



From Elder Neal A. Maxwell

Ultimate hope and daily grumpiness are not reconcilable. It is ungraceful, unjustified, and unbecoming of us as committed Church members to be constantly grumpy or of woeful countenance. Do we have some moments of misery or some down days? Yes! But the promise is that Christ will "lift these up" (Moroni 9:25). The disciple can note the depressing signs of the times without being depressed. He can be disappointed in people without being offended at life. Thus it is that ultimate hope, if it does not finally dissolve our daily disappointments, at least puts them in perspective. (*The Neal A. Maxwell Quote Book*, Bookcraft, 1997).

Comments on Homework

- Temperature conversion

$$T (^{\circ}\text{R}) = T (\text{K}) \times 1.8$$

$$T (^{\circ}\text{C}) = T(\text{K}) + 273.15$$

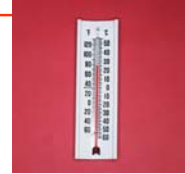
$$T (^{\circ}\text{F}) = T(^{\circ}\text{R}) + 460$$

- However, difference in temperature is:

$$\Delta T (^{\circ}\text{C}) = \Delta T (\text{K})$$

$$\Delta T (^{\circ}\text{F}) = \Delta T (^{\circ}\text{R})$$

$$\Delta T (^{\circ}\text{R}) = 1.8 \times \Delta T (^{\circ}\text{C})$$



Fatherly Advice

- Don't get behind!
- Draw pictures of process
 - Try not to take shortcuts
 - Work efficiently
- We will not be using E-Z Solve
 - We have Mathcad and Excel
- There is a lot of reading in the workbook on Problem 4.11, but it is worth it!
 - Workbook required on all starred problems
- The author throws in some "think about it" problems
 - This coincides with a college initiative on innovation
 - Have fun with it; use engineering intuition



Outline for Class 6

- Define "Independent Equations"
- Define "Other Relations"
- Degree of Freedom Analysis (DOF)
 - Procedure
 - Examples

- Please write in the front cover of your book:

$$\rho_{\text{H}_2\text{O}} = 1 \text{ g/cm}^3 = 1000 \text{ kg/m}^3 = 62.4 \text{ lb}_m/\text{ft}^3 = 1 \text{ kg/liter}$$



Independent Equations



Write on Board

Analogy to Sudoku

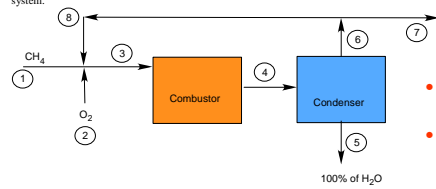
	8	6	4	3	1				
3		2	5		8				
	4		9	6					
4	7	8				9		6	
	5						3		
1		3					2	7	4
				9	4			1	
			1		5	7			9
		5	3		2	4	6		

- How would you set up a logic diagram to solve any sudoku puzzle?

- Is it solvable?
- Where do you start?

Problem from Final Exam 2008

7. (25 pts) Methane is to be burned to produce electricity using a gas turbine combustor. It is desired to produce an exhaust stream of nearly pure CO_2 . The exhaust from the combustor is cooled so that 100% of the H_2O condenses. A portion of the now dry exhaust is recycled to enter the combustor with a stream of pure O_2 . Do the calculations per mole of methane fed to the system.



• Is it solvable?
• Where do you start?

3% excess O_2 is used.
The stream entering the combustor contains 27 mol% O_2 .
The reactor converts 100% of the CH_4 to CO_2 and H_2O .

- Perform a degree of freedom analysis of each unit, split, or mixing point, and the overall system.
- Determine the flows and compositions.

Examples

- Worksheet 1
- Worksheet 2
- Prob 4.15
- Prob 4.19
- [Video](#)

