Canada

# Case Studies in Advanced Manufacturing Technologies

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## FOREWORD

There is growing recognition among industry leaders that advanced manufacturing technologies (AMT), including computer-aided design (CAD), computer-aided manufacturing (CAM) and robotics, are tools that can help Canada maintain its competitiveness on both domestic and international markets by increasing its productivity and improving, whenever possible, the quality of its products. There is a growing awareness in Canada that we must take advantage of these new technologies or see the collapse of our manufacturing sector.

Surveys have shown that many firms, in particular small and medium-sized ones, view the adoption of AMT as an expensive proposition with considerable uncertainty as to operational and financial viability. These firms prefer to wait until the technology is more mature. They watch the development of the technology and wait until the cost of equipment has declined. They also wait until they can see the technology being adopted by pioneers in their sector.

There is evidence that many Canadian industries are lagging behind their major competitors in the application of AMT. The situation varies from sector to sector, but the literature shows that the gap is larger in small and medium-sized firms, and particularly in sectors where there are few, if any, users of the technology.

As the Technology Assessment Directorate mandate is to increase the awareness about, and the rate of introduction of, AMT, a contract was awarded to Deloitte, Haskins & Sells Associates to produce case studies describing successful implementation of AMT. These studies could be used to convince small and medium-sized firms that implementation of these advanced technologies is feasible and would be beneficial to them.

This report provides examples of successful application of AMT in three different industrial sectors: furniture, tool and die-making, and precision manufacturing. The views and opinions expressed in this document are those of the authors and are not necessarily endorsed by the Department of Regional Industrial Expansion.

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## CASE STUDY - REFF INCORPORATED

Reff Incorporated, started in 1964 by four related new Canadians from Germany, now occupies a dynamic position in the Canadian furniture industry. In the late 1970s the owners made the decision to completely rebuild their operations. Their vision was to become a most efficient manufacturer of office furniture, achieving a significant presence in the North American furniture industry. Using carefully planned applications of advanced manufacturing technology (AMT), Reff's sales figures have trebled since 1982.

At its beginning, the company designed and manufactured modular residential furniture units that were sold through major retail outlets. Conceptually, the manufacturing processes supported "flat-line" designs, where most components of a piece of furniture are produced from flat sheets of composition materials. Subsequently, the products were aimed more directly at the commercial designer/systems-oriented market. Component materials now include high-quality wood solids and veneers, plastic laminates, stainless steel trim and wide ranges of decorator-selected fabrics and coverings.

During the move into the commercial furniture markets, product designs became more oriented toward office-modular, multi-component forms. Reff's exclusive in-house furniture designs complement the successes the company is achieving in North America.

Although the company recognizes its share of the larger North American market is relatively small, it can now meet major competitors head-on and win substantial furniture contracts worth millions of dollars on a profitable basis.

Currently, mid-way in its rebuilding program, Reff operates from new manufacturing facilities in Toronto, with showrooms across Canada and in the United States.

### Implementing the Vision of AMT

From its early beginnings up to the mid-1970s the company had expanded operations into six different locations in the Toronto area. The Reff management philosphies ensured that these plant and warehouse locations used good equipment operated by experienced people. It was becoming increasingly clear, however, that manufacturing communications could not provide good support. The difficulties in moving furniture components and materials at various stages of completion between the many locations threatened to cause major problems.

In response to these concerns, Robert Zoebelein, the company's Chief Executive Officer, conceived the idea to re-assemble all Reff's manufacturing facilities under one roof. Other members of the management team saw the opportunity to bring the company's manufacturing technology up to the most efficient standards possible.

In converting its vision into reality, Reff used a "greenfields" approach and, in 1982, built a new 30 658 $m^2$ (330 000 sq. ft.) manufacturing plant to combine its best existing equipment and new state-of-the-art production, material storage, materials handling and warehousing systems. Reff obtained the necessary technical information on manufacturing equipment and operating systems from industrial literature and from regular management visits to European trade shows. These continue to be the company's prime sources of AMT knowledge within the furniture industry.

In maintaining direct contact with manufacturers of the identified equipment, Reff's senior personnel visited a number of plants in Europe to witness the machines in actual operation. During such visits the staff were not able to see a manufacturing arrangement directly similar to their requirements because the European plants tended to be much larger and less flexible than Reff's requirements.

Having developed manufacturing specifications largely in the European environment, it is not surprising that the management of Reff worked closely with industrial consultants from Germany. On the other hand, Canadian consultants made significant input to the building design, construction and operating services such as waste-extraction and energy-conservation systems.

Reff installed a full manufacturing capability to produce plastic-laminated and wood-veneered office furniture. The company is reluctant to provide specific details about the machine systems used, but the process includes computer-driven panel saws, multi-drills, mortice and tenon machines, automated laminating systems, edge-banding machines and an automated continuous-flow finishing line. All production operations are linked by conveyor systems.

An IBM System 36 computer provides financial and production management systems. Future plans include a CAD system for product design and for facilities planning in office design, together with an overall objective of full systems integration.

The new Reff manufacturing facilities are considered superior in most respects to those of other Canadian companies.

The Reff corporate culture also differs from that found in most other Canadian furniture manfacturers. Maintaining close ties with the European industry, the senior management team has provided most of the AMT direction and action. To date, this tightly-knit approach has worked satisfactorily. Other management staff involved with day-to-day operations are of the opinion that only the closeness of the team allowed the AMT installation in just two years.

**Strategic Planning for AMT**

The prime motivational force in planning for AMT was Reff's intention to be the most efficient manufacturer of office furniture systems. In the context of this ambitious plan, objectives such as cost reduction were simply presumed.

In terms of formal strategic planning documentation, the company prepared detailed plans only for bank approval purposes. Reff requested no government financing for any of the manufacturing equipment.

Initially, Reff's AMT plans addressed manufacturing in the context of increased sales. Company management saw the following objective priorities:

- sales revenue increase
- share of market increase
- gross margin increase
- warranty cost reduction (improved product quality)
- labour and material costs reductions.

At the planning stage, the company maintained control through senior management, certain members identifying with particular responsibilities:

| AMT Role | Position Title |
|---|---|
| building co-ordination | CEO - R. Zoebelein |
| manufacturing specifications | V.P. Technology - E. Zoebelein |
| installation | V.P. Plant Facilities - F. Zoebelein |

In retrospect, the company believes that its planning approach was effective and that the original objectives were realistic. Company management stated that problems involved only timing in that, owing to delays in the importation of machinery and equipment, some production areas were slightly late in starting up.

**Requirements Definition**

The original Reff plans cover the four-year period 1981 to 1984. Aimed primarily at manufacturing, the original requirements included accounting, manufacturing management and inventory systems.

The estimated sequence and costs of AMT and related applications covered buildings and manufacturing equipment:

| Year of Plan | AMT Application Area | Capital Cost Estimates ($000s) |
|---|---|---|
| 1 (1981) | Accounting Systems<br>Manufacturing Management | 150 |
| 2 (1982) | Production Buildings (Dust collection/waste burning system) | 6500 |
| 3 (1983) | Production Equipment and Microprocessor Controls - Computerized Numerical Control (CNC) | 3000 |
| | Materials Handling Equipment | 250 |
| 4 (1984) | Inventory Management System - Manufacturing Resources Planning (MRP) | 50 |
| | Total Estimate Cost | $ 9950 |

New buildings constructed in 1982 contain 300 percent more space than did the previous facilities.

After a major increase in the company workforce in 1981/82 which saw the number of employees increase from 200 to 300 (90 being plant related), Reff originally anticipated the workforce would remain stable. But during 1985 increasing sales demand pushed employment up to more than 400. In the period between 1981 and 1985, the company also experienced a trend from unskilled to skilled operator classifications. Owing to the specialized nature of the manufacturing operations, Reff planned to carry out more skills training in-house.

**Acquisition and Implementation**

While an effective management team ran the ongoing operations, the owners controlled most aspects of the AMT implementation. Their approach was to achieve full implementation without any major break in production. This ambitious plan then had to address and deal with several major factors:

- planning, co-ordinating and installing a new building, equipment and systems
- moving to the new facility
- training new employees
- producing new furniture concepts
- maintaining product quality
- maintaining customer service

Inevitably, the management team faced many problems. At times they simply tried to do too many things at the same time. Actual production was often disrupted by unplanned machinery and systems issues. But this was Reff's calculated risk. Management considered that, provided minimum output levels could be maintained, it would be less costly to implement changes under production conditions than to follow a two-plant, "in-parallel" implementation in which there would be fewer incentives to complete the AMT installation quickly.

Reff succeeded in this implementation approach, largely owing to the strong management team, and saved at least a full year over alternative installation schedules.

Reflecting the short time span between defining requirements and the actual installation, acquisition costs did not vary significantly from the original estimates. The visible additional implementation costs amounted to approximately $200 000, including $150 000 for consulting services and $50 000 for identified staff salaries. Owing to the method of implementation -- that is, under production conditions -- the company was not able to identify the true direct labour costs incurred.

**Program Assessment**

Reff's most positive indicator of improved performance exists in the remarkable sales increases for the period 1982 to 1986 and the projections for 1987:

| | Fiscal Years Ended April 30 | | | | | Forecast |
|---|---|---|---|---|---|---|
| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
| Sales ($000 000s) | 18 | 16 | 20 | 26 | 50 | 64 |
| Gross Margin | Trend down | | | Trend up | | |

In 1982/83, the sudden increase in equipment costs resulting from the AMT applications reduced gross margins. Implementation expenses in labour and materials further aggravated the financial position. Trending currently to substantially increased margins, fiscal 1987 annual production rates are now running in excess of $60 million, the major part in exports to the United States.

Additional savings in work-in-progress resulted from major reductions in process cycle times, down from eight weeks to six weeks.

Reff is satisfied that the AMT machinery and equipment met all expectations, although some temporary disappointments existed in 1983 with the initial slow reaction by the market to new designs and improved product quality. Now the company is achieving major increases in sales volumes and looks forward to reaching a full capacity level of $100 million.

For the future, Reff intends to install a computer-assisted design (CAD) system for product design together with separate software packages for office layout design. The ultimate goal is to achieve integration of all management, financial and manufacturing systems.

This AMT implementation suggests that its success centres on the aggressive style of the owner-managers and the strong management team responsible for continuing operations. Reff Incorporated stands out as part of a new generation in the Canadian furniture industry and the strategic decisions made in 1981 and implemented in 1982, during a substantial downturn in the market, show good results. The company intends to maintain its state-of-the-art position in AMT and to remain competitive.

## CASE STUDY - FISHER GAUGE LIMITED

Fisher Gauge has achieved its reputation in the zinc die-casting industry both as a supplier of precision die-castings to a diverse domestic and international market, and as a designer and manufacturer of special die-casting machinery for industrial customers.

Under the Fishercast trademark, Fisher Gauge specializes in the production of precise small zinc die-castings. Its patented high-speed automatic die-casting machines are exclusive to Fishercast, supplied by the company's Fishertech Division. Its tooling, also unique to Fishercast, produces uniformly precise parts which do not require secondary operations such as trimming. Typical small zinc die-casting applications range from gears for time clocks and crankcases for model gas engines to TV, camera and tape-cassette-player parts. Fisher produces millions of these castings each year for customers on five continents.

Fishertech Injected Metal Assembly machines are currently producing assemblies in customers' plants in more than 45 countries. Parts to be assembled are precisely located in a specially designed tool and molten alloy is injected. As this injected metal cools it solidifies and shrinks, mechanically locking the parts into a permanent assembly. Functional components, such as pinions, cams and ratchets, can be injected as an integral part of the injected hub. Injected Metal Fixturblock systems are used in the production of difficult-to-clamp shapes such as blades for gas turbines.

Because of the wide variety of die-casting users, ranging from aeronautical engineering clients to manufacturers of disposable consumer products, Fisher Gauge sales have not been seriously affected by the latest economic difficulties in Canada. Although the company faces ever-increasing levels of competition, it is planning for continued growth.

Starting tool and die-making operations in the mid-1940s, Bill Fisher, still the Chairman and Chief Executive Officer (CEO), progressively built up the company to a level of international recognition in the zinc die-casting industry. Located principally in Peterborough, Ontario, Fisher Gauge now employs almost 400 people and continues to grow.

### Shop Floor Origins of AMT

The introduction to advanced manufacturing technologies (AMT) at Fisher Gauge originated in manufacturing. The company began to use numerical control (NC) and direct numerical control (DNC) in toolmaking and die-casting production, but was also required to enhance the control equipment and systems for the die-casting machines it sells.

From 1977, the company installed a number of NC and, subsequently, computerized numerical control (CNC) machine tools to assist in the manufacturing process. Limited computer-assisted manufacturing and design (CAM/CAD) systems, using systems based on microcomputers, added to the level of design and engineering technology. Fisher then used its development experience gained on the microcomputers to develop specifications for a full-scale CAD/CAM and computer-assisted engineering (CAE) system.

Prior to the CAD/CAM developments, Fisher Gauge installed a number of business management systems, based on an IBM System 36 computer. As a move toward systems integration, the company will further develop its business management and production management systems through 1987.

The business aims in pursuing AMT remain clear at Fisher Gauge -- productivity improvement, cost reduction and reduction of engineering and manufacturing lead times. An important supplementary objective involved the need to reduce engineering errors and design rework.

**Firm Commitment from the CEO**

Bill Fisher, Chairman and CEO, led his company from the outset in the adoption of AMT, which it now intends to apply fully to all functional areas of its operations. Objective priorities remain:

- cost-of-sales reduction
- warranty/QC cost reduction
- inventory turnover increase

Outside pressure to move toward AMT came from the company's subcontractors. Their input reflected what other prime contractors, often competitors of Fisher Gauge, were contemplating and implementing in terms of AMT. Bill Fisher saw that maximum commitment should be given to new manufacturing technology -- or risk becoming a loser in his industry.

As a first step, Bill Fisher recognized the potential returns in CNC profile milling for toolmaking. Convinced of its potential returns during his visits to international machine tool shows in Chicago and in Europe, in 1977 he initiated the purchase of a Bostomatic 1424 4-axis CNC profile mill.

After the profile mill acquisition, Fisher Gauge installed a wide range of CNC machines: additional profile mills, electrical discharge machining (EDM) and manufacturing support systems, and computer-assisted measurement, quality control, weighing and packing. At the same time, the company developed operations management systems based on an IBM System 36 computer for production control, shop loading and management reporting. Additional IBM and Hewlett Packard microcomputers support design, manufacturing and statistical quality control systems.

For the first AMT acquisition the company did not even attempt full financial justification. Impressed by the apparent technical capability of the equipment and recognizing the importance of getting into the new technologies, Bill Fisher relied on his engineering intuition. Once the equipment was installed, Fisher engineering staff discovered a wide range of applications which they could not even contemplate before the purchase.

In the early days of AMT considerations, no formal strategic planning was in place. But in recent years the company has developed a more managed approach, particularly in evaluating needs and requirements.

**Planning and Controlling AMT Implementation**

Intended to embrace most functional areas of the company, the following 11-year plan, now more fully defined, outlines the estimated sequence and costs of AMT implementation and related applications.

| Year of Planned Implementation | AMT Application Area | Capital Cost Estimates ($000s) |
|---|---|---|
| 1 (1977) | CNC | 200 |
| 2 (1978) | CAM | 100 |
| 3 (1979) | Increase in Capacity | 40 |
| 4 (1980) | Facilities Planning | 60 |
| 5 (1981) | Facilities Planning (New buildings) | 100 |
| 6 (1982) | CNC | 100 |
| 7 (1983) | Facilities Planning | 60 |
| 8 (1984) | Capacity Planning<br>Sales Forecasting<br>Distribution | 400 |
| 9 (1985) | Engineering/Design - CAD/CAM/CNC<br>Financial Management | 1350 |
| 10 (1986) | Engineering/Design - CAD/CNC | 930 |
| 11 (1987) | Engineering - CNC<br>- Financial Management | 900 |
| | Total Estimated Cost | $ 4240 |

For the next two to three years, the company plans an impressive number of AMT installations:

-CNC profile mill
-CNC lathe
-CNC EDM (Wire)
-CNC vertical machining centre

To support the anticipated AMT applications and projected increases in business levels, the company saw significant increases in space requirements. Engineering/design, management information systems (MIS) and production areas had to be doubled. Administrative support, raw material stores and finished goods warehouse space increased by up to 50 percent.

In 1982, Fisher Gauge built an additional facility to house general management and activities relating to the design and manufacture of its own injected metal systems equipment. Owing to the rapidly increasing interest in this part of the business, the new building is already operating at capacity.

As part of its re-organization for AMT, the company benefited from having a corporate facilities engineer -- a position usually found only in much larger corporate structures. As this position includes responsibility for all capital budgeting, the company has a natural AMT development focus. More recently, internal "councils" have evolved which provide group leadership by the accountable management personnel in each AMT application area.

Initially, the corporate facilities engineer planned and monitored the acquisition and installation of AMT equipment, largely production machinery. As the plan progressed, the council groups satisfied the need for a more formal approach in AMT implementation.

Currently, three main council groups exist, under the direction of senior management staff and supported by selected user personnel:

- CAM Advisory Committee, led by the corporate facilities engineer
- CAD Advisory Committee, led by the manager, design engineering
- Information Systems Advisory Committee, led by the manager, data processing.

These groups define initial requirements and arrive at equipment and system specifications. During implementation, the equipment is handed over to the regular operating groups. An overlap period exists where the "planning" activity carries over into the "operating" mode, ensuring that all staff involved in an application are continuously informed at each stage.

Although formal criteria are not yet in place for system evaluation, the present company procedures ensure that all operational aspects are fully tested during implementation.

Using more formal procedures, Fisher Gauge achieves effective control of each application. The costs of AMT applications were as estimated, and time frames for implementation have been acceptable. Fisher Gauge stated that the only significant problem occurred in 1976, when the company had some difficulty in acquiring an efficient programmable computerized control unit for its first CNC profile mill.

**Using Outside Advice for AMT Acquisition**

While all project management is internal, Fisher Gauge makes good use of consultants, technology centres and equipment suppliers. Initially, the Canadian Institute of Metalworking (CIM) of Hamilton provided information and assistance in the CNC projects. More recently the Ontario Centre for Advanced Manufacturing (OCAM) in Cambridge assisted in the research and development (R&D) aspects and specifications development for Fisher Gauge's planned CAD/CAM system. For operations management of computerized systems, the company uses its own in-house expertise.

At the beginning of its AMT program, the company worked with a small number of inexperienced agents for equipment suppliers. Finding it difficult at times to get detailed technical information from the agents, management resorted to direct contact with the equipment manufacturers, located primarily in the United States. Over the last few years this situation has changed completely. All original equipment suppliers are now represented in Ontario by competent agents. Service calls that had taken previously three days to satisfy are now handled in less then twenty-four hours. The improvement in service accompanies a significant increase in equipment reliability.

**Training an Enthusiastic Staff**

Internal staff enthusiasm and support has been maintained at a high level. Some initial concerns expressed by production staff over potential labour force reductions quickly diminished when the company began to hire additional staff to cope with increasing levels of business.

Workforce estimates for the period 1977 to 1987 show the potential impact of AMT. The figures below assume continued sales growth:

| Staff Groups | | 1977 (Actual) | 1986 (Actual) |
|---|---|---|---|
| Design: | Management | 2 | 2 |
| | New Skills | - | 15 |
| | Existing Skills | 10 | 5 |
| | Trainees | 2 | 4 |
| Engineering: | Management | - | 1 |
| | New Skills | - | 5 |
| | Existing Skills | 1 | - |
| Production: | Management/ Supervision | 20 | 25 |
| | Direct | | |
| | - Skilled | 67 | 200 |
| | - Unskilled | 32 | 90 |
| | Indirect | 10 | 20 |
| MIS: | Management | 1 | 1 |
| | Operating Staff | 1 | 4 |

Note: The figures shown include AMT-specific areas only.

In planning for increased workforce levels, Fisher Gauge recognized the importance of an effective training plan. All management staff involved in the AMT applications planned to fill training needs through technical seminars and vendor training courses. A number of operating personnel planned to attend local college courses in addition to vendor training.

Operator training relied originally on vendor instruction in the vendor's plants and at Fisher Gauge. Company management now maintains contact with Sir Sandford Fleming College in Peterborough to develop operator, CNC programmer and CAD training.

At Fisher Gauge the majority of manufacturing personnel are skilled operators. Although the capability to train such personnel in AMT applications was not a problem, finding enough people to train was. Recently, however, through activity reductions at other companies in the Peterborough area, skilled operators have become available.

**AMT Performance Strengthens Market Position**

Fisher Gauge believes that AMT performance improvements are well demonstrated by its ability to increase sales and improve margins in the face of intense competition.

Positive indications of reduced process cycle times are available in the design/engineering of die-casting tooling: a reduction from 80 days to 60 days. In the design/engineering activities involved in machinery design, the

cycle times are holding steady at 200 days. However, the company points out that this machinery is now substantially more complex and the equipment itself must incorporate higher levels of technology.

In reviewing the effects of AMT on company performance, Fisher Gauge considers that it is holding a market position which, without AMT, it probably would have lost by now. With advanced technology it can now do work it could not envisage before.

**Justification and Payback**

During the AMT implementation program, the company has endeavoured to refine its justification procedures. At first it had difficulty in seeing clear-cut advantages. New applications were not contemplated. Fisher Gauge plans to use a standard system of cost-reduction analysis. Even so, company management still sees many variables in measuring returns. Currently, the justification procedure relies on production-cost comparisons over identified workloads to show a payback in two years or less.

The financing procedures have pronounced effects on the payback calculations. Fisher Gauge's original AMT acquisitions made use of the federal Defence Industry Productivity Program (DIPP). More recent acquisitions have benefited from the federal Industrial Regional Development Program (IRDP). Currently, the company anticipates reduced loan-cost assistance using the Province of Ontario Training in Business and Industry Program (TIBI). However, Fisher Gauge itself finances most of its purchases. The personal convictions of the owners have led to continuous and substantial re-investment of earnings into company operations.

Fisher Gauge is convinced that it has made the right decisions in its selection of AMT systems and equipment.

As advice for others, the corporate facilities engineer suggests:

> "Spend adequate effort to develop a plan -- defining goals and priorities. Keep the plan flexible enough to react to changes in technology. A consultant should be considered if in-house expertise or time is inadequate to prepare the plan."

Fisher Gauge has achieved prominence in Canadian industry as a supplier of high-quality products and, more importantly perhaps, as a respected manufacturer of original equipment in the zinc die-casting/injected metal industry.

The company maintains an awareness of all technological developments and uses all the outside advice and support available, including government assistance in the form of technology centres and reduced-interest loans.

Such important factors, combined with an advanced philosophy of participative management, have allowed the company to continue to recognize and maximize the advantages of AMT.

**AMT Application Experience**

During our visit we interviewed and had general discussions with the following senior personnel:

W. Fisher, Chairman and CEO
D. Moore, Corporate Manufacturing and Facilities Engineer
V. Taylor, Manager, Design Engineering

It was clear that the company staff is highly competent and dedicated to a process of continuous improvement.

**Strategic Planning for AMT**

Outside pressure to move toward AMT came from the company's subcontractors. Their input reflected what other prime contractors, often competitors of Fisher Gauge, were contemplating and implementing in terms of AMT.

While all project management has been internal, the company made good use of consultants, technology centres and equipment vendors. Current project management procedures include full committee structures for development in CAD, CAM and MIS.

## CASE STUDY - PRECI-TECH LIMITED

### Company Status

Preci-Tech Ltd. has operated in precision manufacturing since 1953. Now employing over 100 semi-skilled and skilled employees, the company provides a subcontract service to the aerospace industry and designs and manufactures high-precision surgical tools.

Currently, aerospace work involving items for laser technology and satellites occupies approximately 60 percent of manufacturing capacity. Surgical tools, including in-house designed stapling devices and needleless injectors, take up the balance of production. Working through prime contractors and agents, most of the company's production is ultimately exported.

### Advanced Manufacturing Overview

Preci-Tech first introduced numerical control (NC) machining in 1965 and the company plans to install a microcomputer-based computer assisted design and manufacturing (CAD/CAM) system by 1986.

On a progressive basis Preci-Tech has installed a wide variety of computerized numerical control (CNC) machines. The company was the first in Canada to use a CNC 3-axis electrical discharge machining (EDM) centre. Preci-Tech claims that without using its present level of advanced manufacturing technologies (AMT), it would not be able to undertake 50 percent of its current work.

Originally set up on a time-sharing basis, the company now uses MDSI programming software in-house for its CNC equipment. The next move planned is to acquire a CAD/CAM system for direct linkage to the manufacturing equipment.

In its development and acquisition of AMT equipment and related systems, the company has used government assistance whenever possible, through grants or reduced-interest loans. The planning time frames, which currently schedule acquisition of the proposed CAD/CAM systems for 1986, are said by Preci-Tech to be dependent upon securing additional government assistance.

### Visit Impressions

The eight-year old Preci-Tech plant in St. Laurent, Quebec, which contains approximately 216 $m^2$ (2322 sq. ft.) of floor space, is a modern facility housing a wide variety of precision machine tools and test equipment. AMT implications were discussed with a number of staff including:

Mr. Raymond Grunwald - President
Mr. Krikor Kouyoumdjian - General Manager
Mr. Alex Britto - Sales Manager

Preci-Tech appeared as a well-managed, professional operation, but definitely at the mercy of the aerospace industry for continuing workloads. The company has ambitious plans for CAD/CAM applications but claims to need government funding to assist it to acquire the necessary AMT equipment.

**Strategy Planning for AMT**

Throughout Preci-Tech's AMT implementation experience, the principal motivational forces have remained inseparable:

- to maintain an equal or better position with the competition
- to keep level with the state-of-the-art in manufacturing technology

These objectives are reinforced by the fact that Preci-Tech no longer has any conventional machine tools. Also, the planning process in the company must be on a continuous basis. As such, current strategic planning covers the forward period 1985-1988.

Having installed a considerable amount of shop equipment, the company's AMT program now includes a number of improvements in manufacturing control areas:

- design
- engineering
- inventory management
- production management
- quality control
- cost accounting

The applications planned for these areas have the following goals over the planning period:

| **Anticipated Benefits** | **1985** | **1986** | **1987** | **1988** |
|---|---|---|---|---|
| Direct Labour-Cost Reduction (%) | - | 5 | 8 | 8 |
| Manufacturing Overhead Reduction (%) | - | 5 | 7 | 10 |
| Sales Revenue Increase (%) | 10 | 10 | 15 | 18 |

In formulating its AMT plans, Preci-Tech makes use of few outside resources. The company believes that, as it is always operating at or close to the state-of-the-art, its own people are often more knowledgeable about planned applications than outside consultants. While not using technology centres, company staff frequently attend educational and vendor-sponsored seminars.

However, the president of Preci-Tech stated that, in his view, the past planning organization could have been more effective. His concern suggested that day-to-day pressures on management tended to divert staff from the planning process.

In any event, the general level of co-operation from all staff and employees was reported as very good. But, for future developments the company will ensure closer control and improved communication between the members of the management team.

**Requirements Definition**

In addition to the equipment already installed, Preci-Tech has defined requirements for the four-year period 1985-1988 as follows:

| Year of Plan | AMT Application Area | Capital Cost Estimates ($000s) |
|---|---|---|
| 1 (1985) | Turning Centre - CNC | 300 |
| | Support Equipment and Conveyors | 50 |
| 2 (1986) | CAD/CAM | 100 |
| | Various machines - CNC | 300 |
| 3 (1987) | Machining Centre - CNC | 400 |
| 4 (1988) | Production Management Systems | 50 |
| | Small Robots | 100 |
| | Engineering Systems - Computer-Assisted Engineering (CAE) | 50 |
| | Total Estimated Cost | 1350 |

To accommodate the defined AMT equipment, the company sees facilities expansion requirements in the following areas:

| AMT Implementation Area | Space Increase |
|---|---|
| Production | 25% |
| Materials Handling | 25% |
| Engineering/Design | 50% |
| Administration/Support | 15% |

In terms of human resources, the company is anticipating a 25 percent increase in shop personnel to support the current plans. This requirement will be for skilled operators, a scarce resource in the Montréal area according to Preci-Tech. The company has, however, been able to train operators itself to the appropriate skill levels. Internal training is usually initiated by vendors and then continued by company staff. Both management and show staff are encouraged to attend educational seminars and part-time college courses.

**Acquisition and Implementation**

Preci-Tech views its history of AMT implementation with mixed feelings. The company stated that vendors of machinery and control equipment fulfilled their obligations quite well. It had no negative comments to make on acquisition costs or on installation time frames.

However, major comments on implementation problems were related to weak management planning and lack of detailed attention to support factors such as operator hiring and training. Unrealistic scheduling of acquisition and training has, on occasion, resulted in machines standing idle for extended periods of time. Generally, however, AMT implementation to date has met expectations at Preci-Tech.

**Performance Assessment**

Although Preci-Tech has stated that its past AMT investments have met expectations, the company is reluctant to provide any in-depth quantification.

Indicating only that sales revenues are approaching $10 million and that employee levels are expected to increase by 25 percent over the next two years, the company is confident that it is maintaining a competitive position.

On much of its acquired equipment, the company has covered a major part of the cost by an initial contract for specialized manufacturing, the balance is then dealt with on a simple payback over two to three years. It is also evident that provincial and federal assistance programs have been used effectively at Preci-Tech.

On this basis, it would be reasonable to assume that the AMT installations have been cost-effective. In the subcontract jobbing business, however, it is essential to maintain a minimum workload. Preci-Tech indicated, in this regard, that it is experiencing certain temporary financial constraints.

It is unlikely that the company will meet its 1986 time frame for CAD/CAM installation without additional government assistance.

**Survey Summary**

Preci-Tech Ltd. may be considered typical in many ways of the majority of small and medium-sized companies installing AMT.

Using primarily their own internal resources to plan and monitor installations, companies such as Preci-Tech have strengths in technical expertise but also often have weaknesses in corporate management. Preci-Tech has established a reputation in specific areas of high-tech manufacturing. As such, it has been moderately successful and is starting to design its own products in precision surgical tools. The company will likely continue to be successful, having established an advanced technology base for an eventual general manufacturing operation.