

Mastering Webinar

Optimisation des processus avec les plans d'expériences et le profileur d'espace expérimental



Emmanuel Romeu

Sr Systems Engineer - Chemistry Europe

emmanuel.romeu@jmp.com

Custom Design Plan Optimaux

Un DoE Classique ne répond pas toujours à certaines problématiques

- Besoin de travailler avec des facteurs variés:

- Quantitatif
 - **Continus** : Facilement ajustables (temps, température, vitesse, force, ...)
 - **Discret** : Seuls certains niveaux sont possibles
- Qualitatif – Categorical : défini par des modalités particulières (fournisseur A, B)
- Mélange – formulation : Le mélange des composants est influé par les proportions des composants et non leur quantité
- Blocking : groupement des essais

- Travailler avec une combinaison de ces différentes variables

- Incapacité à exploiter certaines combinaisons (contraintes)

- Difficulté à changer les niveaux de certains facteurs (split-plot)

- Travailler avec des données existantes (covariable)

4 facteurs + 2 contraintes

DÉFINIR LES PARAMETRES ROBUSTES DE CUISSON POUR TOUS LES TYPES DE PIZZA

Facteurs

Time	Temperature	Pizza Size	Pizza Type
20	450	16	Cheese
			Veggie
			Meats
10	350	10	
10	350	10	Cheese
20	450	12	Veggie
•	•	14	Meats
•	•	16	
•	•		
•	•		

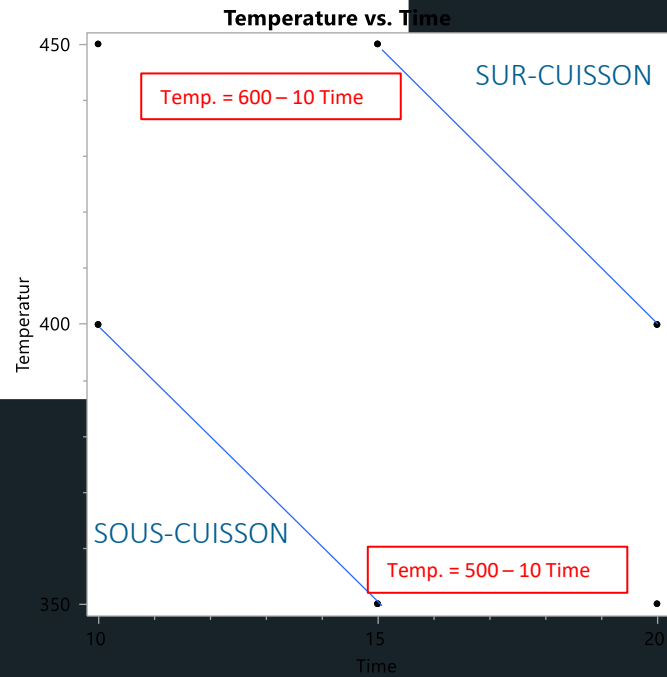
2 variables continues
(dont 1 difficile à modifier)

1 variable
discrete

1 variable
catégorielle

Contraintes

Graph Builder



Definition du plan d'expérience

Factors

Add Factor Remove Add N Factors 1

Name	Role	Changes	Values
Time	Continuous	Easy	10 20
Temperature	Continuous	Hard	350 450
Pizza Size	Discrete Numeric	Easy	10 12 14 16
Pizza Type	Categorical	Easy	Cheese Veggie Meats

Covariate/Candidate Runs

Select Covariate Factors Load a set of candidate runs for covariates from the current data table.

Define Factor Constraints

None
 Specify Linear Constraints
 Use Disallowed Combinations Filter
 Use Disallowed Combinations Script

Linear Constraints

Add

10 Time + 1 Temperature ≤ 600

10 Time + 1 Temperature ≥ 500

Model

Main Effects Interactions RSM Cross Powers Rem

Name	Estimability
Intercept	Necessary
Time	Necessary
Temperature	Necessary
Pizza Size	Necessary
Pizza Size*Pizza Size	Necessary
Pizza Size*Pizza Size*Pizza Size	Necessary
Pizza Type	Necessary
Time*Time	Necessary
Time*Temperature	Necessary
Temperature*Temperature	Necessary
Time*Pizza Size	Necessary
Temperature*Pizza Size	Necessary
Time*Pizza Type	Necessary
Temperature*Pizza Type	Necessary
Pizza Size*Pizza Type	Necessary
Time*Time*Time	Necessary

Whole Plots	Time	Temperature	Pizza Size	Pizza Type
1	20	450	16	Cheese
2				Veggie
3				Meats
4				
5				
6	10	350	10	
1	1	18	378	16 Veggie
2	1	20	378	10 Cheese
3	1	12	378	16 Cheese
4	1	14	378	12 Veggie
5	1	16	378	14 Cheese
6	1	15	378	16 Meats
7	1	13	378	12 Meats
8	1	19	378	14 Meats
9	2	10	411	14 Cheese
10	2	14	411	14 Meats
11	2	14	411	12 Cheese
12	2	14	411	14 Veggie
13	2	10	411	10 Meats
14	2	13	411	10 Veggie
15	2	19	411	14 Veggie
16	2	15	411	10 Meats

Design Generation

Number of Whole Plots 6

Number of Runs:

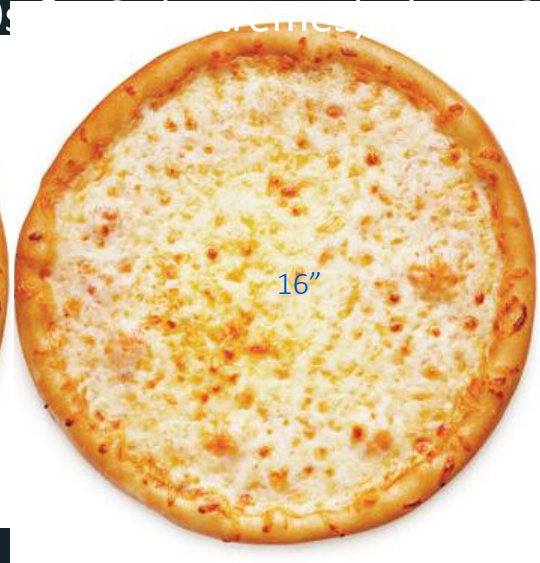
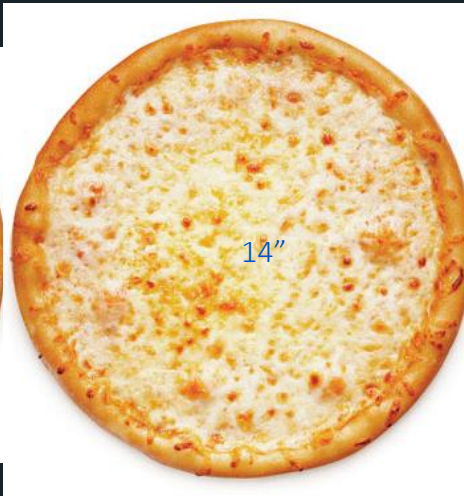
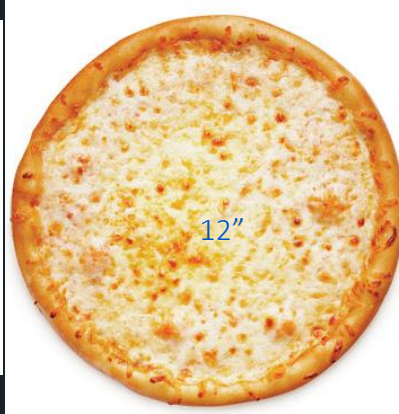
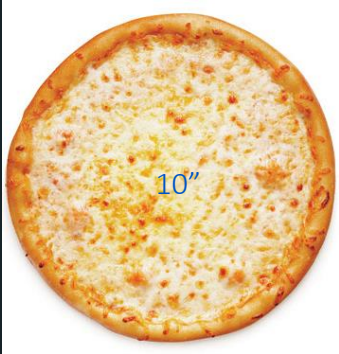
Minimum 38
 Default 48
 User Specified 48

Make Design

Variable numérique discrète

4 tailles de pizza possible 10", 12", 14" & 16"

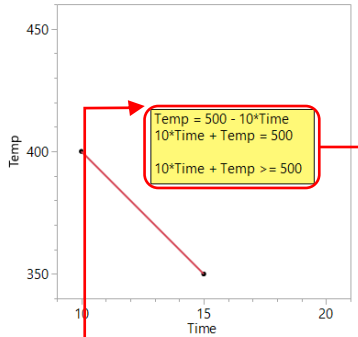
Have only four sizes of pizza pan: 9", 12", 14" & 16" in diameter. Sizes are not evenly spaced and missing mid-point of full range, 12.5". If size treated as continuous factor, 9" to 16" range entered & model specified as quadratic, then JMP will produce design with mid-points of 12.5". If size treated as discrete numeric factor, all four sizes entered, & model specified as quadratic, then JMP will produce design with all four levels. There will be more 9s (more central), 10s & 14s (more central).



contraintes

	Time	Temp	Constraint Location
1	15	450	Upper
2	20	400	Upper
3	15	350	Lower
4	10	400	Lower

Bivariate Fit of Temp By Time Constraint Location=Lower

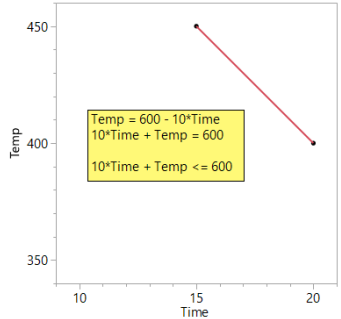


Linear Fit

Linear Fit

Temp = 500 - 10*Time

Bivariate Fit of Temp By Time Constraint Location=Upper



Linear Fit

Linear Fit

Temp = 600 - 10*Time

DOE - Custom Design - JMP Pro

File Edit Tables Rows Cols DOE Analyze Graph
Six Sigma Tools Tools Add-Ins View Window Help

Custom Design

Responses

Factors

Define Factor Constraints

Add Constraint

10 Time + 1 Temperature ≤ 600

10 Time + 1 Temperature ≥ 500

Remove Last Constraint

Model

Alias Terms

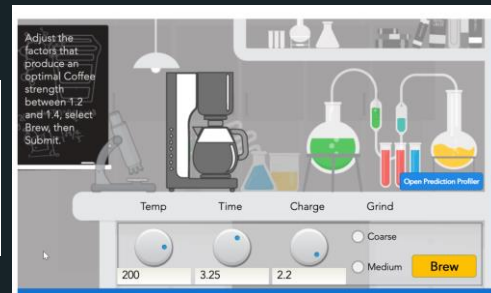
Design Generation

evaluations done

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Statistical Thinking for Industrial Problem Solving

A free online statistics course

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- › Mixed Models and Repeated Measures
- › Data Mining and Predictive Modeling
- › Quality and Process
- › Reliability and Survivability
- › Designed Experiments
- › Using SAS from JMP

Steps

1. Load Factors
2. Temperature : change from Easy to Hard
3. Load Constraints
4. Pizza Size ² and ³ terms : change from If Possible to Necessary
5. Whole plots: set at 6
6. Model:
 - RSM
 - Power 3rd
 - Interactions 4th
 - Pizza Size ² + Temperature ² + Time ² crossed with
Pizza Type + Pizza Size + Temperature + Time

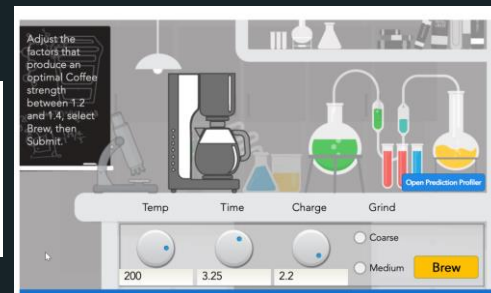
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Questions ?

Emmanuel.Romeu@jmp.com



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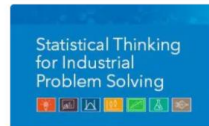
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