Question 1: 2^4 Design

⋆ Given

A ship-breaking company has to be extremely careful due to high possibilities of running into asbestos during the breaking operations.

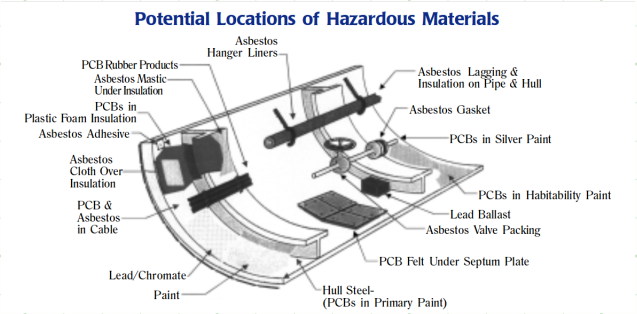

Figure 1: U.S. Department of Labor OSHA 2001

Four factors have been identified through a Cause and Effect exercise that may result in increased airborne asbestos release.

- A: Speed of Cutting Blade
- B: Negative Pressure Environmental Vacuum
- C: Method of Initial Shell Penetration
- D: Duty Cycle of Cutting Blade [i.e. thermal heating of blade]

It has been decided that each of these factors will have two levels to be tested in a 2^4 Balanced Full Factorial Design

- A: Speed of Cutting Blade [2000rpm, 5000rpm]
- B: Negative Pressure Environmental Vacuum [-1atm, -2atm]
- C: Method of Initial Shell Penetration [Plasma Weld-cut, Oxy Fuel Torch Weld-cut]
- D: Duty Cycle of Cutting Blade [2 min on 3 min off, 4 min on 1 min off]

⋆ Find

1. Create the Model Matrix for this Experiment [suggest you use Excel for this]
2. How many replicates are needed to allow at least 20 df_{error} in a model that includes all interaction effects?
3. From a purely Engineering sense, which 'two-factor' interaction would you mostly give up last?

⋆ Solution

Question 2: Saving More Money through Confounding

⋆ Given

Using the last problem information

⋆ Find

1. Take your Model Matrix, and instead of letting D be independent, force it to be equal to the current 'three-way' ABC relationship
2. Draw up the new Model Matrix where D=ABC
3. Notice the relationship between the columns that are identical to each other now as that relationship gets propagated?
4. Anything interesting about the rows?

⋆ Solution

Question 3: Finish the Example

⋆ Given

Look at the example from the lecture [Week 3], and continue trimming down the model. Show each step and your rationale for why you are continuing. Include your Engineering or Fundamental Principle you are following.

⋆ Find

Also for your final model:

1. What is your confidence that this is a useful model?
2. What is r^2_{adj}?
3. What Factor Levels result in the **Lowest** Acoustic Response?
4. What are the 90% confidence intervals on the coefficients?

⋆ Solution

END OF ASSIGNMENT