

# Day 5 Homework Exercises

Smarter Experimentation for Chemists



# Day 5 Homework Exercises

## Smarter Experimentation For Chemists

### Optimizing Multiple Responses

In these exercises, you explore the results of the Anodize experiment introduced in the videos on Day 5.

These data are in the file `Anodize.jmp`.

# Day 5 Homework Exercise 1

## Smarter Experimentation For Chemists

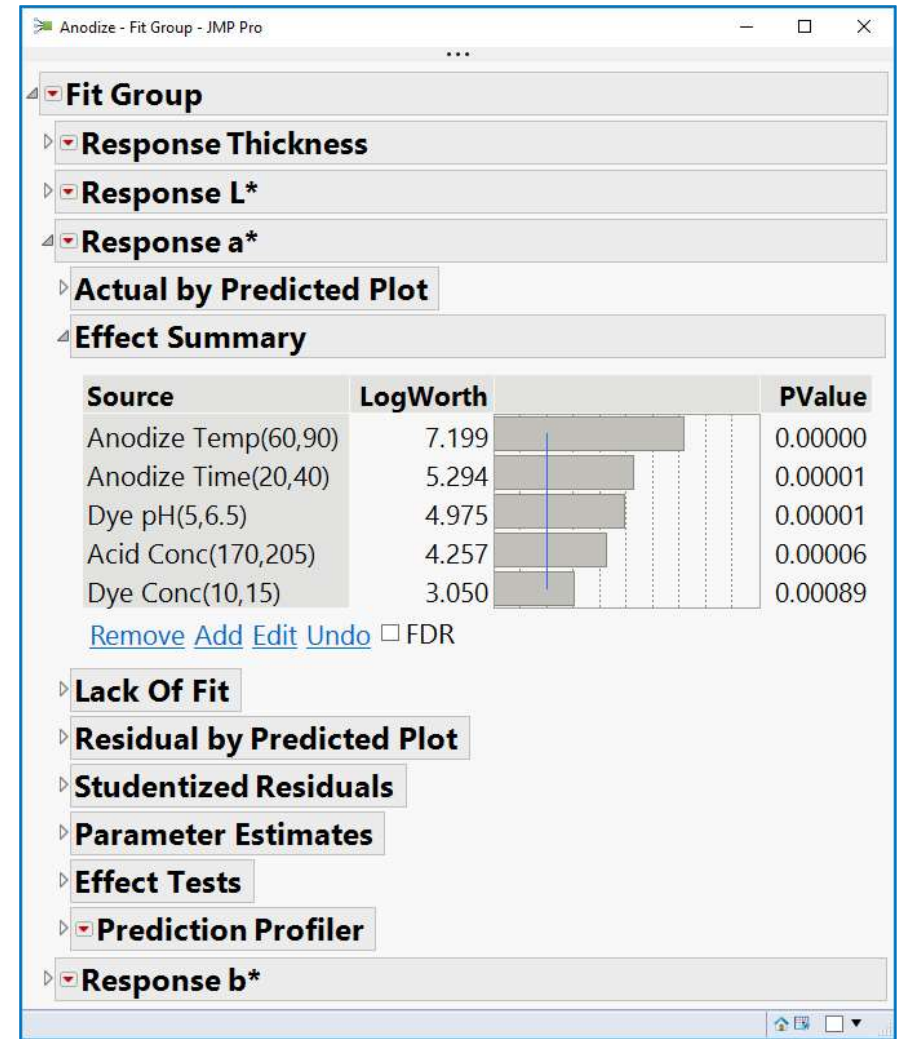
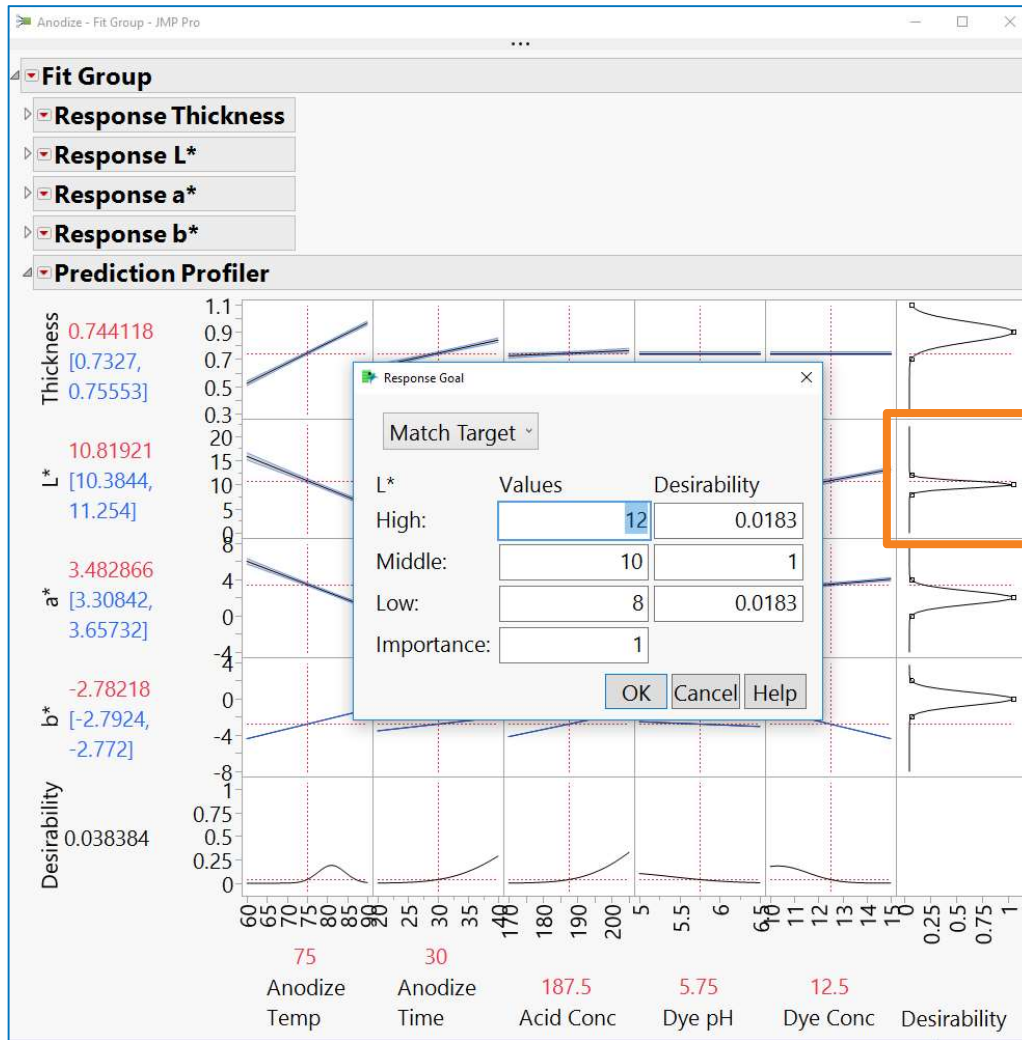
### Optimizing Multiple Responses 1

#### Questions:

1. In JMP open the file and run the saved script **Fit Group Reduced**. This script produces a window with reduced models for each response. Which effects are in the reduced model for the response **a\***?
2. Select **Profiler** from the top red triangle next to **Fit Group**. What is the starting value for **Acid Conc**? What is the predicted value for **Thickness\***? What do the bracketed values for **Thickness** represent?
3. Double-click in the desirability box for **L\***. (Highlighted in orange in image on next page. Make sure that you don't double-click near the curve. Click in the open space in the box.) What is the response goal for **L\***? What is the target value? What are the acceptable response limits?

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# Day 5 Homework Exercise 1

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### Optimizing Multiple Responses 1

#### Solutions:

1. In JMP open the file and run the saved script **Fit Group Reduced**. This script produces a window with reduced models for each response. Which effects are in the reduced model for the response **a\***?

Only the main effects: Anodize Temp, Anodize Time, Dye pH, Acid Conc, and Dye Conc.

2. Select **Profiler** from the top red triangle next to **Fit Group**. What is the starting value for **Acid Conc**? What is the predicted value for **Thickness\***? What do the bracketed values for **Thickness** represent?

The starting value for **Acid Conc** is 187.5. The predicted value for **Thickness** is 0.744. The bracketed values are a 95% CI for the mean thickness at the starting values.

3. Double-click in the desirability box for **L\***. What is the response goal for **L\***? What is the target value? What are the acceptable response limits?

The goal is **Match Target**. The target is 10. The acceptable limits are 8 to 12.

# Day 5 Homework Exercise 2

## Smarter Experimentation For Chemists

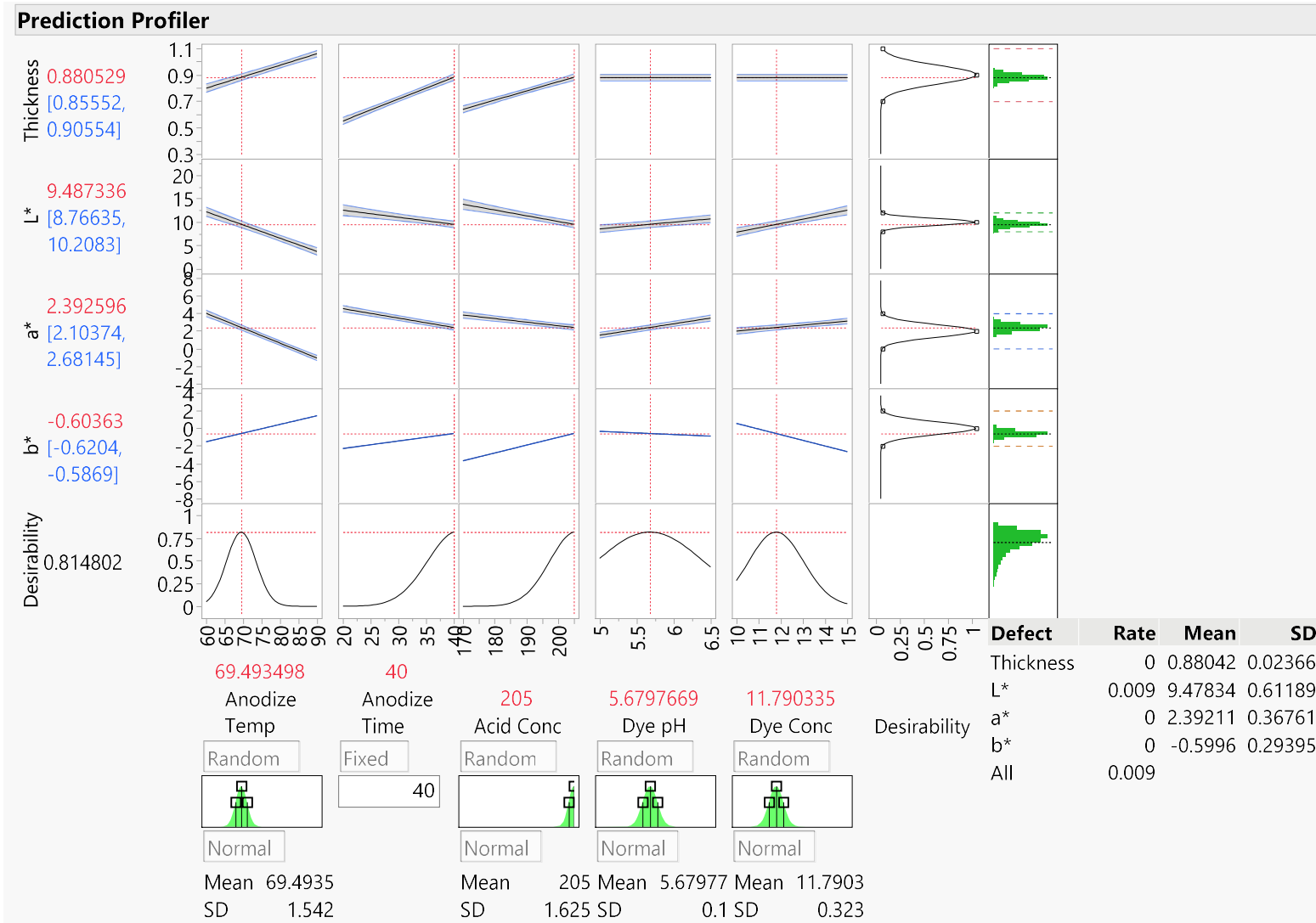
### Optimizing Multiple Responses 2

#### Questions:

1. From the data table run the script **Profiler 1**. This script has been saved with optimal settings for the factors. What is the optimal setting of **Anodize Time**?
2. What is the predicted  $L^*$  for these settings? Is it close to the target?
3. Close this window and run the script **Profiler 2**. This script runs a simulation in which variation in the factors and responses have been added. Click the **Simulate** button several times. What is the predicted defect rate?
4. Change the standard deviation (SD) for **Anodize Temp** to 0.75. Click the **Simulate** button several times. What is the predicted defect rate now?

# Day 5 Homework Exercise 2

## Smarter Experimentation For Chemists



# Day 5 Homework Exercise 2

## Smarter Experimentation For Chemists

### Optimizing Multiple Responses 2

#### Solutions:

1. From the data table run the script **Profiler 1**. This script has been saved with optimal settings for the factors. What is the optimal setting of **Anodize Time**?

The optimal setting of **Anodize Time** is 40.

2. What is the predicted  $L^*$  for these settings? Is it close to the target?

The predicted value of  $L^*$  is 9.49. It's slightly lower than the target value, but it is within the acceptable response limits.

3. Close this window and run the script **Profiler 2**. This script runs a simulation in which variation in the factors and responses have been added. Click the **Simulate** button several times. What is the predicted defect rate?

The predicted defect rate is between around 0.6% and 0.9%.

4. Change the standard deviation for **Anodize Temp** to 0.75. Click the **Simulate** button several times. What is the predicted defect rate now?

After reducing the standard deviation for **Anodize Temp**, the predicted defect rate is approximately 0.1%.