

Practical Dashboard Solutions for Dummies

**James C Johnston, PE, CSP
Vice President, Technical Services
Agilis Group Inc.
Titusville, NJ**

Introduction

“Facts are ventriloquists’ dummies. Sitting on a wise man's knee they may be made to utter words of wisdom; elsewhere, they say nothing, or talk nonsense, “

Aldous Huxley (English Novelist , Critic, 1894-1963)

Facts can be useless unless they are put into method to measure a system against criteria. The wisdom is in constructing a method which easily shows these metrics to achieve the desired results.

How can we expect management engagement in EHS activities when performance metrics are hidden or unrelated to other performance criteria? Management may not have ready access to indicators of EHS performance, EHS compliance and safety management system status. Many small companies with limited budgets recognize the need for more than lagging safety indicators (safety statistics) as the only measure of safety performance. Senior management is looking for an initial computer based overview of EHS performance with the ability to review more specific detail using online screens. The initial overview should show blended metrics: leading, lagging, compliance, and financial indicators of EHS performance in a simple visual presentation. There is a requirement for a flexible system for each site or department which can allow for changes each year to meet needs of the organization and show progress on objectives. There is also a requirement to roll up a site’s performance into a single consolidated metric. Similarly, EHS program performance indicators need to be rolled up for corporate wide consolidated metrics.

Multidimensional Dashboards Make Informed EHS Decisions

The use of injury and illness incident rates are ineffective as the sole metric of performance and can be the source of internal organizational conflict. If OSHA Incidence Rates are used as the primary metric then these are often seen as measure of failure. Relying on a single metric is problematic and just meeting a case rate target can corrupt reporting.

Key Performance Indicators: EHS

There are several methods to establish key performance indicators. Several companies review the established EHS management system programs and develop indicators based on successful implementation of selected individual programs. Many companies use an analysis of significant

incidents to develop prevention activities. The key performance indicators for these programs can be based on these root cause analysis factors. Examples of these indicators include those:

- Based on Company Vision – Policy- EHS Management System Programs
- Based on Incidents Root Cause Analysis Factors

Key performance indicators can be classed as leading, lagging, financial, or compliance.

The type of the indicator depends on the whether the indicator is monitoring an input to an activity or program or if it is the result of the activity or program. Here are some examples:

Leading Indicators: The question is: Is this a measure of an effective/efficient activity? A measure of key leading indicators is that they are predictors of output/ results to meet EHS objectives. An example is departmental job training: Number of employees trained. The limitations are: Identifying indicators involves development and implementation of a proactive program with needed resources and management commitment with systematic collection and analysis of the data.

Lagging indicators: These are the most common type, but are not an effective tool, by themselves, to evaluate EHS performance. Lagging indicator shows what happened in the past. It measures the results of EHS activity or inactivity. A major issue for environmental indices is to normalize the metric to operation's activity. Here are some examples: U.S. OSHA statistics: Annual Reduction in Water Used (Normalized to Production). The limitations: Since performance can be due to numerous factors with variances, developing improvement strategies based on lagging metrics alone, is generally reactive, and provides little information on the effectiveness of current activities.

Financial indicators: Financial indicators can be leading or lagging and need to be directly related to capital cost avoidance or ongoing operations cost containment. Projects that target EHS cost containment are normally part of environmental conservation and waste reduction efforts. Financial metrics can be: Leading or Lagging EHS metrics to assess functioning of EHS programs for cost avoidance. Examples would be capital project EHS review activity or workers' compensation cost containment. The limitations: Identifying indicators involves development of cost containment projects or activities that can be shown to save expenses

Compliance indicators: Compliance indicators are monitors of key regulatory or company requirements that show ongoing attention to the company's regulatory obligations. They can be leading or lagging indicators depending on the need to oversight compliance activities

Indicators can be developed for selected key regulatory compliance. In the US, this could be key indicators for OSHA selected requirement (lockout/tagout audits) or international requirement, i.e. UK COSH training. Here are some examples:

Regulatory: US, International regulations

Company: State, Worldwide criteria EHS policy adherence

Example: Environmental enforcement actions, along with fines paid

Example: Percentage of timely submission of routine regulatory report to the agency.

Types of Indicators

Indicators can also be described according to their type. Here are the type of indicators and examples.

Process: With a defined EHS program, the leading indicator monitors desired inputs. An example would be on-time regulatory submissions for waste water discharges.

Progress: From a baseline, measure and compare the efficiency and extent of improvement achieved over time. An example would be workers' compensation cost savings.

Metric Criteria

The use of indicators needs to be relative to an established goal, target or benchmark. These are typically set by management relative to their industry. Several companies use international recognized environmental indicators to include in their corporate reports to stockholders. Here are some sources of indicators and benchmarks:

Goal/ Targets References Benchmarks: ILO / UN, US BLS, US EPA, and other international government agencies, US NSC, Trade Associations, NGO

Corporate Citizenship:
GRI's Sustainability Reporting Guidelines

Too many indicators for a dashboard can detract from its utility. A confusing dashboard without grouping into underlying EHS policy or key emphasis programs loses management focus. Here are some examples of means to group indicators:

- Group Indicators
- Based on EHS Management System Elements
- Based on Company Emphasis

Criteria for a Multidimensional Approach

Establishment of key performance indicators requires the reporting system should be set up to have each department / site report on its progress/ activity or results. Each of the departments can input to its own reporting sheet within an Excel workbook. In turn, we can evaluate the performance of a program or activity within the department and we can evaluate the combined performance of the department for all the programs / activities they are responsible to conduct. The key performance indicators can be standard metrics to be used for all departments and sites. They can also be department specific metrics that are agreed to meet the company's EHS management system objects.

An Integrated Flexible Reporting System

The reporting system is key to any dashboard. Where there are departmental specific objectives, there need to be indicators rolled up into consolidated metrics for the programs, sites, or company. The utility of this approach is to combine indicator metrics of a department and a program into a simple site presentation for all the site departments and the entire site's key programs or activity

Integrating Metrics

The key to integrating leading and lagging indicator metrics is establish a relative weighing of each indicator metric at the lowest organization level (department). The relative weighting for each indicator is selected for the department with the sum of the weighting to be 100%. The scoring for the activity or goal performance indicator is a percentage completed against the target.

Weighted metrics for blended leading / lagging metrics: Therefore, the weighted score for each site department can be displayed on a dashboard for a section on department performance. Likewise, the mean score for the activity or program can be displayed on the same dashboard for a section on activity or goal achievement across all the departments. A useful means to organize this approach is to setup a matrix sheet with definitions. Here is an example of a matrix sheet (see Table 1).

<p><u>Management System Elements: Z10</u> <u>Section 3. Organizational Leadership/Participation</u> <u>Section 4 Planning</u> <u>Section 7 Management Review</u></p>
<p><u>EHS Committees</u> 1.1 Goal (Gen Mgr): Chair the weekly site EHS Committee Meeting to support compliance with applicable laws and regulations and oversight site EHS plan execution 1.2 Policy Value: Provide EHS direction and leadership to the site's EHS program 1.3 Weight: 10 % 1.4 Metric: # per quarter; 12 1.4.1 Satisfactory(green) > 90% of scheduled cumulative meetings conducted 1.4.2 Caution(yellow): 75% - 90% 1.4.3 Unsatisfactory:(red) < 75% 1.4.4 Acceptable/can be improved (white)</p>
<p>2.1 Goal: (Committee): Review Site Annual plan semi-annually to ensure staff execution of goals and objectives. Implement policy for EH&S goals to be at least 10% of staff's total goals. 2.2Policy Value: Provide EHS direction and leadership to the EHS program and demonstrate management commitment to occupational EHS excellence 2.3Weight: 20% 2.4 Metric: review completed in six months 2.4.1 Satisfactory(green) reviews completed on time 2.4.2 Caution(yellow): partial reviews completed on time 2.4.3 Unsatisfactory:(red) reviews not completed on time 2.4.4 Acceptable/can be improved (white)</p>

Table 1. Leading Indicators

Notice the example matrix sheet linked the indicator matrix to the EHS program or goal that is the policy value of the metric, the staff level and the recordkeeping required.

Developing Metrics for Your Group

The indicator matrix (see Table 2) will have metrics given by the company for all operations. There will also be metric indicators that are unique to the department but meet the objectives of the EHS management system or key objectives. Here is an example of this approach (Table 2):

Site	Metric 1	Weight Factor	Metric 2	Weight Factor	Weighted Score Histogram 1
Leading Indicators	EHS Committee Meetings		Audit Item Completion		
Site1	83	30	92	20	75
Site 2	92	30	92	20	90
Site 3	33	30	92	20	58
Site 4	83	30	92	20	75
Mean by Metric					
Histogram 2	73		92		

Table 2. Matrix Approach: Example by Programs and Departments

Combining all in metrics into a practical EHS dashboard can be shown in this example of a Practical EHS Dashboard Solution using Excel (Figure 1)

Example Dashboard : target and trend format



Figure 1. Dashboard Matrix

Using the embedded link capability in Excel, users can drill down to get the level of detail for any of the indicators on the dashboard. Latest performance can be accessible at all selected levels of the organization.

Dashboard Indicator Color Code- Goals. A color code is part of this approach to show the levels of performance on the dashboard. Here is an example (Figure 2) of a color code:

Dashboard Indicator Color Code

Trend Chart Result	Leadership Decision	Color Assignment		Metric Chart Result
Stable	Average is acceptable ...on target	Continue EHS system		At or better than goal
	Average is not Acceptable Close to trend transition point from green to red	Investigate -improve the EHS system		Below goal
	Average is acceptable, but can be improved Close to trend transition point from yellow / red	Investigate for potential common causes	Investigate for potential causes	At goal, but can be improved Close to falling below goal
Trend	Adverse-increasing rate	Investigate, take action		
	Improving-rate is trending to the target	Reinforce positive EHS system activities		

Figure 2. Color Coded Performance Metrics

Continuous Improvement: Safety Management System Objectives

Continuous improvement is a key objective in safety management activities. It is recognized that safety management is a process with numerous variable inputs and variable results. Safety Management Systems control the accident process. Results of a safety management system are subject to variable factors over time. The variance in results may be significant or not. By using the same data to calculate process statistics, the results can be shown on the dashboard using statistical process control techniques. The goal of the safety performance activity is to be at the desired target with minimum variation over time. These charts use normal statistical calculations for statistical process control method and the matrix moving range to generate the data for the chart. Continuous Improvement- Data Driven (Fig. 3)

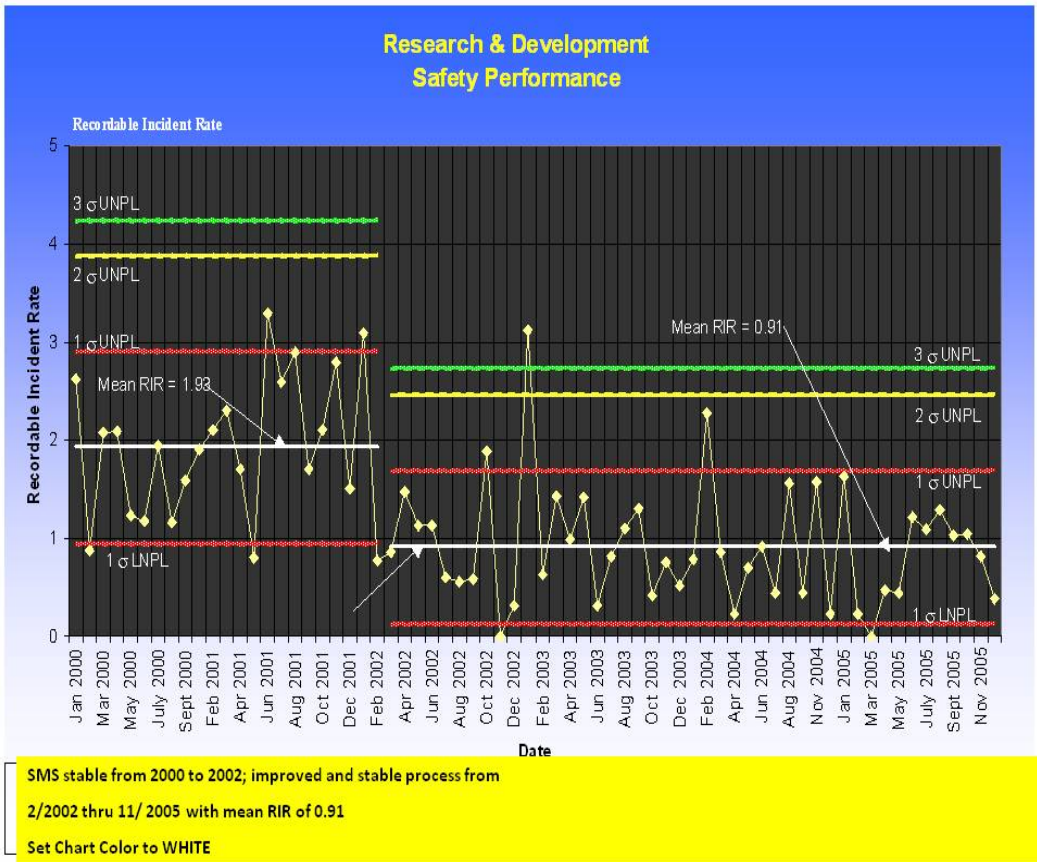


Figure 3. Safety Process Control Chart

Safety Process Charts/System Analysis: How to read the charts:

The key to these charts is shown in this table (Table 3) that gives the basic rules for detecting if there has been a significant change in the metric trend. These charts serve as the basis *for the determination if the trend is satisfactory and this determination is reflected in the change in color on the dashboard.*

<p>Rule One: Points outside the Limits: A single point outside the 3-sigma limit</p>
<p>Rule Two: Runs above the Central Line Eight successive values on the same side of the central line</p>
<p>Rule Three: Runs Beyond Two-Sigma Two out of three successive fall more than two sigma above the central line,</p>
<p>Rule Four: Runs Beyond One-Sigma When four out of five successive values fall more than one sigma</p>

Table 3. Process Change Detection Rules

By using these process detection rules, the safety performance trends can be evaluated. The trend may be stable or increasing or decreasing. The Dashboard Indicator Color Code (Figure 2) can be used to translate the trend into a color code for the dashboard. The goal is to have the EHS performance on target with minimum variation.

Therefore the dashboard can be used to show EHS performance for a goal and it can be used to show EHS performance trends, using the simple dashboard color code.

By using both set targets and process trends, these can be combined in the dashboard as shown in Figure 4

Example Dashboard : target and trend format

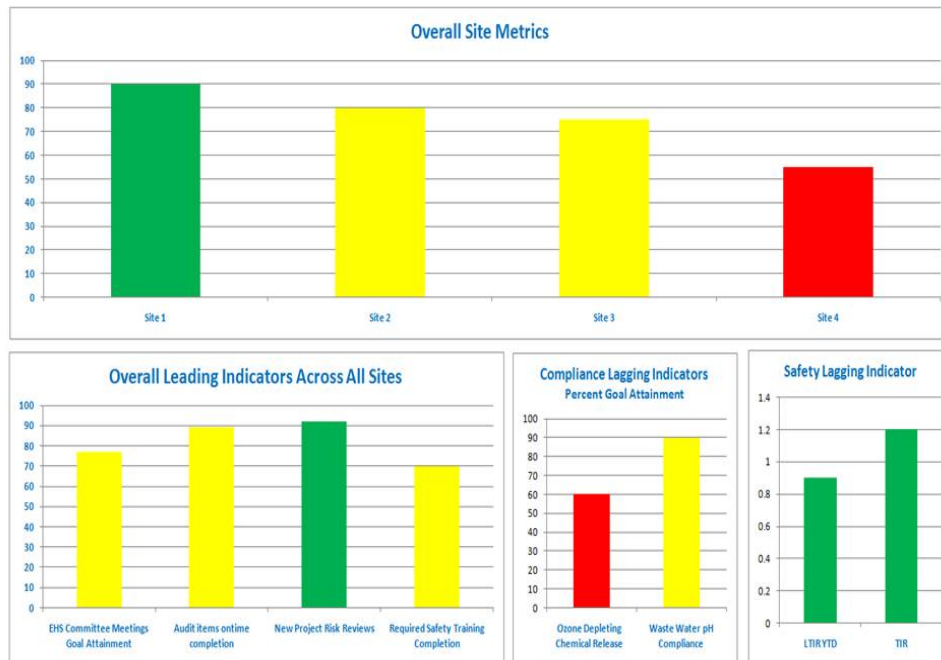


Figure 4. Combined Targets and Trend Dashboard Example

Metrics Must Reflect Priorities and Goals of the Business Unit

The indicator metrics must reflect the key business EHS vision and policy. They are the quantitative basis to establish credibility with the company and can meet basic goals:

- Getting New Product To Market Quicker,
- Minimize risk,
- Assure EHS compliance with regulatory / company requirements
- Minimize Operating Costs
- How will Improving EHS Metrics Make a Difference?
- Use of key performance indicator metrics can have useful role in your program:

Drive EHS Excellence by using Dashboards to Focus on Things That Matter

- Reduce Effort Spent on the OSHA Numbers
- Link Safety and Health Performance

- Closer to the Overall Business Strategy
- Enhance Ability of EHS to Compete for Resources Internally
- Improve Usefulness of Benchmarking

Conclusion/Summary

By selecting the key performance metrics for leading, lagging, compliance and financial indicators for analysis, the dashboard, like a ventriloquist dummy can be made to speak to management to deliver excellence in EHS performance. The types of indicators and the metric criteria need to be clearly understood and consistent with department and company EHS policy and goals. Metric and trend charts can be used for performance analysis to determine challenges and opportunities. The dashboard with multidimensional approach to programs and departments/ sites can give a real-time update on various management levels using the common Excel software platform. The various programs or activities can be weighted for aggregate score for the department and the activity and these scores rolled up to a consolidated dashboard for the company or division. Senior management can drill down to get detailed information as needed.

The dashboard, like the dummy, is no smarter than the EHS staff that helps develop the indicators and use the dashboard to easily and effectively communicate with other management staff to make ongoing informed EHS decisions.

Bibliography

- Eaton, G. and Little D. "Performance Metrics—Leading Indicators Deliver Sustainable Results," Proceedings of the 2009 ASSE Professional Development Conference, ASSE.
- Fearing J. , Freeman N., Garlapati A., and Yap E. "Developing Global SH&E Metrics to Meet Organizational and Regional Requirements." Proceedings of the 2009 ASSE Professional Development Conference, ASSE
- Furst P. "Lean Six Sigma – Innovative Safety Management." Proceedings of the 2008 ASSE Professional Development Conference, ASSE.
- Prevette,S. and Jackson, D. "Dashboards and Control Charts—Experiences in Improving Safety at Hanford Washington." Proceedings of the 2006 ASSE Professional Development Conference, ASSE.
- Prevette, Steven. "The Fluorboard—A Statistically Based Dashboard Method for Improving Safety," *Professional Safety*. May 2006
- Smith T. *System Accidents, Why American Are Injured at Work and What Can Be Done To Stop It*, 2008.
- Thinkexist.com, *Aldous Huxley Quotes* (retrieved December 14, 2009) (http://thinkexist.com/quotation/facts_are_ventriloquists_dummies-sitting_on_a/255789.html).
- Wheeler, D. 2000. *Understanding Variation, The Key to Managing Chaos*. SPC Press.