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Practice: Visualizing the MFI MSA Data

In this practice, you explore the results of an MSA conducted in the White Polymer case study using X-bar and range charts and parallelism plots.

Recall that **MFI**, or *Melt Flow Index*, is a critical quality characteristic for a polymer. Melt flow is measured in an offline laboratory test. In the laboratory, there are four instruments that can be used to perform the test, and there are three different laboratory technicians who run the test.

The test is destructive. The act of taking the measurement destroys the sample. So, you can't get a true measure of repeatability variation.

To provide a measure of repeatability, you can take a large sample from one batch and divide it into several small samples, or *aliquots*. We assume these samples are the same.

In this MSA, you take samples from three random batches of polymer and divide each sample into 24 aliquots.

The MSA design includes the following:

- three technicians
- four instruments
- three batches (divided into 24 aliquots each)
- two measurements per batch

Each technician measures every batch twice with each instrument. This is a fully crossed design, resulting in 72 measurements in all.

Note: For more details on the MSA design and the scenario, see the Read About It for this module. The data are in the file **MSA_MFI_Initial.jmp**.

1. Select the **Measurement Systems Analysis** platform from the **Analyze** menu under **Quality and Process**. Make sure that **MSA Method** is **EMP** and the **Chart Dispersion Type** is **Standard Deviation**.

2. Select **MFI** for **Y, Response**, **Batch** for **Part, Sample ID**, and both **Technician** and **Instrument** for **X, Grouping**. Click **OK**. Select **Parallelism Plots** from the top red triangle.

    a. Look at the standard deviation chart. Does the repeatability variation appear to be consistent across the batches, technicians, and instruments? Are there any obvious patterns, or anything that stands out?

    b. Look at the average chart. Remember that, for a capable measurement system, most of the points fall outside the control limits. Is this a capable measurement system?

    c. Look at the parallelism plot for **Technician**. Are the lines parallel? Is there an interaction between **Technician** and **Batch**?

d. Look at the parallelism plot for **Instrument**. Are the lines parallel? Is there an interaction between **Instrument** and **Batch**?

a. All of the points are inside the control limits on the standard deviation chart, and there are not any obvious problems. Repeatability variation appears consistent across the batches, technicians, and instruments.

b. Most of the points are inside the control limits on the average chart. So, no, this measurement system is not capable.

c. The lines are not parallel. So there is an interaction between **Technician** and **Batch**. This means that the different technicians are recording different measurements for the same batch.

d. The lines are not parallel. So there is an interaction between **Instrument** and **Batch**. The different instruments are producing different measurements for the same batch.

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