HEAT EXCHANGER

1. TECHNICAL DESCRIPTION, BACKGROUND

The air which is entering a furnace is preheated. The velocity of this air is too great when it enters the furnace though and therefore something needs to be done in order to reduce it.

2. PROCEDURE

- The velocity of the air is too great, and therefore something needs to be done in order to slow down the velocity. What should be done? (Add a diffuser at the end of the pipe)

- If the diffuser given below is used, what is the average velocity of the air at the outlet of the diffuser?

3. ENGINEERING CALCULATIONS

A/ Calculate the mass flow rate at the outlet of the diffuser.

B/ Calculate the average velocity at the outlet of the diffuser.

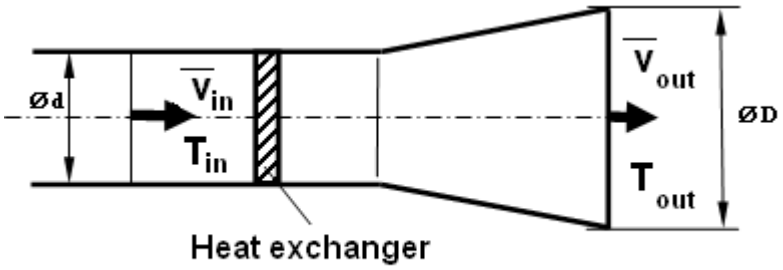

Figure 1.

Fluid Data:

Gas constant of air R = 287 [*J/(kg K)*]

The pressure in the system is approximately constant $p = 10^5 [Pa]$

Inlet Data:

Inlet temperature $T_{in} = 300\ [K]$

Inlet diameter $d = 315\ [mm]$

Inlet average velocity $\bar{v}_{in} = 12 \left[\frac{m}{s}\right]$

Outlet Data:

Outlet temperature $T_{out} = 340\ [K]$

Outlet diameter $D = 600\ [mm]$