Reliance Industries Limited Wins Team Excellence Award Competition

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Reliance Industries Limited (RIL) was set up by the farsighted businessman Dhirubhai Ambani (1932-2002) more than three decades ago. RIL has emerged as India's largest private-sector enterprise and carved out a distinct place for itself in global Fortune 500 companies. Reliance's business success and competitive position reflect the leadership provided by its founder, who said, "Growth has no limit at Reliance. I keep revising my vision. Only when you dream it do you get it."

The leadership system defined by Ambani is based on value creation, particularly for the customers and shareholders. Now, Shri Mukesh Ambani, chairman and managing director, is steering the company, building on the founder's vision. The Hazira manufacturing unit's management team, headed by Shri H. S. Kohli, executive director, is focused on fulfilling the needs of its various stakeholders through excellence in systems, processes, technology, and people and toward fulfillment of the corporate vision: "To become a globally competitive enterprise, driven by the market, creating and maintaining a lead over competition through quality products and establishing itself to be the preferred supplier of its customers."

With vertical integration of its chain from refinery to textiles, Reliance has a unique fully integrated structure, producing fabrics from crude oil. Its existing and

The Reliance Industries Limited team celebrates its Gold Award in the 2006 International Team Excellence Award competition. Left to right: Hari Bhatt, Akhilesh Jain, Suketu Vakil, Sachin Kale, and Neeraj Dhingra.

emerging businesses in exploration and production, refining and marketing, petrochemicals, textiles, and retailing have given Reliance a unique leadership position in India and the world. Reliance has the distinction of being among the top 10 global producers in all of its major petrochemical product lines. The company's vision is "to grow on a sustainable basis and be the largest and most innovative, profitable, and admired polyester producer in the world."

The Reliance Hazira manufacturing unit began its quality journey after starting up in 1991, transforming into a quality organization with quality people. Reliance has built a workplace that proactively fosters professional as well as personal growth, stressing quality of life. The company's commitment to excellence and its efforts to continually enhance the quality of all products, processes, and services contribute largely to its leadership in its major businesses. Total quality management (TQM) has yielded significant benefits in improving productivity, product quality, reliability, efficiency, people involvement, etc.

As an extension of its TQM practices, Reliance Hazira embarked on a Six Sigma initiative in 2001, delighting stakeholders by creating an organizational culture of zero defects through employee involvement. The project described in this case study utilized the systematic approach of Six Sigma methodology to reduce variation and improve business process performance, profits, customer loyalty, and the environment.

This case study summarizes the work of the Polyester Fiberfill Cost Reduction team, which presented its story during the 2006 International Team Excellence Award Competition and received the coveted Gold Award for its efforts. Hari Bhatt, Neeraj Dhingra (project leader), Akhilesh Jain, Sachin Kale, and Suketu Vakil comprised the team. Sekhon Jagmohansingh served as the team's facilitator and coordinated its participation in the competition process.

Evaluation Criteria One: Project Selection and Purpose

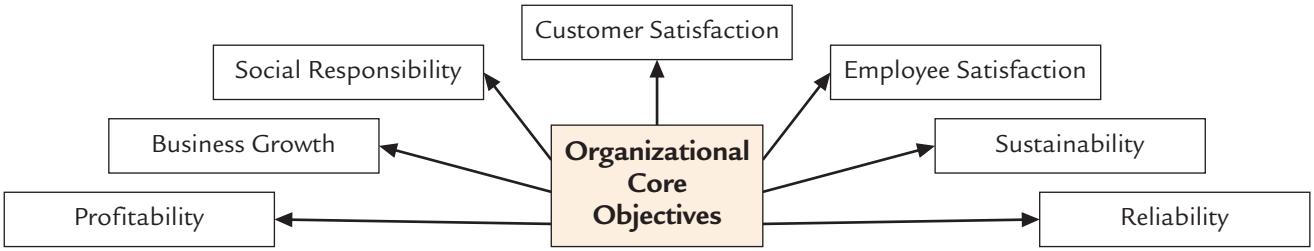
Reliance is the world's top polyester producer with manufacturing facilities in India and abroad. Since Reliance is the world's largest polyester producer, the company also generates the largest quantity of polyester waste; therefore, the company also operates the largest international polyester recycling facility which produces polyester fiberfill used for filling and stuffing applications. Of course, every effort is made to reduce the overall quantity of waste generated in the manufacturing process, but the company's use of recycled materials is an essential step in making it possible for Reliance to serve society by eliminating non-biodegradable polyester waste from the environment and converting it into value-added products. In fact, the company not only recycles its own waste but also purchases waste from external sources.

In order to achieve Reliance's quality and productivity targets, the company must carefully control the materials put into the polyester production process; therefore, the quantity of recycled waste being used was trending down, and high-cost oligomer was used instead. The price of oligomer was rising in conjunction with the escalating price of crude oil, exacerbating the need to improve the quality of recycled fiber. Additionally, the poor quality of polyester waste feedstock required higher doses of high-cost toners, raising the conversion cost even more.

All of these factors affected profit margins adversely, as well as reducing the company's ability to protect the environment with its recycling efforts. Product quality was slipping because of contaminated feedstock, and customer satisfaction issues were also occurring. The company was growing increasingly concerned about the problem, particularly given its mission statement, which includes the following two aspects:

- To produce polyester staple fiber and fiberfill per market requirements in the most economical way while achieving total customer satisfaction.
- To work constantly to encourage employees to develop professional competency and to accept social responsibility through the company's safety, environmental, productivity, and quality efforts.

Figure 1: Project Alignment With Organizational Core Objectives



Business Core Objectives	Strategic Business Objectives	Goals Affected
Customer Focus	Customer success and meeting customer QCD requirements	Yes
Reliability	Consistent high quality and zero failures	Yes
Profitability	Increased profit margin	Yes
Sustainability	Sustainable environment and ecological harmony	Yes
Employee Satisfaction	Employee satisfaction and better learning and growth	Yes
Growth	Growth and sales turnover	Yes
Social Responsibility	Trust and responsible care	Yes

Furthermore, Reliance's four foundational values—trust, environmental friendliness, responsible care, and ecological harmony—all supported the team's work to reduce the production cost of polyester fiberfill and maximize the use of recycled polyester waste materials. Figure 1 shows the company's core organizational objectives, which were affected positively by the project—most significantly customer focus (including quality, cost, and complaint reduction), employee growth, process reliability, and environmental care.

The project's key goals are listed below:

- Reduce production costs by at least 5%.
- Increase the waste recycling rate by 5-7%.
- Continue Reliance's commitment toward social responsibility by conducting business in an environment-friendly manner.

A cross-functional team was established at the business-unit level. The team used various fact-and-data-based tools and improvement methods to determine the project's effect on performance, including brainstorming, surveys, statistical process control, and strategy mapping.

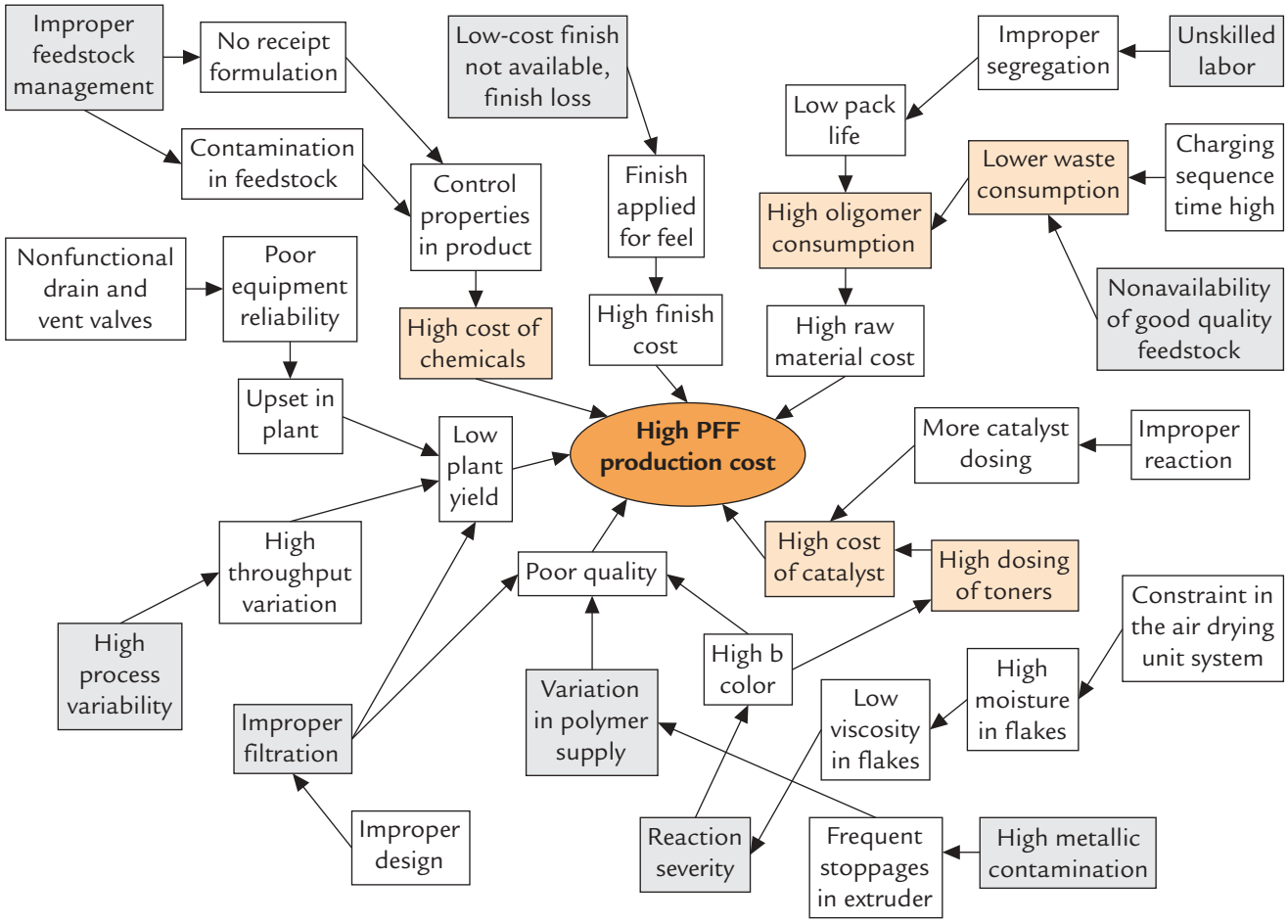
All agencies that had direct or indirect influence on the project were identified as potential stakeholders and were questioned regarding their perspectives. Stakeholders were involved in the processes of project identification, evaluation, and also in ascertaining the impact of a project on their businesses. Stakeholders from the business group were more concerned about profits, volume growth, and customer satisfaction/loyalty while operations management placed greater emphasis on productivity and waste recycling.

Evaluation Criteria Two: Current Situation Analysis

The team formulated a tree diagram to portray the cost drivers of fiberfill production and determined that the main drivers were raw materials, chemicals, and utilities, while the sub-drivers were fiber waste, PET bottles, oligomer, catalyst, toners, and other components.

Various other methods and tools were used to identify the root cause, such as cause-and-effect diagrams, why-why analysis, regression analysis, and failure-mode-and-effects analysis. Figure 2 illustrates the relation diagram created by the team members to portray cause-and-effect relationships and help them analyze the natural links between different aspects of the complex issue of high production cost for fiberfill. The diagram connects the main issues of low quantity of recycled waste and high consumption of oligomer, catalyst, and toners with improper feedstock management,

Figure 2: Relation Diagram



high process variability and reaction severity, and poor waste feedstock quality.

The team held brainstorming and consensus-building sessions with process operators to identify the probable underlying causes for these factors. Figure 3 shows the results of a series of Pareto analyses of the main cost drivers, demonstrating once again that the ratio of oligomer and toner to recycled waste was too high. The first Pareto diagram indicates that raw materials are the highest cost components in the process, as measured in rupees per kilogram. When raw materials costs are broken down further in the second Pareto diagram, oligomer outranks the cost of monoethylene glycol (MEG) and waste feedstock, and the cost of toner/optical brightener is the most significant item in the third analysis.

Other analyses and tools used included the following:

- Process capability studies of the oligomer, catalyst, and toner materials showed their high consumption and poor process capability (high variability), pointing toward a high potential for reducing their cost impact.
- Critical to quality (CTQ) elements were evaluated and prioritized in reference to the company's balanced scorecard perspectives (customer, finance, process, and learning). Maximizing the use of recycled waste and reducing the use of oligomer and toner were the major elements.
- Failure-modes-and-effects analysis (FMEA) validated these components as contributing most greatly to production costs, and a risk priority number was determined for each component based on its severity, occurrence, and detectability ratings.

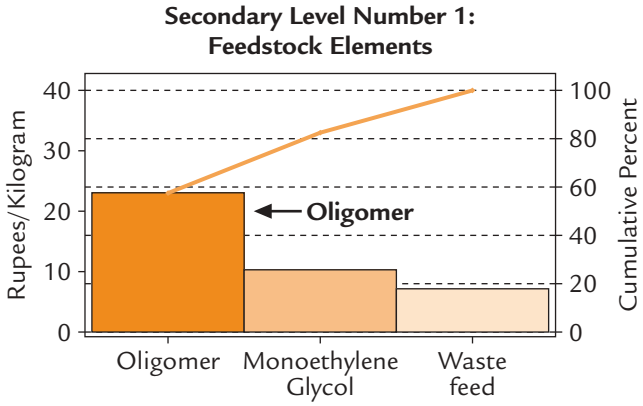
Ultimately, the team proved that the quality of recycled waste feedstock was too variable and that more expensive materials were used to compensate for that variability. It became clear that the process needed changes to eliminate the use of lower quality recycled waste.

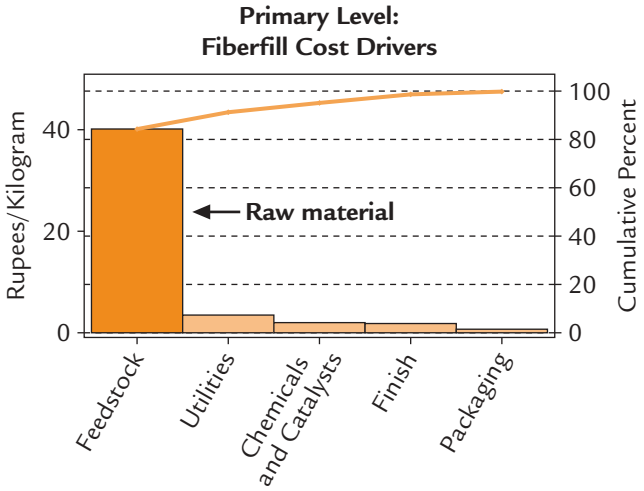
Figure 3: Pareto Analysis

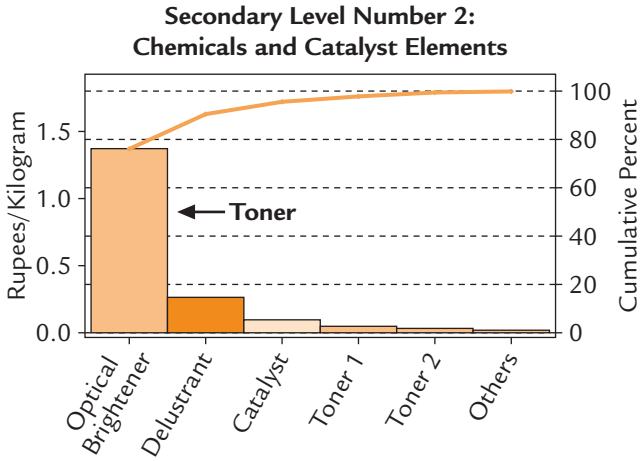
Feedstock—Includes recycled waste, oligomer, and monoethylene glycol (MEG)

Chemicals—Includes toner, finish, catalyst, and delusterant

Utilities—Includes power and steam







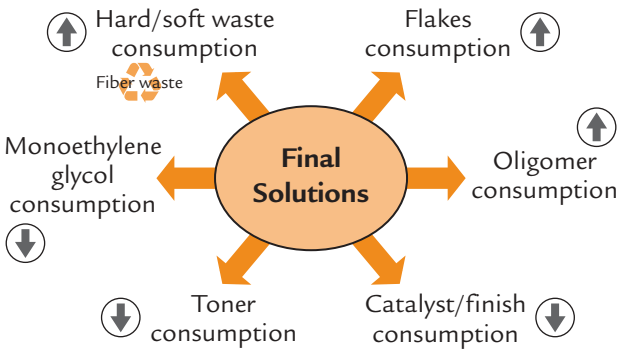
Evaluation Criteria Three: Action Plan Development

The team developed a tree diagram to systematically identify the best way to achieve the required improvement actions. Key actions were designed to increase the amount of recycled waste in the recipe formulation and reduce process variability by segregating feedstock more effectively and decreasing reaction severity.

Possible approaches were considered, and data was analyzed to validate their potential effectiveness. Figure 4 illustrates the team's final solution set. The following actions were incorporated into the team's change plan:

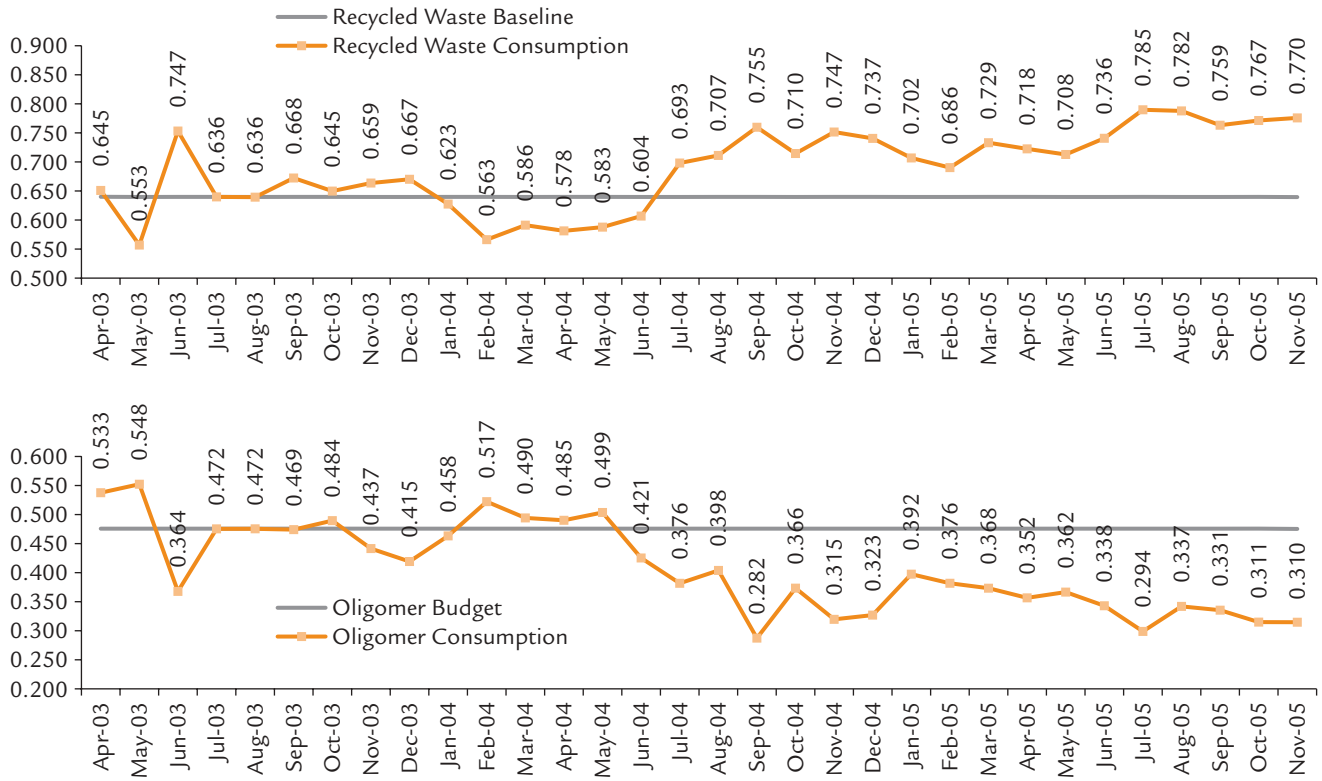
- Improve feedstock quality by segregating the type and supplier of waste materials more effectively.
- Control oligomer consumption by improving feedstock quality and filtration.
- Reduce conversion cost by using lower cost chemicals and reducing reaction severity.
- Increase the waste recycle rate by 40% to reduce the waste charging cycle time.

Figure 4: Final Solutions and Validation



A group of stakeholders including site management, internal customers, support functions and suppliers assisted the team with developing the improvement actions, ensuring stakeholders' needs would be met. Also, the team used the SMART process, as described below, to guarantee that the selected solution would be effective and efficient:

Figure 5: Major Cost Drivers Consumption Trends



- *S—Specific.* When an action item is specific it is states in very clear terms the action, result, or behavior that must be demonstrated or achieved.
- *M—Measurable.* A measurable action item includes information about how much or how well the results, outcomes, actions, or behaviors should be demonstrated.
- *A—Attainable.* An attainable action item is one that has a reasonable chance for completion given the time, resources, and personal capabilities available. They also may cause the team to stretch by taking on challenges that will bring out the members' best efforts.
- *R—Relevant.* Clear links are needed between the action items, manager's/supervisor's goals, company's goals, the company's mission, the company's values, and the company's vision. Each must support the other and lead to the ultimate success of realizing the vision.
- *T—Time-based.* A deadline is needed by which each action item is achieved. Interim timelines also may be built into the action plan.

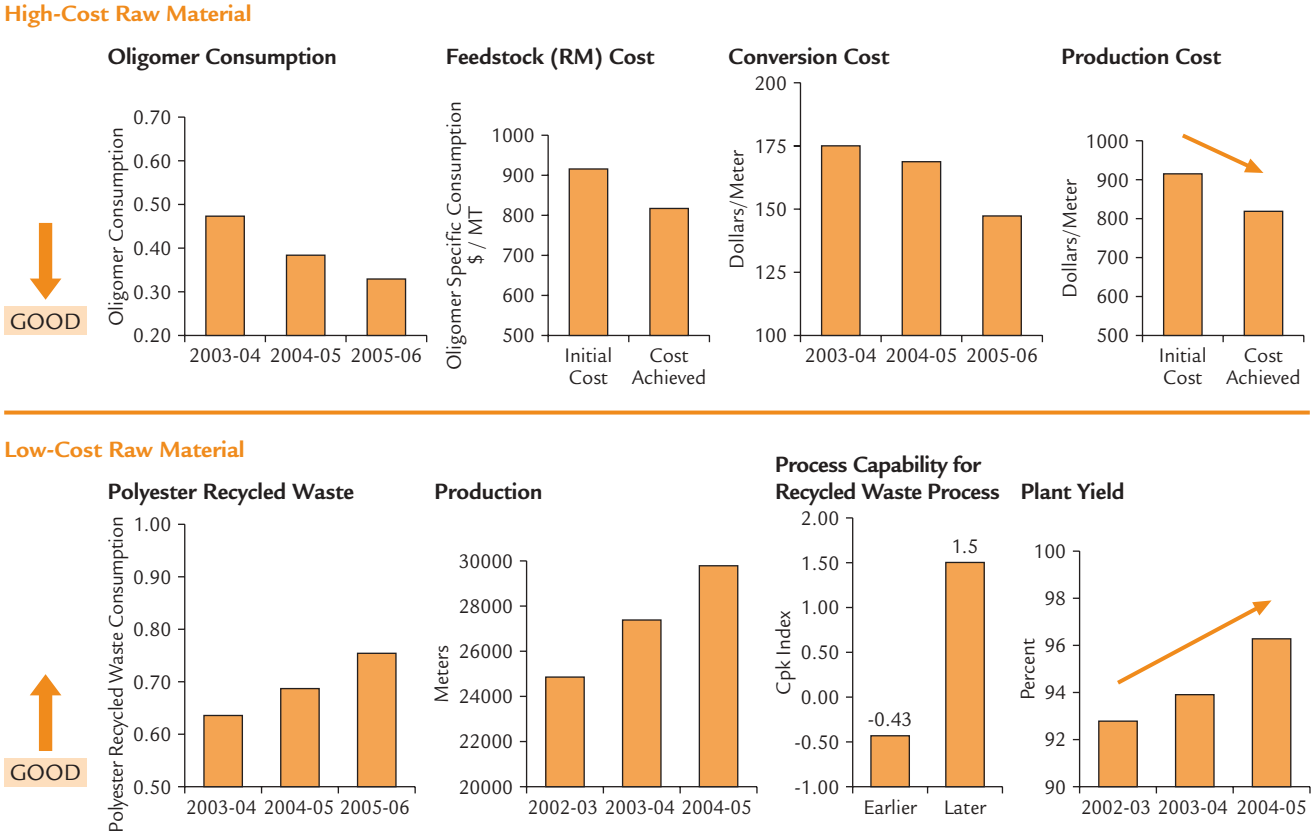
Contrary to the general belief that plant yield and product quality might be adversely affected because of increased usage of recycled waste, both actually improved. Linear regression analysis validated the relation between these performance indicators and the changed parameters as statistically insignificant.

Each action item in the solution and its expected outcomes were checked for alignment with stakeholders' needs. Simulations validated the linkages between specific action items and stakeholders' needs, indicating the proposed action plan would be acceptable.

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

Although the team validated that all stakeholders would benefit in some way, there still were concerns and resistance to implementing the action plan. Operations management was willing to contribute by increasing waste segregation, providing more training, and implementing other process improvements. That group feared operational upsets would occur as a side effect of introducing contaminants along with the recycled waste. The business group feared that the planned change would reduce product quality and increase market complaints.

Figure 6: Favorable Trends of Business Objectives Caused by the Project



Overall, the main challenge for internal customers was to maintain product quality and yield while increasing the portion of recycled waste. This required increased supervision, more training, modified standard operating procedures, and efforts to remove process bottlenecks.

Trials and field-change orders were used to ensure the action plans were implemented as intended and on time. Each implementation step was reviewed for completeness, and adjustments were made as necessary to attain the required measurements.

To sustain results, some software and hardware changes occurred. Process control strategies were formulated, procedures were modified, and operational guidelines were established. Task force teams were formed with polyester and feedstock suppliers, and training on diverse technical and non-technical matters took place.

Similar procedural changes were implemented in the PET bottle collection process. Cooperation with the community resulted in a better system for bottle segregation, and training was provided as part of a well-defined responsible care program.

The team established a new measuring system, which was strengthened by using statistical process control techniques. Regular analysis of process capability, the quality-loss index, and critical parameters' control charts supported corrective actions implementation. Figure 5 shows the improved trends in usage of recycled waste and oligomer.

Figure 6 indicates how the project favorably affected the company's overall business objectives. Raw materials cost dropped by 10%, usage of recycled waste increased by 15%, chemicals cost dropped by 20%, and production cost dropped by 11%. Productivity, process capability, and plant yield increased appreciably. Market complaints dropped by more than 70%, product quality increased by 3%, and product exports increased by more than 50%. Additionally, the project contributed $4 million (U.S. dollars) per annum in monetary benefits.

Intangible benefits included increased awareness of stakeholders` needs, increased employee morale, and a positive effect on society. Reliance engaged in a meaningful partnership with an unorganized group of rag pickers, who would collect post-consumer use waste PET bottles for recycling.

The project also had a positive effect on the community by increasing earnings of rag pickers and improving the quality of collected bottles, creating a win-win situation for all. In fact, the partnership with the rag pickers resulted in their earnings shooting up 150%! Most important, the changes improved the local environment by adding value to the littered PET non-biodegradable waste.

Progress and results were frequently shared with stakeholders through regular team interactions and communications. Feedback provided by stakeholders on the project's impact was assessed and actions were taken to effectively close the loop.

Evaluation Criteria Five: Team Management

As part of the selection process, team members were evaluated regarding their capabilities. Specific knowledge on Six Sigma, quality tools, creativity, and leadership were assessed. As the team conducted the improvement project, members were assigned specific responsibilities according to their strengths. Furthermore, analysis of the members' strengths, weaknesses, and opportunities for improvement guide the education, training, and coaching provided.

This project had representation from the entire supply chain of the fiberfill business. The team had a perfect blend of members who brought essential traits and skills such as leadership, problem solving, decision making, and team spirit to their work.

Summary

This project significantly reduced production costs and helped to achieve the company's business objectives while simultaneously increasing team members' capabilities, satisfying stakeholders, and creating a cleaner environment. At Reliance, the word "TEAMWORK" stands for "Together Everyone Accomplishes More With Organizational Responsibility and Knowledge."

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