

Your individual report is called the **Performance Analysis Report**; it is designed to serve as the primary tool for evaluating your results for each test. The Performance Analysis Report is a one page, two-sided document. The front side of the report is your **Trend Chart [Figure 1a]** that includes data for up to 4 cycles allowing you to track your data over more than a year of testing.

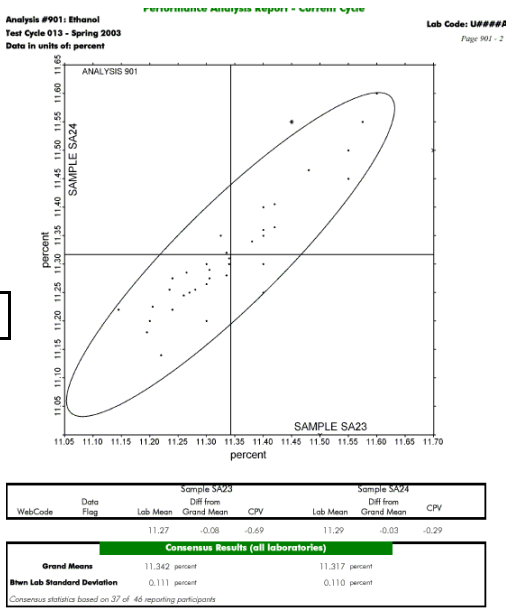
**Figure 1a**



The data table below the bar chart lists the CPVs shown in the bar chart and also provides supporting information. If your results have been flagged in the two-sample analysis and excluded from the statistics, an **Action Item** will be posted below the data, and analyst comments on the flag will appear. The Action Item should serve as notice of a problem that requires immediate attention. Other types of data flags are discussed in the Key to Individual Reports.

The **Current Cycle [Figure 1b]** Performance Analysis Report follows on the reverse side from 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. If both Lab Means are within the boundaries of the plot, your location will be indicated by a small circle around your point or Data Flag. 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 analysis technique.

**Figure 1b**



The interlaboratory program is designed to evaluate much more than just your measurement performance on each sample individually. The design of the program allows laboratories to evaluate the consistency of their measurement system and to compare results over time.

CTS uses the CPV to allow labs to evaluate measurement performance over time. Because small differences in sample/property means and variation are not of critical importance when using the CPV to evaluate performance, 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 continuous 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 examples on the following page illustrate how the information presented in the Performance Analysis Report could be interpreted.

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 for 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.

Keeping in mind the limitations discussed on the preceding page, the following examples show how the results presented in Trend Chart portion of the Performance Analysis Report can be interpreted.

**Consistency**

The ethanol 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 ethanol measurements.



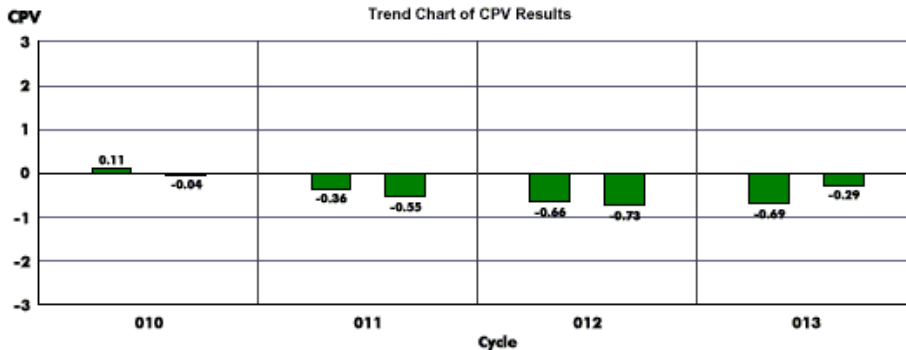
**Performance Analysis Report - Trend Chart**

Lab Code: U

**Analysis #901: Ethanol**

data in units of percent

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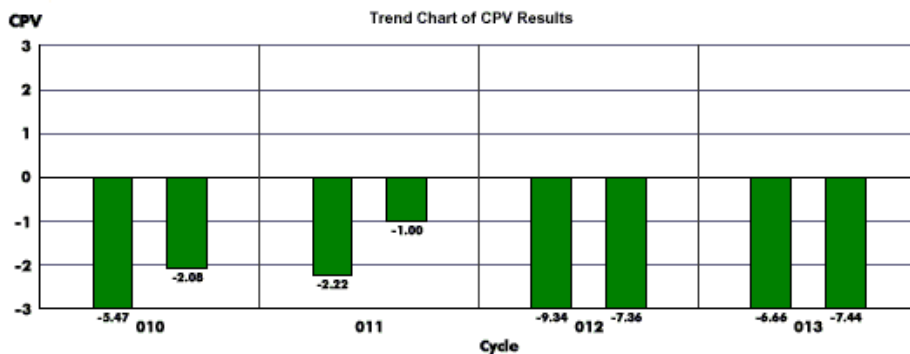
**Performance Analysis Report - Trend Chart**

Lab Code: U###

**Analysis #901: Ethanol**

data in units of percent

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**More Consistency**

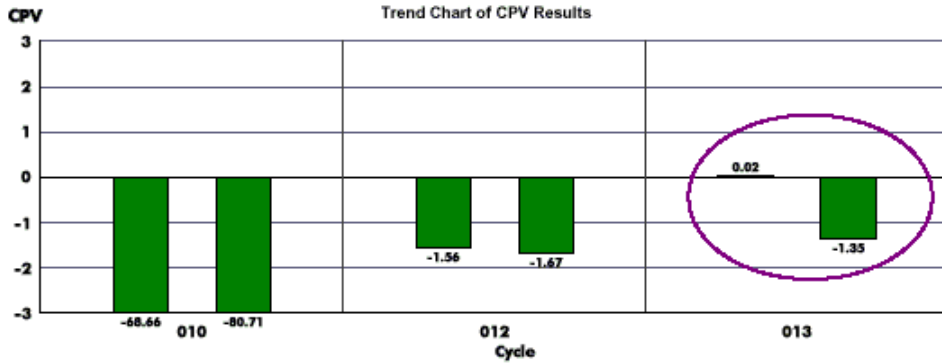
The chart on the left shows results with a different type of consistency.

The ethanol results from this laboratory are consistently lower than the Grand Mean. Depending on the laboratory's interpretation of the results, action may be taken to bring the testing in closer agreement with the consensus.

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. All of this data is information that was previously supplied in the printed reports. Use the WebCode printed on the front of the Performance Analysis Report to locate yourself in the Summary Report located on our web site.

The Performance Analysis Report - Current Cycle presents the two-sample plot and control ellipse for each analysis. The Lab Mean for the first sample forms the x-axis and Lab Mean for the second sample forms the y-axis. 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).



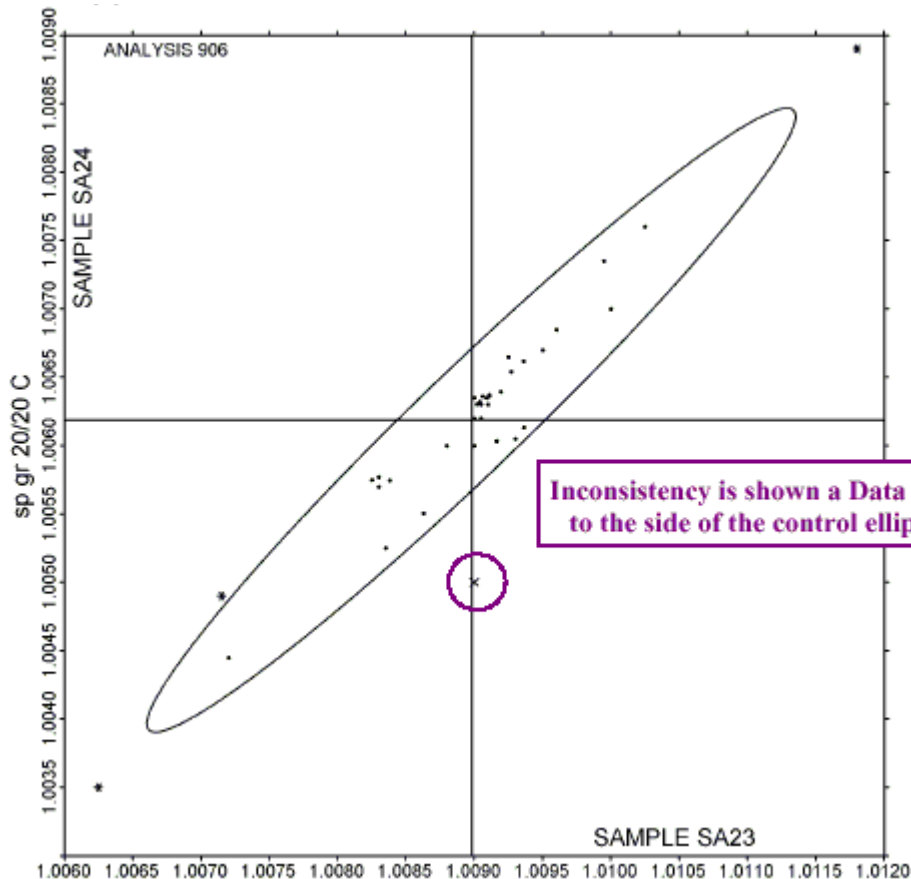
A maximum of 4 test cycles are printed on this page . If there are fewer sets of bars than the maximum and the laboratory was enrolled for all cycles, then one of the following situations occurred: lab did not submit data for a particular test/testing cycle or the data sheets were received late.

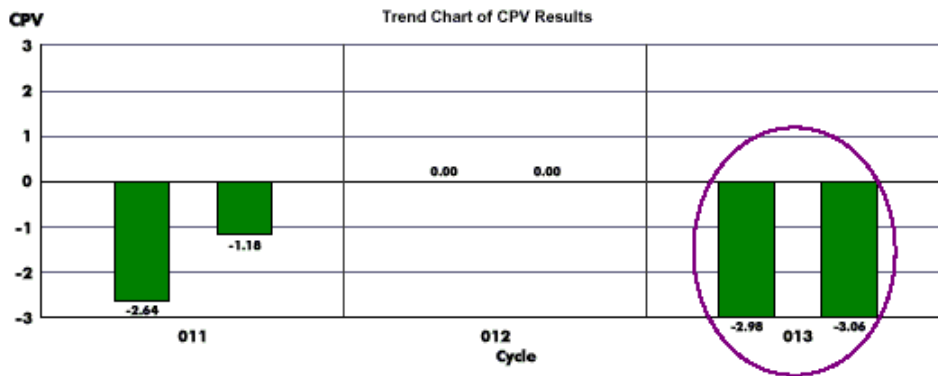
WebCode	Test Cycle	Sample Code	( Lab Mean - Grand Mean ) ÷ Between Lab Std Dev =	CPV	Data Flag (if assigned)			
Not used	013	SA23	1.009	1.0090	0.0009	0.02	X	36 of 42 labs included
	Spring 2003	SA24	1.005	1.0062	0.0009	-1.35		

**Action Item!** Your performance for this cycle was assigned an X Data Flag. Analyst Comment: Slight inconsistency in testing between samples.

### Inconsistency in testing

Inconsistencies that do not involve extreme data may be the most difficult error for labs to understand and to identify a cause. A lab's first instinct often is to conclude that 'each lab mean does not exceed a reasonable limit, so there is no problem'. But because the samples provided are similar to each other, there is an expectation that there should 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 determining an "acceptable" level of inconsistency, that is 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.





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WebCode	Test Cycle	Sample Code	Lab Mean	Grand Mean	Between Lab Std Dev	CPV	Data Flag (if assigned)
Not used	013	SA23	1.006	1.0090	0.0009	-2.98	*
	Spring 2003	SA24	1.004	1.0062	0.0009	-3.06	*

**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 to focus on to identify a cause. Furthermore, since additional testing on similar samples should produce similarly high or low results, it is easier to determine that a systematic error has been successfully corrected.

