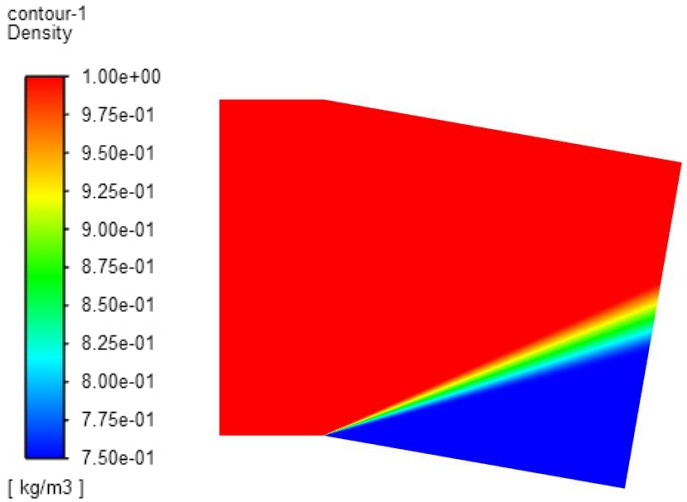
Supersonic Flow over an Expansion Corner

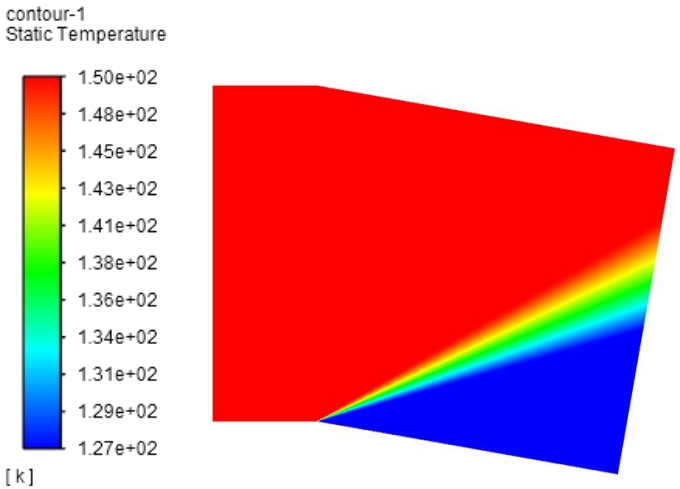
Ansys

Results

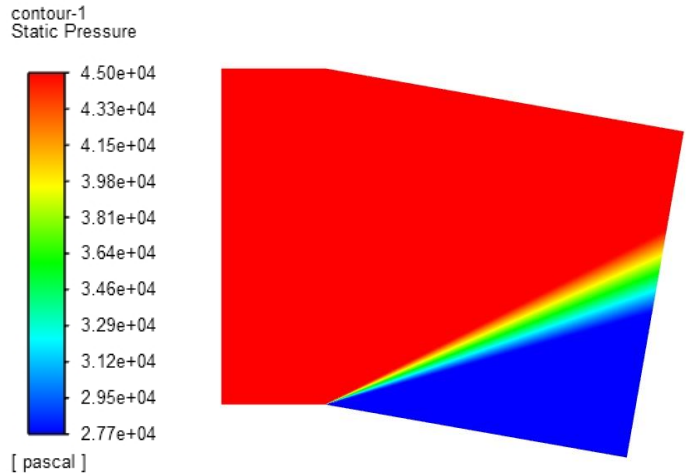
- The contours of density, pressure and temperature decrease downstream of the expansion, as expected.
- As can be seen in respective contour plot, these variables decrease smoothly across the expansion fan.



Contours of Density



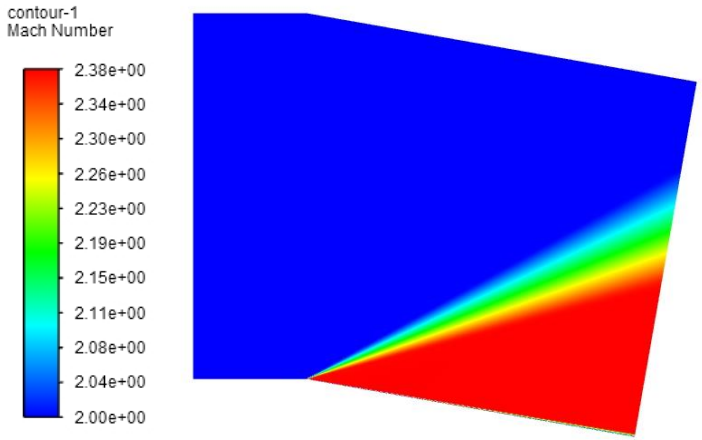
Contours of Temperature



Contours of Pressure

Results

- Unlike the state variables, the Mach number increases downstream of the expansion, as highlighted by the contour plot below.



Contours of Mach Number

- At $M_1 = 2$ and $\theta = 10$ (expansion angle), using the Prandtl-Meyer function, the theoretical value of fully expanded Mach number (M_2) can be calculated as 2.386.
- For the same conditions, we obtain a value of $M_2 = 2.376$ from the simulations, which is within 0.4% from the theoretical value.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