

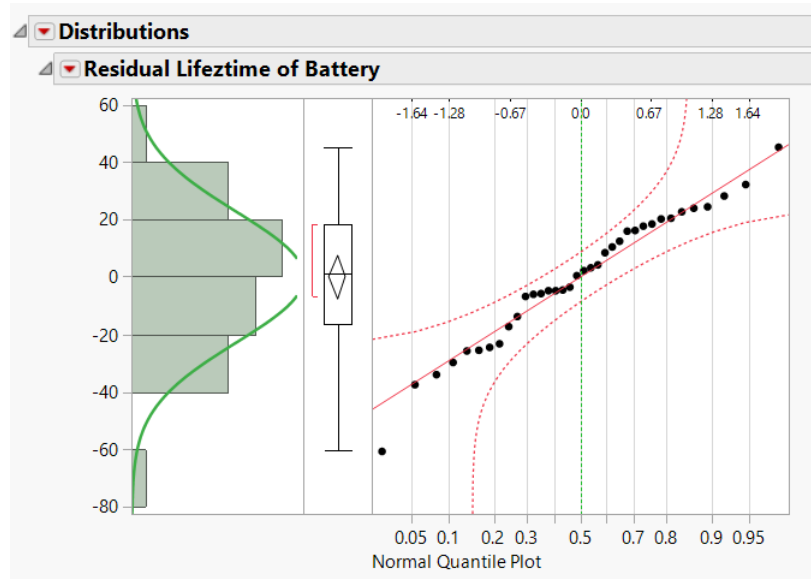
Written Homework 4

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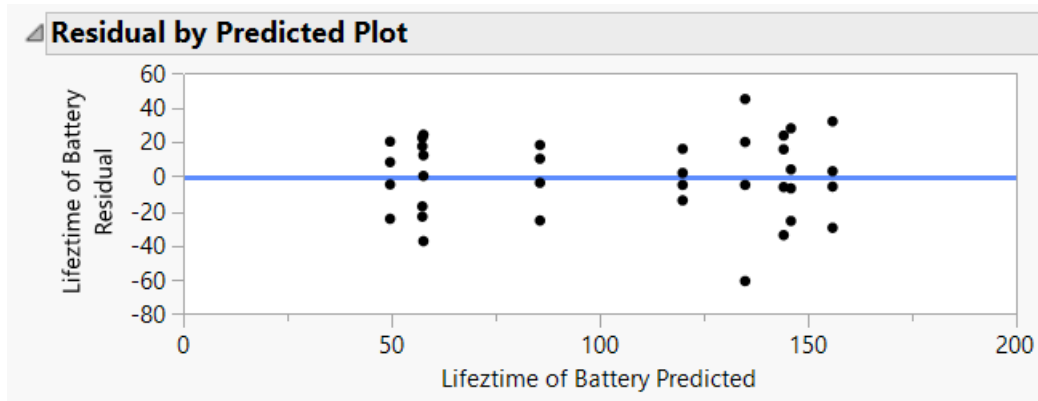
December 1, 2020

1. (a) **Response Variable:** Battery Life, measured in hours
(b) **Factor 1:** Material Type
Factor Levels: Material 1, Material 2, Material 3

Factor 2: Temperature
Factor Levels: 15°F, 75°F, 125°F
(c) **Number of Replications:** 4 replications per treatment combination, 36 replications total
2. Check the assumption that population distributions are normal:



Shape of the distribution resembles the shape of a normal distribution in the histogram, therefore making it safe to assume that the populations follow a normal distribution



Check the assumption that the population distributions have the same variance: Residual plot values average out to around 0 and the residual plot shows no increasing or decreasing relations, therefore making it safe to assume that the populations have the same variance

3. H_0 : Overall model is not significant
 H_1 : Overall model is significant

| Analysis of Variance | | | | |
|----------------------|----|----------------|-------------|--------------------|
| Source | DF | Sum of Squares | Mean Square | F Ratio |
| Model | 8 | 59416.222 | 7427.03 | 10.9995 |
| Error | 27 | 18230.750 | 675.21 | Prob > F |
| C. Total | 35 | 77646.972 | | <.0001* |

Our final p value for the model is evaluated at < 0.0001

With our α value assumed to be 0.05, the p-value $< \alpha$, meaning we reject H_0 and can conclude our overall model is significant

4. As with our overall model, our p value for the interaction with tempature and material type is less than our significane level α , meaning we can conclude that interaction is significant. Since an interaction with both of our main effects is significant, there is no reason to further test the main effects individually

| Effect Tests | | | | | |
|-------------------------|-------|----|----------------|---------|----------|
| Source | Nparm | DF | Sum of Squares | F Ratio | Prob > F |
| Material Type | 2 | 2 | 10683.722 | 7.9114 | 0.0020* |
| Tempature | 2 | 2 | 39118.722 | 28.9677 | <.0001* |
| Material Type*Tempature | 4 | 4 | 9613.778 | 3.5595 | 0.0186* |