Guide to Performance Analysis Reports in the Plastics Program (page 1 of 4)

Your individual report is called the **Performance Analysis Report**; it is designed to serve as the primary report for evaluating your results for each test in the Plastics Interlaboratory Program. These lab-specific Performance Analysis Reports display the wide array of measurment evaluation tools avalible to you. The interlaboratory program is designed to evaluate much more than just your measurement performance on each individual sample. The design of the program allows laboratories to evaluate the consistency of their measurement system and to evaluate performance as part of a continual quality assurance activity. The following pages describe the features and interpretation of the Performance Analysis Report.

Performance Analysis Report - Trend Chart
Analysis #734: Modulus of Elasticity, ISO Method
using ISO 527
data in units of MPa

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Trend Chart of CPV Results

A maximum of 4 test cycles are printed on this page. If there are fewer sets of bars than the maximum and the laboratory was enrolled for all cycles, then one of the following situations occured: lab did not submit data for a particular test/testing cycle or the data sheets were received late.

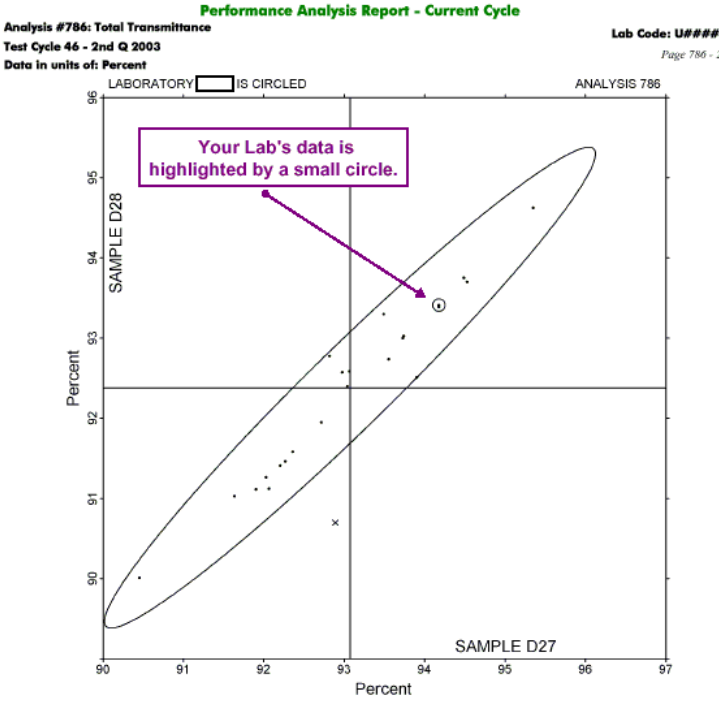
WebCode	Test Cycle	Sample Code	Lab Mean	Grand Mean	Between Lab Std Dev	CPV	Data Flag (if assigned)	
Not used	43	C23	1,587.2	2,034.39	186.72	-2.40		40 of 41 labs included
		C24	1,821.8	2,264.48	203.06	-2.18		
Testing Date: 3rd Q 2002		Sample C23: HIPS			Sample C24: HIPS			
Not used	44	C25	1,987.0	2,246.75	117.14	-2.22	*	35 of 40 labs included
		C26	2,041.4	2,364.27	127.18	-2.54		
Testing Date: 4th Q 2002		Sample C25: ABS/PC			Sample C26: ABS/PC			
Not used	45	C27	2,036.8	2,233.56	122.28	-1.61		39 of 40 labs included
		C28	1,927.4	2,135.10	141.24	-1.47		
Testing Date: 1st Q 2003		Sample C27: HIPS			Sample C28: HIPS			
A1B2C3	46	C29	2,013.0	2,410.82	105.91	-3.76	X	37 of 40 labs included
		C30	2,003.2	2,407.47	91.93	-4.40		
Testing Date: 2nd Q 2003		Sample C29: PC			Sample C30: PC			

Action Item ! Your performance for this cycle was assigned an X Data Flag. Analyst Comment: Systematic error (data for both samples are low).

The Performance Analysis Report is a two-sided document. The front of the report is your **Trend Chart** that includes data for up to 4 cycles, showing a full year of interlaboratory data.

The data table below the bar chart lists the CPVs shown in the bar chart and also provides supporting information. If your measurement performance has been flagged in the two-sample analysis, an Action Item will be posted below the data along with analyst comments. The Action Item should serve as notice of a problem that requires immediate attention. Action Items appear only for the most recent cycle. Other types of data flags are discussed in the Key to Individual Reports.

The **Current Cycle** Section of the Performance Analysis Report follows the Trend Chart. This report contains all of the information about your laboratory that was formerly supplied in the printed group report, including the two-sample plot showing the control ellipse. Your laboratory's data point is located at the intersection of the Lab Means for each sample. Provided both Lab Means are within the boundaries of the plot, your laboratory's results will be indicated by a small circle. The cross hairs in the plot represent the Grand Means for each sample and the control ellipse is a graphical representation of our bi-variate control chart analysis.



Performance Analysis Report - Current Cycle
Analysis #786: Total Transmittance
Test Cycle 46 - 2nd Q 2003
Data in units of: Percent
Lab Code: U####

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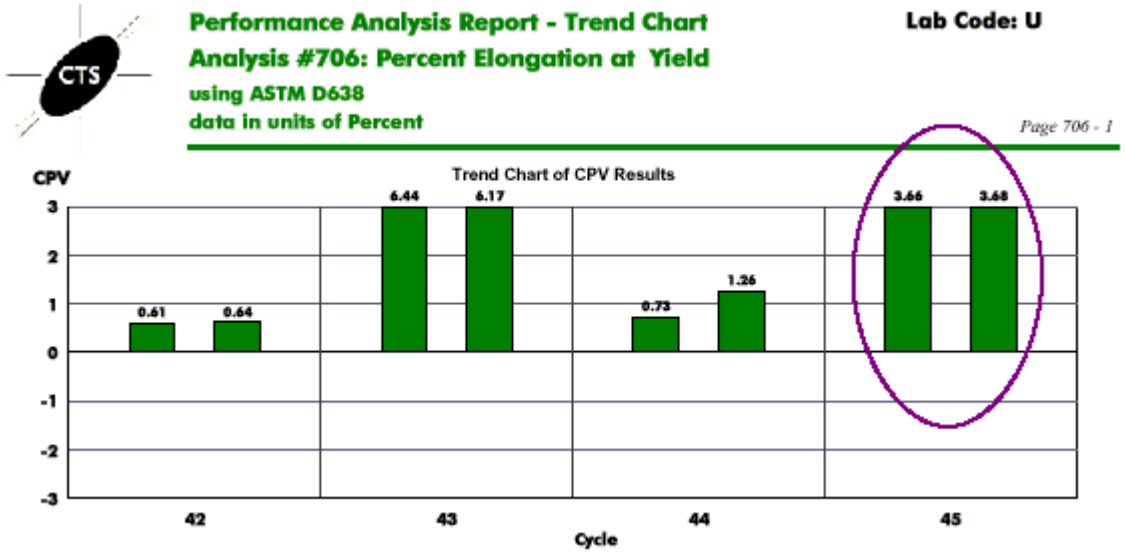
LABORATORY ☐ IS CIRCLED ANALYSIS 786

Because similar materials are chosen for both samples, there should be a correlation of measurement performance between the two samples. CTS uses a bi-variate analysis technique (represented by the ellipse) to judge measurement performance on both samples simultaneously. Quite often measurement performance that differs from the group can be classified as either a systematic difference (means for both samples are similarly offset from the group means) or a consistency difference (measurements for both samples were not as correlated as other laboratories). If your results received a Data Flag, the Action Item may include our characterization of the error as a systematic or consistency variation.

Systematic variations

Bias is an unavoidable fact of life in laboratory testing. The best illustration of bias is the control ellipse on the two sample plot. If a particular analysis/sample combination did not show bias, the control ellipse would become a circle. Differences in procedures, conditions, instrumentation and sample preparation all contribute to the bias of a laboratory. When these differences become too large, a laboratory may receive a Data Flag for a *Systematic Error*. When the test results for both samples are both high or low compared to the group, a laboratory has a fixed set of factors on which to focus to identify a cause. Furthermore, since additional testing on similar samples should produce similar high or low results, it is possible to determine that a systematic error has been successfully corrected.



Not used	43	F23	2.180	1.6963	0.0751	6.44	X	41 of 61 labs included
		F24	2.814	2.2722	0.0878	6.17		
Testing Date: 3rd Q 2002		Sample F23: HIPS			Sample F24: HIPS			

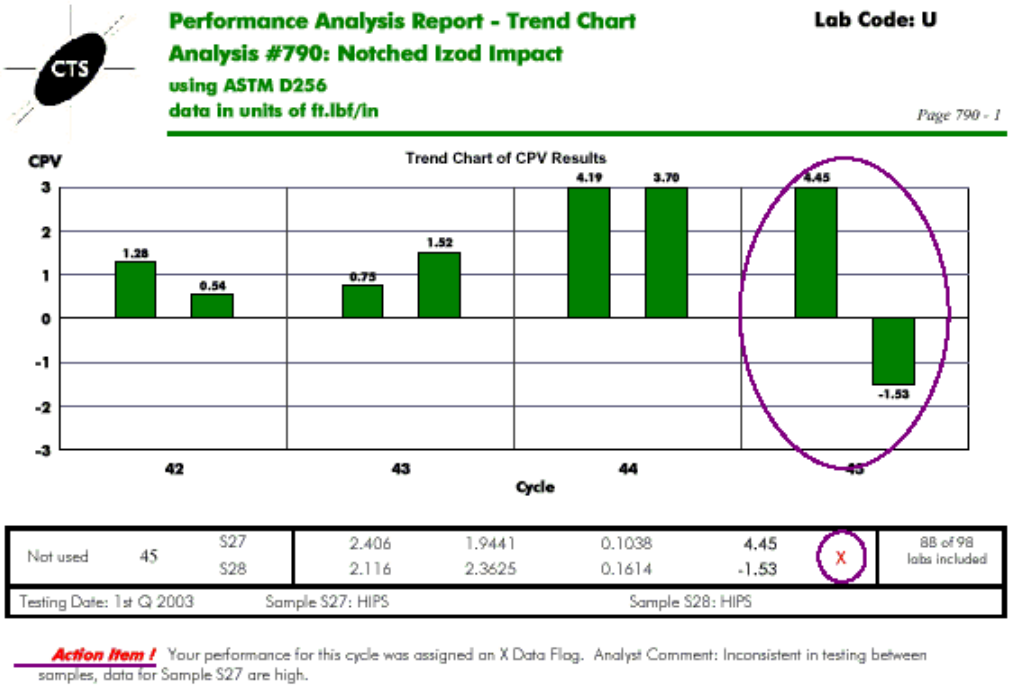
Not used	44	F25	4.988	4.8098	0.2430	0.73		46 of 56 labs included
		F26	4.458	4.1594	0.2370	1.26		
Testing Date: 4th Q 2002		Sample F25: ABS/PC			Sample F26: ABS/PC			

Not used	45	F27	2.362	1.9510	0.1124	3.66	X	44 of 56 labs included
		F28	1.838	1.4051	0.1175	3.68		
Testing Date: 1st Q 2003		Sample F27: HIPS			Sample F28: HIPS			

Action Item ! Your performance for this cycle was assigned an X Data Flag. Analyst Comment: Systematic error (data for both samples are high).

Inconsistency in testing

Inconsistencies that do not involve extreme data may be the most difficult errors for labs to understand and to identify a cause. Often, a lab's first instinct is to conclude that each lab mean does not exceed a reasonable limit, so there is no cause for concern. But because the samples provided are similar to each other, it is expected that there will be a correlation between the measurement results for the two samples. This correlation is clearly shown by the control ellipse. The test results for all labs are compared against each other, thereby computing an "acceptable" level of inconsistency and illustrated in part by the width of the control ellipse. A lab flagged for *Inconsistency in testing* has exceeded what the other labs have determined is a reasonable correlation between the means for the samples.



The Current Cycle portion of the Performance Analysis Report shows your lab's data for that cycle and the consensus data against which you are compared. This information was previously supplied in the printed reports and is now published on our website as the Summary Report. Use the Web Code printed on the front of the Performance Analysis Report to locate yourself in the Summary Report on the website.

The Performance Analysis Report - Current Cycle presents the two-sample plot and control ellipse for each analysis. The Lab Means for the first sample form the x-axis and lab means for the second sample form the y-axis, you can easily find the circled point that represents your lab. However, if one or both of your lab means is extremely high or low, you may "fall off the plot".

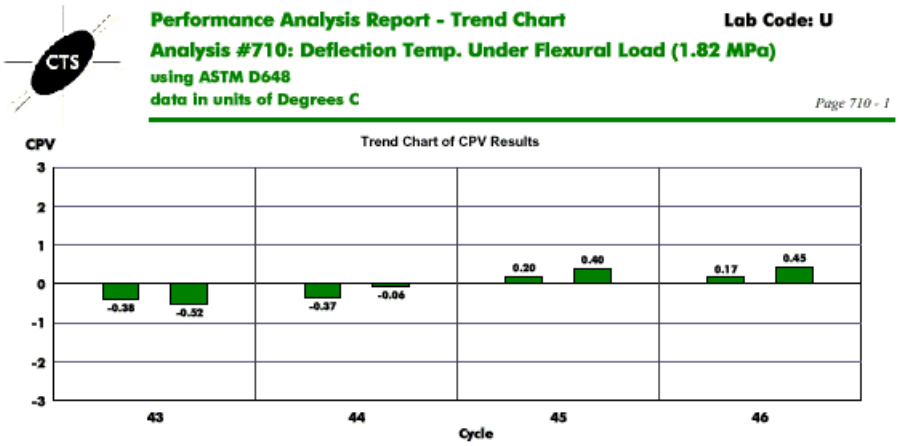
You will notice a correlation between your bar graphs for the cycle and your position on the plot. For example, if both bars are above or below the zero-line, you will find your lab in the upper right or lower left quadrant, respectively. If your lab falls in the lower right or upper left quadrant of the plot, your bars go in opposite directions.

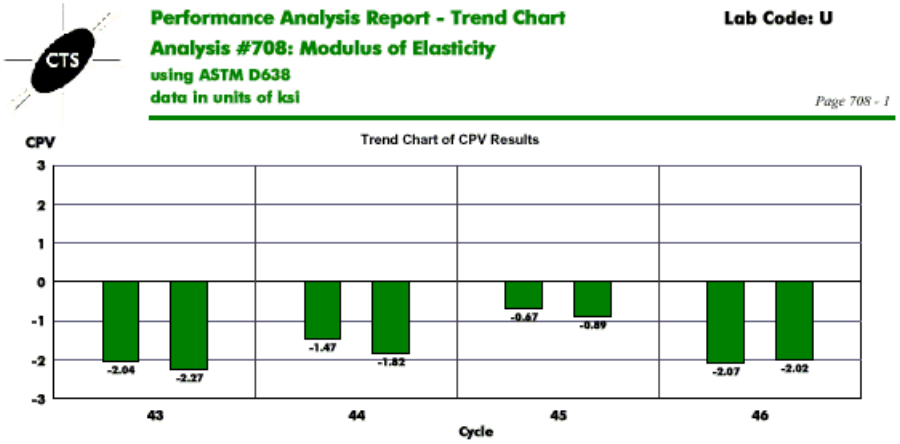
When considering your lab's position on the plot relative to the control ellipse, remember that, generally speaking, if a lab's plotted point falls on the major axis of the ellipse, the lab is consistent in its measurements between the two samples but exhibits an offset from the grand mean (systematic error). If a plotted point falls to the side of the ellipse, it indicates possible differences in the way that the lab tested the two samples or differences in sample behavior (inconsistency in testing). The two-sample plot enables you to see which sample, if either, is out of control and to ascertain the nature of the out-of-control situation.

CTS uses the CPV ratio to allow for evaluation of measurement performance over time. Small differences in sample means and variation are not of critical importance when using the CPV to evaluate performance, so laboratory results can be compared from cycle to cycle, even though the samples used may be different. When comparing data among test cycles, remember that such comparisons may be limited if there have been changes to equipment, test procedures, or technicians. Despite the limitations, labs that choose to maintain a constant approach to the interlaboratory program should find that the Trend Charts provide more than just historical data; the Trend Charts should have *diagnostic and/or predictive value*. The following examples illustrate how the information presented in the Performance Analysis Report could be interpreted. Considering the limitations discussed above, the following examples show how the results presented in the Trend Chart portion of the Performance Analysis Report can be interpreted.

Consistency

The DTUL (HDT) results are consistent from round to round showing only normal and acceptable flutter about the Grand Means, with all CPVs between -1.00 and +1.00. This should give the lab greater confidence in its DTUL measurements.





More Consistency

These results show a different type of consistency. The Modulus of Elasticity results from this laboratory are consistently lower than the Grand Mean, but have not been assigned a Data Flag. Depending on the laboratory's interpretation of the results, action may be taken to bring the testing in closer agreement with the consensus.

Sudden blip

The trend chart can reveal a one-time deviation from usual performance. These deviations happen, even to the best of labs, and cannot be predicted. Was there a change in instrument? Improper calibration? A departure from procedures? New technician?