Using JMP Graphics To Explore Business Solutions

- Going Beyond A Single Solution

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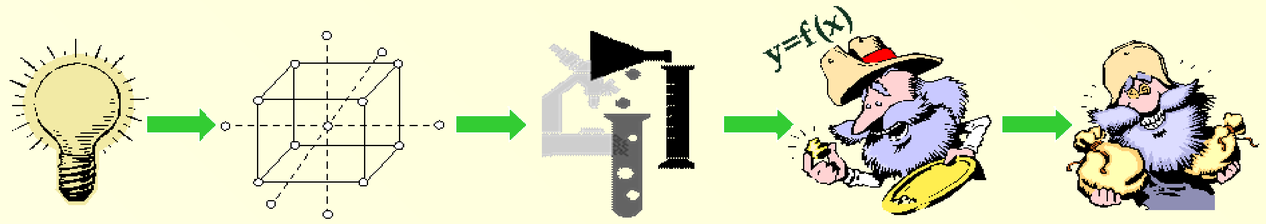
Introduction

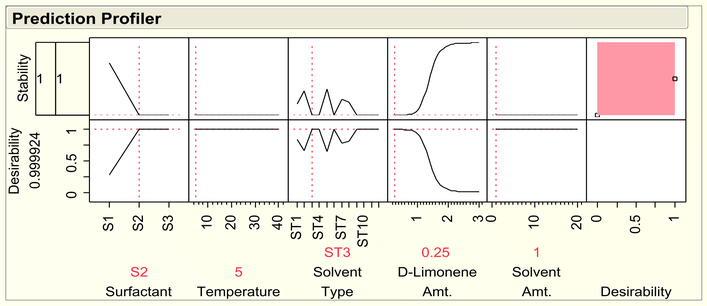
This poster introduces how we have used JMP graphics to explore business solutions in DOE studies with a large number of factors and/or levels. Examples are used to illustrate how different JMP graphics were utilized to display the solution space that goes beyond a single solution obtained from the prediction profiler. These graphics convey valuable information to business decision makers who need to easily interpret the results.



Idea/Hypothesis → DOE → Analytical → Modeling → Business

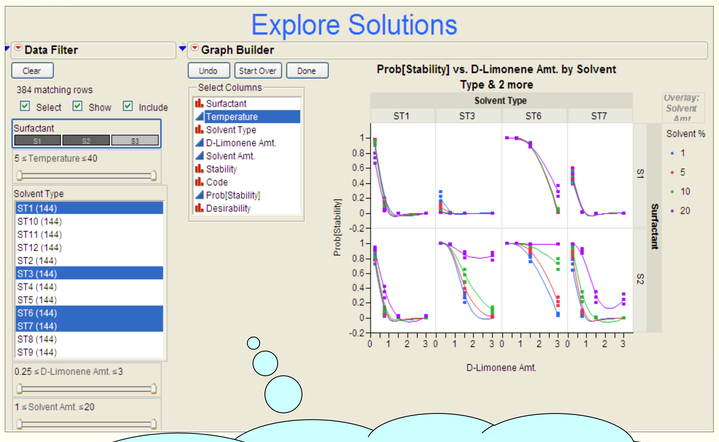
Example 1 Go Green - "Green" Cleaning Materials

- **Project Goal**
  - Increase use of biorenewable ingredients in consumer products
- **DOE Factors**
  - Surfactant (3- level categorical)
  - Temperature (3-level continuous)
  - Solvent Type (12-level categorical)
  - Solvent Amt (4-level continuous)
  - D-Limonene Amt (4-level continuous)
- **Response**
  - Formulation Stability (2-level categorical)



Feedback from Business

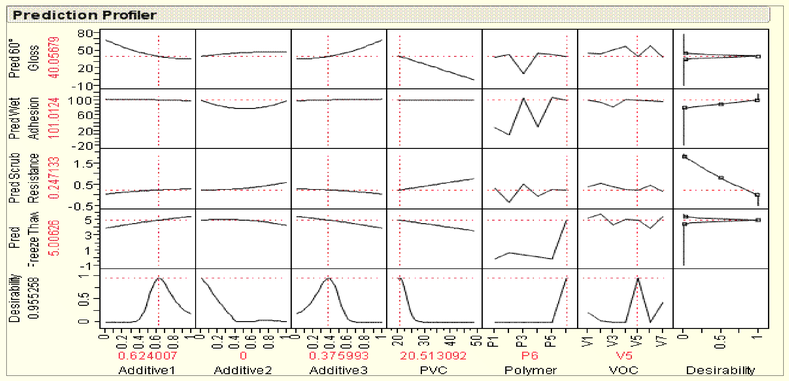
Well, this solution is great, but too costly. There may be multiple solutions to get the final answer... How many?



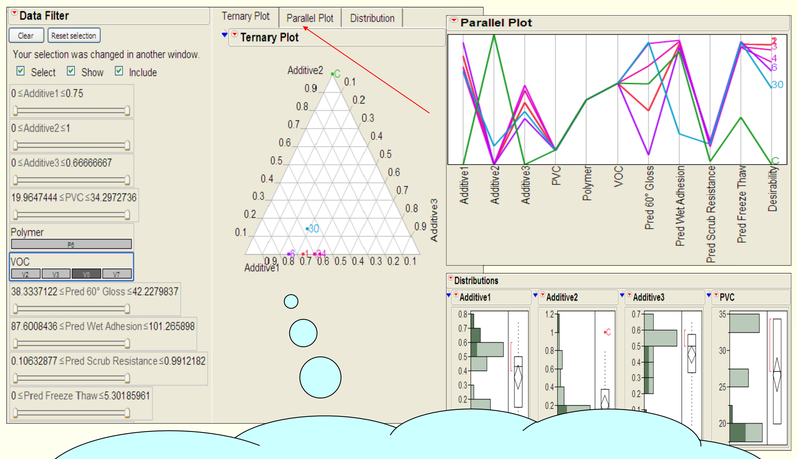
Combination of **Graph Builder** and **Data Filter** is a powerful tool to explore the solutions space when we have large number of factors and/or levels.

Example 2 Paint Formulation - Mixture Study

- **Project Goal**
  - New paint formulation development
- **DOE Factors**
  - Additive1 (mixture component)
  - Additive2 (mixture component)
  - Additive3 (mixture component)
  - PVC (3-level continuous)
  - VOC (7-level categorical)
  - Polymer (6-level categorical)
- **Responses**
  - 60° Gloss, Wet Adhesion, Scrub Resistance, freeze/Thaw



Only a single potential optimal solution is shown on the prediction profiler. Can we compare multiple potential optimal solutions with the competitive product?

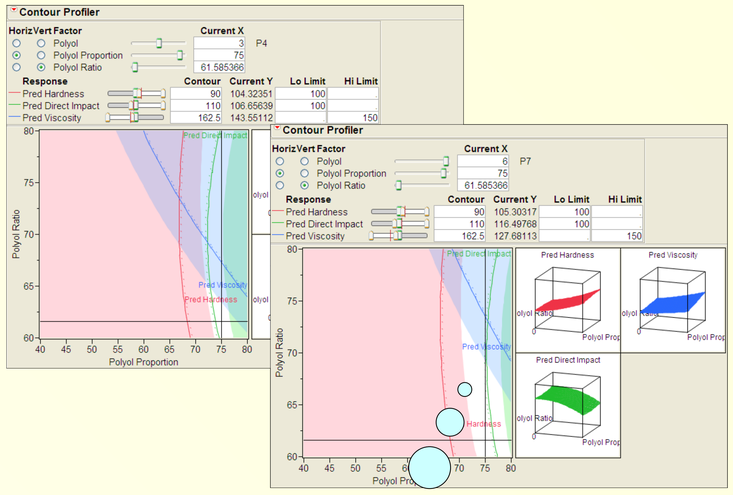


JMP Dashboard with Tab Box combines Data Filter, Ternary Plot, Parallel Plot and Distribution into one template, thus researchers can utilize multiple tools to interactively explore the solution space.

Example 3: Car Coating

- **Project Goal**
  - Optimize car coating formulation
- **DOE Factors**
  - Polyol (7-level categorical)
  - Polyol Proportion (3-level continuous)
  - Polyol Ratio (3-level continuous)
- **Responses**
  - Hardness, Direct Impact, Viscosity

The competitor's polyol (P4) has great properties. Which of our polyols can compete with P4 and still maintain all the good properties? What amount of the polyol should be put into the formulation?



As shown in the **Contour Plots**, polyol P7 is superior to the competition due to broader formulation window.

Conclusion

Examples from three DOE studies show the power of JMP graphics for exploring the business solution space when we have a large number of factors and/or levels. Relevant graphics have allowed us to reach a larger audience base, especially business decision makers who need to easily interpret the results.