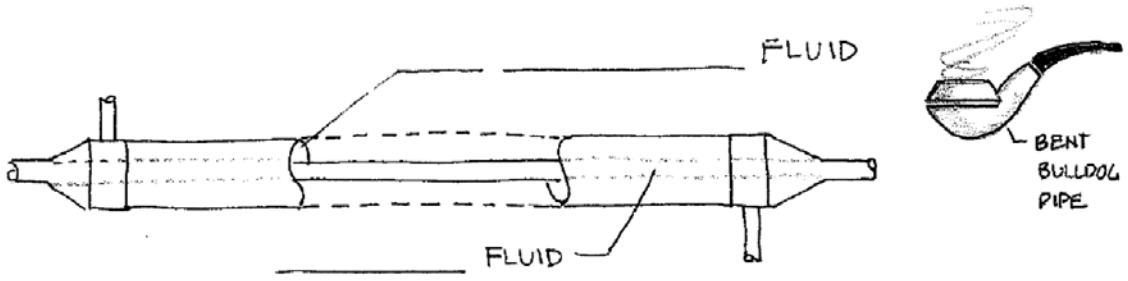
NOTES: **Heat exchangers**

DOUBLE PIPE (DOUBLE PIPE) HEAT EXCHANGER



NOTATION: T_h :

T_c :

(IN):

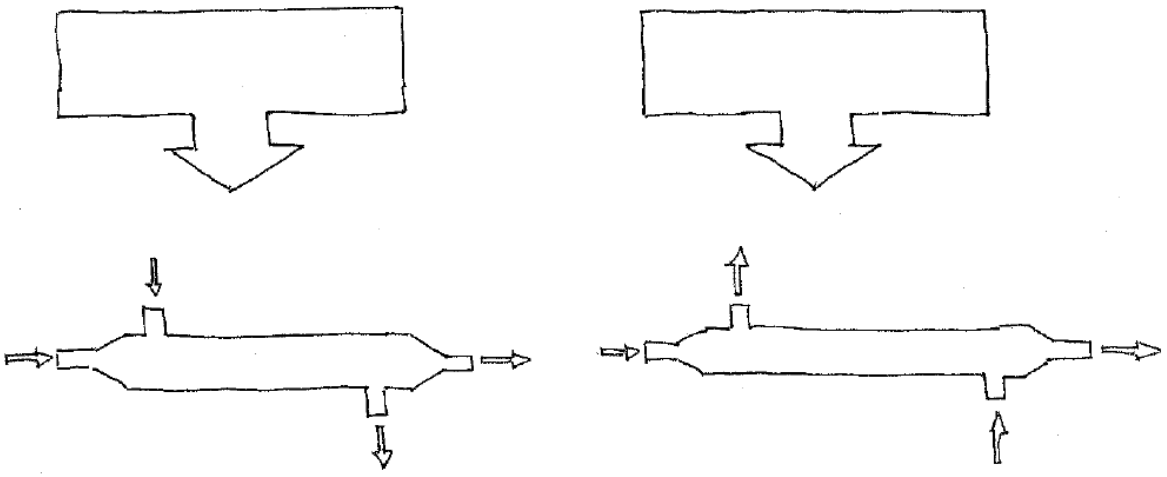
(OUT):

E.G.,

$T_{c,out}$ =

$T_{h,in}$ =

TWO ARRANGEMENTS



ASSUMPTIONS FOR ANALYSIS:

1)

2)

3)

4)

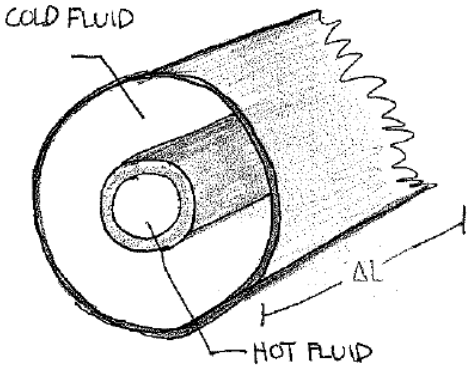
NOTES: Heat exchangers

WE WOULD LIKE A HEAT TRANSFER COEFFICIENT THAT GIVES $\dot{Q}$ BETWEEN THE TWO FLUIDS FOR THE WHOLE HXR*.

¿ $\dot{Q} =$ (HEAT TRANSFER COEFFICIENT) $\times$ (AREA) $\times$ (TEMPERATURE DIFFERENCE) ?

HOW DO WE FIND U?

FOR A SMALL SECTION of HXR:

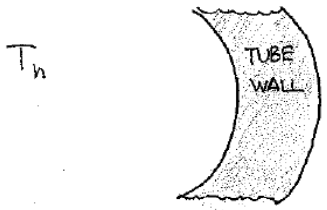


SIDE VIEW OF INNER TUBE

$\delta\dot{Q} =$ ———

WHERE

$R_{TOTAL} =$



SO:

$UA =$

* "HXR" IS A COMMON ABBREVIATION FOR HEAT EXCHANGER.

NOTES: Heat exchangers

MUST CHOOSE AN AREA ON WHICH TO BASE U:

$UA =$ $=$

↑ USUALLY BASED ON AREA

ANYWAY...

STILL NEED

$$\dot{Q} = UA\,\Delta T_{AVG} = UA\,(T_h - T_c)_{AVG}$$

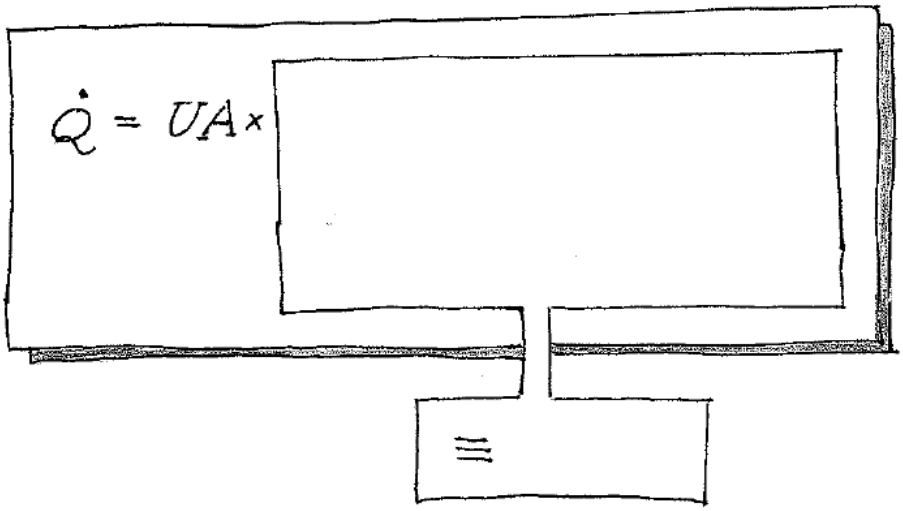
$= ?$

PROBLEM:

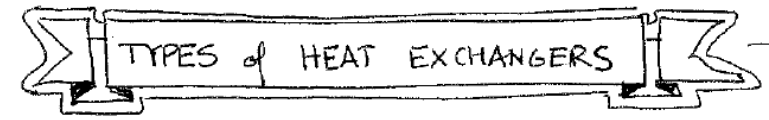
SOLUTION:

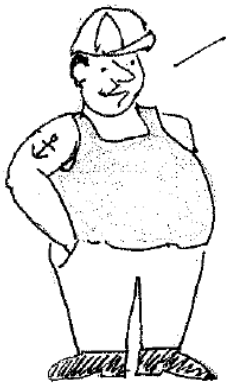
ASSUMPTION # 5:

CONSERVATION of ENERGY + ASSUMPTION # 5 YIELDS



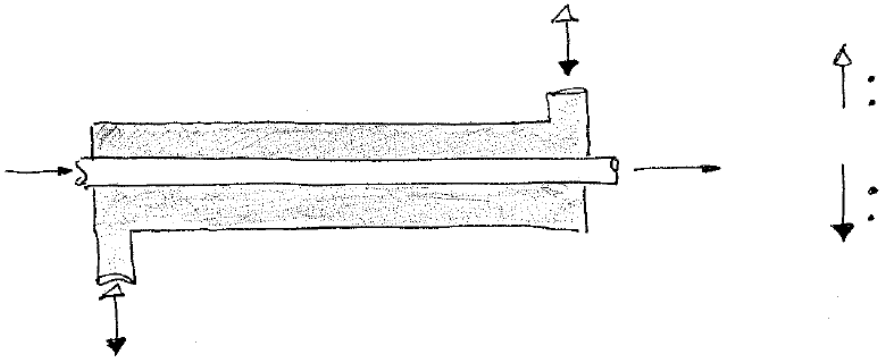
NOTES: **Heat exchangers**



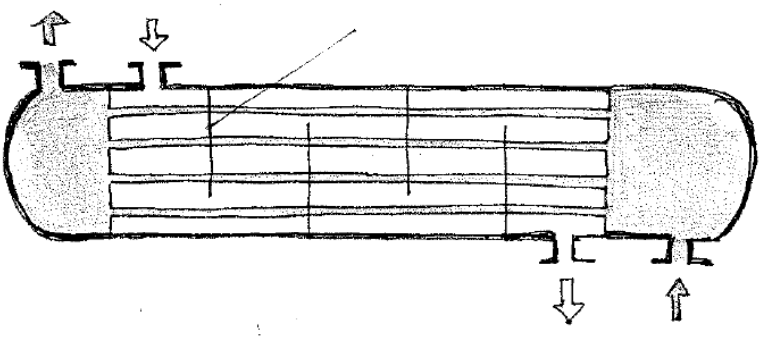


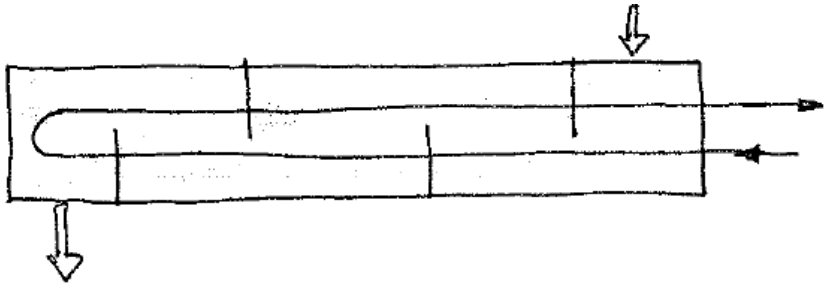
HEAT EXCHANGERS ARE USUALLY CLASSIFIED ACCORDING TO

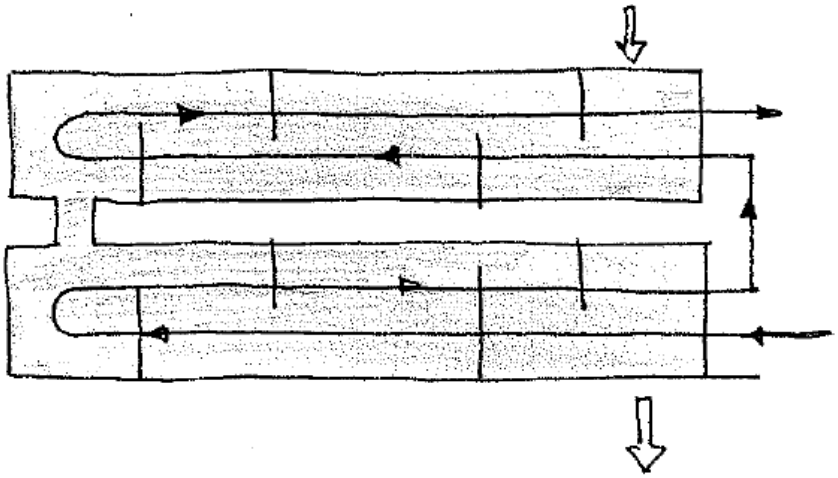
I.

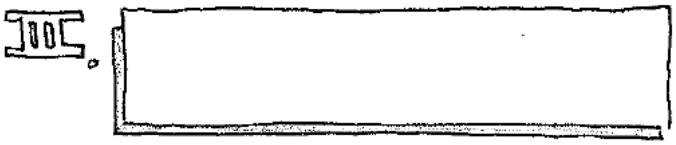


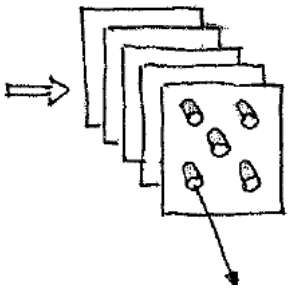
II.

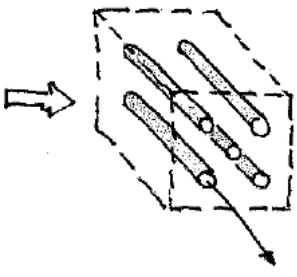






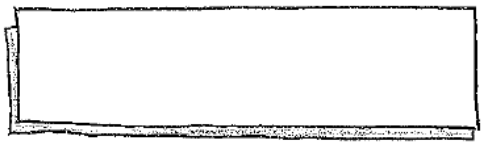


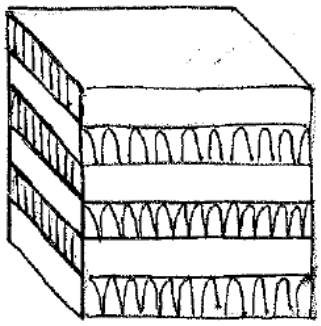


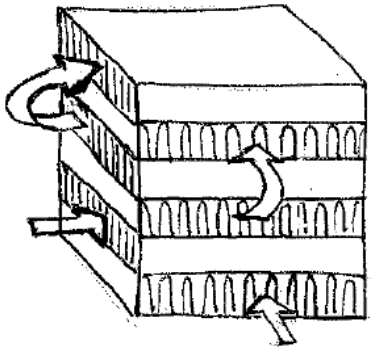


NOTES: Heat exchangers

IV.







$\dot{Q} = UA * \Delta T_{LM}$ WAS DERIVED FOR A DOUBLE-PIPE HXR. CAN I USE IT FOR THESE OTHER TYPES?

Answer: YES, IF.....

WHERE

$F = f($

$R =$ _____ *

$P =$ _____ *

* HOT VS. COLD FLUID DOESN'T MATTER HERE