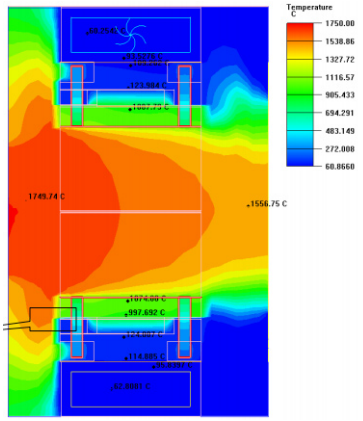
# High Temperature Heat Exchanger

*Design Case Study*




## Introduction

Aavid, Thermal division of Boyd Corporation, was chosen by an alternative/ renewable energy company to design, simulate, prototype and test a solution for a high temperature ther-moelectric generator. The objective was to use computational fluid dynamics (CFD) analysis to determine the most beneficial design for the heat exchanger and liquid cold plate, which have to maintain a temperature differential of 500°C across a thermoelectric module.

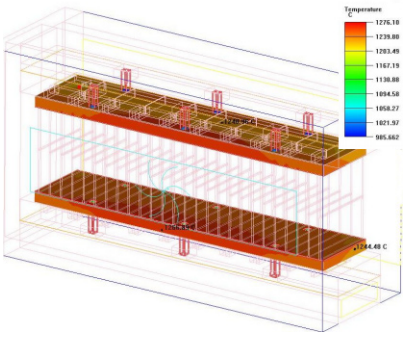
## The Challenge

Aavid selected the proper material for the heat exchanger where gas temperatures could surpass 1500°C.

Aavid constructed a test rig to withstand very high temperatures to closely approximate the application.

Due to high operating temperatures, Aavid took radiation into account, which is often neglected in many forced airflow cooling solutions.

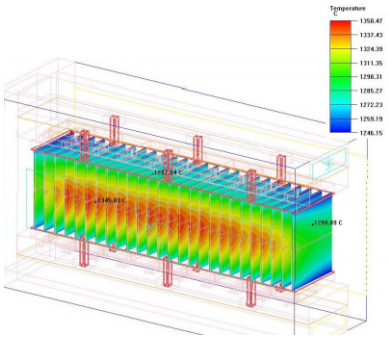
Aavid researched high temperature thermal interface materials as standard interface materials were not appropriate for this application.




## The Solution

Several CFD models were created and run to optimize heat exchange geometry. The final designs were presented to the customer with recommendations as to which one would be most beneficial.

Two hardware designs were selected for prototype and performance testing in Aavid's Laconia facility. Mechanical mock-ups were used to provide the most accurate thermal properties and data throughout testing. Testing of the actual thermoelectric modules then followed.




## The Deliverables/Results

A detailed CFD model was used to simulate the system. Using the prototypes, testing was performed to gather data. Data from the prototype was used to further refine and finalize the CFD model based on the results.

Detailed material properties investigation, coupled with CFD analysis enabled the selection of material used to withstand the generator's high operating temperatures.

Concurrent engineering between Aavid and customer was practiced to meet engineering and timeline goals.