connections moved up to the submodel level for connection to a radiation surface of another *shield* submodel or to one of the root-level temperature sources. Connecting a shield surface to a temperature source fixes its temperature. Connecting two shield surfaces together forces their temperatures to be equal but allows both to float as part of the solution.

The view-factor components (those with *config* in the name) calculate the view factors for the various view configurations of the enclosure.

Recast Variables

User-defined inputs at the *segment* submodel level define the overall geometry and radiation properties of the enclosure:

Dshield	shield disk diameter (m)	1.000E-01
Spacing	axial distance between shields (m)	1.000E-02
EmShield	emissivity all surfaces (NonDim)	5.000E-02

These inputs are referenced by recast inputs of the individual radiation-surface and view-factor components within each *segment* submodel:

base surface **and** ***top surface***
A = 0.25 * Pi * Sqr(Dshield)
Emiss = EmShield

cylinder surface
A = Pi * Dshield * Spacing
Emiss = EmShield

parallel disk config
Sepr = Spacing

These recasts automatically set the component inputs according to the model geometry.

Net Radiation transfer

The net radiation transfer is given by outputs QNeg or QPos in the top-level *cold sink temperature* or *hot source temperature* components. In the *cold sink temperature* the result is:

QPos	net heat flow pos bnd (W)	-3.075E-02