Management Practices and Technology for Mining, Process and Discrete Manufacturing decision makers

May 2007

R24.00

MMS mag

ISSN: 1818-2380 MMS Mag

Best-in-class benchmark study — Food & Beverage packaging operations

Strategic Asset Management

Food & Beverage packaging operations

Best-in-class benchmark study

Manufacturing enterprises gain competitive advantages when they focus on operational excellence initiatives like Six Sigma, Lean Manufacturing, Total Productive Maintenance and other continuous improvement methods. They set goals to unlock capacity and reduce inventory and labor costs, while increasing productivity without additional capital investment. Leading manufacturers meet these goals by identifying and measuring key performance indicators (KPIs) within and across facilities on an ongoing basis.

FROM May to September, 2006, Informance studied 141 food and beverage packaging lines worldwide. Researchers used The Informance Enterprise Manufacturing Intelligence Suite (including patented analytics), and IMPACT Advisory Services to collect data, derive insight and discover correlations to operational success of tactical and strategic actions.

"Best-in-class organisations excel in OEE, operational availability and asset utilisation."

By John Oskin,
Executive Vice President – Professional Services, Informance International

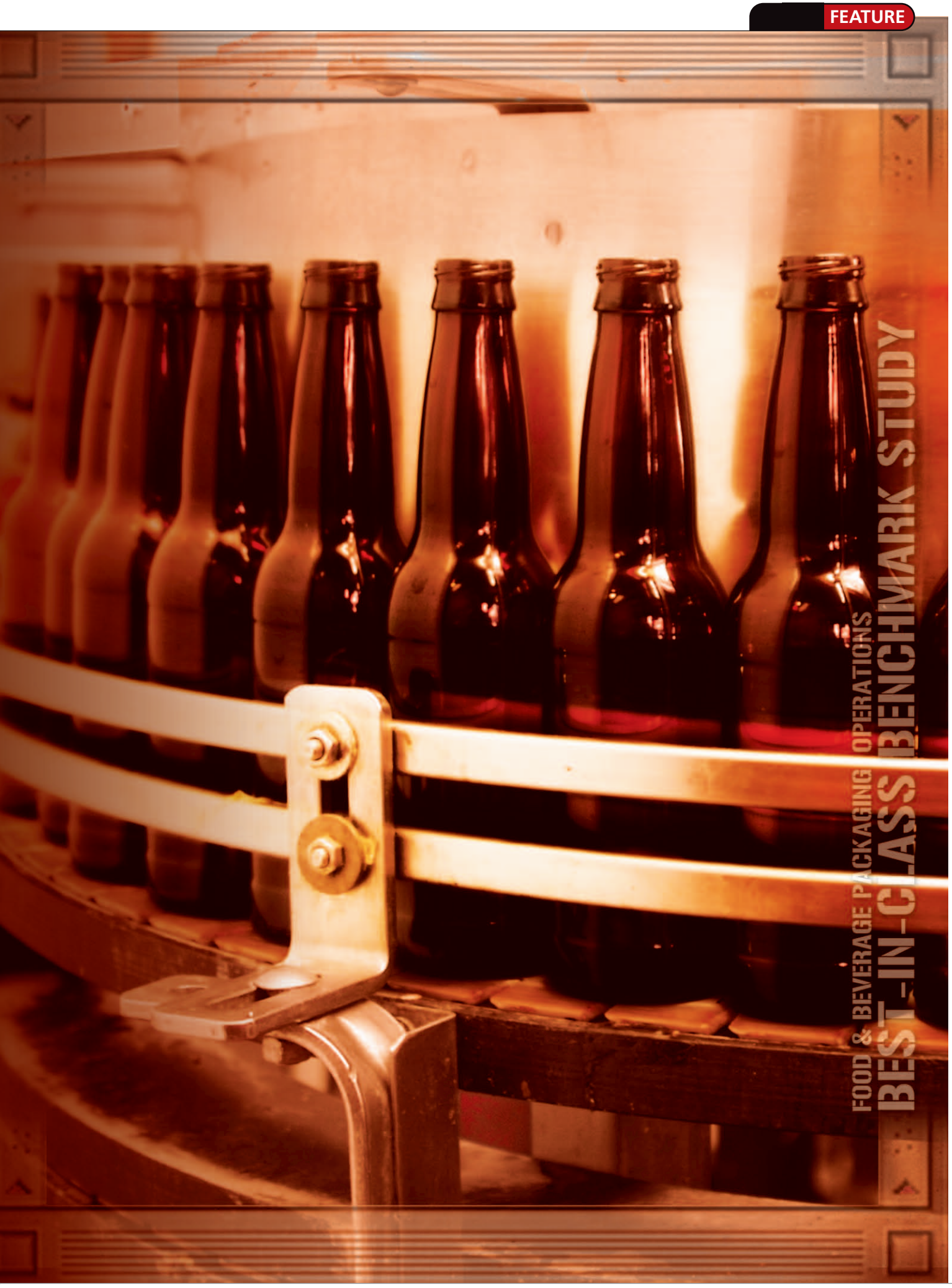
Key findings

- Best-in-class manufacturers are 22% more productive by identifying manufacturing losses at a rate 45 times greater than laggard manufacturers.
- Typical plants in the food and beverage industry average more than 87 000 "short duration" line interruptions per year.
- Best-in-class manufacturers approach 80% Overall Equipment Effectiveness (OEE) with asset utilisation rates as high as 97%.

Best-in-class differentiators

Best-in-class organisations excel in OEE, operational availability and asset utilisation. There is a wide performance gap in each KPI category from best-in-class to laggard manufacturers *(Figure 1)*. Best-in-class enterprises break down and analyse OEE components by availability, performance, quality, assets and product type. By reducing the impacts of changeovers and turning products very quickly, the best-in-class organisations quickly meet customers' ever changing needs, and therefore build competitive advantage.

Figure 1: Top KPI Differentiators for best-in-class



FOOD & BEVERAGE PACKAGING OPERATIONS BEST-IN-CLASS BENCHMARK STUDY

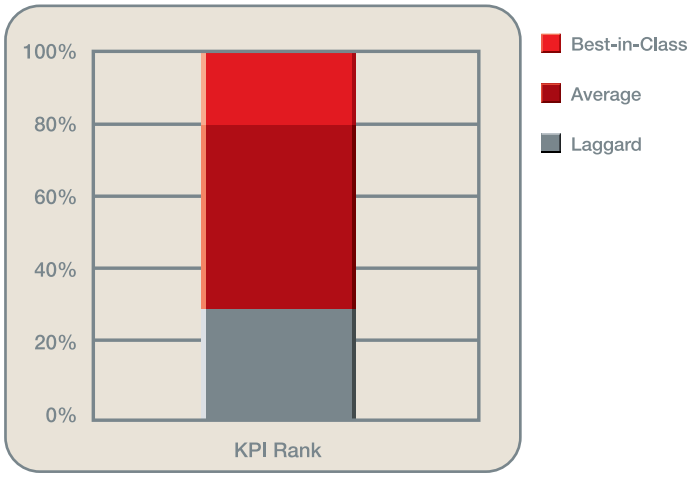


Figure 2: Competitive Position by KPI Rank

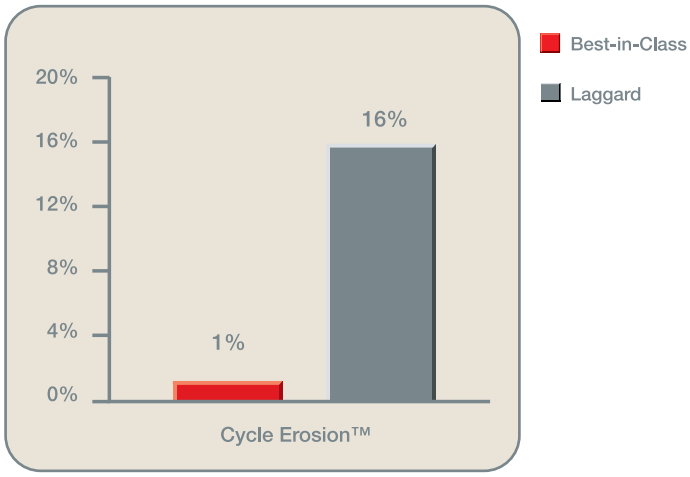


Figure 3: Cycle Erosion™

Definition of best-in-class

To determine an organisation's competitive position, we rank each key performance indicator from best score to worst score. The top 20th percentile represents best-in-class organisations, the middle 50th percentile represents average, and the bottom 30th percentile represents laggards *(Figure 2)*.

Cycle Erosion™

Cycle erosion represents performance loss from minor stops, hesitations, reduced speed and operator fatigue. Researchers calculated the cycle erosion index by applying standard rates to all parts produced. The standard rates are calculated in units per hour to ensure that the performance rate applied is a sustainable goal and not a short burst or anomaly of productivity. The lost opportunity in the index is the amount of time or parts lost because a machine is not operating at peak output capability.

"A strong practice of best-in-class performers is deep and granular knowledge of capacity."

Best-in-class manufacturers experience only about one percent performance loss while laggards experience speed losses up to 15.5%. This gap reveals that laggards suffer heavy cycle erosion from inefficient production processes. To reduce cycle erosion operations management must develop strategic plans to target the minor stops and equipment failures typically associated with the reduction in performance. Food packaging operations with high cycle erosion (greater then 30%) should consider alternate configurations for production lines or facilities and setting standardised methods for flow of raw materials.

Knowledge index

A strong practice of best-in-class performers is deep and granular knowledge of capacity. By knowing what is happening with capacity — available, not available, down for specific reasons, and all others — organisations are able to prioritise and reduce losses. Top performers in the food and beverage industry are able to identify a reason for all but 0.46% of their lost capacity while laggards fail to record up to 21.12% of their capacity losses. This "knowledge" gap places laggards at a serious disadvantage when preparing to implement improvement initiatives and identifying root cause failures. Best-in-class manufacturers report their KPIs more frequently. The majority of laggards report on a monthly basis while the best-in-class report KPIs on a daily or weekly basis. It is the responsibility of management and the workforce to create a company culture that vigorously attacks the production issues utilising the tools available.

To illustrate how large this gap is, the table below *(Figure 5)* represents an average 120-hour work week. The amount of unknown capacity is approximately ½ hour, ½ day or over 1 day, respectively for best-in-class, average and laggard organisations.

Big Six losses

Informance researchers have defined a set of loss categories for the food and beverage industry based on best practices from TPM practitioners. Best-in-class organisations have mastered the Big Six losses and exhibit a large delta over laggards in each area *(Figure 6)*. By adding up the Big Six losses, we see these losses are a cumulative 3% for best-in-class companies, while these same losses add up to 71% for Laggard performers.

The leading causes of downtime in food and beverage operations are process failures, equipment failures, and changeovers. The best-in-class manufacturers manage to control process failures to less than one percent while the laggards experience over 17% lost time.

Figure 5: Lost capacity hours

	Total Production hours per week	Unknown Capacity	Hours lost to unknown
Best-in-class	120	.46%	.6 hours
Average	120	10.57%	12.7 hours
Laggard	120	21.12%	25.3 hours

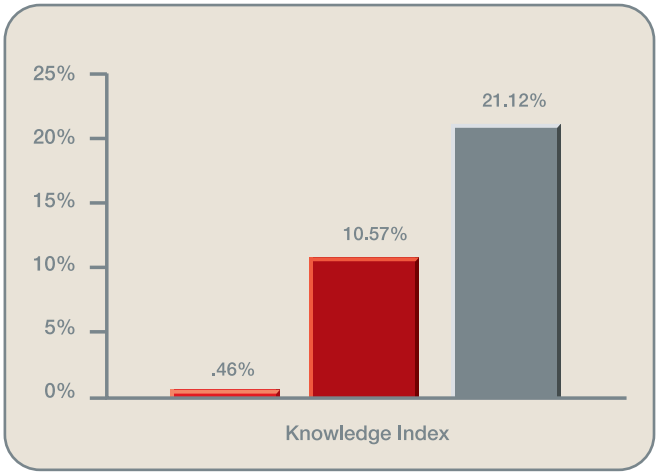


Figure 4: Knowledge Index

Laggards spend seven times the amount of time on equipment failures than the leading manufacturers and they lag behind the average by almost double. The smallest average loss category is production adjustment which accounted for 2% of scheduled hours. The gap between best-in-class and laggards represents the dramatic difference in the operational process and ability to avoid and resolve breakdowns and production issues.

How do the researchers define and categorise the Big Six loss areas?

Shutdown
Shutdown losses include preventative maintenance, breaks and lunches, training exercises, and other miscellaneous production stops.

Operational Down Time
Operational downtime includes adjustments or related equipment losses that are not direct failures during scheduled run time.

Changeover
Changeover downtime includes capacity lost during changes in material, equipment, or product.

Equipment Failures
Equipment failures incorporate the time lost when equipment unexpectedly becomes dysfunctional or inoperable.

Process Failures
Process failures include the loss from changes in defective raw materials, operating errors, spills, and supply of key packaging material.

Production Adjustments
The production adjustment losses include time spent on changes in supply and demand that required adjustments to production plans.

Case study

A food division of a large global consumer products company had challenges in the areas of fulfillment (achieving schedule attainment for customers), poor asset utilisation, and higher-than-industry-average costs. The firm developed a plan to leverage enterprise manufacturing intelligence (EMI), record KPI benchmarks first in their highest profile facility and then across the entire plant network, and chart a plan for improvement against the KPIs. Management suspected that the performance issues were the result of problems with a few key assets, like fillers and cappers, and they intended their approach to justify capital investment to replace certain assets.

The initial benchmark results took them by surprise. They discovered that the root causes of the performance issues were not the few assets, but rather a combination of frequent short line stops caused by packaging material replenishment and high changeover rates. The network management team decided to focus on eliminating the short duration stops and reducing changeover time.

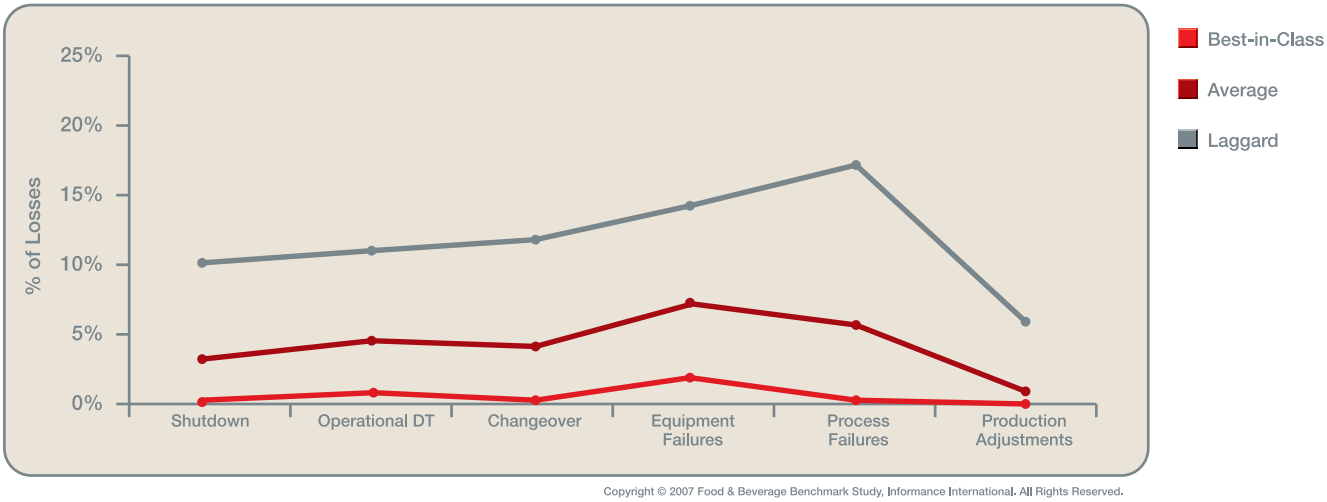


Figure 6: Big Six Losses

At the same time, the improvement team set out to benchmark and investigate the causes of performance loss at each plant throughout the network of more than 20 facilities. They wanted to understand if each plant mirrored the production issues of the first, or if causes varied from one plant to the next.

"The characteristics that differentiate best-in-class enterprises from average and laggard performers are visibility of key metrics, more frequent measurement of those metrics and an understanding of the financial impacts of change — positive or negative."

In this case, causes were similar and process adjustments were propagated throughout the network. After the initial benchmark process, each facility continued to collect KPI results continuously for ongoing improvement. Each plant in the network reported almost immediate production improvements, and after the first year the business reported the following consolidated gains:

- Increased schedule attainment by 5% (even after consolidating plants)
- Performance – reduced minor stops by 33%
- Cost reduction – reduced cost per ton by 7%

A holistic approach to improvement

The characteristics that differentiate best-in-class enterprises from average and laggard performers are visibility of key metrics, more frequent measurement of those metrics and an understanding of the financial impacts of change — positive or negative. Average and laggard performers should increase understanding and visibility of losses, frequently measure the impact of process change on KPIs, and institute processes to quickly react to KPIs that deviate from acceptable levels.

Based on the large gap in Big Six losses between best-in-class and laggard organisations, a simple first step for laggards is to measure and monitor these loss areas to determine the problem areas in their own operations.

Operational and shutdown losses

Best-in-class manufacturers see tangible gains on unit labour costs, lead times, and capital avoidance by reducing operational downtime and shutdown losses. Cutting operational losses translates into higher output and revenues while reducing the unit labour cost of production. Eliminating wasteful time in the process means a reduction in lead times and improvements in customer satisfaction ratings. The improved process increases the capacity of a manufacturer and relaxes the need for additional equipment or labour.

Efforts to reduce operational and shutdown losses have a high probability of success. It is possible to achieve a 50-75% reduction with up to a 75% probability of success. In some cases, an entire loss subcategory can be eliminated by changing a practice. For example, many companies are recognising that staggering break and lunch intervals or eliminating them with relief crews can be very effective.

Changeover

Lean practitioners focus on changeover reductions to improve flexibility and produce smaller, more frequent batches. These improvements result in more level throughput and reduced inventory and lead times. World class manufacturers work on single minute exchange of dies (SMED), or performing changeovers in less than ten minutes. A manufacturer capable of rapid changeover can eliminate millions of dollars tied up in inventory. The cost of stocking large inventories can not be balanced by producing long "economic" runs. The increased flexibility from SMED means reduced backlog costs and more reliable on-time shipments.

Efforts to reduce changeovers have a high degree of success. Once reduced, typically by procedural or equipment changes, the reduced changeover time is sustainable. When evaluating improvement opportunities, both short and long term objectives should be considered.

Equipment Failure

Equipment failures impact a business by reducing output and increasing maintenance costs. Manufacturers experiencing equipment failures rely heavily on operators and maintenance teams to fix issues as they arise. While it is important to

About the author

John Oskin has more than 20 years' experience in manufacturing, lean manufacturing, design for manufacturability and six sigma methodology. Oskin spent 12 years driving manufacturing excellence at General Electric, where he doubled the output of one facility and influenced GE improvement initiatives globally. In 1995 he leveraged his reputation as a thought leader in manufacturing performance and founded FactoryWare, a company dedicated to helping global manufacturers improve line performance. He grew FactoryWare into a leading enterprise manufacturing intelligence firm, known today as Informance, an acknowledged leader in helping manufacturing companies accelerate operational performance initiatives, drive operating strategies for manufacturing performance. John remains with Informance as a guiding presence and to give customers and the manufacturing community access to his broad expertise. A graduate of the University of Louisville in mechanical engineering, Oskin publishes benchmark study reports by manufacturing industry every 18 to 24 months.