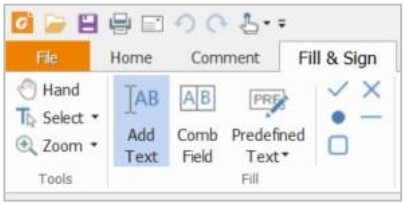
Intro to MCA (Measurement Capability Analysis)

Homework - 2

Name	
Employee ID	
Date	
Department	

Instructions :

1. Please use the space provided to write down all the answers and pasting JMP screenshots. Use "Fill and Sign < Add text" in Acrobat Reader to add text to the fields. You can directly paste images in the space provided (after unselecting the Add Text) and then adjust the size to fit the space.



2. Save the file as .pdf (PDF format) and send out via email to the instructor.
3. The email should be titled [subject] " **Intro to MCA – Homework 2**". Copy and paste this title to avoid any typos.
4. Feedback will be provided as comments in the pdf itself and you will be asked to resubmit with corrections (if required).
5. Addition and deletion of comments cannot be done by students. Only instructors can add/delete comments.
6. Please DO NOT send the homework in any other format else your homework will NOT be graded and sent back.
7. There are 7 questions in total. Please answer all the questions.

Questions :

A complete measurement capability study consisting of accuracy, repeatability and reproducibility evaluations was performed on an automated coordinate measurement machine (CMM) which was programmed to measure cartridge length. The specification for length is from 5.500" to 5.515" (5500 to 5515 mils).

- Equipment: CMM
- Application: SECC Cartridge
- Measurement: Length
- Spec Limits: 5.500" to 5.515" (5500 to 5515 mils)
- *Note: For easier interpretation, conduct all analysis in mils.*

1. An accuracy study was performed by collecting 16 measurements on a standard that is 5.500" (5,500 mils) in length. Technical significance was determined to be 0.0005" (0.5 mils).

   Dataset: **MCA_hw2_acc.jmp** *[JMP SOS< Sample Data Set Index < MCA Datasets < Homework]*

   Prepare a technical report including:
   a. Graphs
   b. Analyses
   c. Interpretations and Conclusions

Paste your JMP output here.

Provide Interpretation and conclusion for accuracy

2. A repeatability study was then performed on the CMM. A sample cartridge was measured 30 times consecutively without re-fixturing or re-doing the set-up procedure.

   Dataset: ***MCA_hw2_rpt.jmp*** *[JMP SOS< Sample Data Set Index < MCA Datasets < Homework]*

   Prepare a technical report by including:

   a. Graphs
   b. Analyses
   c. Interpretations and Conclusions

Paste your JMP Output here.

Provide Interpretation and conclusions for repeatability

3. A reproducibility study was performed as follows:
   - 3 Parts, 3 Days, 2 Pockets, 3 Replications
   - Operators were not included since the CMM is fully automated.
   - The fixture on the CMM has two pockets for part placement.
   - Each part was measured each day in each pocket.
   - **The set-up procedure and fixturing of the part was conducted prior to every measurement.**

Dataset: ***MCA_hw2_rpd.jmp*** *[JMP SOS< Sample Data Set Index < MCA Datasets < Homework]*

Prepare a technical report including:

a. Design validation
b. Graphs and analysis

Paste your Design matrix

Paste your JMP analysis for Repro including Sanity Check.

4. Compare σ_{rpt} from reproducibility to the estimate from the repeatability study. Comment on the comparison. Is this an expected result based on consideration of static versus dynamic measurements?

5. Report σ_{MS}

6. What is the largest source of measurement variation? Clearly describe the cause.

7. Interpret the analysis and draw conclusions.