**An-Najah National University**

**Chemical Engineering Department**

**Equipment Design (64442)**

**Second Exam 28/4/2010**

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A 1.25 triangle shell and tube heat exchanger of 3/4 in outside diameter 14BWG is used to cool 8000kg/hr sodium hydroxide from 80 to 40°C where it is located in the tubes with a velocity of 2.3m/s, the cooling is done by water enters at 20 and leaving at 35°C allocated in the shell with velocity of 0.75m/s, the heat exchanger is one shell-four tube passes.

***Calculate the total capital cost of this heat exchanger***

The physical properties of NaOH solution are shown in the table below:

|  |  |  |
| --- | --- | --- |
| **Temperature (°C)** | 40 | 80 |
| **Specific heat (kJ/kg. °C)** | 3.84 | 3.85 |
| **Density (kg/m3)** | 992.2 | 971.8 |
| **Thermal conductivity (W/m. °C)** | 0.63 | 0.67 |
| **Viscosity (mPa.s)** | 1.4 | 0.43 |