

PERCEPTION[®]

Tracking Progress & EAC

Maximize Efficiency

Shipyards that know their true costs are more likely to be profitable and are in a better position to challenge their competition.

They can focus their efforts and resources on those areas that can benefit the most from productive change.

A shipyard would never know this unless it had a means for measuring benefits and their relative impact upon profits.

World-class shipyards have a strong focus on maximizing the efficiency of their manufacturing and assembly processes. They strive to perform work at the most productive stages of construction, eliminate wasted time, and simplify shipyard production processes.

These shipyards execute effective production plans and work hard to successfully stay on budget and on schedule. They know where they are and where they are going.

PERCEPTION takes a snap shot of project performance information every time a user executes the roll-up process. This process rolls up costs and measures progress and forecasts costs and schedules for each defined level of the WBS (SWBS, PWBS, COA, and CLIN)

This information is stored on the *PERCEPTION* Database “History Table.” The system generates a variety of graphics reports using this history information to track performance for any and all levels of the defined WBS.

Tracking Progress

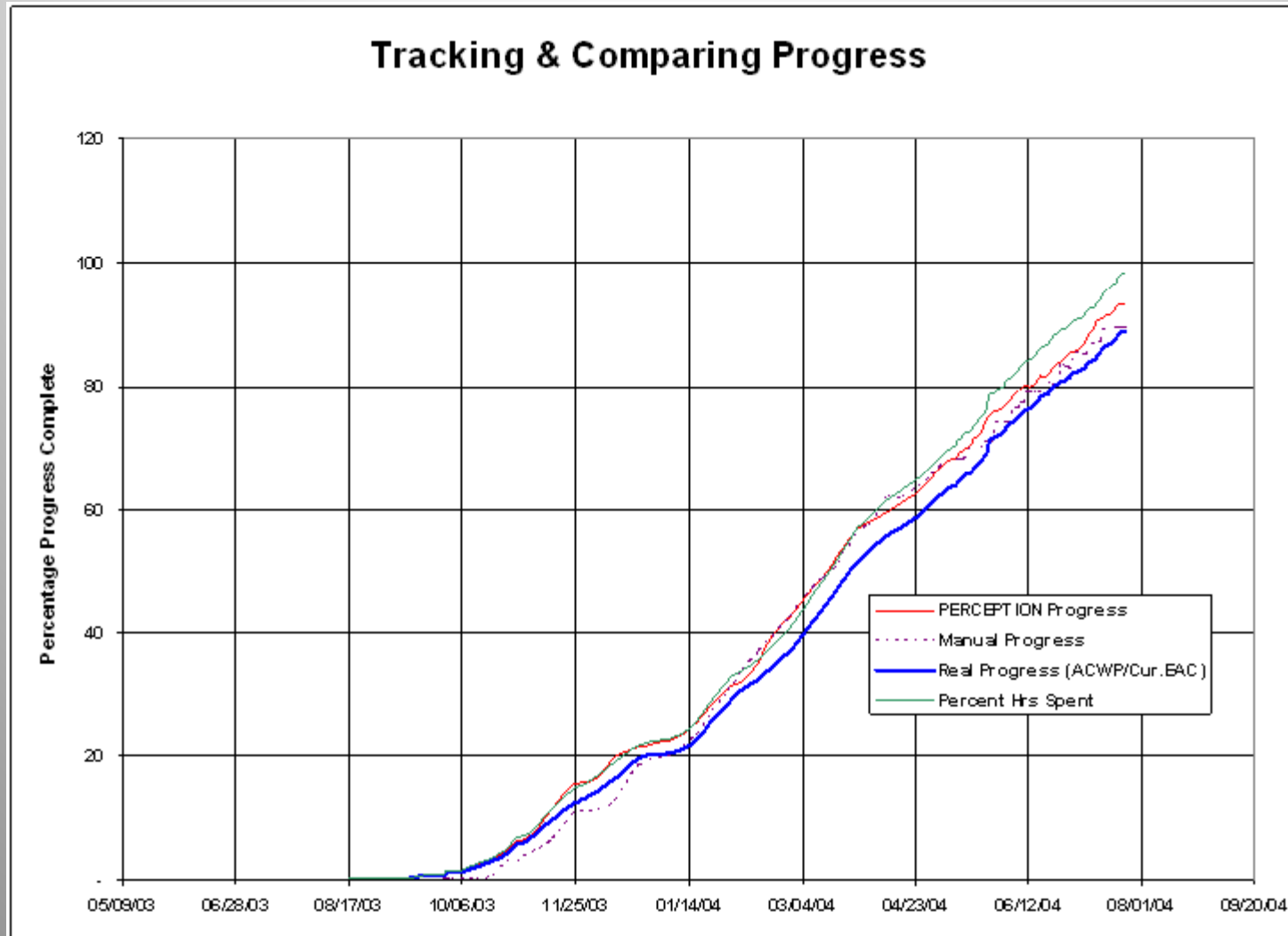
PERCEPTION tracks a project's progress as automatically determined by the system from recorded cost performance of project work orders.

PERCEPTION also can track a project's progress as determined manually from physical observations of work orders and their estimated state of completion.

The following figure plots the following progress estimates over the course of the project:

- a) *PERCEPTION*'s automated progress**
- b) Manually entered progress**
- c) “Real Progress” defined as actual costs divided by current EAC.**
- d) Percent of budget for hours spent**

Tracking & Comparing Progress



PERCEPTION's Automated Progress Assessment

PERCEPTION's automated approach to measuring progress takes into account both completed work orders and an assessment of in-process work orders.

Progress achieved from completed work orders is the percentage that the completed work order budgets comprise of the total budget for all work orders.

Progress estimated for in-process work orders is based on the charges to date to these in-process work orders with effects of over-runs or under-runs experienced from the completed work.

Manual Progress Assessment

Like the *PERCEPTION* progress, the manual progress takes into account both completed work orders and an assessment of in-process work orders.

Progress achieved from completed work orders is the percentage that the completed work order budgets comprise of the total budget for all work orders.

However, for manual progress estimated for in-process work orders requires a physical review of those work orders. This usually is a subjective assessment, which requires expensive labor resources to ascertain.

Since the manual progress assessment is subjective, it often is not very accurate, especially when individuals charged with making these manual assessments are busy with other responsibilities.

Manual progress often tends to be optimistic, especially when costs and schedules become problematic.

The manual assessment also often suffers from not being able to measure all in-process work orders at the same moment in time. When time charges continue to be collected, earlier assessments will become obsolete, yet these figures are rolled together with more timely assessments in order to obtain an overall progress figure.

“Real” Progress Assessment

Real progress is simply using the following formula:

$$\text{Real Progress} = \text{ACWP} / \text{Final Total Cost}$$

Prior to knowing the final total cost, the estimate at completion (EAC) can be used.

Real progress can be reconstructed back in time at various stages when ACWP was collected. This provides a means for measuring how closely interim assessments of progress actually were when they were assessed.

Historically, the *PERCEPTION* progress tracks very closely to good manual progress assessments, often the two methods varying by only a few percentage points.

A clear benefit of the *PERCEPTION* progress is that it is free, while the manual progress is not.

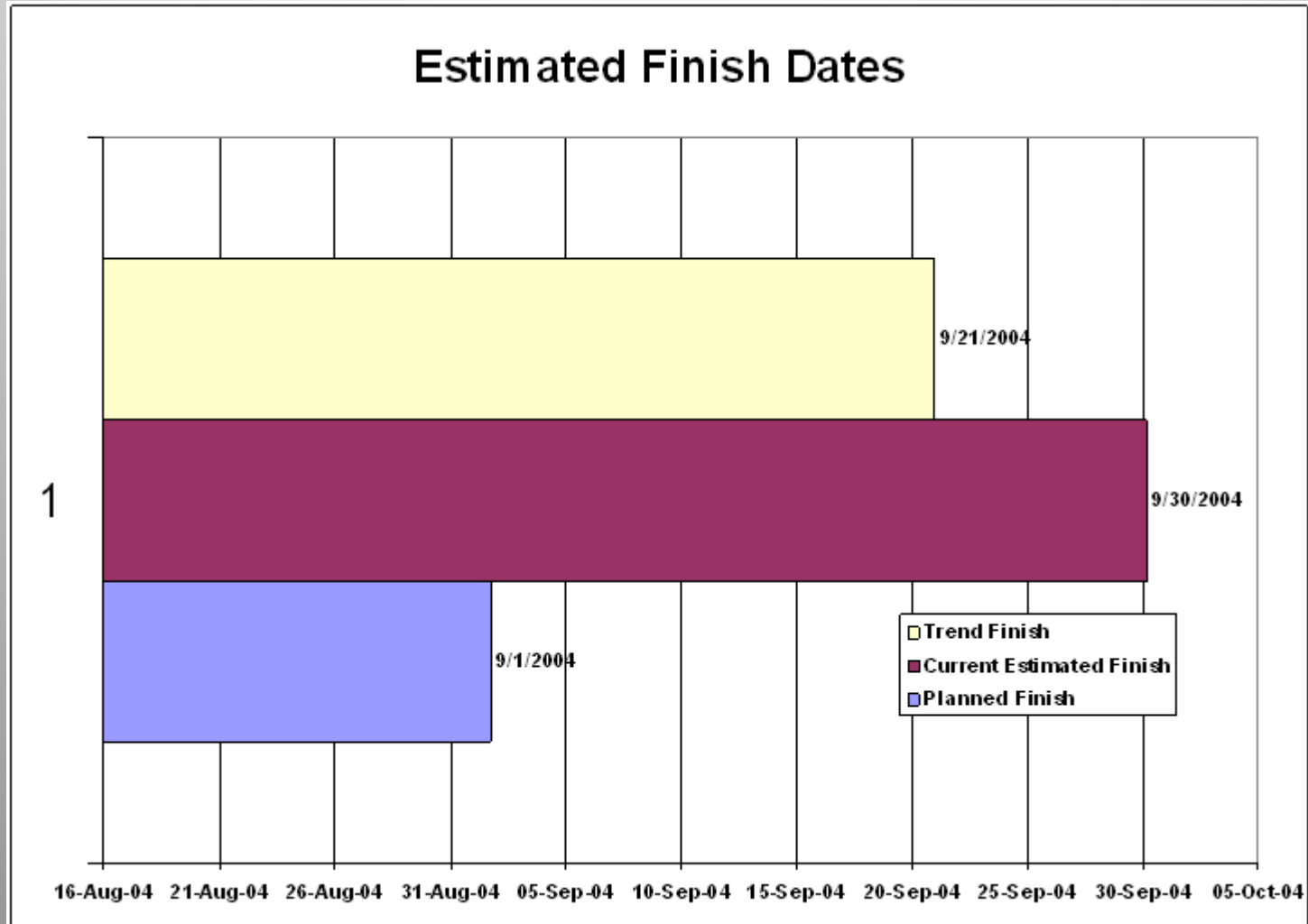
As the project nears its final state of completion, all progress figures should be converging to 100%.

Tracking Schedule

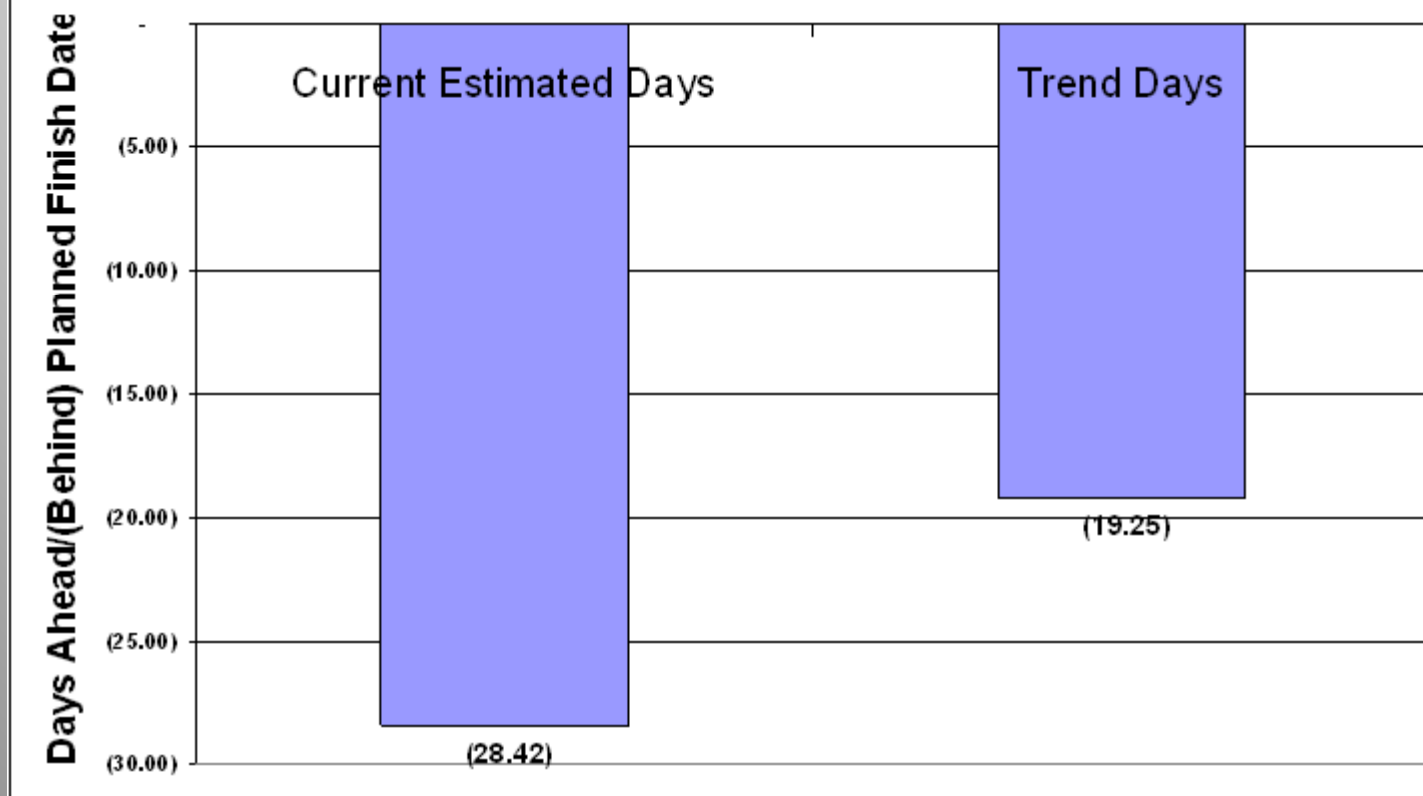
PERCEPTION tracks a project's schedule variance (ahead or behind schedule) based upon the progress and planned work order schedules.

PERCEPTION also tracks a trend of these variance estimates.

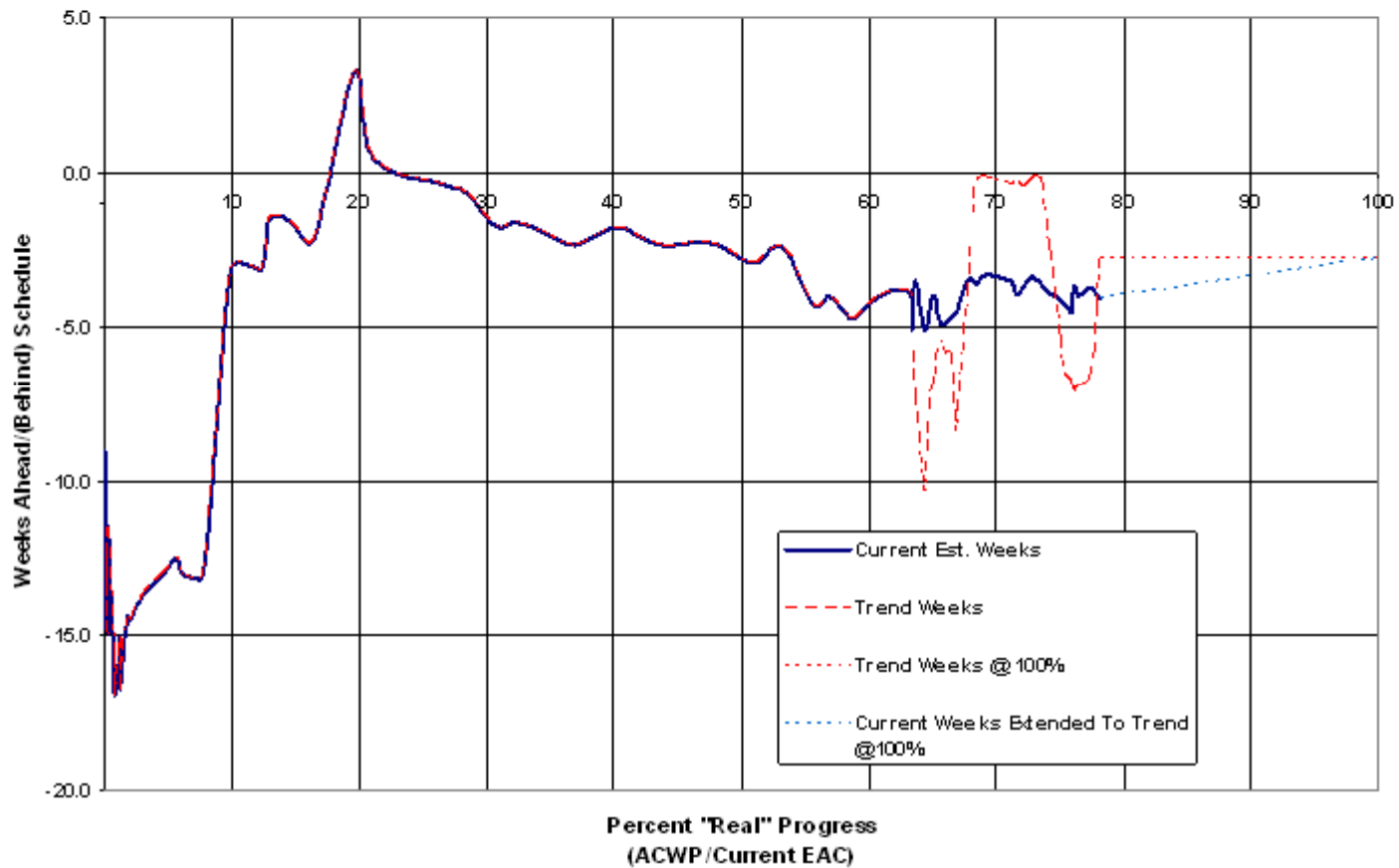
Estimated Finish Dates



Projected Days Ahead (Behind) Planned Finish Schedule



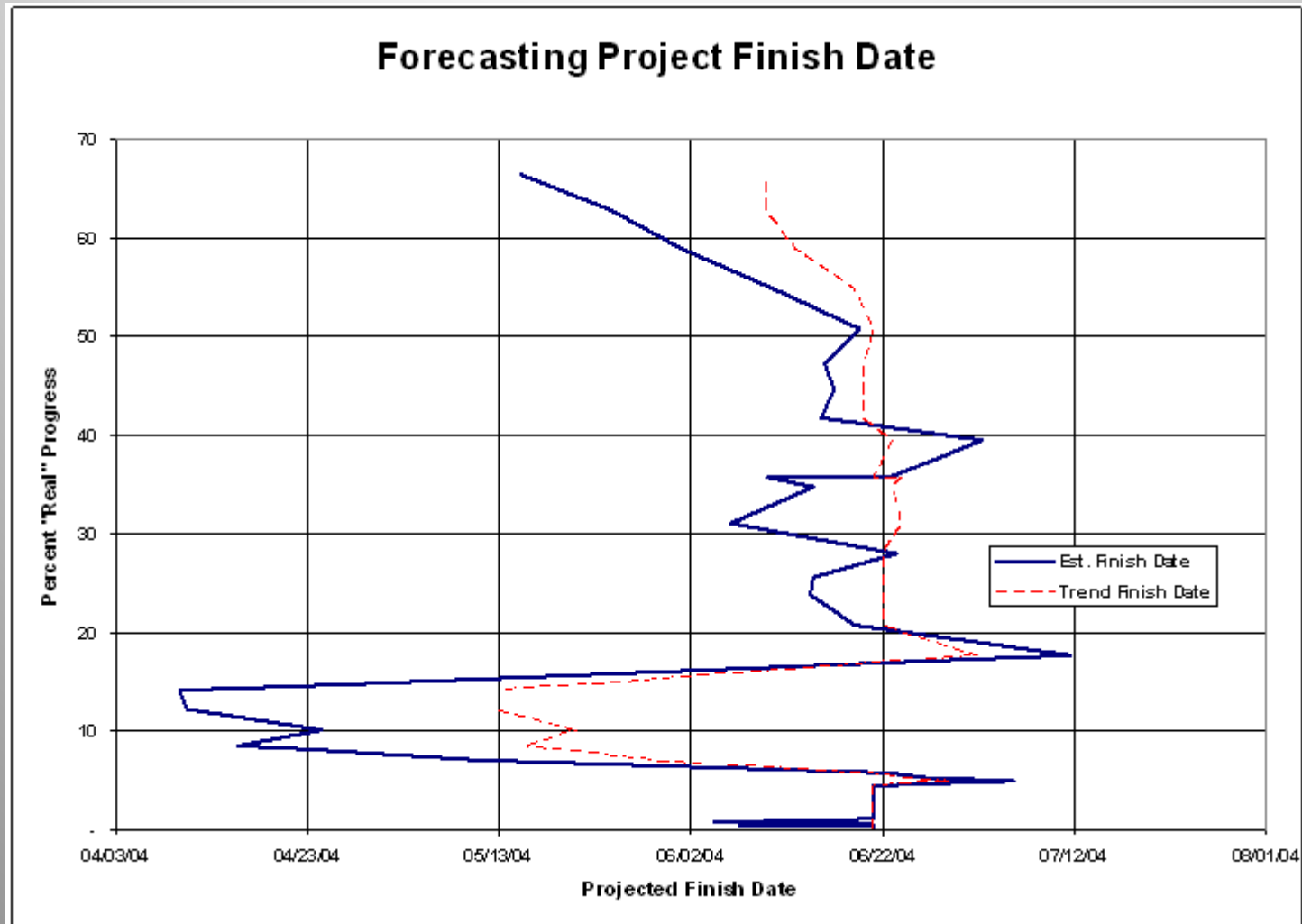
Tracking Schedule Variance In Weeks



Using this schedule variance information, *PERCEPTION* tracks a project's estimated finish date based upon the progress and planned work order schedules.

PERCEPTION also tracks a trend of these finish date estimates.

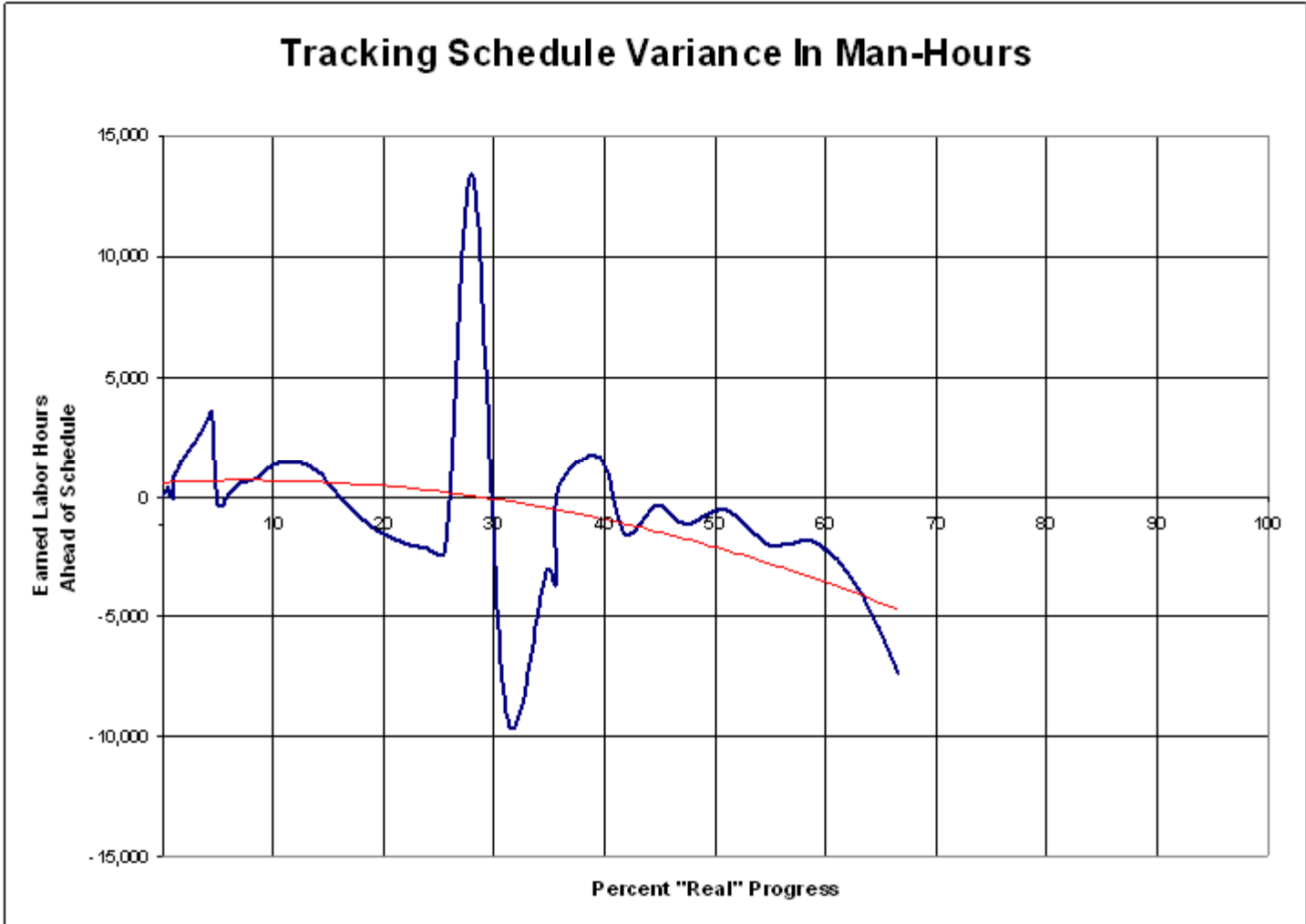
Forecasting Project Finish Date



The system tracks schedule variance in terms of labor hours. It is the difference between the earned value (BCWP) and the Budgeted Cost of Work Scheduled:

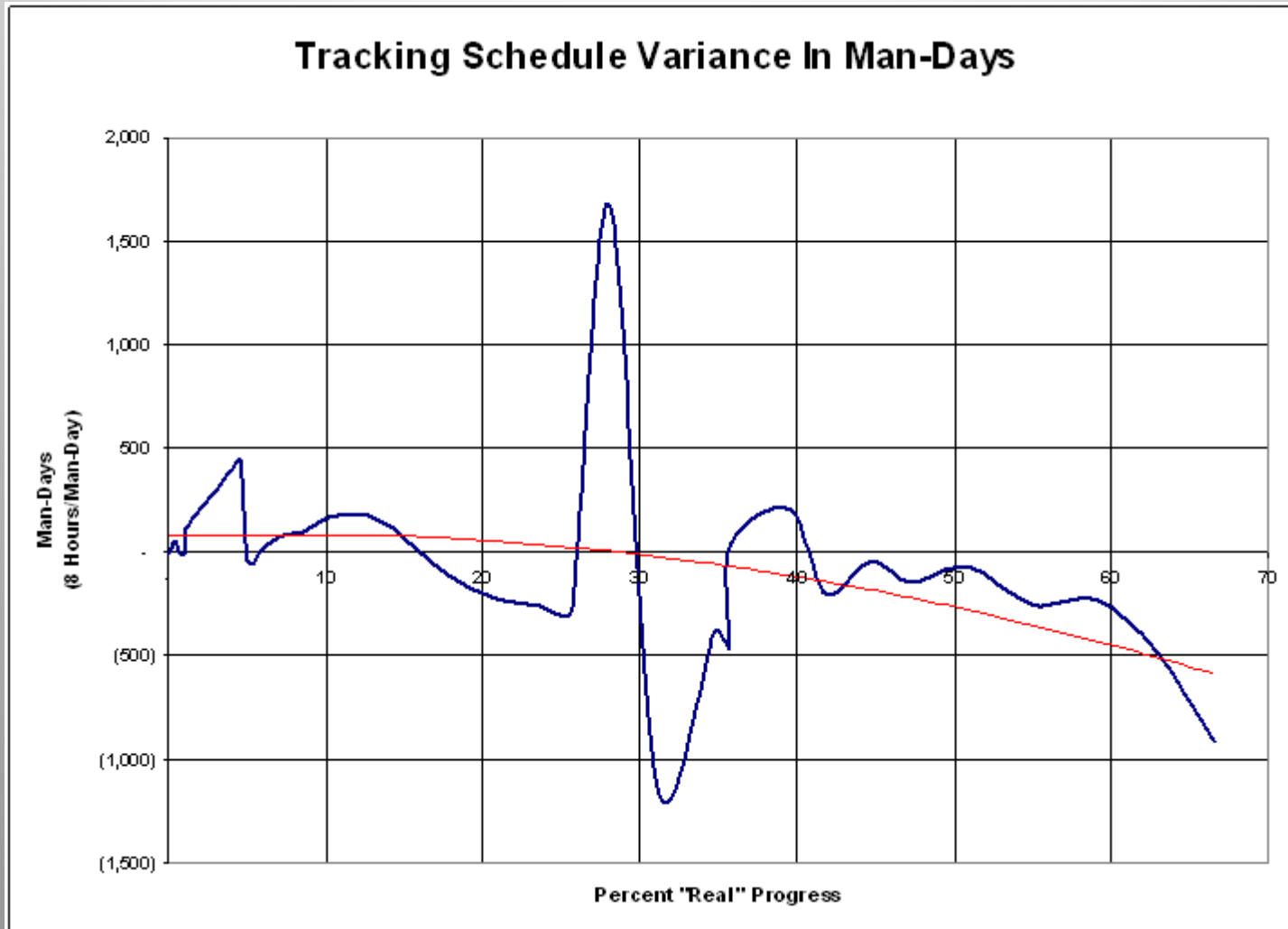
$$\text{Schedule Variance} = \text{BCWP} - \text{BCWS}$$

Tracking Schedule Variance In Man-Hours

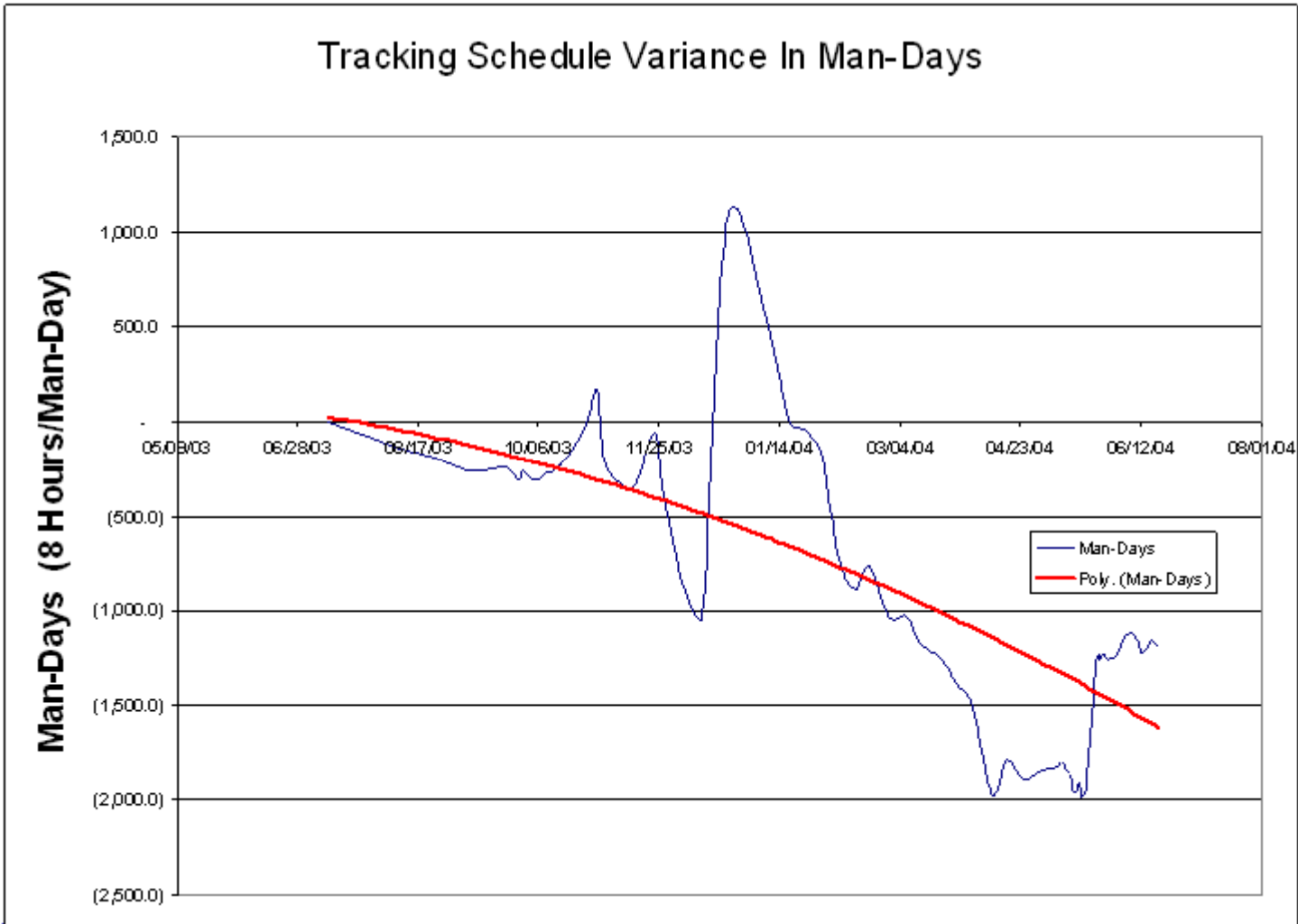


An alternate display of schedule variance is given in terms of man-days ahead/behind schedule.

Tracking Schedule Variance In Man-Days



Tracking Schedule Variance In Man-Days

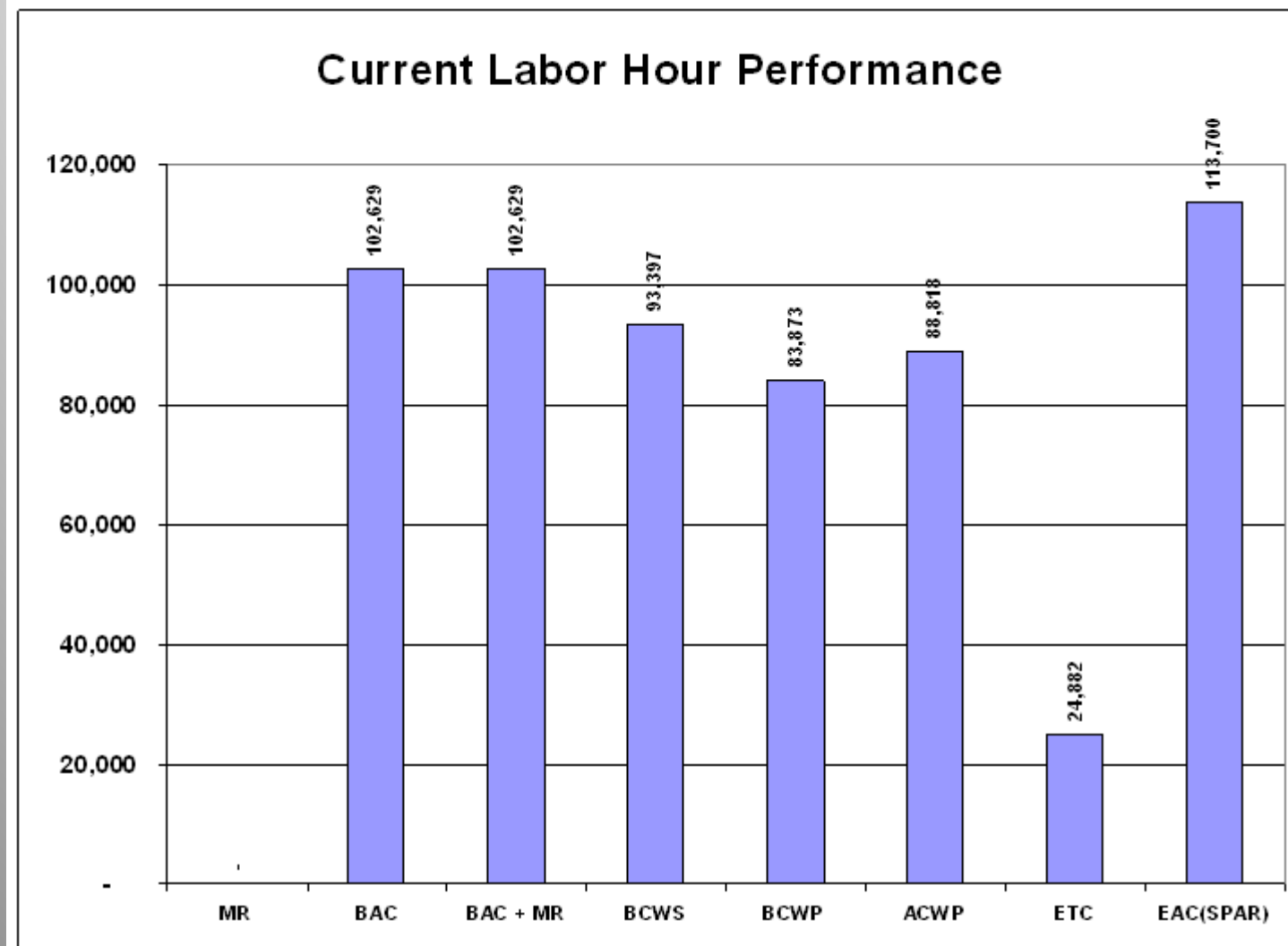


Tracking Costs

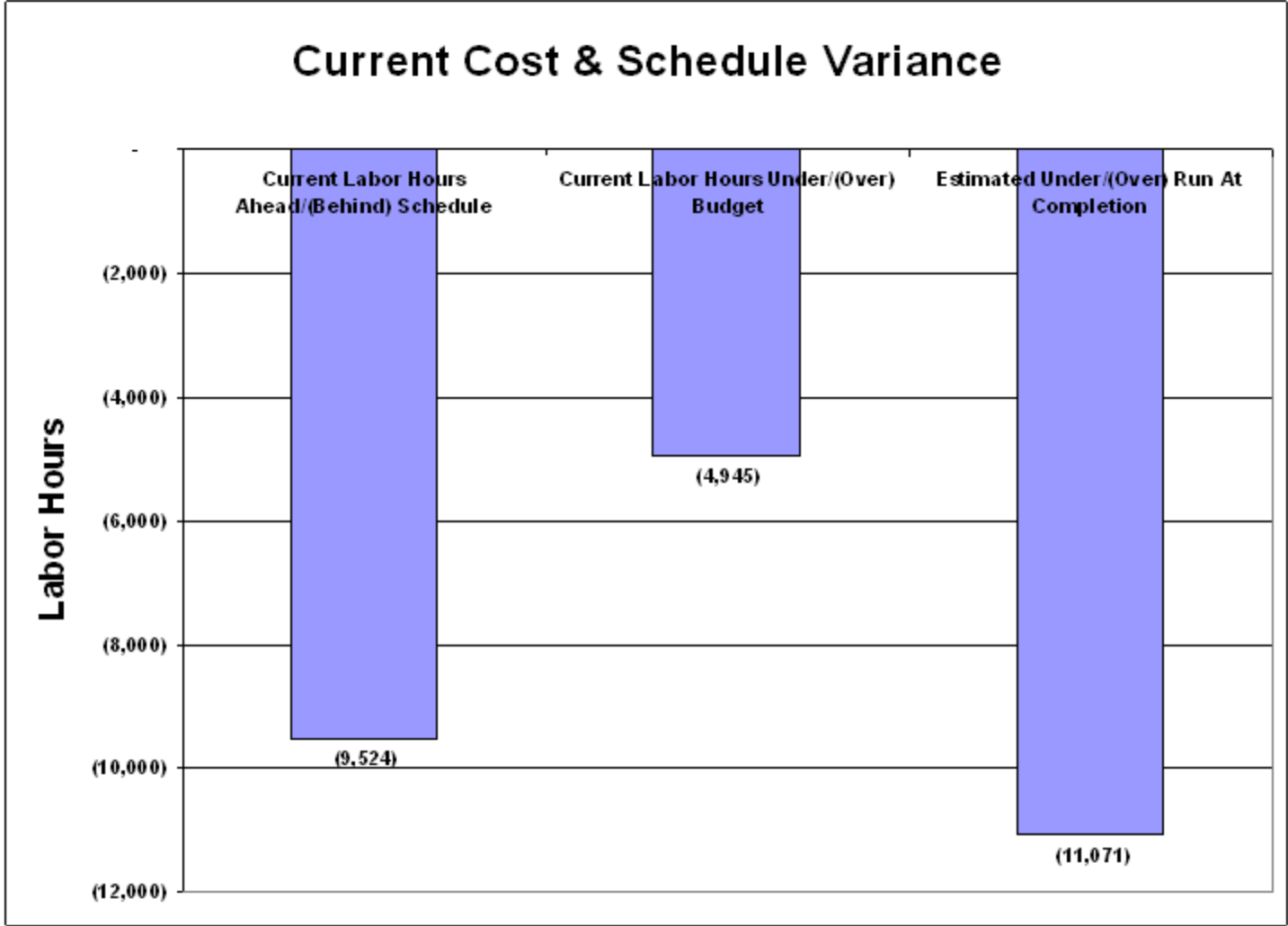
The tracking analysis displays the history of costs as measured in the following categories:

- The Budget At Completion (BAC)
- The Estimate At Completion (EAC) as measured by *PERCEPTION*
- The Trend of EACs
- The Actual Cost of Work Performed (ACWP)
- The Budgeted Cost of Work Performed (BCWP), or Earned Value
- The Budget Cost of Work Scheduled (BCWS)
- The Estimated Cost to Complete (ETC)
- Management Reserve (MR)

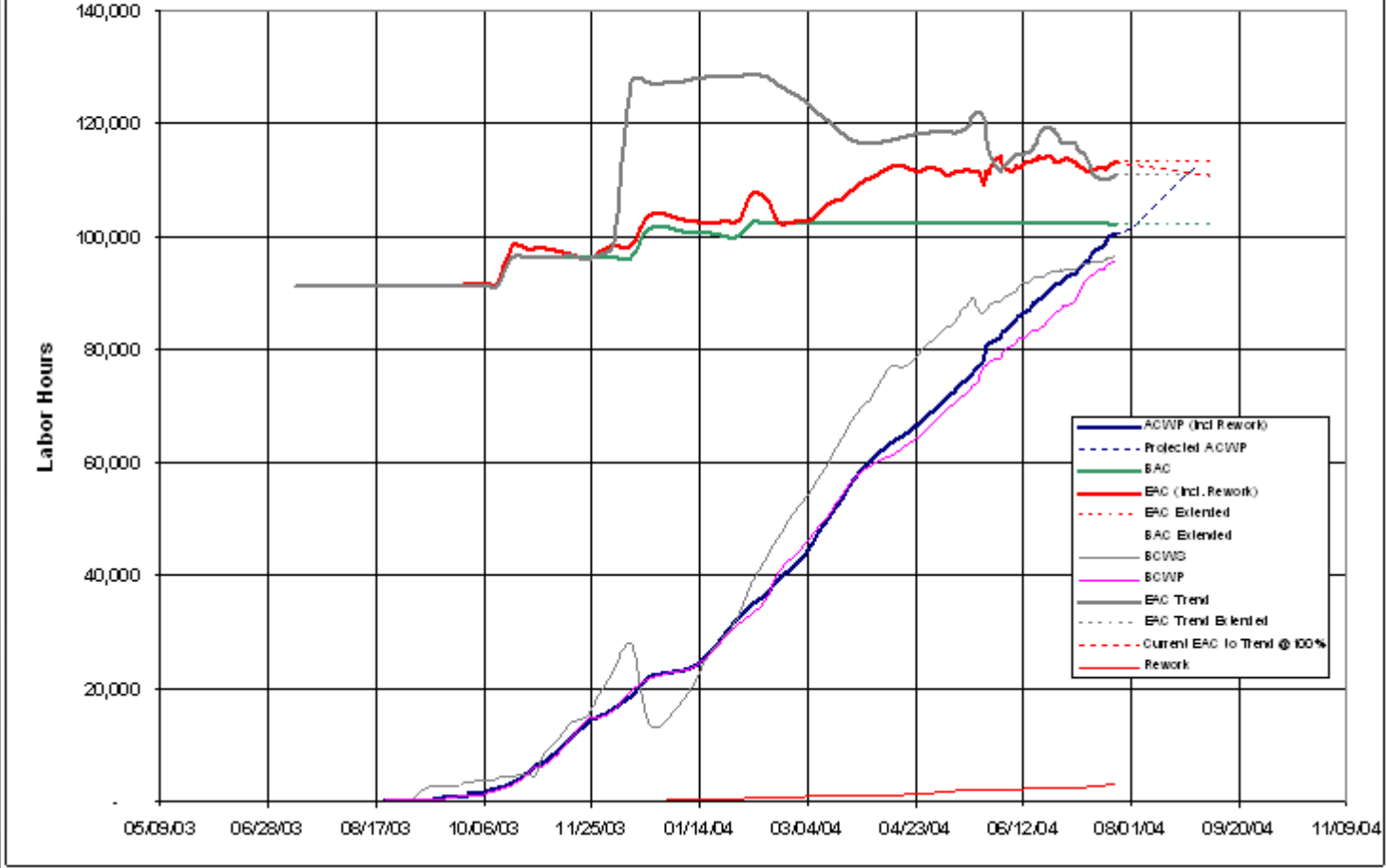
Current Labor Hour Performance



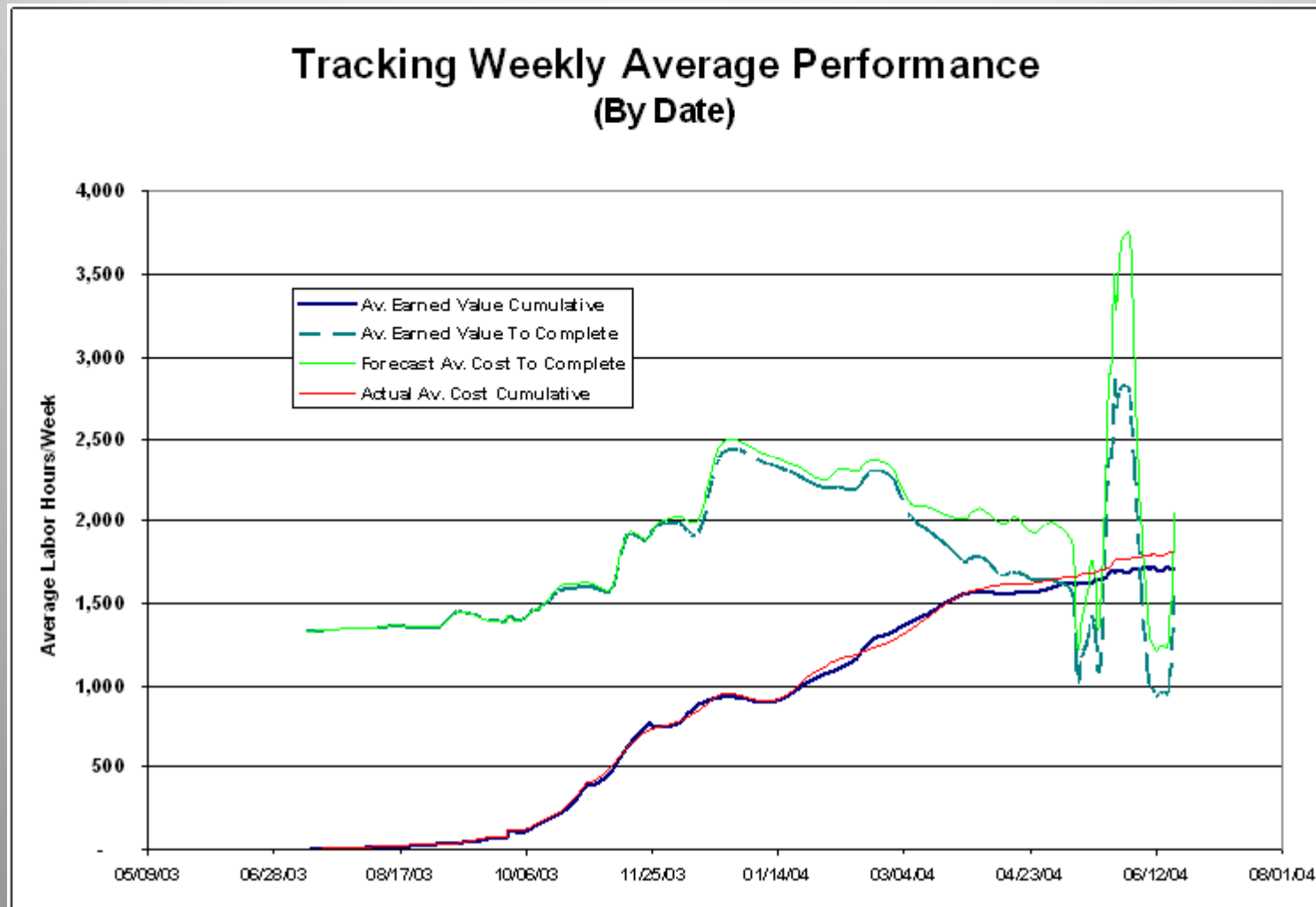
Current Cost & Schedule Variance



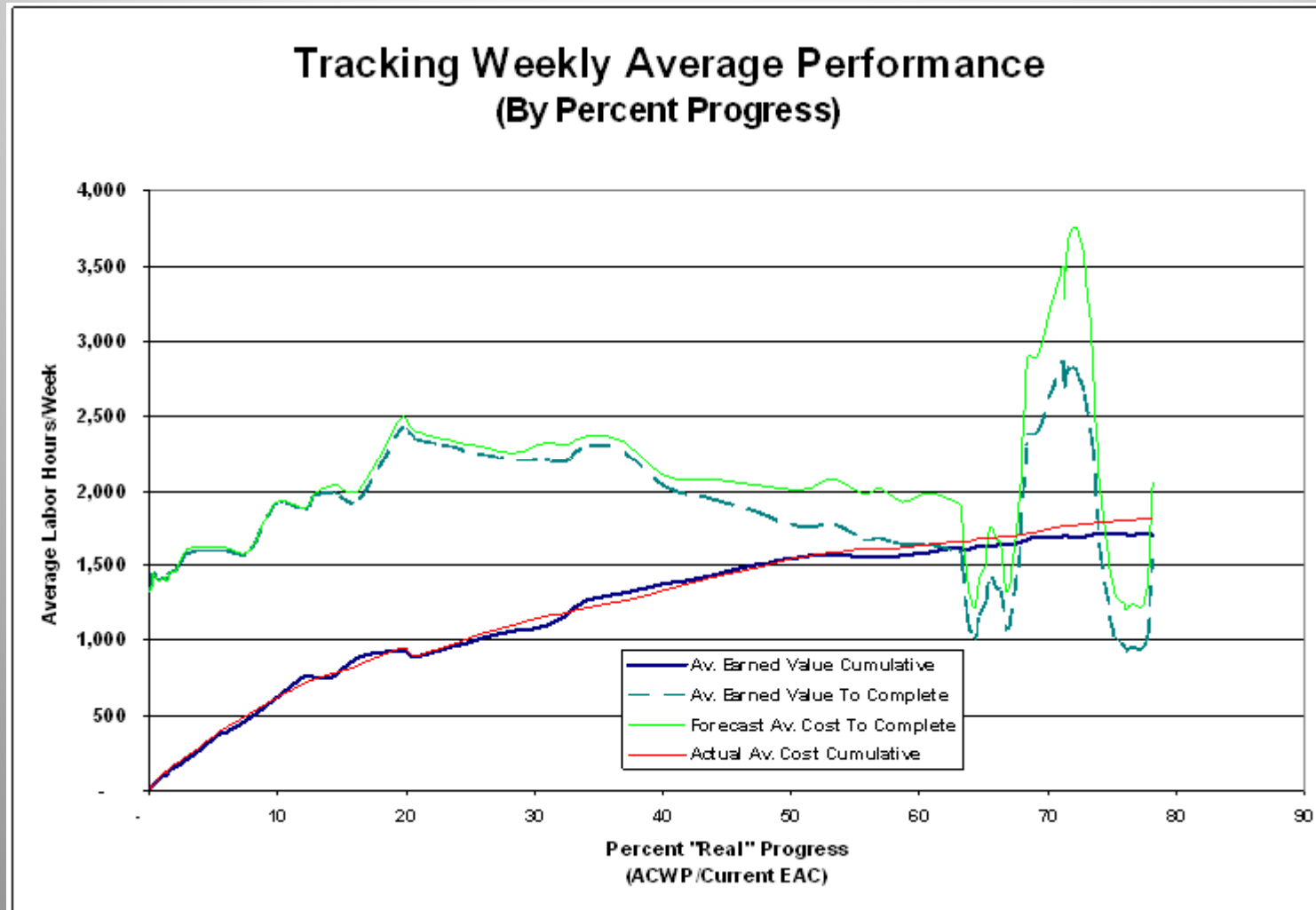
Tracking Labor Hour Costs



Tracking Weekly Average Performance (By Date)



Tracking Weekly Average Performance (By Percent Progress)



In addition, the analysis displays how the projected remaining actual costs will likely be distributed from the date of the last recorded historical ACWP through to the time forecast for the EAC.

The time forecast for the EAC is the *PERCEPTION*'s estimate of weeks ahead or behind schedule applied to the planned finish date for the project.

Tracking EAC

Estimates At Completion, or EACs, are always subjects of considerable discussion. There is no silver bullet formula that is so good that it accurately predicts the exact final cost of a project from day one through to the end of the contract. There are too many unknowns, and there are too many conditions that can change over the remaining time of a contract.

Nevertheless, the EAC should provide management with an indication of whether or not the contract is headed in the right direction or not, whether it will be profitable or not.

The EAC should be realistic, neither too optimistic, nor too pessimistic, unless, of course, the facts at hand warrant otherwise.

If early in the project the EAC varies too much from the total budget, there is an all-too typical reaction from project managers that the EAC is unrealistic and not credible.

On the other hand, EACs that jump quickly over a short period of time also suffer from being regarded as unrealistic and not credible.

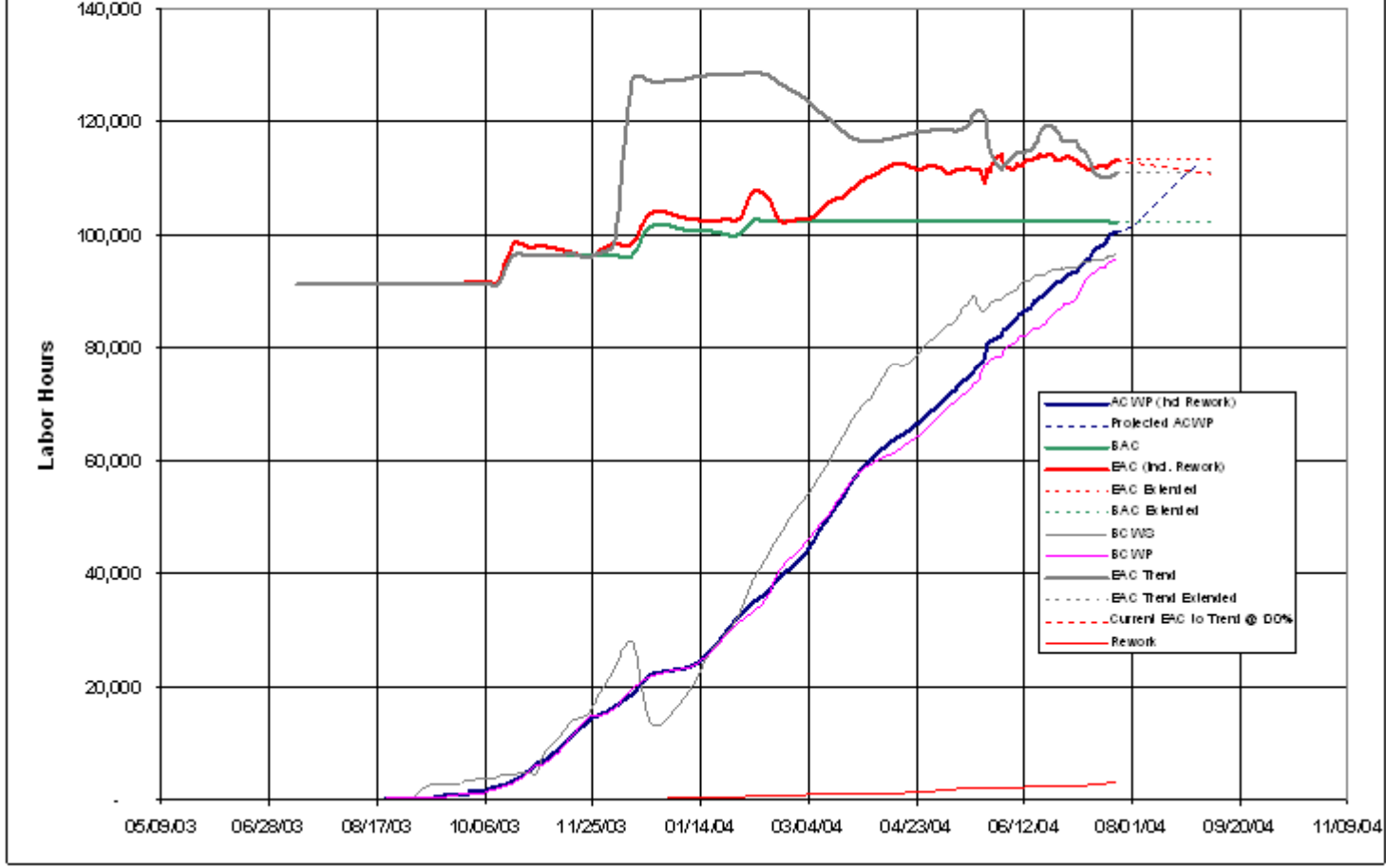
What's needed, therefore, is an EAC that reflects current performance, reflects changes being made that affect costs, yet does not change radically from one period to the next.

It is critical that managers understand that an EAC is only an estimate, but that it should be providing early indications of problems that should not be ignored or glossed over without serious corrective actions.

The tracking analysis produces a comparison of a number of different EACs, each based upon a different method of determination:

- **The Total Budget At Completion (BAC)**
- **The *PERCEPTION* Automated EAC**
- **The EAC Derived Directly From ACWP And *PERCEPTION*'s Progress**
- **The EAC Derived From The Cost Performance Index (CPI)**
- **The EAC Derived From The Schedule Performance Index (SPI)**
- **The EAC Derived From The Combined Cost & Schedule Performance Index (SCI)**
- **The EAC Derived From The Manual Progress Assessment**
- **The EAC Trend Derived By *PERCEPTION***

Tracking Labor Hour Costs



PERCEPTION's Automated EAC

PERCEPTION EAC is based on an objective assessment of facts, the performance of costs incurred to date relative to their earned value budgets.

This method also takes into account the current progress. The system moderates the influence of budget variances upon the EAC when progress is small, but applies increasingly more influence upon the EAC as progress advances.

The *PERCEPTION* EAC, while recognizing the variances early, provides management with some benefit of the doubt that budget problems can be corrected prior to the completion of the contract.

This benefit, however, becomes less and less if variances continue to be a problem.

Total Budget At Completion (BAC)

The BAC is the baseline from which overall cost performance must be measured.

CPI EAC

This is the EAC developed from the Cost Performance Index (“CPI”), the ratio of Budgeted Cost of Work Performed (BCWP) and the Actual Cost of Work Performed (ACWS):

$$\text{BCWP} = \text{BAC} \times \text{PERCEPTION Progress}$$

$$\text{CPI} = \text{BCWP}/\text{ACWP}$$

$$\text{EAC} = \text{ACWP} + (\text{BAC}-\text{BCWP})/\text{CPI}$$

The CPI EAC can vary erratically over the course of a project. At early stages of progress, the CPI EAC can suffer from very large swings from even small changes in the CPI.

SPI EAC

This is the EAC developed from the Schedule Performance Index (“SPI”), the ratio of Budgeted Cost of Work Performed (BCWP) and the Budget Cost of Work Scheduled (BCWS):

$$\text{SPI} = \text{BCWP}/\text{BCWS}$$

$$\text{EAC} = \text{ACWP} + (\text{BAC}-\text{BCWP})/\text{SPI}$$

As with the CPI EAC, the SPI EAC can vary erratically over the course of the project. At early stages of progress, the SPI EAC can suffer from very large swings from even small changes in the SPI.

SCI EAC

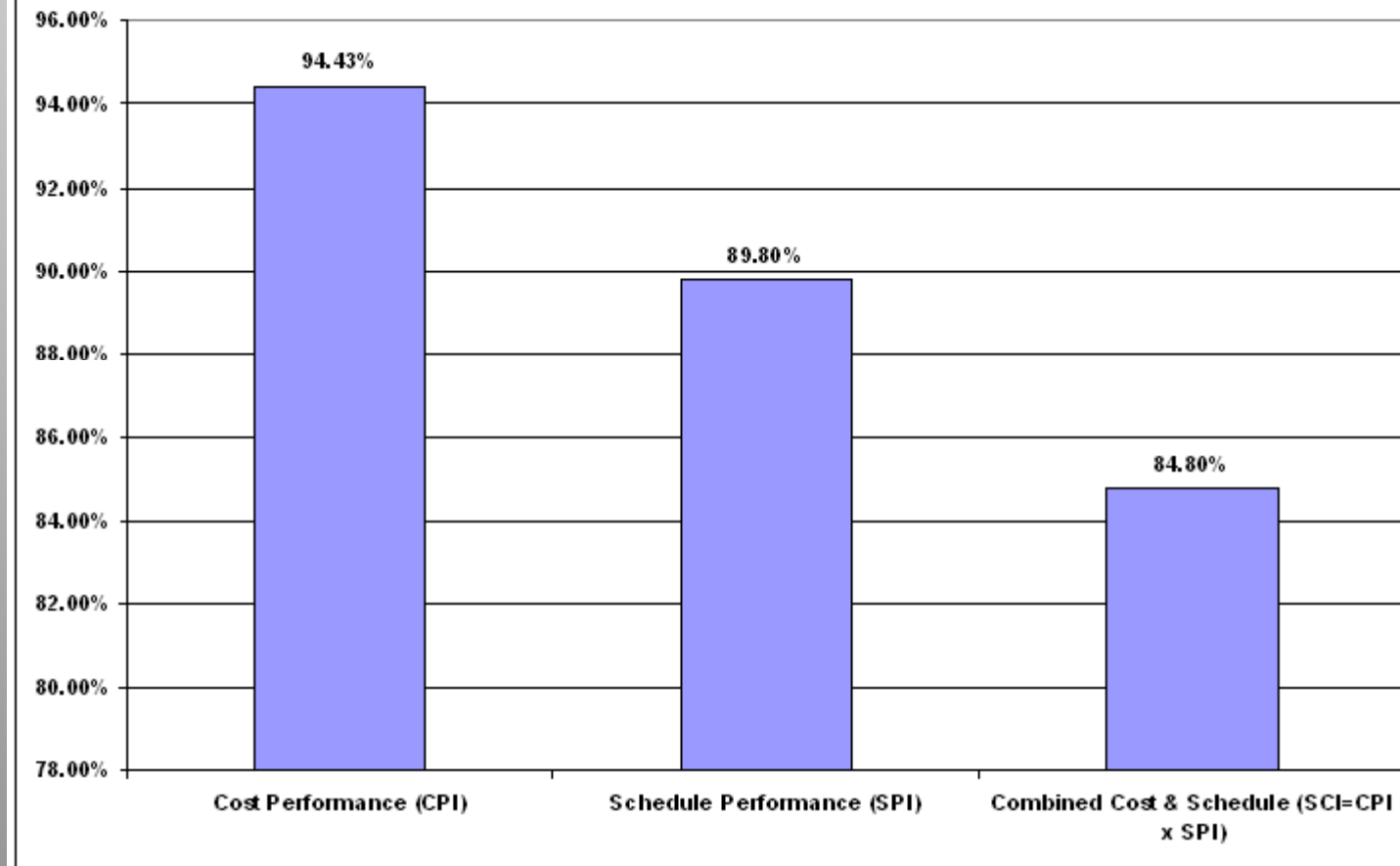
This is the EAC developed from the Schedule-Cost Index (“SCI”):

$$\text{SCI} = \text{CPI} \times \text{SPI}$$

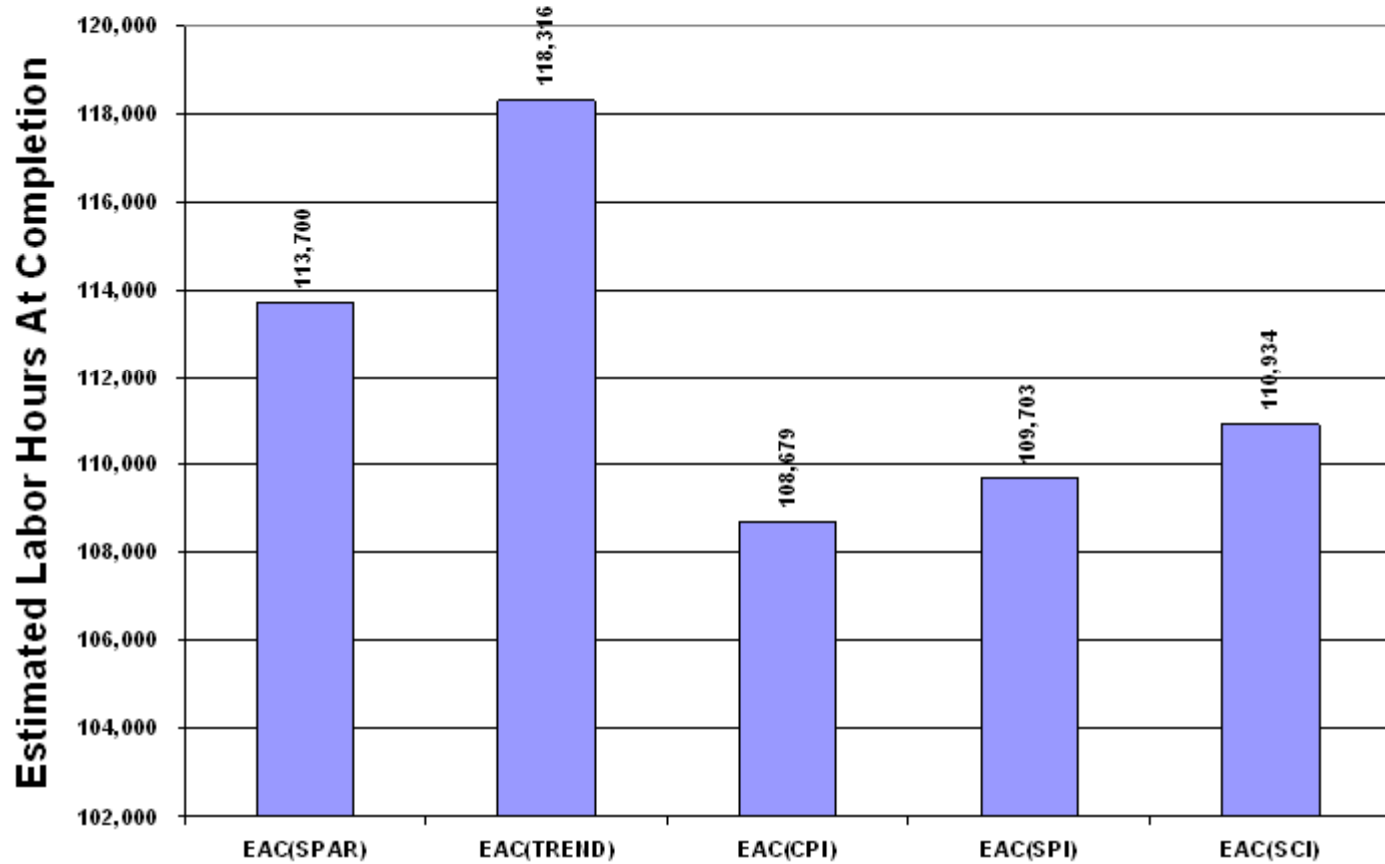
$$\text{EAC} = \text{ACWP} + (\text{BAC} - \text{BCWP}) / \text{SCI}$$

As with the other performance index methods, the SCI EAC can vary erratically over the course of the project. At early stages of progress, the SCI EAC can suffer from very large swings from even small changes in the SCI.

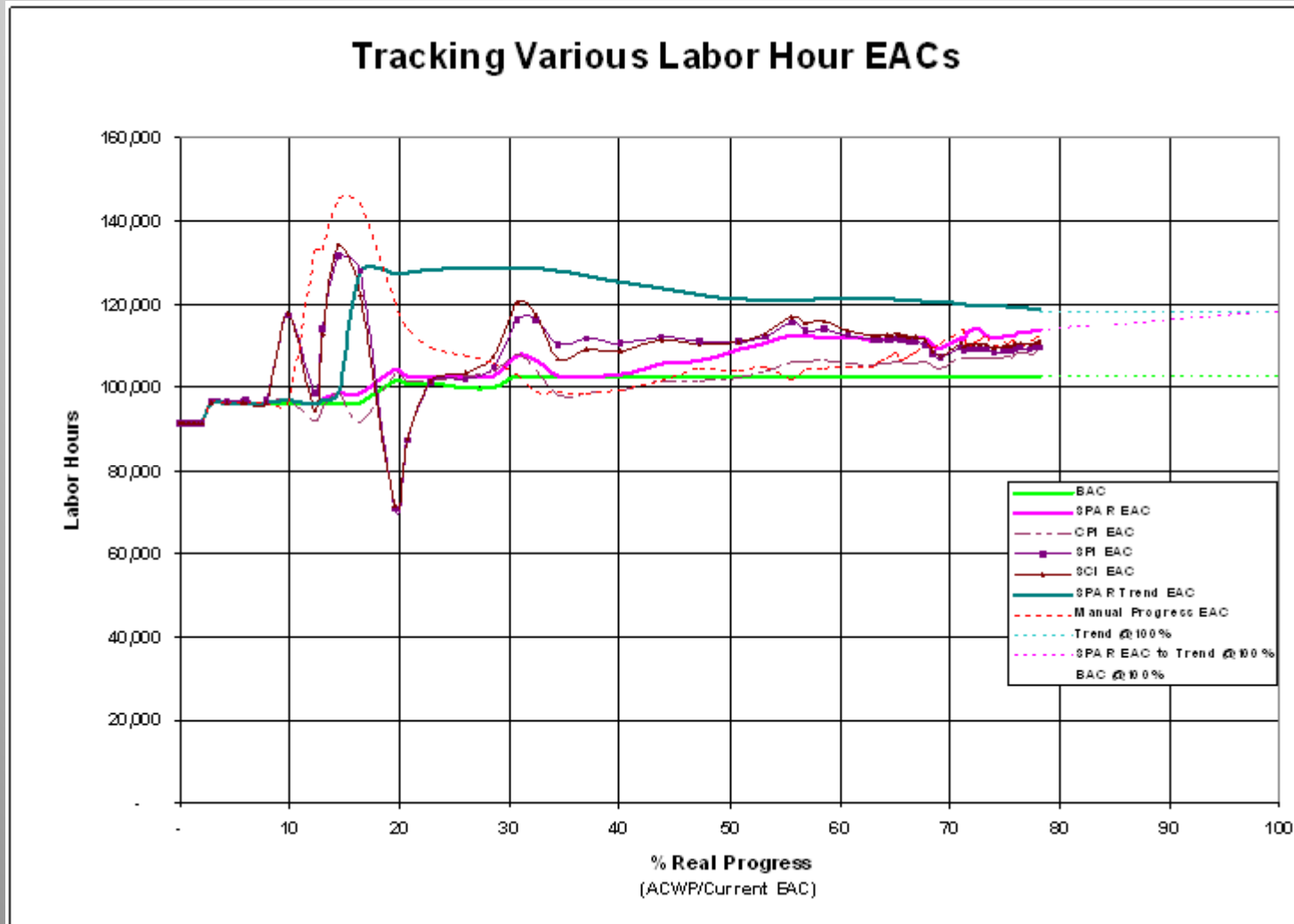
Performance Indexes



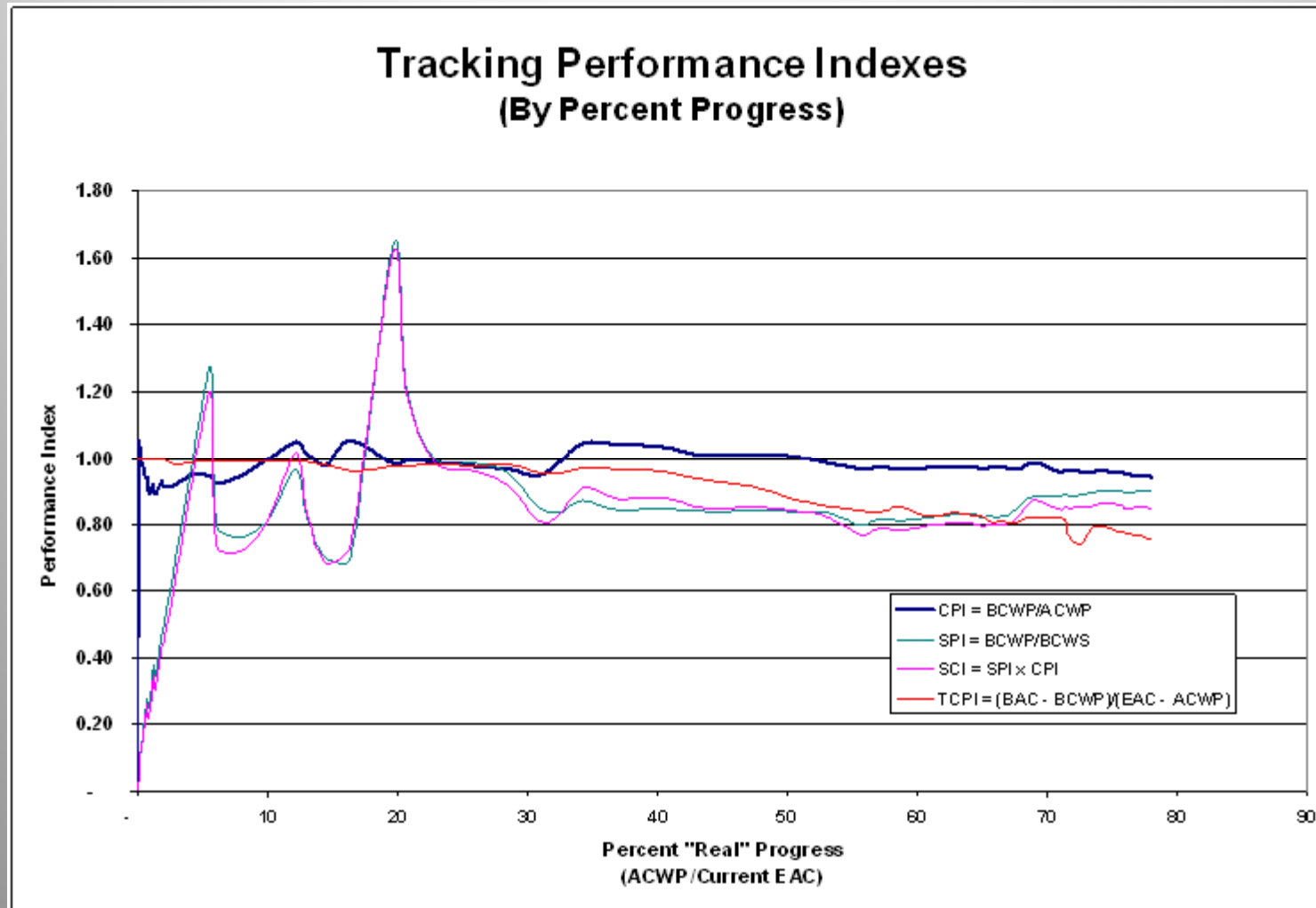
Comparing EAC Methods



Tracking Various Labor Hour EACs



Tracking Performance Indexes (By Percent Progress)



Manual Progress EAC

This is an EAC computed as follows:

$$\text{EAC} = \text{ACWP} / \text{Manual Progress}$$

This EAC generally is unreliable particularly where the manual progress assessment is questionable and progress is small.

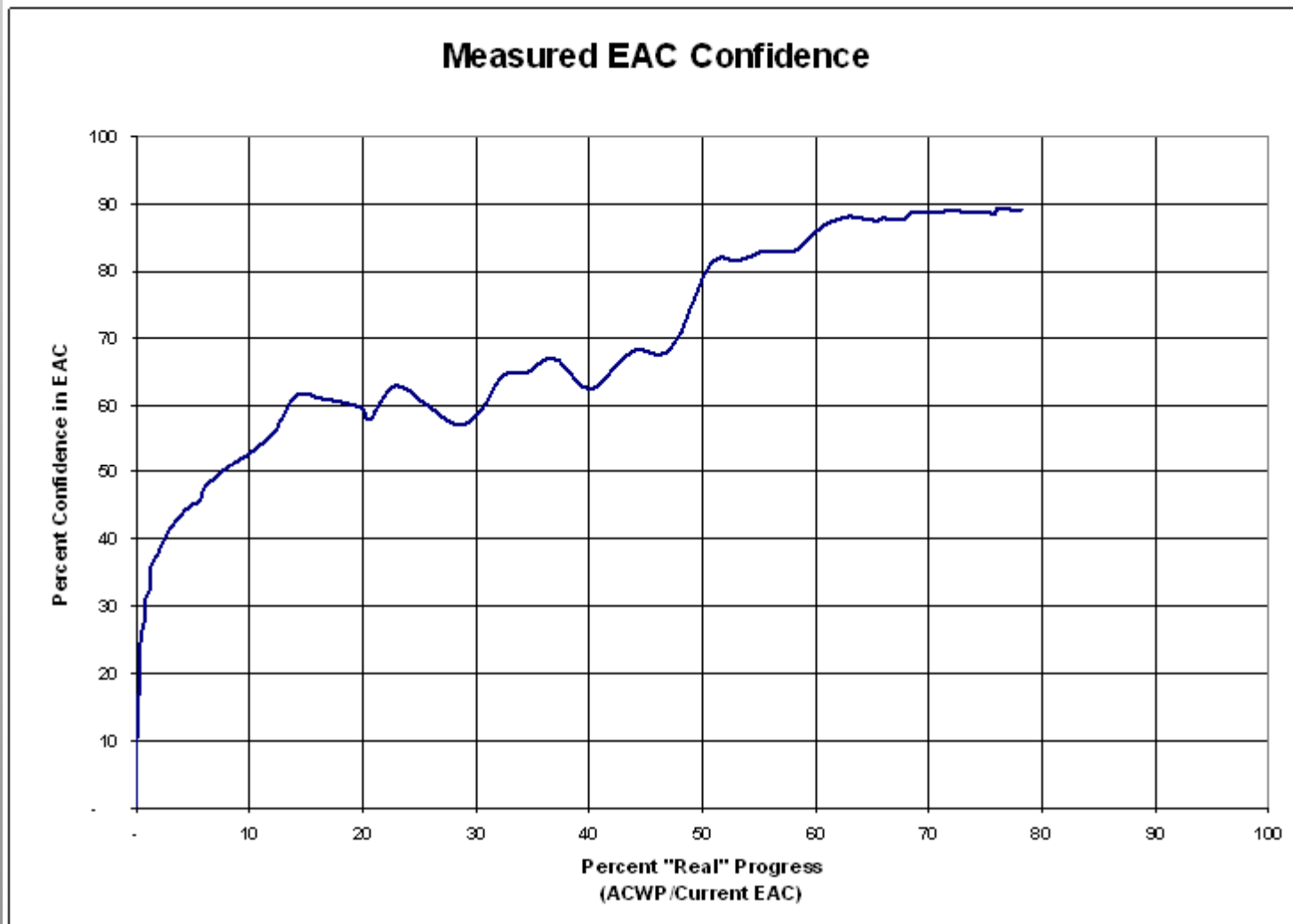
It also can result in large swings in values over short periods of time where it may be difficult to correlate a correct relationship between ACWP and Manual Progress.

***PERCEPTION* Trend EAC**

The Trend EAC uses a regression formula applied to the *PERCEPTION* EAC figures developed at different points in time as the project advances progress-wise. The regression formula then extrapolates an EAC from the current progress figure out to 100% progress.

The Trend EAC can react more quickly than the *PERCEPTION* EAC as it tries to anticipate a final direction for the incremental changes in the EAC. At early stages of progress, the Trend EAC can suffer from large swings as even small changes in the EAC can result in very large trend values extrapolated too far into the future at 100% progress.

Measured EAC Confidence



The Trend EAC can be a useful measure especially if cost performance is not steady.

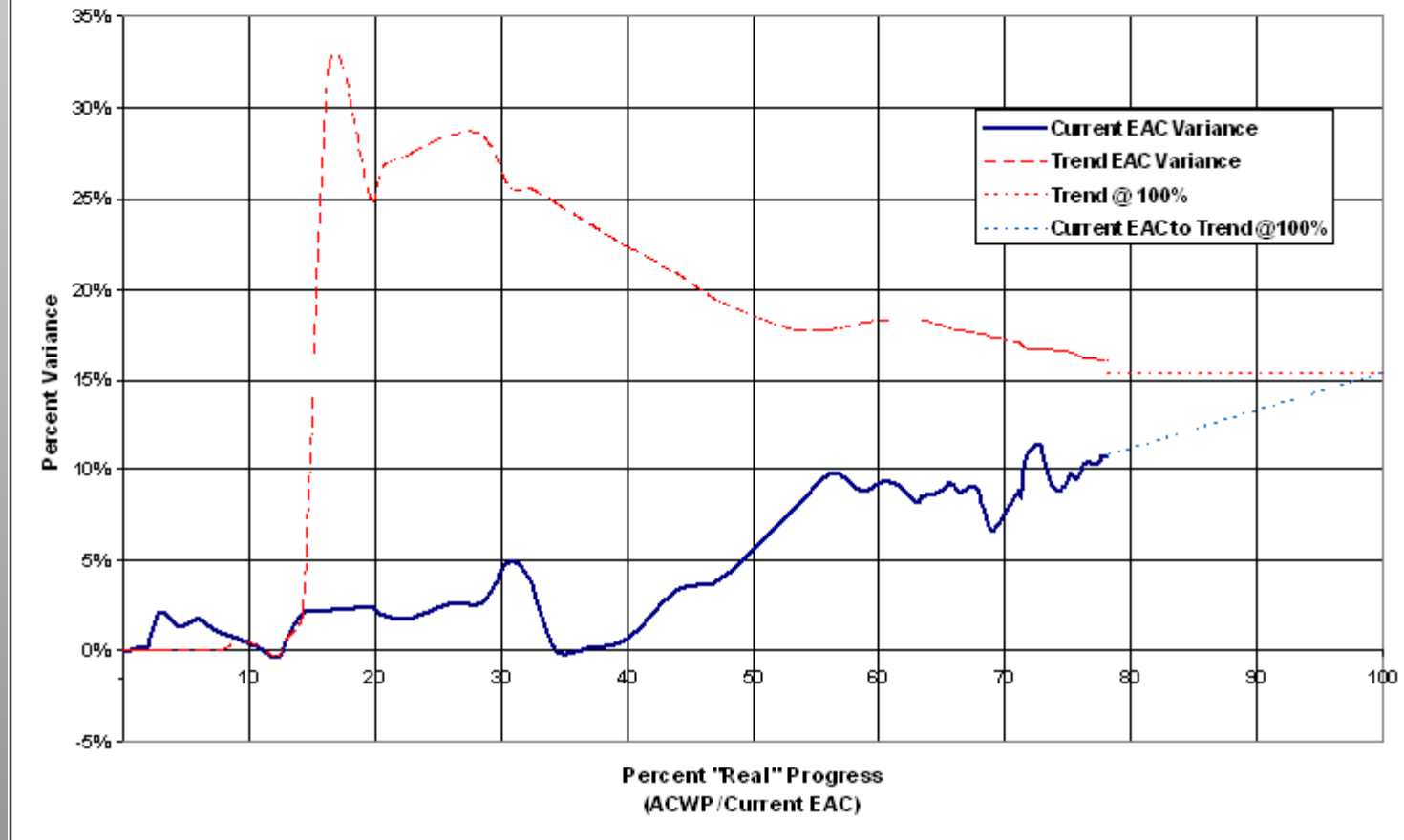
It also can indicate if changes made to improve performance are showing signs of success or not.

Tracking EAC Variance

With the EAC determined, its variance from the BAC also can be tracked.

The EAC analysis displays both the current estimated EAC variance and the trend variance.

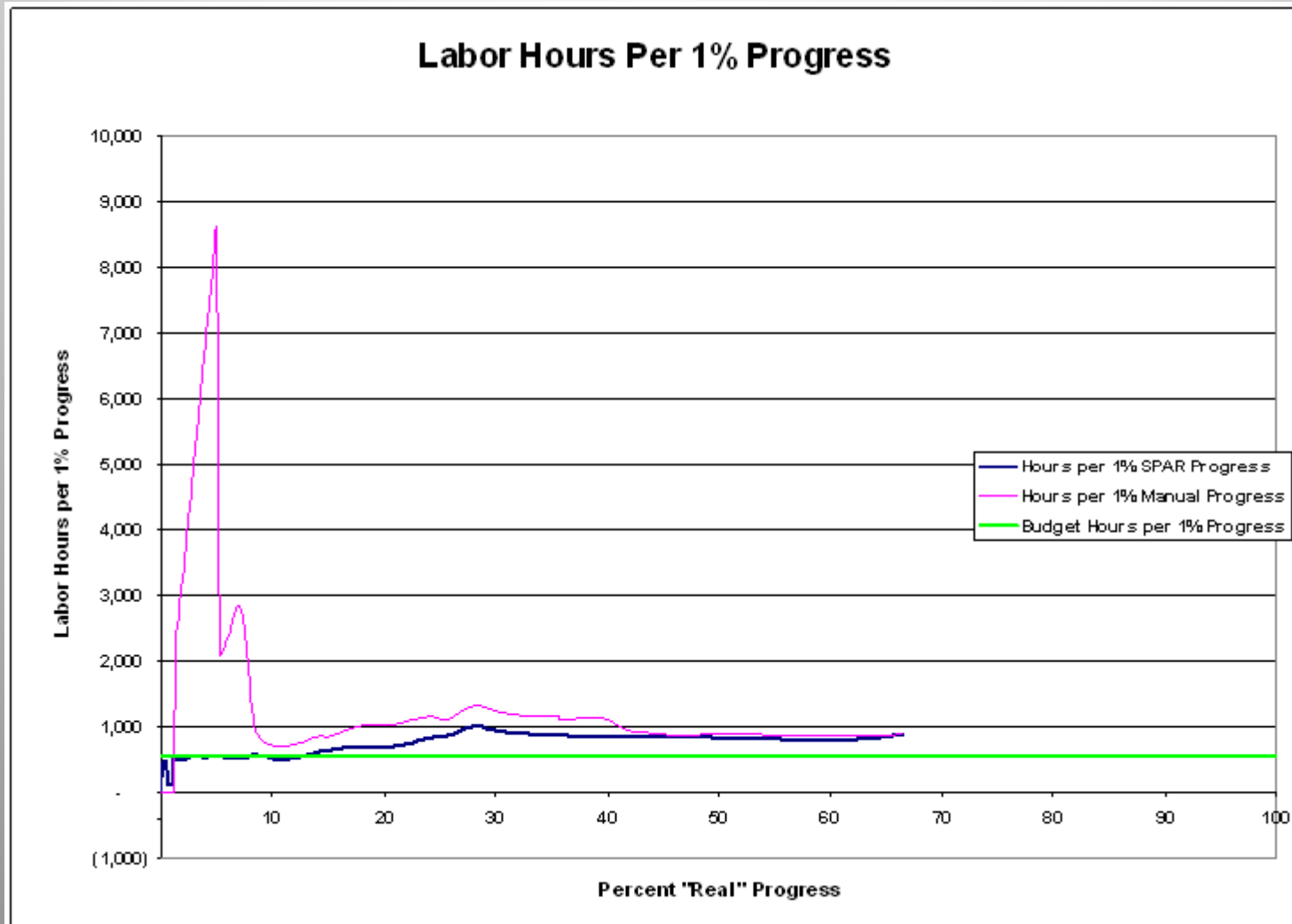
Forecast Labor Hour Variance



Tracking Labor Hours per 1% Progress

Another view of productivity can be seen by tracking actual labor hours per 1% progress against the project budget figure.

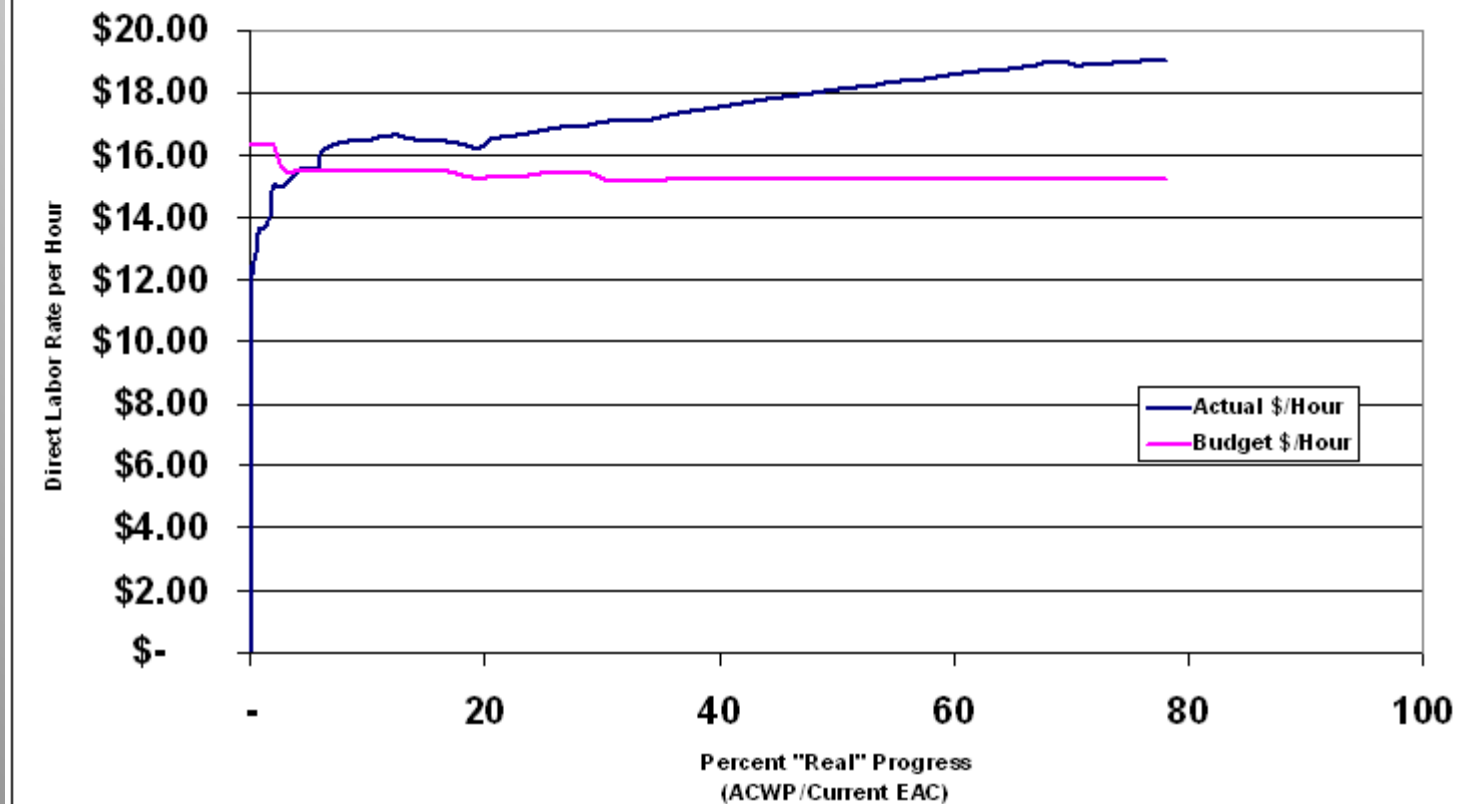
Labor Hours Per 1% Progress



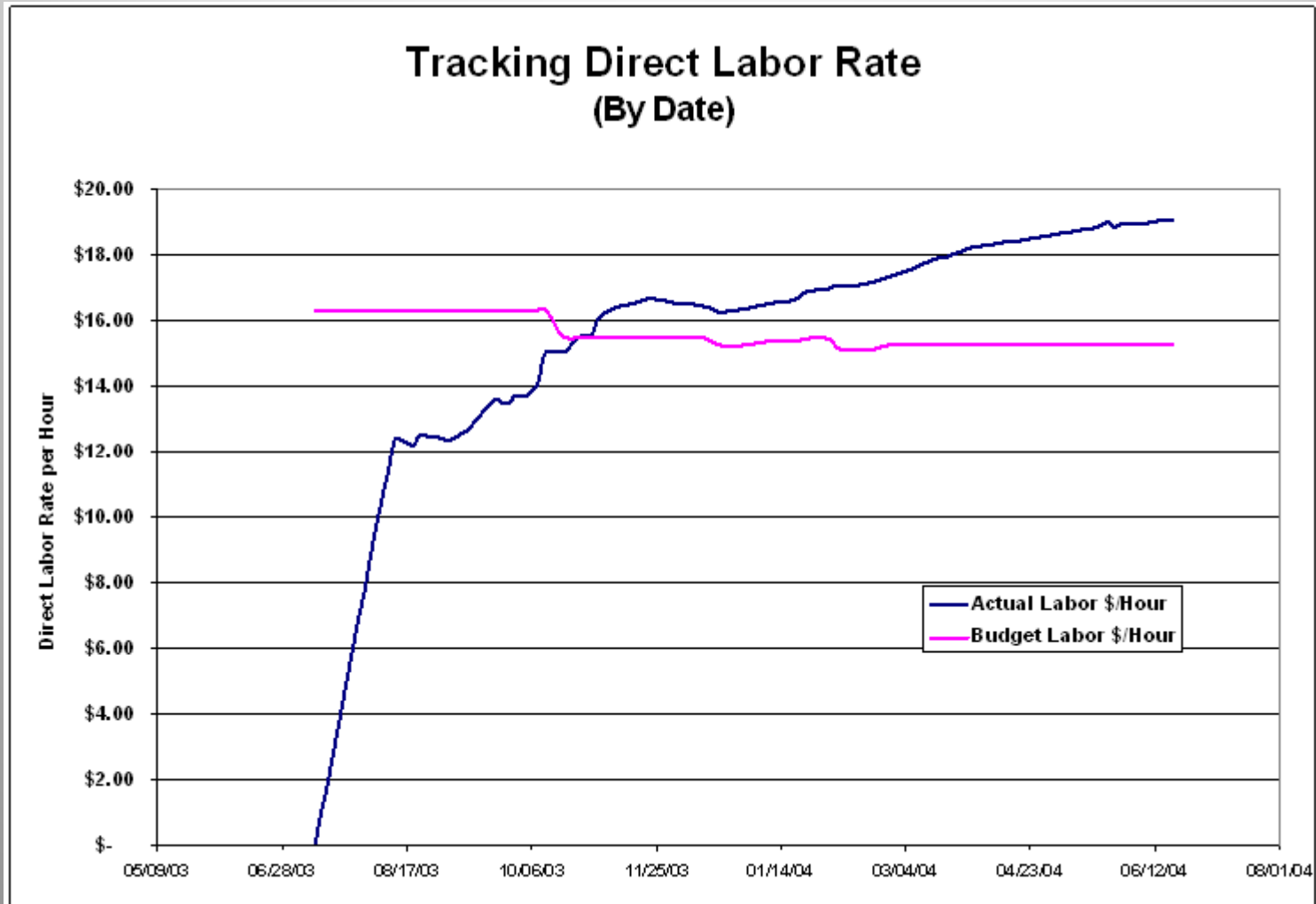
Tracking Labor Rate

Another view of cost performance can be seen by tracking actual labor rate against the project budget figure.

Tracking Direct Labor Rate (By Percent Progress)



Tracking Direct Labor Rate (By Date)



PERCEPTION summarizes performance at all levels of a project. The following presentations describe those that are critical to the management of any project.

- **Tracking progress and estimates at completion**: these reports track budget, earned value (BCWP), actual costs (ACWP), budgeted cost of work scheduled (BCWS), and estimate at completion (EAC), as well as cost/schedule variances and trends.
- **Measuring and summarizing work order performance** in terms of costs and schedules. The system can focus on any selection of work orders for in-depth analysis of detail performance.
- **Measuring and summarizing work center performance** in terms of costs and schedules. The system can focus on any selection of work orders for in-depth analysis of production process performance.
- **Measuring and summarizing cash flow requirements**. The system tracks cash flow requirements for labor, material & overhead. The system details commitments, receipts, and usage of direct purchase material, subcontract work, owner-furnished material and general stock

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