Preparing the Work Force for Knowledge Intensive Manufacturing

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Human Resources Manager, Automation Division
Remmele Engineering, Inc.

Background

Remmele Engineering operates five plants in the St. Paul/Minneapolis area and employs approximately 460 people. The company was founded in 1949 by the former German machinist, Fred Remmele. The products are mostly intricate and precision machined parts used in computer disc drives, ABS braking systems, aircraft components and medical equipment. The plants use generic, flexible machines operating at high speeds. In doing so, Remmele strives to operate with 10% of the setup times that similar companies require while cutting lead times by one-third of the standard 12 to 14 weeks.

Since the founding of the company, employee training has been a focus of management. Like many German companies, Remmele instituted an apprenticeship program for machinists that taught workers different jobs. A company orientation program supplemented this apprenticeship and was required of all employees. His focus on training has remained a part of the corporate culture at Remmele.

Strategy

Machinists are given extensive training, consisting of eight core courses, supplemented by review/ orientation classes and on-the-job training. The eight core courses consist of:

1. SPC
2. Interactions (team exercises)
3. Safety
4. Focused Factory
5. Basic Problem-Solving
6. Train the Trainee
7. Metrics
8. Preventive Maintenance.

The Train the Trainee program tests the workers' recollection of learned techniques while holding instructors responsible for conveying the correct information. Although an additional course in basic manufacturing is required, courses in math, basic measurement, print reading and introduction to machine controls are at the discretion of the instructor. In total, the set of training courses takes from 90 to 109 hours to complete.

After the training period, Remmele employees are empowered in their jobs. Individual operators are in contact with customers and are responsible for the quality, quantity, and timing of delivery. Often on longer projects, operators visit other facilities in order to develop a better understanding of customers' requirements. Work cells in the plants are groups of machines dedicated to a portion of the project. Within these cells, workers perform routine preventive maintenance. Operators even order tooling while maintaining a budget, which facilitates ownership of final products. Management's role has thus become one of support; to provide training and information on tooling and equipment to enable operators to make daily decisions.

The Remmele system encourages worker's growth while providing a sense of security. In yearly performance reviews, each operator discusses with his/her supervisor a lists of skills necessary for jobs. Training courses at local universities and community colleges are then scheduled as desired. Unlike many other tuition reimbursement programs, Remmele pays all fees initially, trusting that the employee will learn the necessary information. As for new business opportunities, engineers, buyers and managers discuss details with potential customers. However, as soon as the project is agreed upon, machinists are involved to integrate the new program into the plant's existing procedures and tooling.

Results

Because Remmele is a privately held company, profit figures are not released. However, revenue has grown from $10 million in 1977 to a projected $70 million in 1994. Just as important, employee turnover is approaching negligible amounts, while job satisfaction is high. These results have been achieved while competing for experienced machinists with larger organizations such as 3M and Honeywell. During the period between 1992 and 1994, customer price reductions of up to 22% have been achieved while reducing scrap and rework by 25%. Also, daily JIT shipments to customers have been established, attributable in part to Remmele achieving six sigma quality levels. Even during downtimes, Remmele remained committed to investing in its work force and intends to continue the work begun by Fred Remmele in 1949.

Accelerated Continuous Improvement: Maximizing Performance of Technology and Teams

Lee Sholley
General Manager
Timken Company

Background

The Timken Company began manufacturing tapered roller bearings during the late 1800s and entered the steel making business around the turn of the century. Timken has grown into a multi-national company, posting sales of $1.9 billion in 1994. While the U.S. steel industry was experiencing difficult times during the early 1980s, Timken was formulating plans for a greenfield production plant. The Faircrest site, a high-tech integrated alloy steel manufacturing facility, cost approximately $435 million. The investment accounted for almost two-thirds of the company's net worth at the time.

Timken began with a three-tier vision for the proposed facility. Management wanted a plant which was to run much faster than average and invested in high tech equipment to facilitate this goal. For instance, the Hierarchical Computer Control System controls information flow and directs certain equipment automatically. Secondly, the plant was supposed to operate with significantly less downtime. A total preventative maintenance plan was instituted along with a plan to reduce problems associated with shift changes. Finally, the plan was to greatly reduce scrap rates that would result in increased output of high quality products. With these goals in mind, the Faircrest Steel Plant (FSP) was opened in 1985, employing 468 in total.

Strategy

Operations at the Faircrest facility were to achieve these goals through personnel and technical development and continuous improvement. Although 80% of the workforce was drawn from an existing Timken facility, management was committed to changing cultural norms and to operating the facility around self-directed work teams. To enable this change, Timken invested heavily in employee training, reaching 33,000 hours in 1991.

The organizational structure of the typical Timken plant was changed to operate under these new conditions. A special contract was negotiated with the union to allow for this teaming, in which all hourly and staff workers are called associates. While six operators per shift coordinate some administrative tasks and see that the production flow is maintained, hourly associates are able to manage operations within their functional boundaries. Five different types of teams were formed to tackle different types of problems:

1. Cross-Functional
2. Cross-Area
3. Technical
4. Team Concept
5. Communication Teams

Examples of projects undertaken by such teams range from scrap segregation and saw utilization to time-clock relocation and alternative work scheduling.

Timken did not isolate these concepts within the Faircrest plant, but included suppliers as well. The company established a "Supplier City" directly across from the plant where suppliers are housed. At the time of the presentation, six suppliers occupy the space, with more slated to be added by the end of 1995. These suppliers are linked via an EDI system that allows for speedy delivery. Timken entered a 20 year agreement with these suppliers to highlight the team nature of the relationship.

Results

By any measure, the Faircrest Steel Plant has been an overwhelming success. Although designed for 550,000 tons per year, the facility's output stands at 770,000. In terms of man-hours/ton, this is nearly four times the output of average U.S. and Japanese facilities. The site is now the world market leader for large alloy bars. Fully 100% of the workforce operates in self-directed work teams, which has led to a turn-over rate of just .9%. Since introducing the team concept, customer rejects have fallen 62%, scrap and rework by 27%, while increasing productivity by 28%. In recognition of these accomplishments, the Faircrest facility was the first steel mill ever to receive the honor of being designated one of America's Best Plants.

Future

Because of the successes at Faircrest, Timken hopes to transfer the methods to its other facilities. The key inputs focused upon include: employing technically competent people, setting aggressive goals, simplifying both process and product and giving rapid feedback through measurement of metrics. Through identifying transferable management practices as opposed to those practices inherent to the site, Timken hopes to realize similar successes.

Competitive Strategy and Performance Measurement
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Mass Customization: Strategic Response to Commodity-Based Competition

Michael Pessina
Director of Manufacturing

Paul Younger
Operations Project Leader
Lutron Electronics Company

Background

Lutron Electronics Company is a privately held company that was founded in 1961, after the successful patent of an electric light dimmer switch. The company defines its market not just in lighting, but in visual and environmental control for both industrial and commercial uses. Lutron's corporate headquarters is located in Coopersburg, PA with a manufacturing facility a short distance away. Lutron began operations in Puerto Rico in 1977 and a decade later in St. Kitts. Its labor intensive operations are generally performed outside of the U.S. To support its product line, Lutron operates sales offices in the U.S. as well as in London and Tokyo.

Although the company is relatively small, with each operating facility employing between 200 and 300 employees, Lutron holds a commanding presence in the market. Through continually focusing on three main items, they now command a 50% market share. Constant innovation has been a major thrust of their efforts, evidenced by their investing 10% of annual revenue in R&D. In addition, producing high quality goods has been essential. Lutron designs its entire product line for a mean time between failure of 100,000 hours and offers after-sales service for at least 10 years. Finally, maintaining customer focus permeates their operations. Michael Pessina, the Director of Manufacturing, spends 20% of his time talking with customers and Lutron's engineers also must have sales experience.

Strategy

One major event contributed to Lutron's pursuit of a mass customization strategy. Approximately twenty years ago, a large conglomerate began a price war in Lutron's market. To illustrate, a product similar to a 600 Watt light dimmer that Lutron was producing for $3.00-$4.00 and selling between $5.00-$5.50 was priced by the competitor at $3.00. The competitor was able to accomplish this significant reduction in price by offering only standardized products made in long manufacturing runs. The competitor's non-standard parts, i.e., different colors, styles, etc. had lead times of 3-4 weeks, compared to a few days for Lutron. Lutron chose not to compete on price. Therefore, in the words of strategy theorist Michael Porter, Lutron adopted a niche, differentiated strategy, while the competitor became a broad, low cost producer.

A number of factors has enabled Lutron to achieve its goal of gaining a strategic advantage through mass customization. Lutron's customer base: Home Depot, Lowe's, Builder's Square, etc., has very demanding ordering policies. They all have strict delivery time frames and do not allow back-ordering. Thus, Lutron must quickly design new products and produce a wide variety of components at a reasonable cost. To do this, engineering has made considerable use of CAD systems and new microprocessors. The microprocessors allow customers to program the lighting systems to fit the job. They have also been pro-active in involving suppliers in their design process.

Additionally, Lutron has used a number of other methods to be able to mass customize. For instance, they have focused on developing a limited number of common modules. These modules can be combined to produce many more types of end products. All manufacturing is done on a make-to-stock basis and in small runs. Indeed, a significant portion of their SKUs are made in production runs of 500 units or less. Finally, because of the typical erratic demand of products, all of their non-union work force has been cross-trained in different areas of production. To facilitate this, operations has focused on eliminating differences in assembly techniques which has also reduced the need for different types of machine capacity.

Results

Lutron has fared very well with mass customization, achieving almost constant steady

growth over the past decade. Through that time, product growth has been over 100%, while sub-assembly growth has been held to under 10%. The corporate goal is to achieve revenue growth just over 20% per year. The company's product line now consists of approximately 11,500 SKUs. Lutron can ship all of these within 48 hours of receipt of an order while maintaining a line item fill rate of 95%.

Future

Lutron has a number of objectives that allow them to continuously improve their operations. They plan to remain focused on the commercial and industrial markets through discussions with distributors, contractors, architects and other end-users. The company will continue investing in its work force through formal training and skill-based pay. In addition, engineers will focus on designing products that can be customized at the job site or distribution center, while eliminating the need to customize on existing manufacturing lines. Problem areas, such as the increasing number and overlapping product offerings as well as expensive set-up charges will have to be investigated further. However, through focusing on customer preferences while continuing to produce high quality, innovative fixtures, Lutron expects to remain the dominant player in the visual and environmental control market.

Time-Based Continuous Improvement Approach

Keith K. Watts
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OSRAM Sylvania

Background

OSRAM Sylvania Inc. was formed with the acquisition of Sylvania (Electrical Products) from GTE in early 1993. The U.S. headquarters is located outside of Boston, MA, while OSRAM, a subsidiary of Siemens, is located in Munich, Germany. The corporation is the second largest manufacturer of incandescent, fluorescent and high-intensity discharge lighting products in the U.S. There are 26 manufacturing facilities in the U.S. and Canada that employ approximately 12,500 employees. In 1994, OSRAM Sylvania expected to achieve $1.3 billion in sales.

The three divisions within the company are:

1. lamp manufacturing
2. automotive and miniature lighting
3. and materials and components.

An internal consulting group is responsible for providing direction, support and assistance to the business units using both technical and social skills. The group focus is low cost, high quality and quick response, while fostering a sense of entrepreneurial thinking. Included within the technical and social elements are such aspects as: team problem-solving, self-managed work teams, JIT, cost reduction projects and total preventative maintenance. Process simplification is the overriding goal of the consulting group.

Strategy

OSRAM Sylvania adopted the Time-Based Continuous Improvement Approach (TBCIA) to enable the company to analyze and then optimize the business as a whole. This is a systematic customer-driven approach to continually improve the business. The TBCIA works with little capital expenditure while eliminating cost, reducing lead times, improving quality and involving employees.

There are essentially four ingredients necessary when applying TBCIA. First, management determines how processes are currently performed and also how they should be performed. The consulting group documents each step of a process. It determines the time required, notes who performed the step and identifies barriers to that step. The second ingredient is separating value-added and non value-added activities. Non value-added activities are those that take time, resources or space but do not add value to the product or service that meets customer requirements. The group found that for most processes only 5% of the time was spent on value-added activities.

The other ingredients are the tools to conduct the change and employee involvement. OSRAM uses a variety of tools to solve process problems. Initially, the groups use Pareto analysis to identify those processes that would produce the most gains when fixed. For every process, the consulting group makes a flow chart. The flow chart contains both who is responsible for the process and also the amount of time necessary to complete it. Additionally, OSRAM uses SPC, concurrent engineering and layout analysis as tools. Employee involvement is also

critical. Teams form, establish the state of a process, and set goals and objectives to improve it. Of course, time is allotted for these groups to achieve the goals and appropriate award systems are used to reward success.

The group determines a number of performance measures for each project. Because time is very important to customer satisfaction, lead time reduction is documented. Also, the ratio of value-added to non value-added and first pass yield are calculated. Finally the actual to theoretical cost is determined either by step or by the process as a whole. In collecting these metrics, OSRAM hopes to become more customer driven while having a few standardized indicators for similar businesses.

Results

OSRAM hoped to achieve a number of benefits through its Time-Based Continuous Improvement Approach. For all employees, it minimizes frustrations of the job, eliminates wasted time and time spent on habitual activities. In terms of empowerment, the TBCIA programs allow employees to question their duties and to improve internal and external communication.

Typically, improvement data have been encouraging. Time-based metrics have improved dramatically; lead times have been reduced between 30 and 70% and setup reductions by 60-90%. Other documented improvements have been in scrap/rework rates and space reduction, where levels between 15 to 40% were achieved. Finally, productivity has increased by as much as 25% and inventories reduced up to 60%.

Future

OSRAM believes the TBCIA system will continue to produce returns for the company. Although most of the large opportunities have been investigated, other projects will continue to be pursued. Additionally, there are the increased advantages of having a more empowered work force, being more responsive to customers, and having the structure in place to allow for future change.

Re-engineering as a Source of Enhanced Strategic Capability

Richard Dobzelecki
General Business Director & General Manager
Dupont

Background

Dupont collectively is a $40 billion dollar company that is divided into two distinct businesses. The original Chemical and Specialty Products portion, founded in 1806, represents approximately 60% of total revenue. Conoco, an oil company acquired in 1981, accounts for the remainder. Within Chemical and Specialty Products, the businesses are organized into strategic business units (SBUs.) The focus of the discussion was the Packaging and Industrial Products division of one of the SBUs. This division supplies a number of industrial markets with a variety of products from food packaging materials to golf ball coverings.

Dupont faced a number of challenges in the early 1990s. Management was characterized as very hierarchical with many layers. The large revenue increases typical in the 1980s were slowing, while costs were steadily increasing. Conversations with customers revealed that although they were satisfied with product options and quality, Dupont was becoming too expensive. The Seagrams Corporation, which held 25% of Dupont's stock following the Conoco acquisition, began to demand changes.

Strategy

Dupont was charged with re-engineering the corporation in order to reduce costs and prepare the company for the future by becoming more flexible. At the same time, Dupont desired to remain true to its four core values: discovery and innovation; safety, health and the environment; ethical treatment of employees and customers; and, finally, commitment to performance. However, the re-engineering focused more of Dupont's efforts on its commitment to performance.

Beginning in 1991, the company began implementing its five step plan. Among the goals were to restructure its portfolio, reshape the organization, lower fixed costs by at least $3 billion, become more focused on profitable growth, and ultimately to build healthier businesses. To begin, management investigated each of the SBUs for

healthy business criteria. Based upon these investigations, each SBU was designated as: currently viable, candidate for growth and reinvestment, or candidate for reduction or divestment. In the words of the current chairman, Dupont wanted to "bring reliability, speed, step change, accountability and specificity to everything we do."

The steps focused on performance. The healthy business criteria first looked at variable margins and after-tax margins. The corporation preferred to have variable margins of at least 50% because of the high fixed costs associated with benefits. Secondly, return on net assets (RONA) of at least 14% was desired. Finally, growth rates in both the market and product as well as the global opportunities for the SBU were discussed. The second stage tied management compensation to the performance of the SBU with the acknowledgment that this could potentially cause some short-sightedness in decision-making. Then, performance reviews were initiated. These reviews included a discussion of the business direction and plans for implementation, attempts at team building and feedback on personal leadership styles.

The final two steps dealt with broader issues. The corporation as a whole was charged with developing ways to reduce purchasing costs. Because the SBUs were organized around supply chains, the division directors sought to pursue efficiencies throughout the business units. Finally, there were attempts to link requests for capital to performance. Not only would this enable Dupont to use their available capital more wisely, but also would hold management accountable for the return on that capital.

Results

As a result of Dupont's re-engineering efforts, the company reported record earnings in 1995. In addition, they completed their $8 billion repurchase of shares formerly held by Seagrams. The attempts at flattening the layers of management were also successful as the company reduced overall employment by 25%. Many of the reductions came from reporting committees and related staff.

Other metrics show Dupont's success. In 1993 only 25% of Dupont's business units reported the goal of a return on net assets of 14%. Presently, only a couple of outliers do not achieve this goal and are the focus of additional re-engineering efforts or targets for divestiture. Overall, the after tax margins have risen 8% and has resulted in a two year 225% earnings growth. Finally, Dupont has reduced their break-even point by between 6 and 8% and is better hedged against expected downturns in the cyclical industry.

Future

Dupont hopes to continue this success by focusing on a number of key success factors. Upper management's involvement in re-engineering efforts while focusing on merging strategic and tactical issues has been crucial. Also, DuPont will continue to track appropriate metrics to make managers accountable for their actions. This accountability will also be supported by using monthly SBU report cards which post earnings and cash flow results.

The corporation will remain focused on profitable growth through exploiting their advances in core technologies. Because of the growth opportunities in the Far East, Dupont will expand regionally through acquisition, joint ventures and, when necessary, partnerships. Dupont plans to establish worldwide leadership in the high-end chemicals market through constant assessment of progress.

Kaizen: A Catalyst for Organizational Renewal

Frank Giannattasio
Vice President of Operations
The Wiremold Company

Background

The Wiremold Company is a 95 year old, privately held company headquartered in West Hartford, Connecticut. The company currently generates over $200 million in annual sales, up from just $100 million in 1991. Wiremold supplies a variety of products, including wire management systems, power conditioning and wire systems used in the communication and lighting industries. To provide these products, the company maintains three warehouses which distribute products from 11 plant locations. The Wiremold Company serves a wide range of end users in the U.S. and abroad, including electrical and telecommunication distributors, OEMs and "do-it-yourselfers."

During the late 1980s, the company was experiencing a number of familiar problems. The industry as a whole was growing very slowly, while more foreign competitors entered the stagnating market. Because of these external forces, Wiremold attempted to remain profitable through cost control.

A number of factors hindered their attempts. The company was characterized by top-down management and poor labor relations. At the same time, their manufacturing operation used MRP-scheduled batch processes and introduced less than one new product per year. Overall, during the period between 1987 and 1990, while sales increased a moderate 20%, Wiremold's operating profit fell 82%.

On a positive note, the company had invested in two years of total quality training and had a profit sharing program that distributed 15% of its pre-tax earnings. However, management recognized the need to make further changes for the company to survive in the long term.

Strategy

Wiremold's new president, a firm supporter of Kaizen, instituted a 15-step plan for revitalizing the company. Management established three core values for the company to focus on: customers, employees and Kaizen. An early retirement program was offered to the entire work force, which reduced overall employment by 35%. However, middle management was not trimmed enough and was again offered additional incentive packages. Wiremold recognized the anxiety the changes were having on its personnel and therefore provided an oral job guarantee to all, which was strengthened by a written agreement later. The job guarantee allowed reductions in the face of economic downturns, but did not allow for layoffs due to Kaizen. In order to obtain feedback about their process changes, Wiremold collected an annual survey that included an assessment of management.

Once the company reduced its work force to reasonable levels and gained employees' confidence in the program, management analyzed the business. First, products and processes were investigated for inefficiencies. The people involved were then evaluated on both their skill level and their commitment to Wiremold's three core values. The company was then reorganized into six business units and four support teams centered around similar products and processes.

A strategic mission statement was written to provide long-term focus: "Be the leading supplier in the Electrical Products Industry and one of the top ten time-based competitors in the world." Through working with the heads of its business groups, Wiremold "gave ownership" of the company strategy to the group leaders and made them responsible for instilling it in the other employees. The strategy included doubling in size every 3-5 years through acquisition and offering new products, while strengthening its base business (100% customer service, 50% reduction in defects/year, 20% productivity gains/year, 20x inventory turns, 20% profit sharing and a clean working environment). To chart this strategy, the company established a progress report to be completed each week that outlined how management intended on meeting its objectives. In addition, regular cross-functional team meetings with line workers were held to discuss problems and successes.

The company then revised the profit sharing program to be based on quarterly periods. Wiremold management also worked closely with union representatives in order to promote independence on the part of hourly workers and enable the company to institute changes. Finally, all associates had Kaizen training that included: at least seven hours of theoretical and practical instruction, cross-functional classes and an emphasis on questioning the status quo and making changes.

Results

The result of this strategy was the Wiremold Production System with its three focal points. Management sought to control "Work to Takt Time," or spreading production over available manufacturing time. This made Wiremold more responsive to customers. "One Piece Flow," where a single part was produced in its entirety during a shift, attempted to minimize WIP. Finally, the entire production line went to a "pull" scheduling system.

The Kaizen approach was facilitated by Wiremold's JIT office, which was manned by a cross-functional mix of hourly and salary personnel. Specific Kaizen projects, defined by team leaders, were attempted to be completed within 3-5 days. The JIT office worked with the business units to define the current system and then set objectives for improvement. For instance, typical Kaizen objectives include: reducing the number of necessary operators, space used in the factory or warehouse, number of defects, etc. by over 50% in most cases.

Other, more quantifiable successes were achieved through Kaizen efforts. Set-up time reductions for the three classifications of machinery were reduced by 20-43%, while inventory turns improved 215% over three years. Reported accidents were reduced from 105 to 63; a 40% reduction in one year. Through working closer with Wiremold's fifteen core suppliers, the overall number of suppliers was reduced by 72%

over a three year period. These savings could be directly linked to the bottom line; the cash saved in holding less inventory paid for five acquisitions.

Future

Wiremold's Kaizen approach resulted in doubling sales over the past two years, while operating profit is 5.5 times that of 1991. Consequently, management plans to continue to use the Wiremold Production System as a strategic weapon. In doing so, Wiremold believes that increased customer service will allow for expansion both in existing and new markets. Also, the savings in working capital will enable the private company to finance this growth. Finally, Wiremold management expects these gains to be sustainable by continually focusing on improving its processes and developing its capabilities.

Partnering for Manufacturing Excellence

Richard Nielsen
President & CEO
Center Manufacturing Inc.

Background

Center Manufacturing Inc. is a provider of stamped metal products to the automotive and consumer electronic industries. The company, with revenues of $75 million in 1994, operates three primary facilities: Byron Center, MI, Williamsport, PA and Culver, Ontario.

Japanese manufacturers such as Sony Corp. had been looking for U.S.-based operations to provide support for localized products. However, they were hoping to find levels of sophistication not normally found at U.S. consumer product suppliers. Center Manufacturing was investigated as a potential candidate to provide Sony with 20 in. Trinitron TV frames.

Sony initiated the discussions with Center based upon their ISO 9000 certification and reputation in the industry. They initially sent teams of approximately ten employees to discuss the opportunity with Center Manufacturing. Sony was prepared to give Center the opportunity to submit a bid after extensive discussion and management interviews. The bid, however, was much higher than Sony was willing to accept.

The problem was somewhat rooted in the culture of the industries in their respective countries. In Japan, tooling costs were normally paid for by the supplier, with the costs being absorbed. However, U.S. firms normally bid a price per unit as well as estimated tooling costs, which were to be paid up-front. The $1 million tooling investment included heat treat and washing equipment, robotic welding and special milling tools. Center had no other uses for the tooling and had no previous sales to Sony. In spite of these differences, Center and Sony pursued a partnership.

Strategy

Sony was very aggressive in its pursuit. They sent a number of engineers familiar with the frame manufacturing process to Center and included actual videotapes of Japanese production. Sony hoped to allay some of Center's reservations and eventually agree on a mutually-acceptable bid. To do this, Sony arranged for a tour of one of their Japanese-based suppliers of TV frames. The Japanese supplier agreed to assist Center after speaking with Sony management. In exchange for the information, Sony agreed to purchase higher resolution computer monitors that the supplier was developing.

Center Manufacturing took this information and rethought its cost structure. Their normal COGS averaged around 70%, but this project would be approximately 80%. Center rejected their traditional decision-making methodology and decided upon using a separate income statement for the project. Management decided to pursue the project for two reasons. It was a high value-added activity and would also serve as a ticket-to-entry for more sales volume with Sony.

Manufacturing operations began with a number of problems, including items internal and external to Center. Again, Center worked with Sony engineers while using daily problem-solving meetings, multi-functional teams and total preventative maintenance. When quality problems surfaced with the locally sourced steel, both Center and Sony were involved in the discussions.

Center identified three major reasons for its successful partnership with Sony. First, both parties were willing to share information and look at each others' perspective. While Center was seeking to expand its business, Sony needed local production. Also, both firms shared technological and cost information in attempting to find a mutually

beneficial resolution. Secondly, Center's willingness to adopt different cost structures was seen as instrumental in reaching an agreement. Finally, the companies recognized that confidence in each other must be developed over time. Center was initially skeptical about its potential returns and thought it was being held to higher quality standards than even Sony's Japanese suppliers. These elements were essential for forging the relationship between Center and Sony.

Results

Center Manufacturing has grown from a $15 million to a $75 million company and expects to grow another 33% in the next three years. The volume of frames supplied to Sony has risen from 30,000 per month to more than 200,000. To support this growth, Center has added additional working cells and milling centers. Center now ships to manufacturing facilities in San Diego, Singapore, Japan and recently Wales.

Their presence in the market has been noticed. Although the facility in Wales has the capacity, Center provides it with 60% of its frames. Also, Center is frequently brought in to give manufacturing advice and to trouble-shoot. Sony's original frame supplier recognized Center's improvements and has relocated from Japan to California. Indeed, Center has been able to compete effectively against many firms based in the Far East.

Future

Center Manufacturing hopes to continue its partnership with Sony. It has initiated a re-engineering process and is seeking additional tooling to expand the potential product line. In doing so, it hopes to provide frames for the larger TV sets currently produced by Sony in San Diego and New Stanton, PA. In addition, Center is looking to become more active in pre-engineering product offerings with Sony, Honda, etc. Through careful investigation and sometimes a leap of faith, Center Manufacturing has succeeded in developed beneficial partnerships.

For more information regarding the Center for the Management of Technological and Organizational Change, contact:

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