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| 1. **A 1 m**2 slab of **mild** **steel** leaves a forging operation with a thickness of **0.5 cm** at **1,000◦C**. It is laid flat on an insulating bed and **27◦C air** is blow over the top side **at 30 m/s**. How long will it take for the hottest part **to reach 200◦C**? Clearly state all your assumptions.  Assumptions:   1. Flow Geometry: Flat plate Geometry 2. Calculate reference temperature: 3. Find the Reynolds number:        1. Find local or average Convection coeffects 2. Select a Correlation Function Nu 3. Plug in and assume question | z y  27◦C at 30 m/s.  To= 1000◦C x  0.5cm    **1407.311810 Seconds** |

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| 2. Water **at 37◦C** flows **at 3 m/s** across a 6 cm diameter tube that is held **at 97◦C.**  In a second configuration, **37◦C** water flows at an average velocity of **3 m/s** through a **bundle of 6 cm diameter** tubes that are held at **97◦C**. The bundle is staggered, with **ST /SL = 2**. Compare the average heat transfer coefficients for the two situations.   1. Flow Geometry   Flow over a pip   1. Calculate reference temperature: 2. Find the Reynolds number: 3. Find local or average Convection coeffects   3712.639193   1. Select a Correlation Function Nu 2. Plug in and assume question | One VS bundle staggered  \  **11726.73838 W/m^2K**  **58906.33570 W/m^2K** |

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| 3. Copper spheres of **20 mm** diameter are quenched by being dropped into a tank of water that is maintained **at 280 K.** The spheres may be assumed to reach the terminal velocity of **2.2 m/s** on impact and to drop freely through the water. What is the approximate height of the water tank needed to cool the spheres from an initial temperature of **360 K** to a center temperature of **320 K**?   1. Flow Geometry 2. Calculate reference temperature: 3. Find the Reynolds number: 4. Find local or average Convection coeffects 5. Select a Correlation Function Nu 6. Plug in and assume question       **1.43 m** |  |