The Story of SRF

1. Deming Prize:

In November 2004, Arun Bharat Ram, then vice-chairman of SRF, went up to the stage to receive the Deming Application Prize for his company's Industrial Synthetics Business. This elegant ceremony in Tokyo marked a crucial milestone in his career, and in the 30 year history of the company he had founded.

2. About SRF:

SRF's roots go back to over a century, with the establishment of the parent company, Delhi Cloth Mills (DCM) in 1889. In 1971, DCM founded Shriram Fibres Limited (renamed in 1990 as SRF) under the leadership of Arun Bharat Ram, who belongs to the family of the promoters. Production commenced in 1974.

A small plant was set up at Manali, near Chennai in Southern India, to make Nylon tyre cord, which serves as reinforcement for tyres. Before Nylon, Rayon, a cellulose-based fibre, had been the most popular fibre for tyres. The technical know-how for polymerization and spinning was licensed from Unitika, Japan, approved by the Government. Ayaha, also of Japan, provided technical license for weaving.

The fledgling company faced early troubles, for it was the time of the first oil crisis. The market for Nylon tyre cord fabrics developed slower than expected, as tyre companies took time to switch from Rayon to Nylon. It was also a time when industrial relations in India were turbulent. Considerable management time had to be devoted to labour matters. Cooperation was not commonly achieved.

The company's countermeasure was to develop related products. SRF created a development facility, and the engineers developed fishnet twines, and used nylon waste to make engineering plastics. Later, they also developed leather chemicals and spinning additives. Of these, engineering plastics and fishnet twines became successful businesses with potential for growth.

In 1983, SRF set up a plant near Trichy in Southern India to make fabrics for conveyor belting. In 1986, the plant started making PVC coated fabrics for covers. These businesses grew and were integrated with ISB in 2005.

In 1989, SRF invested in fluorochemicals business to make refrigerant gases. This grew into a highly successful business. In 1994, the company acquired a small polyester film business, which too eventually grew to become a core business.

In mid 1980s, Government restrictions on industry were slightly eased. As a result, many Japanese auto makers set up joint ventures in India. The most prominent was Maruti, owned then by Government of India, and Suzuki. Four other joint ventures made light trucks. Mainly in order to support these companies, Denso (then called Nippondenso) and SRF set up a joint venture near Delhi to make starter motors, alternators etc.

In April 1993, economic reforms had progressed further, and Nippondenso took over the management of the joint venture from SRF and the JV was divested. But as will be seen, the JV with Denso was to have far reaching effects on the launch of TQM in SRF.

3. The Industrial Synthetics Business:

The tyre cord business, or Industrial Synthetics Business (ISB), is the largest Division of SRF. In 2004-05, it accounted for 56% of the Group sales. From a small plant near Chennai, it had grown to four plants. In 1995, a new plant near Gwalior in Northern India was acquired from a tyre maker who had set it up with technical license from Toray of Japan. Soon, in 1996, a downstream plant was set up in Dubai in United Arab Emirates, mainly to meet European demand. In 1999, another downstream plant near Chennai, belonging to DuPont, was acquired. In 2004, at the time of winning the Deming Application Prize, the business employed 1550 people.

The manufacturing value chain was deep, starting from the polymerization of caprolactam, through the spinning of yarn, to twisting and weaving of the yarn into fabric, and to the dipping of the greige fabric to make it suitable for calendaring by the tyre manufacturer. Only the first plant at Manali produced the full value chain while the other plants produced parts of the chain, as shown in the Figure 1. Downstream capacity of fabrics exceeded that of yarn, which was bought out to feed the downstream textile machines. In 2004, ISB was No. 1 in India and had become the eighth largest in the world in terms of market share for tyre cord.

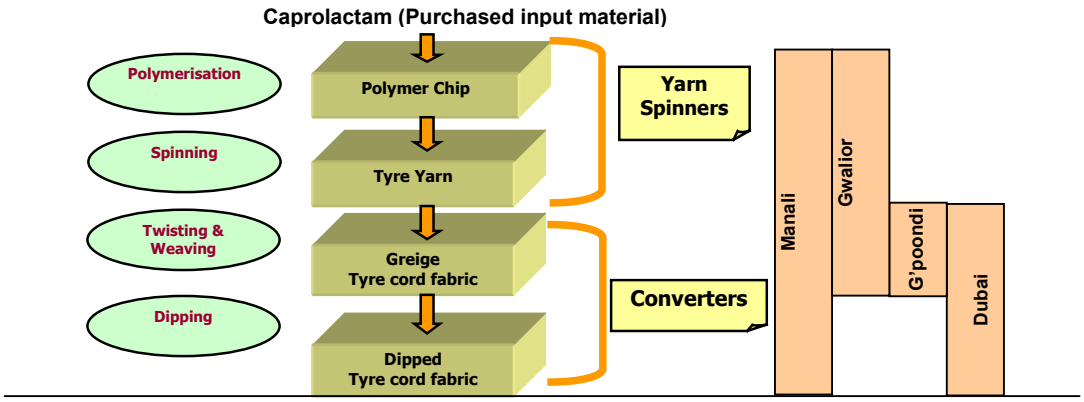


Fig. 1 *Value chain of the four plants*

4. The Period till 1994:

4.1 Early days and QC Circles:

The start-up of the first plant in Manali in 1974 had not been auspicious. The changeover by tyre companies from Rayon to Nylon proved to be slow. The company was losing money. To make matters more difficult, India was going through a trough in its industrial relations. SRF too went through agonizing times, as its managers were forced more often than not to deal with day-to-day strife with the Union rather than devoting their time to technical and market challenges.

The plant in Manali faced strikes in 1977, 1980 and 1988.

Many Indian companies imported the idea of quality circles from the U.S., and not from Japan. SRF too started its circles, named *Employee Participation Circles,* in 1983. The number of circles grew to 17, and one circle even won a prize in a regional convention. Arun Bharat Ram, then Managing Director of SRF, brought the Japanese guidebook *QC Circle Koryo* and gave it to the team that promoted the circles. Unfortunately, these circles had been created in an environment where quality management had not been grasped. It was difficult for untrained supervisors and managers to guide or encourage the circles. In addition, the circles were aimed primarily at neutralizing adverse work relations. Despite evidence of worker enthusiasm in unfavourable conditions, the labour relations did not really improve. After a strike, the third in the history of the Manali plant, the whole movement slowed down and ended in 1988.

In 1987, the Confederation of Indian Industry (CII) launched a TQM Division for promoting TQM in Indian industry. N. Ramanathan, who then headed the Nippondenso joint venture, started some TQM activities with CII help, and in 1991went on a CII Mission to Japan to learn TQM in a JUSE Program. The management methods of Nippondenso, based on quality, had already had a deep impact on Arun Bharat Ram. After Ramanathan's visit, Arun Bharat Ram took three of his top managers on a two week TQM Mission organized by CII to JUSE in 1992.

On their return, the Executive committee of SRF met and decided that SRF would adopt TQM as its management way. Immediately, CII was requested to conduct a few TQM training programs for the senior management, as preparation.

Meanwhile, in 1992, the Industrial Synthetics Business had explored TQM in its own way with an external consultant. In the conditions prevailing in the plant, not much progress could be achieved.

Arun Bharat Ram appointed Ramanathan to form and head a TQM cell in the corporate office with the view to systematically promoting TQM in SRF. A TQM cell was also created simultaneously in the Manali plant of ISB.

4.2 TQM Introduction:

Arun Bharat Ram had foreseen the coming economic reforms. He would often talk to his executives about the need to become capable of competing in the world. He also saw great opportunities unfolding for Indian companies that reformed their management. He wanted SRF to be a world-class organization, and could sense that TQM would be the way of achieving this vision. After the decision to launch TQM had been taken, he sent out a message to all employees in SRF:

"When we say that our mission is to become world class we mean that, in terms of performance, we are fired by the desire to be among the best in the world in respect of QCDSM…this means that our organisation must develop the capability to be world beaters consistently…
Our businesses must be united by a characteristic "SRF Way", practiced wherever there are SRF people. The SRF way is founded on the principles of the QC Way…"

The initial TQM effort was focused on ISB. Manali, as the oldest plant, faced many challenges. It had to be SRF's incubator for TQM.

The corporate TQM cell designed a TQM framework for SRF (partially shown in Figure 2), a model that has, with small changes, endured. The framework was in three parts: 'The way we think and do things' or the QC Way, 'the way we manage', comprising the management vehicles of TQM, and results for different stakeholders. The framework provided a total picture of the transformation journey to managers. It integrated principles, methods, tools and systems of TQM.

A three-day basic course on TQM was designed internally. Senior and middle managers were given this program in order to build awareness of TQM. A program was designed for 5-S too, and manuals were prepared for different areas like factory, stores, office areas, utilities, maintenance, open areas and contractor sheds. A problem-solving methodology was evolved, and a three-day training program was administered to two batches which were then facilitated in their improvement projects. This was the first time that managers had applied a systematic methodology for making improvements. Two successful projects were completed in the manufacturing area. That

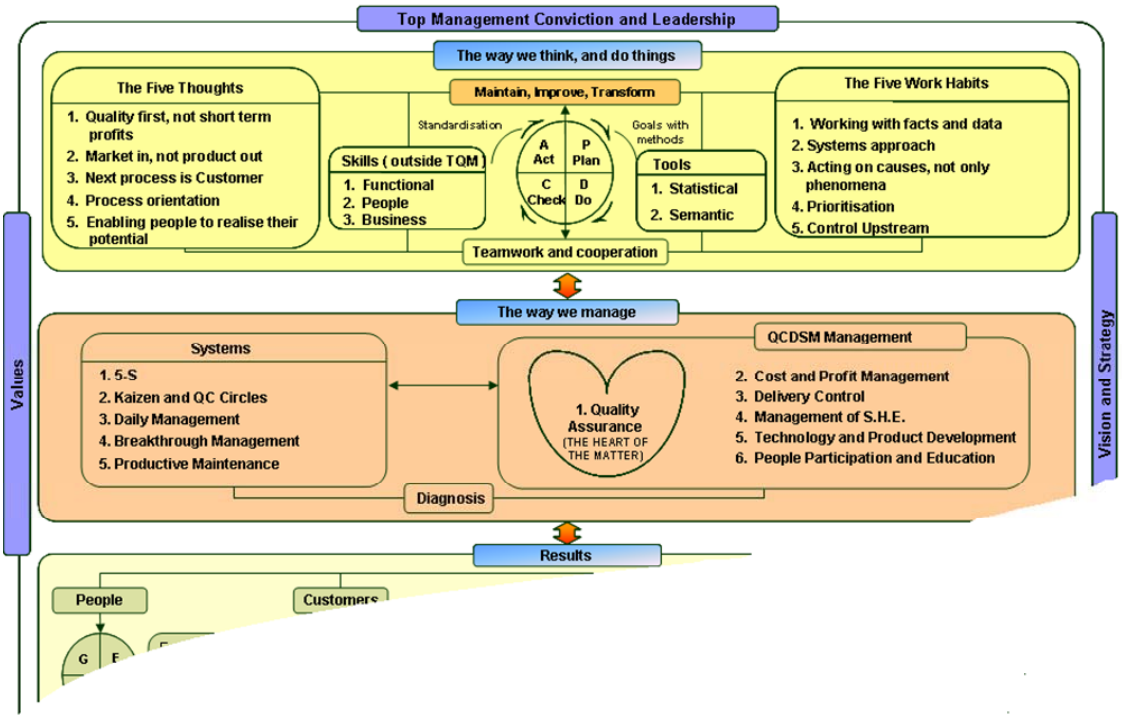


Figure 2: *TQM Framework*

all these programs were internally designed made SRF's TQM journey somewhat unique. These efforts have served to raise internal capability in TQM.

Despite these initiatives, the reception of managers to TQM remained lukewarm. Workers were often seen outside their workplaces, but the factory management had got used to this sight. Machine conditions were poor, and breakdowns high. Managers talked a sophisticated language which contrasted with the conditions on the shop floor.

The concept of quality did not extend beyond inspection and meeting specifications, if that. One monthly report from QA reported that the customer was complaining 'even

though the specification was met'. Customer orientation was low, and an adversarial relationship resulted from the tensions arising from price negotiations – which involved frequent raises based on input costs. There was great pressure on managers for producing and selling more quantities and for higher prices, but there was little grasp of the processes involved in doing so. Quality was judged to be quite acceptable really. Customer orientation was *not* a priority for the top executives.

Though the internally designed TQM related programs received good feedback from participants, they would argue that TQM was a method suitable for the assembly industry but not for a 'process industry like ours'. Many of the examples in TQM training programs were in fact from assembly industries, thus proving their conviction. Arun Bharat Ram saw otherwise, but there was always a dilemma about 'forcing' a new management way into the company.

For much of 1993 and 1994, Union relationships dominated management attention. The workers were not sure if they should join hands with this new TQM initiative of management. Eventually, a six-month strike in 1994 stopped meaningful TQM promotion in Manali.

Top management had begun to see that 'productivity agreements' based on incentives to workers for higher output were counterproductive in an era when continuous improvement would be needed. They therefore merely wanted a situation where workers would work all eight hours of their shift, and get a fixed pay. This idea got accepted, and was to pave the way for some excellent improvement activities later on.

Another fallout of the strike was that the supervisors and managers had to operate the plant during the strike with their own hands; this was matchless training. It raised their ability and confidence, which was of great value in promoting TQM.

5. The Period from 1995 to 1999:

5.1 Initial Trust-building:

When workers returned in January 1995, it was clear that the first challenge was to build an atmosphere of trust. Two workshops were designed. The first, *Joy of work,* a two-day workshop, was conducted for all workers before they restarted their work. The main emphasis was on understanding each other and on teamwork. The second, conducted a few weeks later, was another two-day program called *World class SRF*. It focused on the rapidly changing environment in India. It dealt with globalisation that had started happening, and its impact on the Indian industries. The urgent need to improve quality and customer satisfaction was explained, as was the importance of becoming competitive. Survival was no longer assured in a liberalized economy, but this was not a palatable truth even to managers at that time.

Simultaneously, a group of 33 managers from the President of the tyre cord business down underwent a two day refresher course, again internally designed, and titled *Transformation in the way we manage.*

A strong communication program was also developed. This included posters which gave out facts, and a system by which employees could send letters to the head of the business, and they would be given written and publicised answers.

5.2 The First Defining Moment: 5-S Campaign

It was time to resume TQM activities vigorously. 5-S was chosen as the main campaign. It was recognized that 5-S could be the means to the transformation of ISB.

Checklists were tailor-made for each area. They comprised five points for each 'S', scored on a 0~4 scale, so that the total points for each 'S' would be 20, and the overall maximum score 100.

The plant was divided into 39 zones covering everything. A coordinator was appointed for each zone. All managers and workers were retrained on 5-S. The coordinators were facilitated in using the checklists. The TQM cell of Manali oversaw the whole campaign.

The President of the business and his senior managers set an example by leading the initial cleaning effort, by personally using brooms. Gradually, operators joined in. The TQM cell, together with the coordinators would do monthly audits of each zone using the checklists specially prepared. Their comments would be quite specific, and were reviewed in the next round of audit. This was perhaps the first time in ISB's history that people participated in large numbers in any improvement activity. Several hundreds of improvements were made, though only 200 got documented. 5-S standards were made by most departments. They served to remind people of the value of working to standards.

A surprise for many people was that, suddenly, more space seemed to be available. In the engineering plastics plant, which was housed within the tyre cord compound, a proposal to invest Rs. 50 million for a new shed could be withdrawn, simply because the space generated by 5-S made the proposal unnecessary. In the textile section, trolley shortage seemed to disappear.

The plant underwent a visible transformation. It looked and felt different. Visitors to the plant, including customers, often expressed amazement at the change. Such appreciation motivated everyone further to improve conditions. Engineers and workers developed confidence that they could make improvements and change shop conditions proactively. They also learned to quantify and judge progress on an intangible like 5-S and saw the value of a radar chart. The 5-S levels improved well initially but got stereotyped for a while before moving up again. Figure 3 shows the progress.

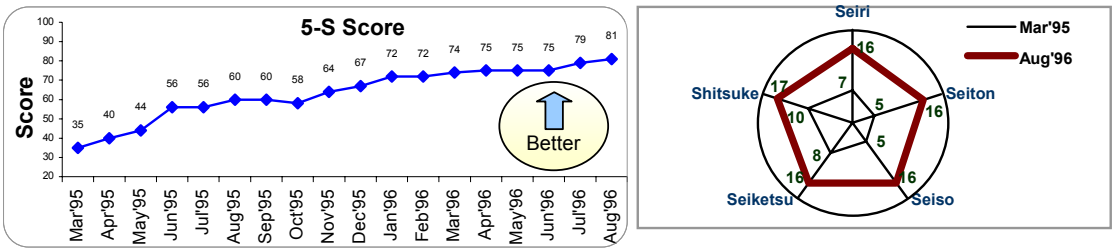


Fig. 3 *Progress in 5-S*

In retrospect, the 5-S campaign was the first defining moment in the TQM journey of SRF. It laid the foundation that made the rest of the journey possible.

5.3 Growth into Four Plants:

In late 1995, SRF announced the acquisition of a loss-making tyre cord plant near Gwalior from a tyre maker. Tyre cord imports were already imposing a downward pressure on selling prices. The new plant, which used advanced technology from Toray, Japan, but had needed high investments, found it difficult to compete. SRF gained by the consolidation, and with SRF's ability to restrain costs, the plant was immediately turned around into making profits. Many managers had chosen to stay with their original company and not move into SRF. Moreover the workers of the plant were young and had doubts about their future with a new and unfamiliar management. Much communication and training was carried out from 1996 but it took some years to gain trust.

In 1996, SRF set up a new plant in Dubai to convert yarn to fabric. Indian customers bought the untreated 'greige' fabric and did their own dipping in latex. European customers tended to buy dipped fabric. Accordingly, SRF installed a dipping plant for the first time. One purpose of locating the plant in Dubai was to learn to operate in truly international conditions.

Though the entire plant was operated by expatriate Indian workers and managers were chosen from SRF's Indian operations, wages in Dubai were high and so tight manning was necessary. With the help of an American consulting firm, the organization was designed around business processes rather than conventional departments like marketing, HR etc. Dubai thus began an experiment with a *Process-based Organization.* Managers had multiple, overlapping roles in teams, which improved cross-functional interaction, and reduced manpower needs. The organization was also attuned to meeting customer requirements – in line with the basic principles of TQM.

From the beginning, the head of the Dubai unit realized the need to set it up as a world class model for SRF. The vision was to be "torchbearers for the globalization of SRF. We will be the role model for SRF…" Even before the plant was commissioned, everyone in the plant was given the TQM Basic course and 5-S training, while some attended the problem-solving workshop too. The Dubai unit lived up to its promise in advancing along the SRF management way, but its financial situation took long to stabilize in a difficult market environment, impacted by the South-East Asian financial crisis.

In 1999, SRF made its third acquisition: a textile-only unit for tyre cord at Gummidipoondi near Chennai from DuPont, whose purpose had been to exploit the potential for Nylon 66 fabrics in place of Nylon 6 which dominated the Indian market. This had not worked out, and the plant had accumulated large losses. SRF, with its style of managing with lean overheads, turned the plant around immediately. It also doubled the capacity soon after. One great benefit to SRF was that the plant followed DuPont's famed safety practices, and this knowledge helped all the SRF units.

Economic reforms had made it possible for SRF to do what would have been unimaginable when the decade of the nineties started – acquire two plants and set up one overseas in its core area, while disinvesting from four companies which were unrelated to its main track. At the same time, a new level of complexity had been introduced in managing the business. The differences in culture were not small and needed to be addressed.

5.4 Quality Assurance:

A two-day internally designed training program on quality assurance was held for marketing, technical, manufacturing and QA persons in 1995. A QA diagnosis was also carried out. The tyre cord business had always assumed that their job was to receive the specifications from the tyre maker, and then conform to them. The program highlighted the need to understand the tyre maker's needs, and the problems that could be faced in tyre making, and eventually tyre use as well. The marketing persons admitted that they really did not understand the tyre making processes, but resolved to learn more. The first quality table was attempted. After several field visits and interactions with customers, some of the needs of the downstream tyre making processes were understood, and their relationship to characteristics mapped. In later years the quality table was considerably refined and has provided insights into the requirements in each stage of tyre making and in tyre use.

ISO 9000 was rapidly becoming popular in India at this time. The Gwalior plant, which had been working on ISO 9002 certification prior to their being acquired, had got certified in 1995. In 1996, the Manali plant got certified to ISO 9001. Dubai and Gummidipoondi got certified in 1997 and 1999 respectively. Each plant continued to function independently rather than as part of a cohesive business. The main benefit of the ISO certifications was to standardize many processes, though some of these standards were in fact perfunctory.

Moreover, under pressure, production quantity still seemed to take priority.

5.5 Improvement Efforts:

In November 1995, Mr. K, renowned Japanese author, teacher and counsellor in TQM, visited Manali at the request of SRF. He visited the plant again in September 1996. At this time many improvement efforts had begun to show results in terms of yield, waste, productivity etc. Over the years, the polymerization plant had been modified many times and its throughput too had been raised. Not all the changes had been systematically done or documented. Control charts were started on characteristics such as relative viscosity. Because of many changes made to the plant and the process, polymerisation showed unstable patterns of the early-stage type. Process analysis had been started, and many improvements made, but every improvement was followed by new periods of instability. During his diagnoses, Mr. K often heard that the problems of the plant were on account of frequent power failures from Government-supplied power. He advised the company to look harder for factors inside the plant. Mr. K saw that the 5-S campaign could develop into participation of employees in kaizen activities. He also stressed the need to improve daily management first. In addition, Mr. K laid out a four-phase journey that could lead to challenging the Deming Prize after 2001.

In 1997, an attempt was made to improve daily management. The continuation of process analysis reduced the degree of uncertainty with the polymerization plant – and its manager went on record to say that he could now go home in the evening without getting emergency phone calls. A large number of work instructions were written up, and some of them were made pictorial and easy to use. Workers were involved in writing these. Improvements were made in spare parts ordering by developing a large number of drawings for parts where original equipment makers were no longer stocking parts.

TQM training was extended until they covered all managers and supervisors, and a great number of workers. Problem-solving workshops were refined and continued, and newer batches of participants were facilitated in systematic improvement activities.

In 1998, the company's financials were tight and cash needed to be conserved. It was decided to launch policy management with the theme of reducing working capital requirements. The campaign led to codification of a wide range of causes of inventories and receivables from customers, as well as the possibilities of innovative financing of payables to vendors. Credit control systems got documented. However, the deployment, the search for causes, and the retention of gains left something to be desired. Though it had been suspected before, the campaign proved that sound daily management was a prerequisite for large-scale improvements through policy management.

5.6 The DM-98 Campaign:

With four plants in place of one, a consistent method of following TQM was clearly necessary. The TQM journey needed acceleration. Moreover, TQM had hitherto been applied mainly to the plant functions, and non-manufacturing areas had not kept pace. Daily management needed to be institutionalised, and yet this was one area where there were no text books for guidance. CII had at this time started a system by which a cluster of prominent tier-one suppliers to Maruti collaborated with each other to learn and practise TQM, with the help of a Japanese counsellor. Ramanathan interacted with the cluster, obtaining insights into daily management. As a result, in 1998, a new SRF program called DM-98 was designed as a practical, step-by-step approach to implementing not only daily management but also QA, production control, and improvement activities by everyone.

The DM-98 system had ten elements put into a framework as shown in Figure 4.

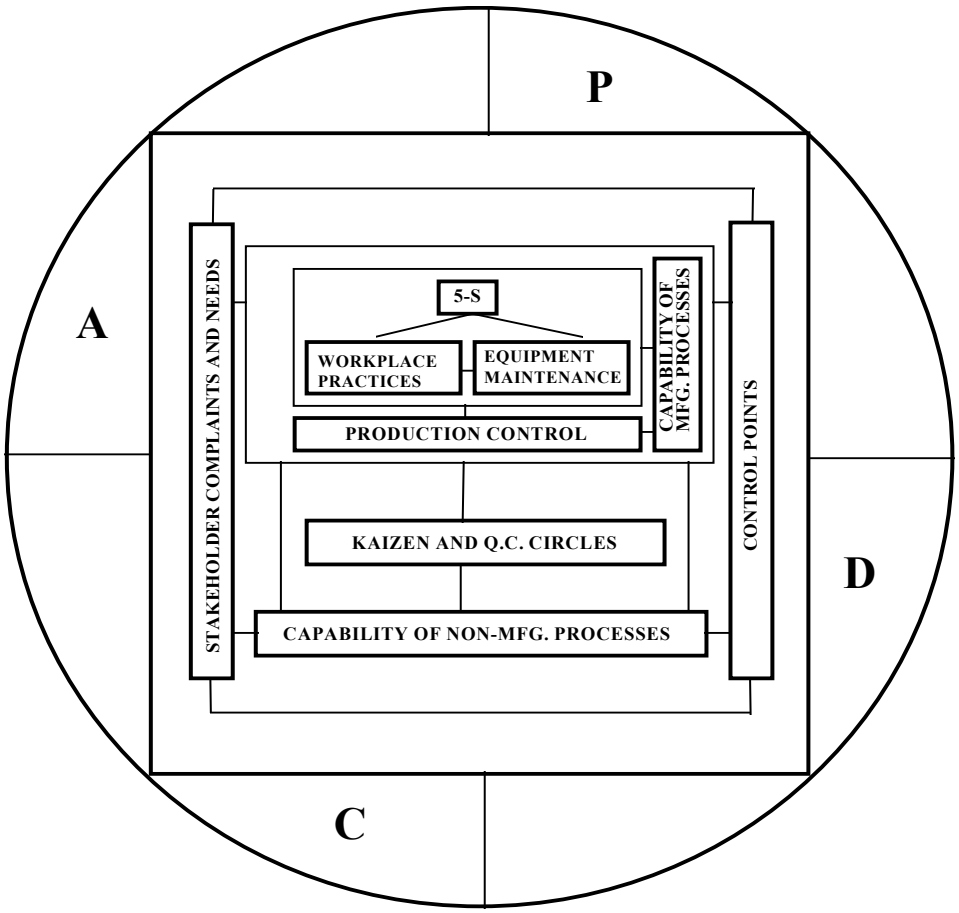


Figure 4: *DM-98 Model*

The system started with identifying stakeholders' complaints and needs, and covered shop floor practices, process capability, kaizen, 5S, production control, non-manufacturing processes, and the clarification of roles through control points. SRF has always stayed with its own terminology for what it does, and in this case too, care was taken to prevent different words doing the rounds in rest of India infiltrating into SRF.

Each of the ten elements of DM-98 was divided into sub-elements. A total of 62 sub-elements were developed. Checklists were designed on a 0~4 scale for each sub-element. This was used to diagnose and assess the status of Daily management in any plant. Moving up on DM-98 scores would indicate improved operations a higher level of

maturity. The checklists were made severe so that achieving even a score of 2.0 could mean a reasonably good status.

Every plant carried out its diagnosis and reached consensus on the score of each element. The Manali and Gwalior plants made significant efforts to raise their levels.
A score of 45 and above qualified for a commendation certificate from the CEO. The Dubai plant was the first unit to secure this certificate. The Dubai plant raised 5-S and visual control methods to new highs in SRF.

The aim of the DM-98 system was to eliminate fire-fighting. By clarifying responsibilities, establishing and following standards, and taking corrective actions, the achievement of day-to-day plans had to be made more reliable. Control charts on the shop floor aided process control. Control points began to be displayed in similar formats and colours across the plants, thus bringing a similar look to them.

The DM program also strengthened problem-solving activities, which became more methodical. Not only the seven tools, but also other statistical methods began to be used skilfully by some.

6. The period from 2000~2004:

The year 2000 had begun on a difficult note. There had been many chronic customer complaints, but one of them was a critical trouble in the calendaring stage of a multinational tyre maker in India, but it defied solution. In one sense there was also a state of denial of these problems. What could not be denied was the bottom line. Demand had not picked up after the slowdown of the late nineties, and this was affecting profitability. At the same time imports had risen to hold the second largest market share – after SRF – and the downward pressure on prices continued. Battling for price caused strain in customer relationships, for customers believed SRF was being 'too tough'.

6.1 Customer Satisfaction - The Second Defining Moment:

Mr. K visited Manali in March 2000, after a gap of over three years. In preparing for the visit, the marketing team was asked to make a catalogue of customer complaints with data and history. But the marketing department initially came up with a list of service complaints alone, believing that 'technical' complaints were in the purview of QA only. Ramanathan told them then that "there are no non-technical jobs in SRF", and requested them to take responsibility for making the list by collaborating with others. To their credit, they did an excellent job of this, but to the top management of the business, it felt like self-criticism. They also believed that the main problem was that SRF lacked communication skills rather than that there were customer complaints. Ramanathan believed that making this list itself was a defining moment in the TQM journey of SRF, and so, notwithstanding these hesitations, a presentation on customer complaints was boldly made to Mr. K. This simple recognition of the status of complaints strengthened everyone's determination to solve them.

The first step was to solve the critical trouble of the multinational tyre maker. A team of senior technical and manufacturing persons made onsite observations at customer premises and at SRF's plants, and openly shared the data with the customer. This enabled internal resistance to be overcome, and solutions were found, which improved

the know-how of engineers. The phenomenon was eliminated and the customer's business gradually rose to 100% share.

The practice in the business hitherto had been that plant persons rarely visited customers. They had depended on the reports of sales or technical personnel. This policy was reversed, and plant engineers were assigned customer visits. These teams were trained to proactively ask about and observe troubles at tyre-maker stores and plants. They spotted many new minor phenomena and made a number of kaizens. Customers began to experience the removal of minor irritants. The confidence of the factory engineers with their products rose.

July 2000 was the time for a quarterly review by corporate management. The mood in the business was sombre. Despite their efforts, the bottom line was not looking good. On the suggestion of Ramanathan, top management decided that the budget discussions were to be wound up in an hour after hearing them, without making any adverse comments. Everyone was then told that there had to be a single-minded focus from that moment on: customer satisfaction. For two days thereafter, the entire team debated how and why customer satisfaction problems existed, and the means to solving them. A campaign was designed under the banner 'Customer Satisfaction through Quality Improvement and Relationship Building,' as these were the two main aspects that needed improvement.

An important new step was to adopt a market-based pricing method that was transparent about input or currency exchange costs. Quarterly price negotiations with customers were targeted to be completed faster, with reduced tension to both sides. This program helped improve relationships.

Quality phenomena causing complaints were prioritised and assigned to trained problem solving teams. Soon, this paved the way for many joint projects with customers for improving customer-end performance.

Clearly, this campaign was a defining moment in the quality journey of SRF. Without it SRF might well have stagnated, and failed to make progress with the kind of acceleration that actually took place. Great energy was released in the organization, which made the unfolding of so many more initiatives feasible.

6.2 Initiatives Demonstrating *Quality First* Principle:

Building on the customer satisfaction campaign, ISB took investment decisions that had the sole purpose of quality improvement. Complaining about the quality of power supply had become a joke, as even unrelated problems would be blamed on it. Tongue in cheek, Mr. K 'forecasted' that SRF people would next blame the weather, and 'hoped' that they were not agriculturists.

ISB invested in its own power plant in order to improve the quality of power. This ensured that continuous processes like polymerization and spinning would get reliable power. The textile shop in the Manali plant was re-floored, in order to minimise dust generation, and its roof reconditioned to prevent rain leaks. The whole of textiles was air-conditioned in order to improve cord quality, and to relieve the stresses, space was

created for proper ageing of the cords. The plant manager then took up an improvement project on all the cooling equipment so that air conditioning would be reliable.

A bank of old, second hand twisters that had long been proved to be incapable of meeting the requirements of cord properties were retired, and space created. Obviously this caused production quantities to decline, but the plant launched a vigorous improvement program to catch up with the original production levels with the remaining twisters.

Taking advantage of the dust-free conditions and proper aging of cords, a multi-level improvement project was successfully carried out for improving the attribute quality of the fabric rolls. Especially, defects like stains were totally eliminated.

The management had made an unequivocal communication to everyone through their actions. No longer was mere quantity the first priority. Quality, and with it, customer satisfaction, took centre stage.

These decisions had a profound impact on the confidence and morale of employees.

6.3 The People Red Book and the Turnaround in Employee Relations:

Even though the idea of a 'People Red Book' featured in the DM-98 checklists, it had not evolved into a system. In 2001, determined to make a breakthrough in employee relations, the People Red Book system was launched. Employees tend to make formal complaints only in extreme circumstances. Many of their dissatisfactions and needs surface only in informal settings, with emotional rather than factual content. Such data are usually lost by organizations. The People Red Book system aimed to unearth such raw data, and using simple language-tools, detect the real phenomena behind the dissatisfaction. Corrective action is now made possible. Thousands of complaints involving hundreds of phenomena were thus identified and documented, and kaizens carried out.

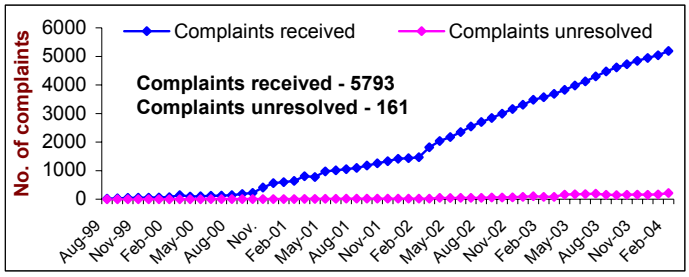


Figure 5: *Red book complaints*

Simultaneously, intensive communication programs reached out to employees and their families. Team building classes were held, and meditation lessons offered. Trust was built in the new plants gradually.

Surveys revealed steady increase in people satisfaction scores.

6.4 People capability:

With TQM activities accelerating, considerable increase had to take place in off-the-job courses. Figure 6 shows the increase in training hours.

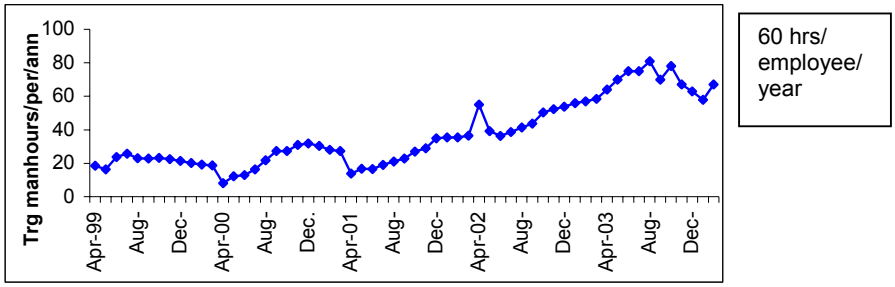
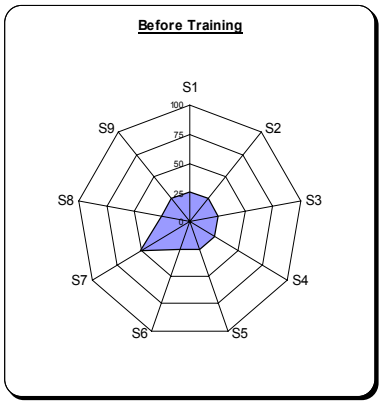
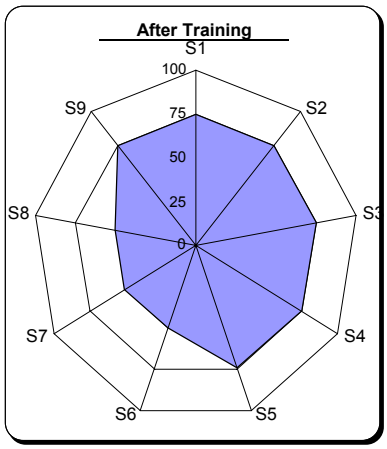


Figure 6: *Training hours*

At the level of operators, skills are evaluated on a four-quadrant scale going up to 'expert'. Manali again piloted a project. Each job was broken down to its elements. For each step, the knowledge and skills required were listed. The training method and materials for each item of knowledge or skills was then designed. Each operator was assessed for each skill and knowledge, and training provided. Videos were extensively used. As the skills rose, the quadrant level reached by the operator would improve, and the average level for the plant was tracked.



S1: Friction motor changing in winder
S2: Bobbin chuck changing in winder
S3: Package Receiver mechanism
S4: Replacement of Acceleration wheel.
S5: Kicker plate removal cleaning and fixing
S6 : Traverse cam removal and fixing
S7: Quadrant bracket replacement
S8: Balance cylinder U-seal replacement
S9: Turret housing removing and fixing



Training Programs conducted

- Understanding the different spare parts
- Understanding the different spare part functions
- Lubrication check points
- Different machine settings & adjustments
- Machine safety & human safety
- Different logic gate functions
- Understanding the basics of solenoid valves
- Understanding the different limit switch functions (Pneumatic & Electrical switches)

Figure 7: *Training and progress of a maintenance worker*

In areas such as maintenance, key skills were evaluated, and radar charts of current skill level and targeted levels made. In this way, people capabilities were steadily raised along with their participation and mutual cooperation.

6.5 Kaizens and QC circles:

SRF uses the word kaizen in the limited sense of data-less improvements, either as corrective actions or as ideas from the work force. Though 5-S campaigns had produced large numbers of such improvements in the past, properly recorded kaizens with a display and recognition system was introduced in 1999, starting in Manali and Dubai. A manual was made and training given. What constituted a kaizen and what did not was clarified, though in the initial stages encouragement was the main goal.

Only implemented kaizens were included. Supervisors provide guidance, and help in implementation. All kaizens are documented, sometimes with supervisory help. A variety of recognition methods are innovatively used to keep up the momentum. Monetary rewards on the lines of a suggestion system are discouraged. It is a system that honours rather than rewards the person for his improvement. Autonomous maintenance gave another fillip to kaizens. Periodic kaizen campaigns help keep up the excitement.

Some really spectacular kaizens have been produced over the years. In 2004 about 25 kaizens per employee per year were being implemented. Figure 8 shows the cumulative trend.

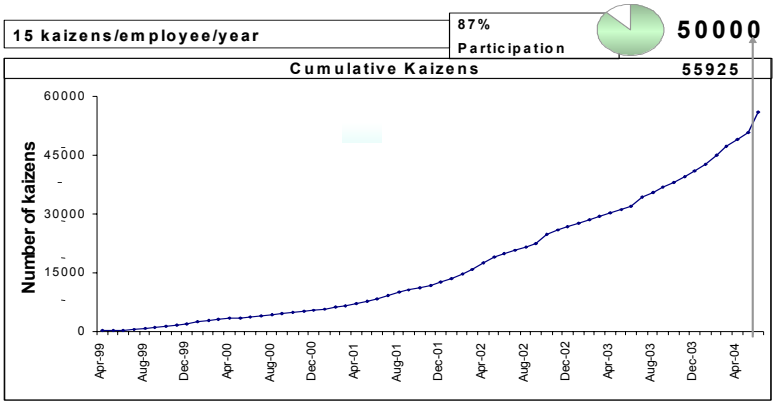


Fig.8: *Kaizen growth*

Even though 5-S, autonomous maintenance and kaizens had been started successfully, SRF had desisted from calling them QC circles because of past experience. Eventually, in 2001, QC circles were restarted slowly, and their activities focus on problem solving using statistical tools. They have quickly gained ground, and by 2004 had qualified for international events by scoring over rivals in domestic competitions.

The process analysis work in polymerization, started in 1995, had led to improvement but not complete stability, and periodic drifts had to be corrected by trial and error and the downstream spinning conditions adjusted accordingly. In 2001, improvement following the use of multiple-regression analysis was shown to Mr. K, who gave more

suggestions to look for technical parameters. By his next visit in August 2002, this long-standing problem had been resolved and stability achieved as shown in figure 9.

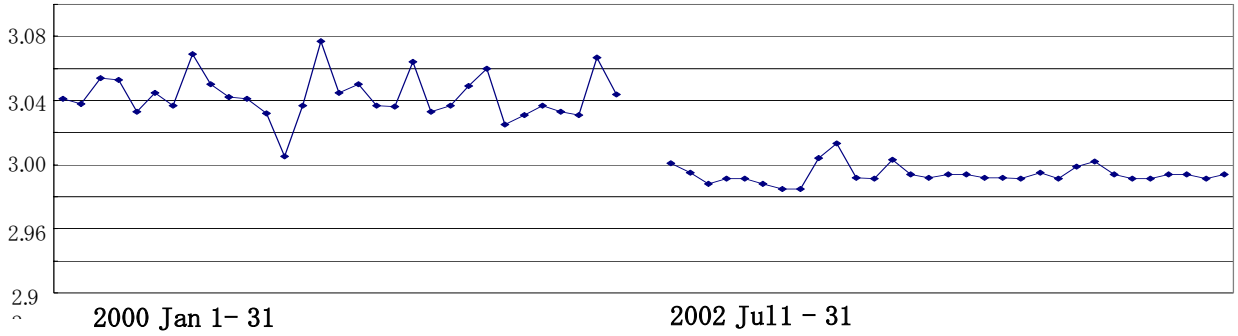


Figure 9: *Wet Chip RV from 2000 Jan 0 to 31 and 2002 from July 0 to 31*

Process capability was achieved, as the following histograms show, and thus frequent adjustments in the next process of spinning were no longer required.

At the same time, customer complaints were steadily brought down. Out of 21 major phenomena listed in the year 2000, 16 had been eliminated in 2004, while two new phenomena had got added.

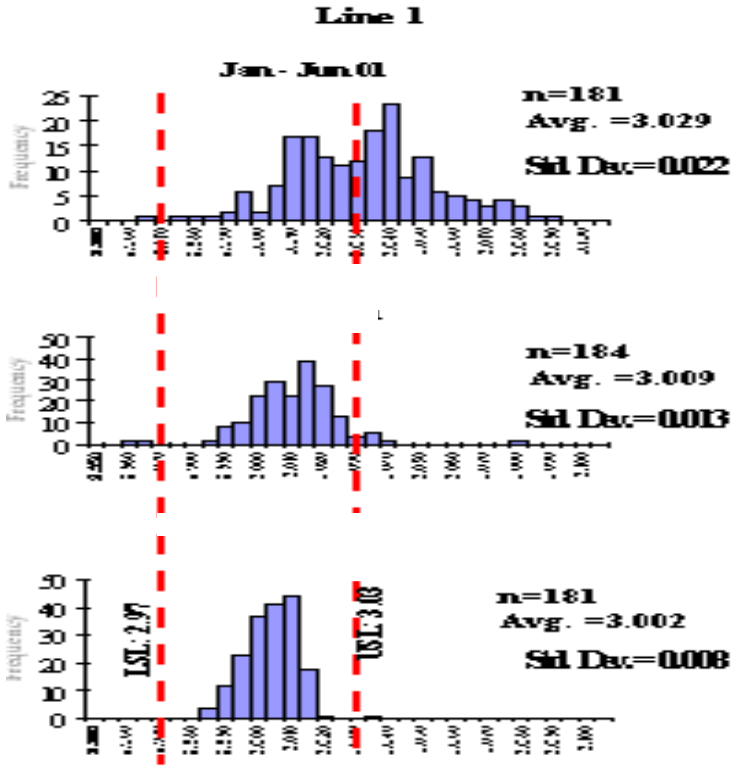


Figure 10: *Improved process capability in polymerization*

In Manali, participation of all employees had become a reality.

6.6 Equipment Management:

In 1996, Mr. K had said that the progress in 5-S should logically lead to TPM. However, it was to be 2001 before a manager's model loom was created in 2001 after six months of effort by the production manager and his team. In the very first cleaning, over 200 abnormalities were tagged. Chasing the ever-present grease, the team dis-assembled the loom, which had not been part of their task. As a result, they studied every part by dusting up an old supplier manual and learnt many things about the loom for the first time. They also realized that grease would always attract textile fluff, and so they modified the lubrication system to use a minimum of oil instead. The exercise revolutionised management thinking on maintenance. More model machines and their deployment formed part of the autonomous maintenance campaign. Over 10,000 equipment kaizens were recorded in the next three years. Time-based maintenance was improved and schedule-adherence was raised to 99%. Over 600 new standards were made. Predictive maintenance based on condition-based monitoring was applied to over 400 equipments.

The maintenance crew, especially in Manali, was somewhat unskilled, though they believed that they were skilled. It was decided to invest in a fundamental vocational training for the crew. A training workshop was set up in Manali, and a syllabus devised with a German company. A German trainer was then invited to provide a six month training to the crew not only on maintenance skills but basics like fits and tolerances or reading engineering drawings. By overseeing their work during shutdown maintenance activities, their skills were raised to high levels. Three batches were run, each for six months, and crew from the other plants were included. Together with autonomous maintenance, the program has helped produce dramatic reductions in breakdowns and improved reliability. Inspection of spares is done without errors and repair quality and time were improved.

In one of his visits, Mr. K was told that there were many difficulties arising out of the fact that the twisting machines in use were old. "Your machines may be old," retorted Mr. K, "but they are also cheap. Take advantage of this by improving their efficiency and quality for achieving high performance levels. A high level of maintenance technology could turn your low-cost production equipment into added strength."

Soon, an ingenious idea emerged from a supervisor at the Dubai plant to convert the old two-stage twisters to single-stage machines in the pattern of modern practice. A pilot machine of 12 spindles was built, and it proved the workability of the hybrid concept. A full machine was then constructed. In both these stages innumerable engineering challenges were overcome, thereby raising the technology level within the company. Statistical data was compiled for every spindle, and process capabilities established.

At some 30% of the cost it would have taken to acquire such machines new, all the advantages were realized. Space requirement was halved, and 43% power savings, 33% drop in waste, 58% drop in generation of incomplete bobbins, and 80% greater

productivity were realized. The success of the 'wacky' idea was made possible only because of the confidence that had been generated through years of continuous improvement through a systematic problem solving methodology.

The successful experiment was followed up by conversion of machines at all locations, leading to stronger cost-competitiveness.

6.7 Harmonized QA:

When a business is unified, it also needs a single Quality Assurance system that is harmonized across plants and processes, and covers the entire product life cycle. A QA Conference was held in 2001 to begin this process of integration. However, integration took time because of misconceptions about having a common system over multiple technologies. Once it was understood that technical differences do not come in the way of integration, work proceeded quickly. QC process charts, measurement system analysis and complaint handling system were among the first methods to be harmonized between all the plants. An overall QA diagram was made and went through several revisions. This was based on dividing quality into 14 stages, and developing a clearly defined system for each stage. Not all the stages were fully developed at the time of challenging the Deming Prize, and were developed thereafter.

The 14 Dimensions of Quality

Upstream QA
(Q0) Product planning
(Q1) Product development
(Q2) Project for installation
(Q3) Stabilization

Down stream QA (before supply)
(Q4) Vendor items
(Q5) Intermediate product
(Q6) Physical properties
(Q7) Roll rating
(Q8) Packing and logistics

Down steam (after supply)
(Q9) Tyre making- processability
(Q10) Tyre Performance
(Q11) Application Service
(Q12) Commercial service
(Q13) Relationship

The quality table, which had begun in 1995, was now very large and much better grasped. The table showed clearly that fabric roll attributes had the greatest impact at the stage of tyre making, while mechanical or thermal properties influenced tyre performance. The quality table precisely identified the likely troubles in subsequent

processes of the customer for each fabric defect that had, in the past, been treated merely as a visual defect. This understanding led to the development of a unique system of evaluating 'demerit points' in finished rolls – even though the role met specifications. The demerit points covering about 20 attributes were tracked through control charts and systematically improved, and compared with best benchmark rolls. The result was a dramatic upgrade in the quality of product that the customer receives.

6.8 SPARC and the Process-based Organization:

Even though the business had grown from one plant to four, organizationally they had remained separate. In 2001, they were unified as one business. A project with the acronym SPARC (Structure, Processes and Role Changes) was launched from the corporate office at Delhi. Its purpose was to take the process-based organization, which had worked in the Dubai plant, and been tried in Manali with limited success in 1999, to the entire business covering all the plants as well as common processes that dealt with customers or suppliers. Such a structure for a large organization, with multiple memberships in processes, was a unique step. Role changes occurred for many managers in the new structure, often with multiple responsibilities. The project scope included a one-time large-scale redesign of all the newly created processes (which replaced departments), with IT enablement. Although a great deal of effort was expended in this redesign for about two years, the results were not significant. Meanwhile the processes had been improved through daily management efforts in any case.

In 2004, this structure was integrated with the concept of cross-functional management, with the creation of a 'Quality Management Team' comprising senior persons to assure quality in the business as a whole. This is the equivalent of the cross-functional committee in TQM.

6.9 Strategy and Breakthrough Management:

A system of creating a six-year vision, with two strategic planning periods of three years was put in place.

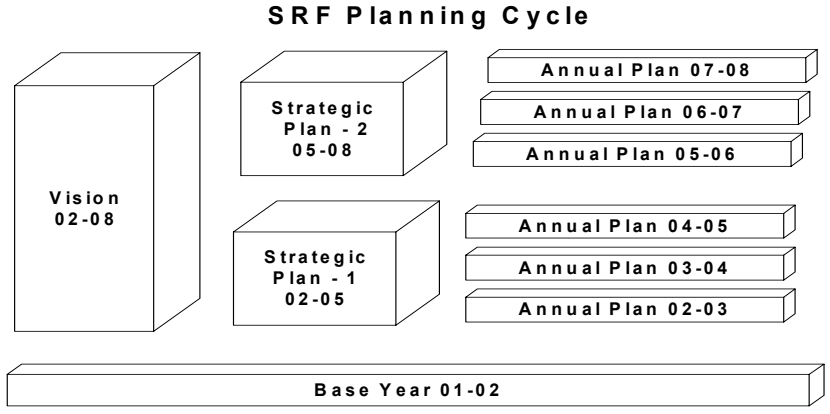


Fig. 11: *Vision and Strategy*

A vision of becoming a "reinforcement solution provider" rather than a tyre-cord supplier was developed. This would mean that in the long run, SRF would be able to

make proposals to tyre companies about the fabric reinforcements rather than make them to customer-given specifications only. The vision also broadened the field of interest to a whole range of "technical textiles". Subsequent to winning the Deming Prize, the belting and coated fabric divisions as well as twines which had been separate divisions were brought under ISB, which was renamed as TTB – *Technical Textiles Business.*

In 2000, as a prelude to policy management, daily management was further strengthened. Day-to-day control on the shop floor was improved through analysis of gaps in daily control points and by abnormalities in control charts.

In early 2001, policy management was piloted. In India, the word policy tends to mean a rule or a guideline. So SRF renamed it as breakthrough management, to distinguish it from daily management. The breakthrough directions were drawn for the President and deployed to marketing and manufacturing, more especially for Manali plant. The first challenge was to prioritise. The tendency was to include everything, and the connection to the strategy was not clear. The next challenge was to know the real issues, and their causes.

In 2002, breakthrough management was developed as a full-fledged charter, and an X-matrix used to depict the deployment. A three-day offsite meeting of some 35 managers of ISB was held. The directions were clearly related to the first year of the three year strategic plan, coming from a six year vision. The challenge was to list up issues from facts, from reviews, and from fresh developments. The tendency was to state issues in abstract terms, and this had to be painfully combated by asking for facts. The exercise was a breakthrough because it really taught everyone what working with facts really meant. The impact lasted well beyond the year. In subsequent years, open sharing of issues took place regularly.

Each year the planning methodology was improved. The annual planning cycle became systematised. It now included breakthrough items, projects and daily management items. A defined three-stage cycle led to the budget and plan approval hearing by top management before being presented to the Board. The prioritization of top management directions became sharper, never exceeding three. Means were sharply defined, through causal analyses often using affinity and relationship diagrams. Deployment reached down to supervisors. The participation of all managers and supervisors in planning became a reality. Deployment became increasingly precise. Achievement ratios were improved.

Breakthrough management relies to a great degree on effective problem solving. A two-tier certification system was introduced in 2002 for problem solvers. The basic level, called Blue, included 7.5 days of class room training, two assignments, a test and two improvement projects which are evaluated and scored. An advanced level – Silver – was then added. This included the methodology called PSP II, akin to the task achieving QC Story. The ability to execute plans rose as a result of improved problem solving skills. Statistical software was introduced used so that time could be devoted more to interpretation than to calculation. The documentation of problems solved improved dramatically and began to serve as a knowledge base.

Later, Blue certification was declared as applicable to every employee, including workers. The campaign was titled *everyone a certified problem solver.*

The planning system comprising strategy, breakthrough management and the annual planning system, in combination with rising problem solving skills provided confidence that even complex challenges could be regularly met.

7. Challenging the Deming Application Prize:

A few days after Mr. K's visit in August 2002, Arun Bharat Ram, who had missed the visit, toured the Manali plant. He was at once surprised by the visible changes in the plant and the friendly greetings of operators. Something had changed dramatically, he felt. In reality, accumulated improvements tend to become strikingly visible at some stage and appear dramatic. It was clear that the time had come to apply for the Deming Application Prize.

The Deming Prize system mandates a diagnosis prior to application, and this took place in December 2003. Though everyone had worked hard to send the required documents in advance and to make presentations and be examined, the teams had a hard time with the sharp questions posed by the assessors. There was much hesitation about challenging the prize next year. However, with encouragement from Mr. K and Arun Bharat Ram, the plunge was taken.

A new President of the business had taken over. He had a background in SRF Nippondenso, and had held several important positions in ISB. Everyone realized that a great amount of work remained. As the examination dates in August 2004 neared, the momentum peaked. Everyone seemed to stay late and work even on Sundays.

In the examination, some of the individual departments turned into occasions where eager members were seen persuading the examiners to see their work also. After rigorous examination, the Deming Prize committee decided to award SRF ISB the Application Prize in 2004.

8. Effects of TQM in ISB:

Human productivity doubled in five years, without the aid of any expensive investment.
ISB's waste levels had fallen significantly, as had downgrades or rework. Most chronic phenomena leading to product complaints had been eliminated, and customer relationships had improved, as reflected in satisfaction scores. Joint projects with customers had helped reduce cost and waste at the customer's end. Many excellent

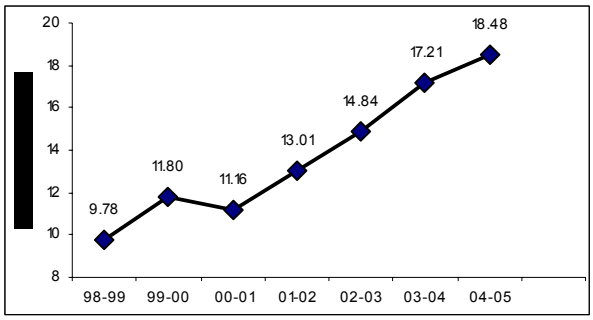


Fig. 12: *Productivity Index*

comments had been received from customers. ISB was rated No.1 by over half its customers.

Breakdown hours had been reduced rapidly, as shown in figure 13.

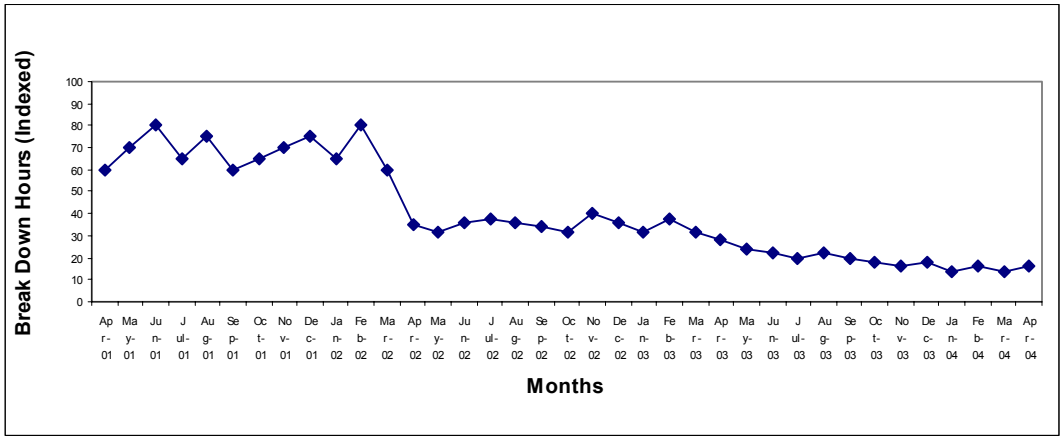


Fig. 13: *Reduction in breakdown time*

Technology development had moved up in line with vision, as reflected in innovative equipment development from 'wacky' ideas and in process development.

People participation and satisfaction scores (from surveys) moved up remarkably.

While three competitors closed down and two more were acquired by SRF, ISB remained profitable after weathering a 45% drop in conversion margins — that had first dropped due to the Asian meltdown and then due to Chinese competition. (Figure 14)

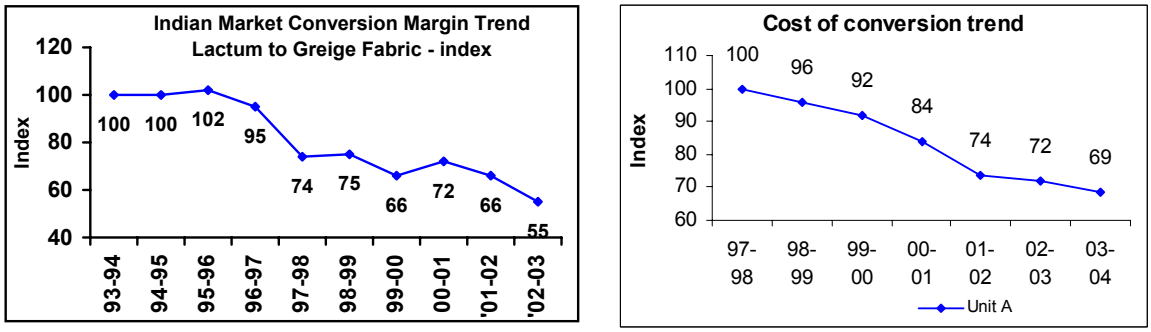


Fig 14: *Cost reduction*

The TQM journey of SRF had not always been smooth-sailing. There had been doubts, diversions and stop-go movements. But the company had always persisted regardless. As

the managers understood what TQM meant and as they saw what customer orientation meant, they simply kept doing what ought to be done. Even though the momentum was built up gradually, it became suddenly noticeable when it was large enough. In 2004, the feeling was that ISB had reached a point of no return. TQM was clearly the way of SRF in the journeys ahead, through global challenges.

The management of SRF and ISB did not claim that their achievements were greatly satisfactory; they knew how much more needed to be done. But they had made improvements all-round. In fact, looking back, they could not believe they had come this far. At the same time, looking ahead, they saw possibilities and challenges they never thought of when they had started this journey.

When Mr. K visited Manali plant in 1995 for the first time, he felt this factory was close to a state of despair, but by the unstinting efforts of its people, the factory's TQM program began to deliver better business results. The quality of its products improved, and its market share increased.

The most significant effect achieved through these improvements was the change in the mindset of the factory's employees. Before, quality variations were invariably attributed to power failures, but once they started to use control charts to monitor the polymerization process, and data to study how the quality varied in conjunction with variations in operational methods and process conditions, they realized that there were other causes. They changed the control charts, which were originally just for show, into an effective tool for controlling process variation. After a problem had been resolved, another would surface, and progress was made by solving them one by one. We call this phenomenon *Improvement driving improvement*. When people start experiencing it, a different dimension of quality management emerges. Professor Ishikawa used to call it the *Taste of QC*. The more we chew our food, the tastier it becomes. No matter how hard one tries, it is impossible to know what a food tastes like by listening to a verbal explanation. One can only find out by trying it for oneself. This is exactly what Professor Ishikawa meant when he talked about the Taste of QC. As improvements begin to happen, people begin to appreciate the taste of QC; and, once they have tasted it, more and more improvements happen. One only realizes this through experience. Mr. K has come across this phenomenon at several Japanese companies, and this Indian company are experiencing it too. He is convinced that it is a universal phenomenon that can be enjoyed by any company anywhere in the world.
