May 22, 2023

IE 368 – Quality Planning and Control

Case Study 3

Due Date: June 10, 2023 (17:00)

FASTPOP INC. is a small company of food trucks selling several types of foods and beverages especially on the streets and at fairs. Within the company, the food division wants to increase the yield due to increased demand and decrease costs. They have decided to improve their popcorn making process for the purpose of decreasing the amount of unpopped kernels.

A robust design study will be conducted to improve this design.

Suppose your team is assigned to conduct the project. You are expected to:

- ✔ Decide on a single response variable of your popcorn making process so that it can be measured on a continuous scale.
- ✔ Design an appropriate measurement process according to your response variable. (Pay due attention to developing a capable measurement system for collecting accurate and precise data. However, you are not required to do or submit a formal gage capability analysis for this case study.)
- ✔ Define your control factors (or controllable design parameters) (such as corn brand, pan size) as well as the noise factors (such as worker). Try to define your control and noise factors in such a way that they are independent of each other as much as possible. Otherwise, consider defining compound factors.
- ✔ Choose 3-4 control factors and 2 levels for each. Design a control array. The control array should be smaller than the full factorial experimental design (such as a half or a quarter fraction, or an orthogonal array).
- ✔ Decide on how you manage the noise factors (i.e. how you do the replications). (Suggestions: For each control array run, you may choose to do the replications according to a noise array in the form of a full factorial design of the two most important noise factors each at 2 levels, or you may randomly repeat the experiments with the same control factor settings as many times as your time, budget and other conditions allow. Here 4 replications might be sufficient.)

- ✔ Conduct your experiments; present the results and the order of data collection. Remember to randomize the order of data collection to eliminate any possible bias that may arise in the experiment.
- ✔ Analyze your data to find the optimal design parameter levels using the Taguchi method.
- ✔ Predict SNR, mean and ln(standard deviation) of your response variable at the optimal design parameter settings using the corresponding ANOVA models.
- ✔ Carry out also confirmation experiments at the optimal settings, and comment on their results. If your model predictions are not confirmed by the results of these experiments, you may simply comment on what to do next, or carry out the further steps you envision as your time, budget or other conditions allow.
- ✔ Pay due attention on utilizing your resources wisely and reducing adverse effects of your study on people and the environment around you.
- ✔ Provide photographs taken while you are conducting the experiments in the submitted zip file.

Submission Details

1. Please find the **case study guideline** uploaded on ODTUClass. Make sure that you read and understand the instructions in the document before starting your studies.
2. Submissions to Case Study 3 Assignment on ODTUClass (2 files: Zip file and written report):
   a. Zip file: Upload a zip folder consisting of the project files of the software you used, and all additional documents related to the case study (i.e., photographs taken while you are conducting the experiments).
   b. Written report: Submission to Case Study 3 Turnitin on ODTUClass

Please let only one of the team members make the submission.

3. Fill in the peer evaluation forms individually and submit them to **Case Study 3 Peer Evaluation** on ODTUClass. The deadline for submitting peer evaluation forms is **June 15 (17:00).**

Table 1: Checklist Before Submitting Your Case Study Reports

No.	Measurement Item	Check
1	An appropriate response variable for the described problem is determined.	
2	An appropriate measurement process according to the response variable is designed.	
3	Controllable and uncontrollable design factors and their levels are determined appropriately.	
4	The control experiment is in the form of a sufficiently small fractional factorial design (or an orthogonal array), and the noise factors are handled appropriately, so that it is possible to test at least the main effects.	
5	Experiments are conducted appropriately, and the results are reported well.	
6	Data are analyzed appropriately using ANOVA and effect plots. The optimal levels of the control factors are determined correctly. Also, performance measures at the optimal settings are predicted using the corresponding ANOVA models.	
7	Confirmation experiments are carried out, and comments on the results are reported.	
8	The case is properly introduced and concluded.	
9	Comments are provided for proper use/disposal of the tested samples.	
10	Photographs of teams working on the case are provided in the report.	