KEY PERFORMANCE INDICATOR (KPI)

VISUALIZATION TOOLS FOR LEAN MANUFACTURING FACILITIES

As a production process becomes more complex, the availability and exchange of information become more critical to the efficiency of the business. The correlation of planning, production, sourcing, distribution, finance and work force information in near real time is a proven way to empower both management and staff to reduce errors and increase production efficiency.

MAVERICK Technologies' KPI Dashboard is a set of robust tools that employ a Web-based platform on which a wide range of production data, reports and other key information can be visually conveyed to employees from the production floor to the boardroom. The MAVERICK dashboard visualization applications provide access via the Internet/intranet and can include closed circuit video display (visual factory).

A fundamental requirement for a KPI Dashboard project is the development of a comprehensive functional description to define:

- Data inclusion requirements
- Data sources
- Data visualization types
- Detailed report definitions

The development of the functional description is performed during a preliminary study in which MAVERICK's engineers and plant personnel work together to ensure that the final product conveys the critical key performance indicator (KPI) data in a meaningful and intuitive way. During the course of the study, the current processes and metrics used to track production are mapped, streamlined and simplified prior to automation. The KPIs will be further detailed from a top-down perspective (plant manager down to production supervisor) and then aligned with plant operations from the bottom up (production supervisor up to plant manager). This alignment of KPIs is used to produce a balanced and consistent window through which the business operation can be viewed.

MAVERICK TECHNOLOGIES

engineering | systems integration | consulting

The study will focus on a detailed definition of the following major functional aspects of the application:

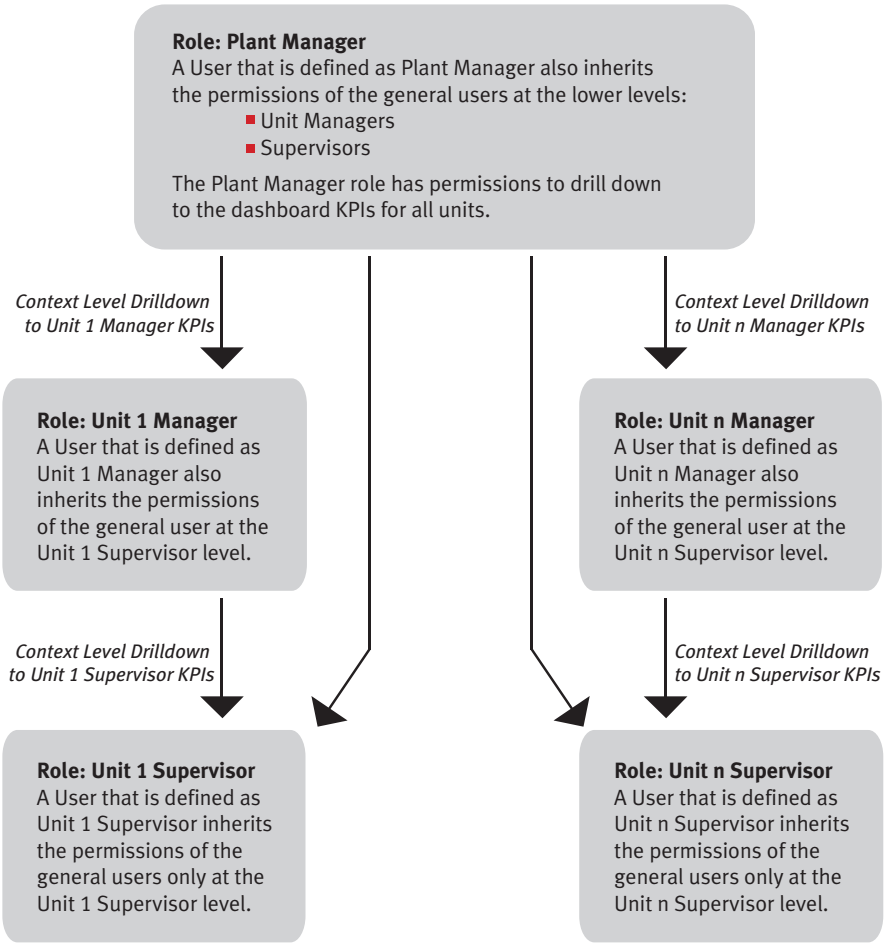
Identify the KPIs.

The KPIs will be used to gauge production at a glance. KPIs must reflect the organizational goals and be quantifiable with existing data or combinations of existing data. KPIs must be key to organizational success. In selecting KPIs, it is critical to limit them to those factors that are essential for the organization to reach its goals. It is also important to keep the number of key performance indicators small, in order to focus everyone's attention on maximizing the same KPIs.

Identify the user roles (audience) and their access to information.

The information displayed on the dashboard is specifically relevant to the type of user viewing it. The plant manager needs to see metrics that show how the entire operation is functioning; this view will incorporate information from all aspects of the business. Unit managers and operations personnel will need to see specific subsets of the information available to the plant manager that is relevant to their position.

Each level of user generally has access to information at his /her level and those below. This diagram illustrates the role relationships.



Define KPI variance notification rules.

Users can be notified via e-mail when KPI variances occur. The rules governing the configuration of remote notification capabilities will be defined during the study.

Identify data deficiencies.

In some cases the data required for the formulation of a KPI may not be available from the plant floor production system. Some common examples of data deficiencies are downtime tracking and manpower performance. In order to fully realize the benefits of the dashboard / visual factory system, these functions may need to be added as part of the overall project implementation phase.

Identify the data composition of the KPIs.

It must be determined whether the individual KPIs will consist of single or composite data elements. In either case, the specification for each distinct data element will consist of descriptive attributes, including source, structure, type, scale and unit of measure. In addition, composite KPI definitions must include the operation(s) that are to be performed on the data elements in order to arrive at the desired KPI.

Identify the data sources from which the KPIs are derived.

The data to be used in the display of the KPIs can come from multiple sources. These sources can include databases, spreadsheets, text files and manually entered data. Each source and its associated location, accessibility, entry method (automated or manual), security and administration must be identified.
In addition, any potential for additional overhead (network, database, processor) caused by the KPI data acquisition should be identified. A data matrix will be developed jointly by MAVERICK and plant personnel.

Define the refresh rate requirements for each KPI.

The data refresh rate for each KPI must be determined. Some values may need to be updated or totalized on hourly, daily, weekly, monthly or yearly boundaries. The data required to perform historical comparisons and trends on KPIs for dashboard visualization purposes usually need to be aggregated in a dedicated dashboard database. The depth of this data and the administration of the database must be defined in this phase.

Define the visualization type for each KPI.

The data can be displayed in a pie, trend, chart, graph, gauge, tabular or video format. The desired format for each KPI display and associated titles, headings and groupings of data must be defined. The dashboard graphic page(s) will be developed from the results of this step.

Identify the reports that are to be generated.

The data definition requirements for the dashboard KPIs and the reports are the same; therefore the items listed above apply to reports. Other considerations specific to production reports that must be defined are:

- Frequency of generation
- Formatting
- Printing requirements
- Archiving requirements

Consider the usability.

The following items will need to be addressed prior the software design phase:

- Reliability and access
- User customization (add / delete / modify reports, etc.)
- Monitor locations and types (for screen sizing considerations)
- Number and types of users
- Menu organization (hierarchy)
- Special user considerations (color blindness, dark environment, bright environment, etc.)

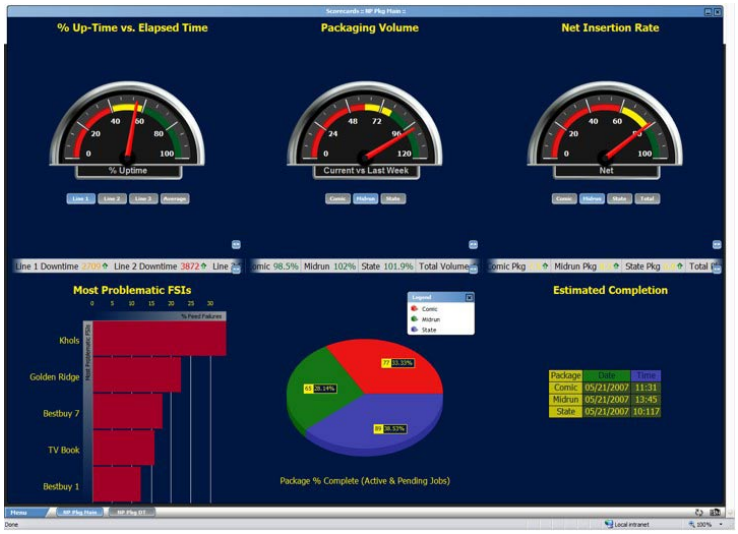
Examples of MAVERICK's Dashboard Applications.

The balanced scorecard approach to KPI categorization is generally accepted as the starting point in aligning KPIs for a lean manufacturing environment. The balanced scorecard is a concept for measuring a company's activities in terms of its vision and strategies and to give managers a comprehensive view of the performance of the business. The key element is to focus not only on financial outcomes but also on the human issues that drive those outcomes so that organizations focus on the future and act in their long-term best interest. An example of the KPI groupings using the balanced score approach is SQCD, Safety, Quality, Cost and Delivery.

This is an example of a balanced score card dashboard from the perspective of the plant manager. The power of the application lies in its ability to notify the plant manager via e-mail when a KPI has crossed into an undesirable range and to provide drilldown to more granular information for root cause analysis. This application was designed and implemented for a leading worldwide producer of soy protein.

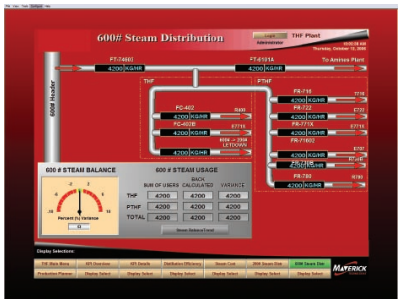
The following two screens were developed to show how a newspaper packaging dashboard may be configured.

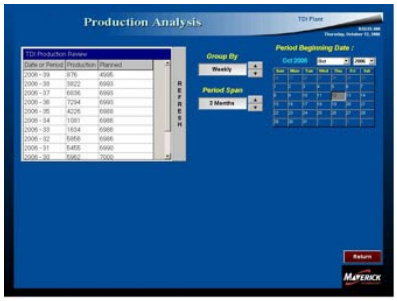
The first screen shows the top level of a packaging manager's dashboard.

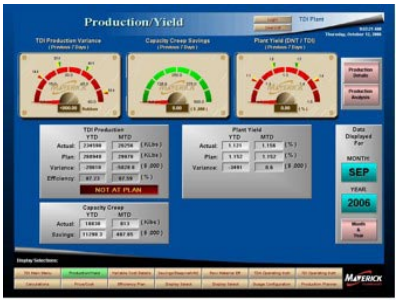


This screen shows the packaging manager's drilldown view into a downtime analysis screen. The context linking between the individual charts facilitates at-a-glance correlation of the information.

The following four screens represent a process-oriented operator's dashboard. This application was designed and installed for the world's leading chemical company.







For more information on MAVERICK Technologies' KPI visualization solutions, contact:
R. Tim Gellner, Director, Operational Consulting, 600 University Office Blvd., Pensacola, FL 32504,
Phone: 850.291.6869, E-mail: tim.gellner@mavtechglobal.com

MAVERICK Technologies is a next-generation engineering, systems integration and operational consulting firm. We deliver innovative solutions for a wide range of manufacturing and process clients, leveraging our extensive network of skilled employees deployed from regional and international locations.

Our talented staff is dedicated to helping our clients break away from the business inefficiencies they face. We deliver profitability improvement — individually in plant automation, performance management and business systems, and holistically by integrating knowledge across the enterprise.

MAVERICK Technologies, LLC
265 Admiral Trost Road | P.O. Box 470 | Columbia, IL 62236 USA
+1.618.281.9100 | Fax +1.618.281.9191
www.mavtechglobal.com

MAVERICK TECHNOLOGIES
engineering | systems integration | consulting

SP003 | 02/08