Chapter9_example4

The area of annulus is 2.59e-03 sq.m

The area of inner pipe is 4.28e-03 sq.m

Air flows through inner pipe

The heat transferred is 1.68e+03 W

The low temperature of carbon dioxide is 533 K

The LMTD for counter flow configuration is 243 degree C

The Annulus Equivalent Diameter for friction is 0.01862 m

The Annulus Equivalent Diameter for heat transfer is 0.0416 m

The Reynolds Number for air is 2.42e+04

The Reynolds Number for carbon dioxide is 1.72e+04

The Nusselt number for air is 66.5

The Nusselt number for carbon dioxide is 48.9

The convective coefficient for air based on inner diameter is 25.3 W/(sq.m.K)

The convective coefficient for air based on outer diameter is 23.6 W/(sq.m.K)

The convective coefficient for carbon dioxide is 39.4 W/(sq.m.K)

The overall exchanger coefficient is 14.2 W/(sq.m.K)

The area required is 0.48 sq.m

The number of exchangers is 1

The velocity of air is 5.96 m/s

The velocity of carbon dioxide is 8.98 m/s

The pressure drop for tube side is 12.83 Pa

The pressure drop for shell side is 196 Pa

Summary of Requested Information

(a) Exchanger required: 1

(b)Overall exchanger coefficient = 14.2 W/(sq.m.K)

(c)Air pressure drop = 12.83 Pa

Diesel exhaust pressure drop = 196 Pa