

# FOR **news** A C H A N G E

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IN THE SPOTLIGHT:

## Case Study: Reliance Industries Wins Silver at International Team Excellence Competition



We're pleased to launch a new series of case studies with this "In the Spotlight" article. Each of these reports will share the real-life experiences of teams that participated in the 2004-05 International Team Excellence Competition. The Gold Award-winning

team's story appeared in the summer issue of *The*

*Journal for Quality and Participation*. The remaining articles will appear in *News for a Change*.



Reliance Industries Team Excellence Silver Award Recipients (left to right): Rohit Agrawal, Neeraj Dhingra, Sandesh Kadam, S. Aravindanath, and J.S. Sekhon.

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Reliance Industries Limited is India's largest private-sector company and a major player in the Indian petrochemical sector. Reliance Industries was founded in 1977 by Dhirubhai H. Ambani (1932-2002). He was a leader of indomitable will and commitment who started his career as a small-time trader in Mumbai and went on to build the Reliance Group into a Fortune 500 global company. In his relentless pursuit for perfection, Ambani created Reliance's most valuable asset—an unparalleled commitment to growth.

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**The latest on bringing business to life and life to business.**

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Today the management team is headed by Shri Mukesh Ambani, chairman and managing director, and Shri H. S. Kohli, executive director and head of the Hazira manufacturing division. They are focused on fulfilling the needs of various stakeholders (customers, employees, society, and shareholders) through excellence in systems, processes, technology, and people and to the fulfillment of the corporate vision, which states:

“Create value for the nation by offering competitive goods and services in the materials and energy value chains.”

With vertical integration of its chain of products from textiles to refinery, Reliance is a unique company with its ability to produce fabrics from crude oil. Reliance is the world's largest polyester producer with manufacturing facilities at eight domestic locations and four overseas locations, and a worldwide marketing presence in 58 countries.

### Performance Improvement System With People Engagement

In a competitive business environment it is essential to continually harness employees' creativity and innovation, adopt the best practices in-house, take up scientific breakthrough strategies through quality improvement tools, and develop robust processes. The Hazira manufacturing unit has spearheaded and adopted world-class practices to bring focus to performance improvement.

Beginning in 1991, the company moved toward transforming into a quality organization with quality people. To sustain the quality journey, various strategic measures were implemented through the plan-do-check-act (PDCA) approach.

The company has utilized ISO 14001 (since 1999) and OHAS 18001 systems (since 2004) to achieve continual improvement in processes and performance in its health,

safety, and environmental programs. The PDCA cycle involves policy making, planning, implementation and operation, checking and corrective action, and management review for continual improvement. All businesses at Hazira have been certified to the quality management system ISO 9001:2000 (since 1995).

In addition to conforming to international standards, Reliance Hazira has adopted a Total Quality Management (TQM) philosophy to achieve continual improvement in all spheres. A synergistic approach with TQM and ISO standards is practiced by following the guidelines of ISO 9004:2000.

A very significant aspect of our TQM activities is promoting the involvement of shop floor employees in improvement activities. This is achieved through quality circle activities. Reliance Hazira is an institutional member of the Quality Circle Federation of India. Since 2000, our quality circles have won state, national, and international awards for exemplary work. In 2003, Reliance Hazira won the QCFI National Trophy for “The Best Company Promoting Quality Circles.” In addition to winning the Silver Award in the ASQ Team Excellence competition this year, Reliance also won the silver at the International Convention on Quality Circles in Singapore.

As an extension of TQM practices and to achieve breakthrough improvements in processes and bottom-line results, Reliance Hazira embarked on a Six Sigma initiative in the year 2001. To address process variation the company adopted Six Sigma methodology as the common performance improvement methodology on a corporatewide scale. An organizational transformation is now under way to look at the business objectives, core processes, effectiveness, and efficiency parameters, and to improve the sigma level of critical processes. A fully functional intranet portal is utilized for tracking Six Sigma projects.

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Reliance “Polyester Fiber ‘b’ Color Control” was one of the critical processes taken up in 2003 for breakthrough improvement by following the structured DMAIC approach of Six Sigma. The define, measure, analyze, improve, and control phases of the DMAIC model align well with the Team Excellence criteria.

## Evaluation Criteria One: Project Selection and Purpose

The project selection and purpose step of the Team Excellence Award criteria aligns with the define and measure steps of the DMAIC model.

The global textile industry had been affected by a chronic problem of shade variation in fabrics, arising out of variation in “b” color and UV glow of fiber. These defects make the fabrics unacceptable to consumers and prevented Reliance from exporting the fibers to overseas customers.

Spectrophotometers are used to measure “b” color, or yellowishness, which indicates the presence of impurities or the process degradation. When seen under ultraviolet light, fibers with high “b” color values glow, whereas normal “b” color fiber does not. Product with unacceptable “b” color measurements

is downgraded. The primary objective of this improvement project was to reduce product downgrades from 23% to 5%.

A cross-functional team comprised of production, engineering, technical, and quality control staff conducted the project. This team also interfaced with a similar cross-functional team comprised of business, marketing, sales, and customers. The systematic approach of DMAIC under Six Sigma methodology was utilized for reducing variation and achieving improvements.

As a part of a business process management system, critical processes were modeled. SIPOC diagrams were developed for all the processes describing the suppliers, inputs, transformation processes, outputs, and customers and their requirements. This provided the basis for identification of customer “critical to quality attributes” (CTQs). A cross-functional team rated CTQ elements on 1 to 10 scale; the higher the rating, the higher the criticality. Figure 1 shows the Pareto analysis of these ratings, signifying the vital few output variables (fiber “b” color and UV glow) among the useful many.

A matrix diagram was developed for showing the involvement of various stakeholders in the process of criteria identification, criteria evaluation, projects identification, and projects evaluation. The stakeholders also ascertained the impact of project implementation on their respective busi-

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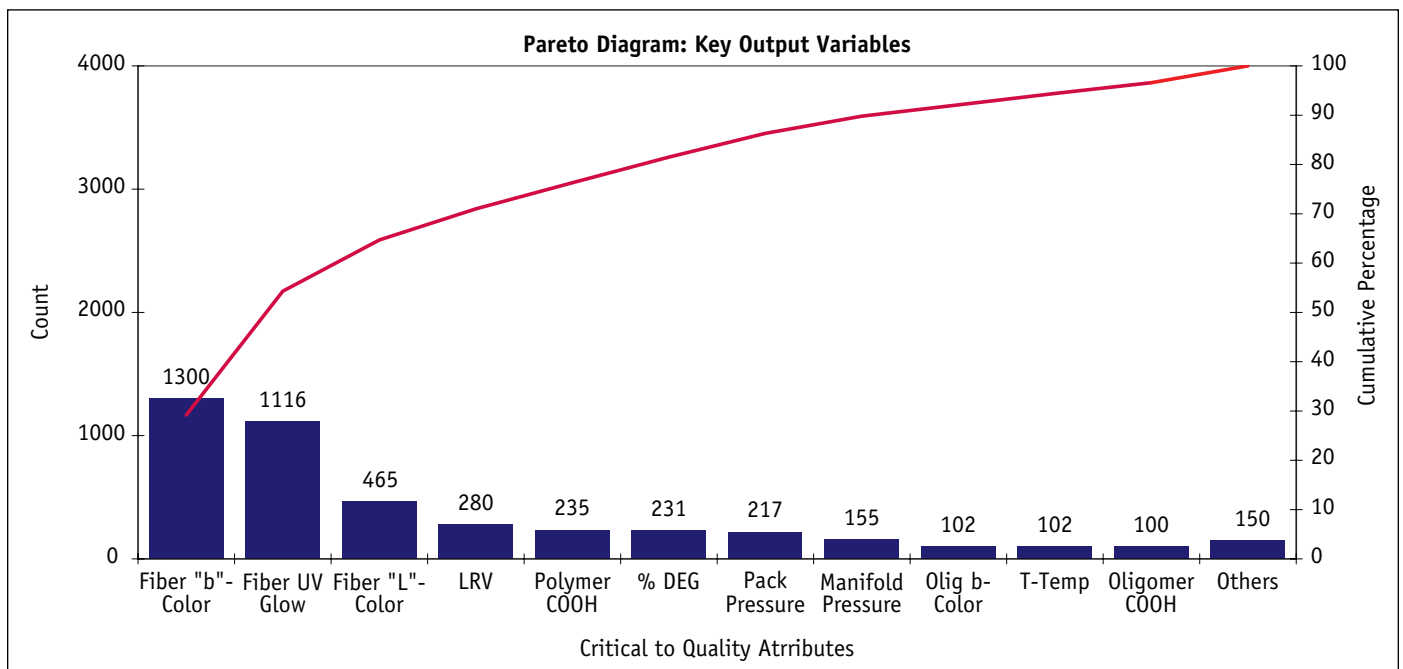


Figure 1

# Case Study continued from p. 3

nesses. The organizational goals affected by this problem were identified. These core objectives, as derived from the corporate vision-related strategies, were customer satisfaction, reliability, growth, profitability, and employee satisfaction.

The potential impact of high “b” color on stakeholders included:

- Low profit margin and global sales loss.
- Customer loss/poor customer satisfaction.
- Quality loss.
- Poor reliability of product.
- Increased cost of production.

In the case of external customers, the biggest impact came as customer dissatisfaction and large costs related to customer-complaint resolution.

The fiber product downgrade trend was plotted for a period of three years with a 23% average occurrence attributed to high “b” color. Process capability studies were conducted for all critical quality and process parameters, showing high

defects and low capability; “b” color not only remained close to the upper specification limit but had a substantial number of occurrences outside that limit, and the spread was too high.

The following critical objectives were based upon the process capability studies:

- Reduction in downgrades by 75%.
- Increase in profit margin by 3.5%.
- Improvement in sigma level and process capability by 30%.
- Revival of expansion projects, currently on hold, to enhance production volume.
- Reducing in-market complaints to zero—an extremely ambitious target.

## Evaluation Criteria Two: Current Situation Analysis

The current situation analysis step of the criteria aligns with the analyze step of the DMAIC model.

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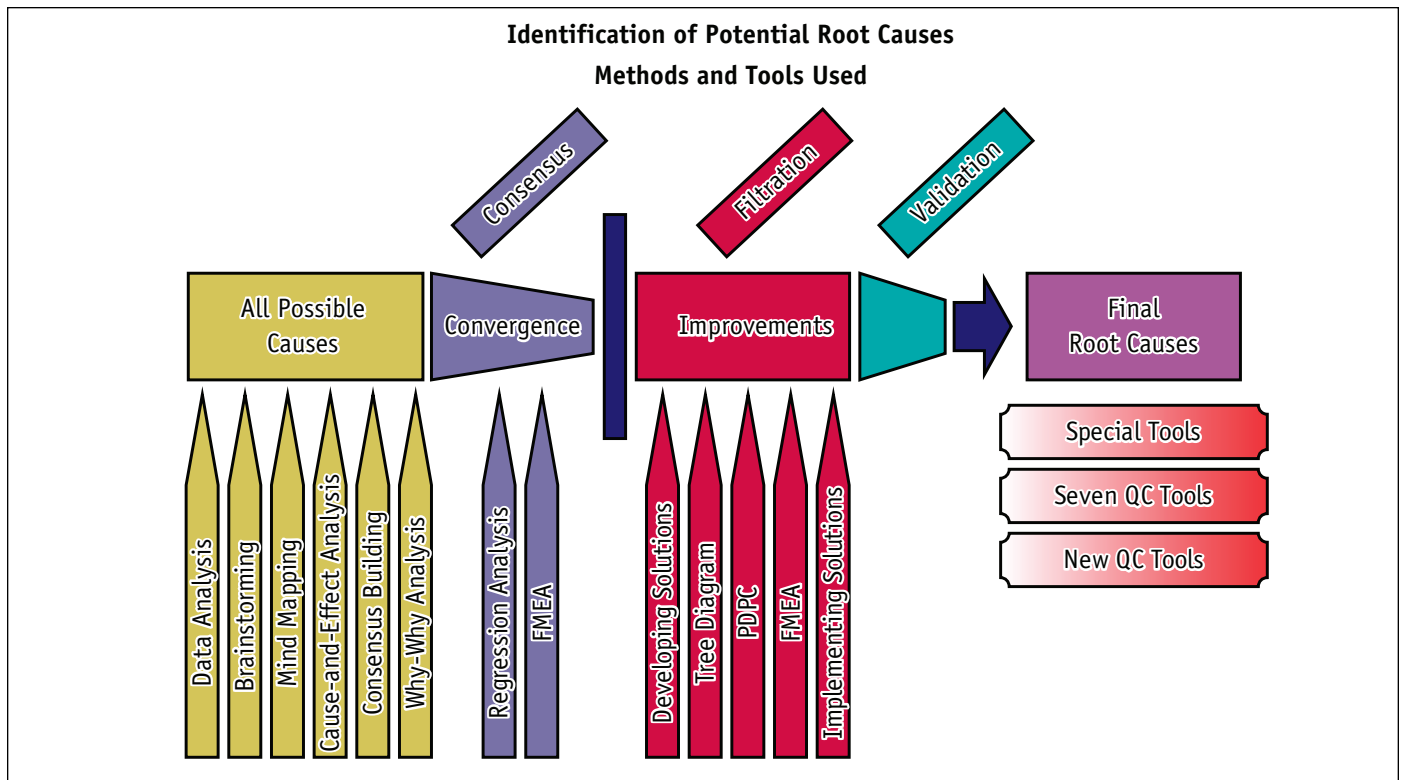


Figure 2

## Case Study continued from p. 4

In the fiber manufacturing process, the raw materials, terephthalic acid and monoethylene glycol, are processed to produce polymer. This polymer is extruded and quenched in the spinning section to produce filaments, which are stretched, heat set, crimped, and cut to desired lengths in the draw-line section. This process was analyzed to determine potential root causes for the “b” color defects.

Figure 4 shows the typical model of root-cause analysis followed in this project. The model first expands to identify all causes; then it converges to a few more likely causes. Finally, the insignificant causes are filtered out and the important ones are highlighted. Decisions on the importance of causes are based on discussion and consensus and are further validated by other experimental tests.

The various methods and tools used for data analysis included stability tests, analysis of variance, brainstorming, cause-and-effect analysis, failure-mode-and-effects analysis (FMEA), and mind mapping. Stability test results clearly indicated that “b” color and variability were associated with an unstable process.

The matrix diagram shown in Figure 3 was used to ascertain the impact of the identified root causes on key output variables in the form of moderate and strong relationships. The causation was narrowed down to:

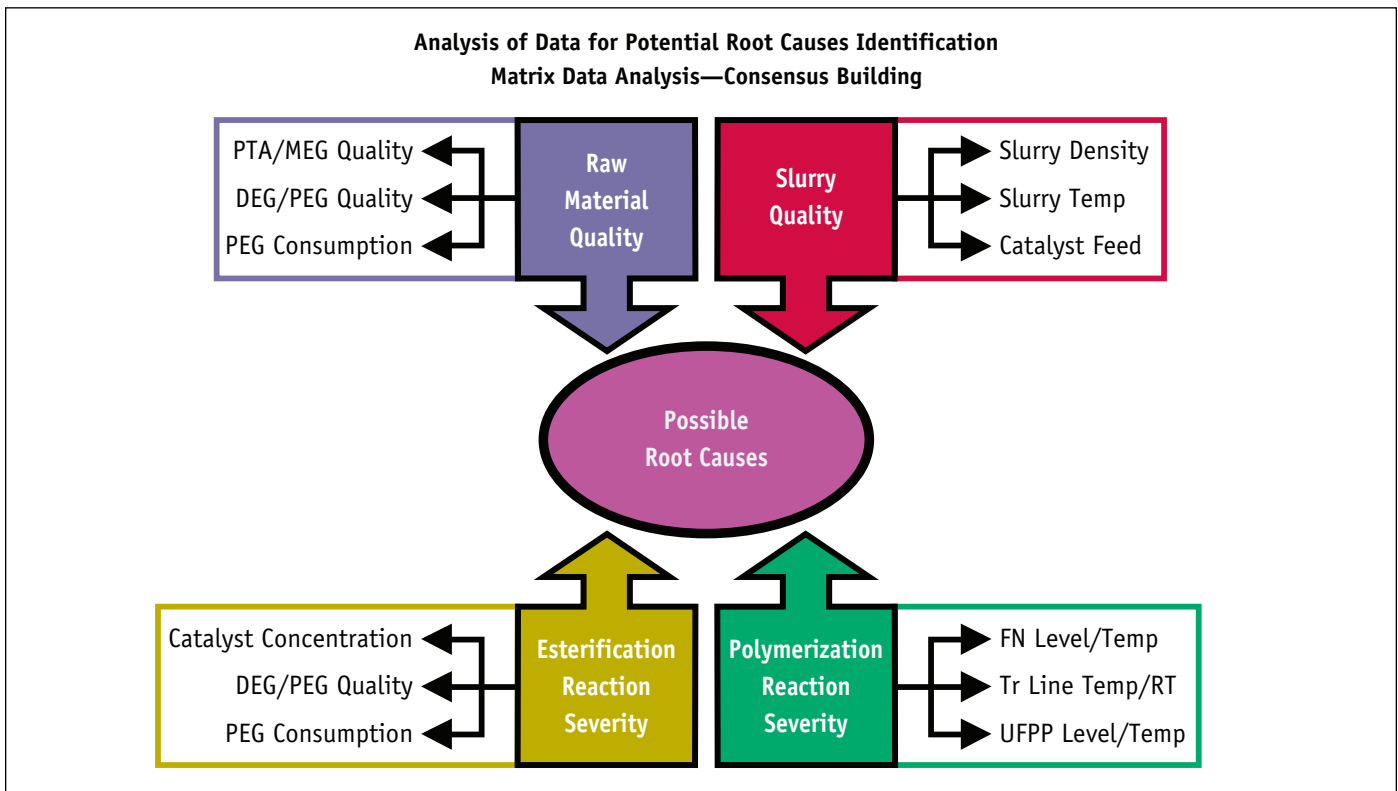
- Reactor temperature.
- PTA/EG quality.
- Slurry temperature.
- Reactor level.
- Slurry mode ratio.

### Evaluation Criteria Three: Action Plan Development

The action plan development step of the criteria aligns with the improve step of the DMAIC model.

After identifying the root causes, a tree diagram was prepared to identify the potential actions and solutions for the root causes (see Figure 4). All the root causes were subjected to

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**Figure 3**

# Case Study continued from p. 5

thorough analysis to arrive at the possible solution. For each failure mode, corrective actions were developed through interactive discussions, implementation responsibilities were defined, and time targets were set. Each of the improvement actions was validated as shown in Figure 2.

## Evaluation Criteria Four: Project Buy-In, Implementation, Progress, and Results

The project buy-in, implementation, progress, and results step of the award criteria includes information on the control step of the DMAIC model.

As a part of the FMEA process, a risk-priority number (RPN) was calculated after implementation of the formulated actions. The marked difference in original and post-action implementation RPN signified the effectiveness of actions taken.

Several major tangible benefits were realized, as shown in Table 1, providing a total savings of \$1.8 million. In particular,

- Product downgradation was nearly eliminated (see Figure 5).
- Market complaints were reduced to zero.
- CSI increased by 10%.
- Monetary benefits soared to \$1.8 million (U.S.) per annum.

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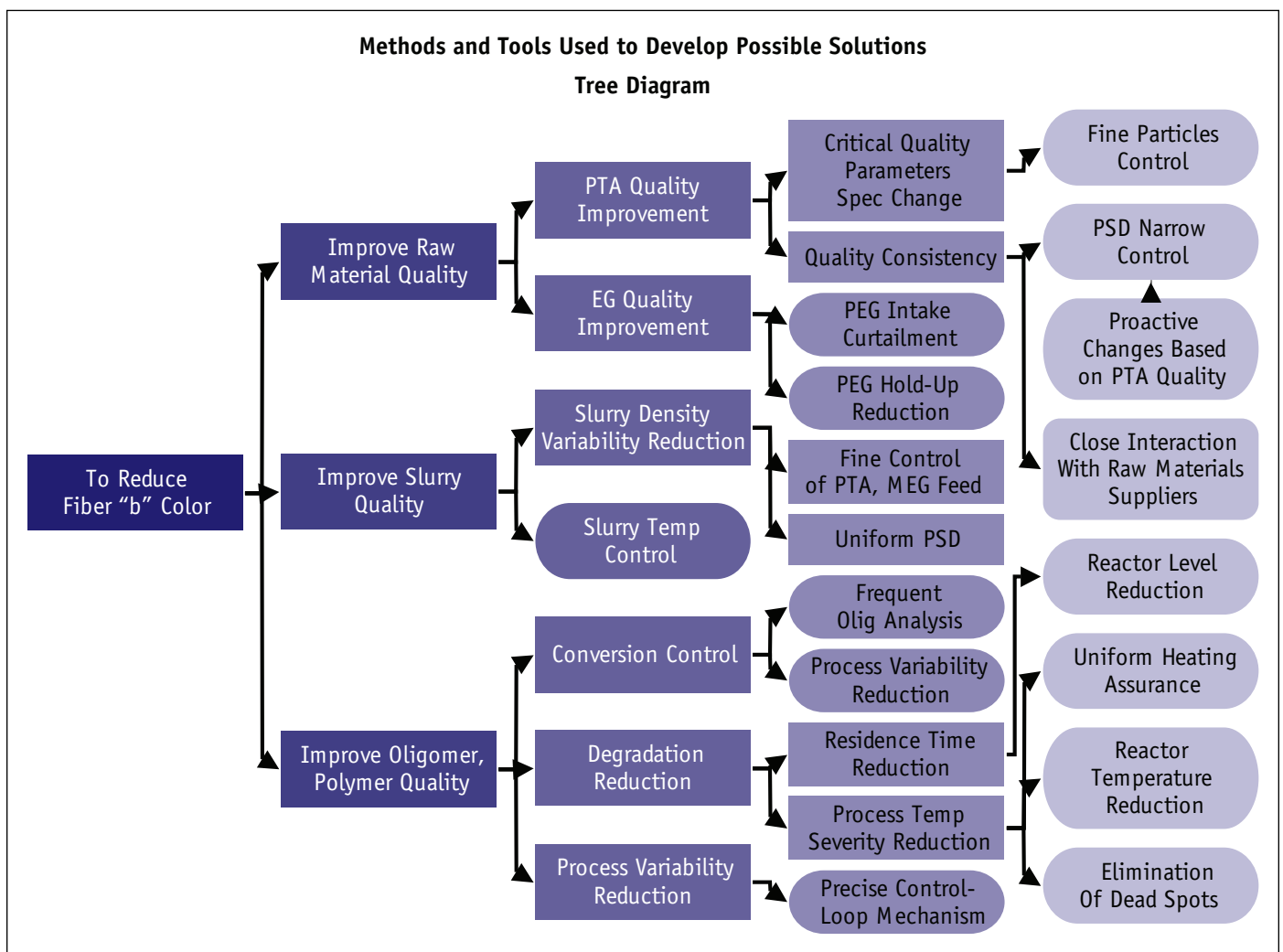


Figure 4

# Case Study continued from p. 6

An industrywide analysis of fiber “b” color among the global producers now indicates Reliance’s superiority over its competitors. Additionally, our overall production volumes will increase by 110% by the end of 2005 as major expansion projects that were previously hampered can now be implemented.

Results measuring systems were established and strengthened by employing statistical process control (SPC) and statistical quality control (SQC) techniques. Regular analysis of trends, process capability, and the quality loss index were initiated with the implementation of corrective actions.

## Summary

One way that Reliance encourages its employees to continuously renew their competencies is by giving them the opportunity to try new things and maintain an effective network. Company leaders strongly believe that unless you take risks, you never learn. We continuously benchmark our company against the best in the world, and we pursue excellence by trying new tools, techniques, etc. We believe that since the world is constantly evolving, no single thing can remain static. This passion drives us to be on the lookout for newer ways of accomplishing things once we consolidate our previous learning. We utilized the ASQ International Team Excellence Award Competition process to help us determine how well we collaborate in our teaming process.

As we say at Reliance, “There is a ‘Jonathan Livingston Seagull’ whose journey into exploring the unknown will never end.”



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Tangible			Intangible	
Benefit	Initial	Achieved	Benefit	Achieved
Downgrade due to high “b” color (percent)	23	0.0025	Awareness of various stakeholders’ requirements	↑
Quality loss (million dollars per year)	1.31	0.009	Learning problem-solving techniques and statistical tools	↑
Hot EG bleed out (million pounds per year)	2.20	0.10	Team spirit	↑
Market complaints	9	0	Confidence buildup and self-satisfaction	↑
CpK improvement for “b” color	0.71	1.85	Environmental improvement	↑
Sigma level for “b” color	2.1	5.6	Improved employee morale	↑
Customer satisfaction index	77.07	86.5	Increase in available time for other critical jobs	↑

**Table 1: Tangible and Intangible Results Achieved**

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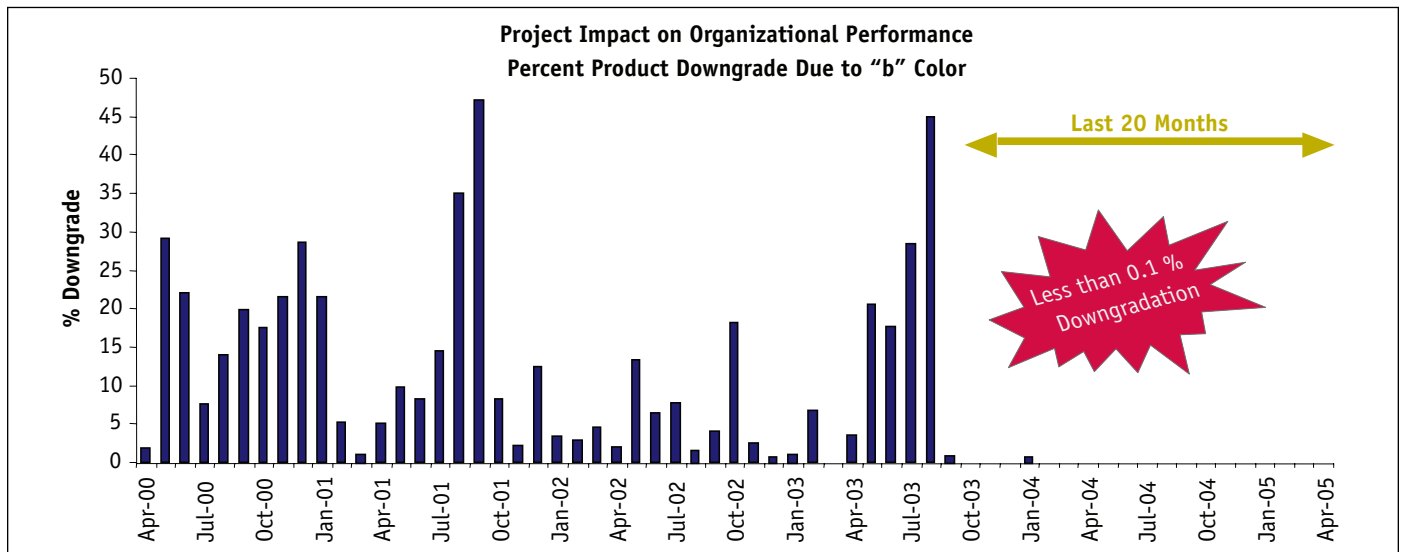
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**Figure 5**