A REPORT BY THE SECTOR TASK FORCE ON

THE CANADIAN MACHINERY INDUSTRY

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REPORT

OF THE TASK FORCE

ON

THE CANADIAN MACHINERY INDUSTRY

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OBJECTIVE OF REPORT

The objective of the Task Force has been to examine the structure, operations, problems, constraints and opportunities facing the machinery sector in Canada in a changing world environment and to formulate recommendations for concerted action by government, industry and labour to improve the economic performance of the sector. In arriving at its recommendations the Task Force has taken into account background information on a broad range of issues provided by various government departments and agencies, and by industry associations, including the data contained in the Machinery Sector Profile which is attached as part of this Report.

INDUSTRY SUMMARY

The machinery sector comprises those companies engaged in the production of the wide range of machinery and equipment required by Canada's resource, processing, manufacturing and service industries. It consists of 2000 companies, with annual shipments of $5.5 billion and 120,000 employees. Canadian machinery exports have reached a level of approximately $2 billion annually and these exports now represent close to 35% of the industry's total production. However, imports currently supply approximately 60% of the domestic market for machinery.

About 85% of machinery industry activity is concentrated in the urban centres of Ontario and Quebec. Nevertheless, many small operations such as machine shops and tool and die makers are spread throughout the country to meet local requirements. There are also regional centres of machinery industry activity close to concentrations of resource-based activities - e.g. agricultural implements in Manitoba and Saskatchewan; oil and gas equipment in Alberta; fish processing equipment in the Atlantic Provinces; and, logging and sawmilling equipment in British Columbia. There are some 300 relatively large firms which account for the bulk of machinery production, of which over 200 are subsidiaries of multinational corporations.

The machinery industry's contribution to the Canadian economy compares favourably to other manufacturing sectors: it represents 6% of total manufacturing production, 8% of exports and 7% of employment. In addition, it is a high technology area which provides rewarding employment opportunities in terms of skills and variety of work.

IDENTIFICATION OF ISSUES

The range of issues considered by the Task Force have been grouped into six major categories - manpower policies, export promotion, import substitution, research and development, MTN adjustment and investment policies. Each of these issues is treated as a separate section in the Report.

TASK FORCE MEMBERSHIP

A list of the Task Force membership together with representatives/ observers is contained in Appendix 1.

SECTION I - MANPOWER POLICIES

The lack of skilled manpower is one of the most serious problems facing the Canadian machinery industry. In fact, the shortage of experienced and skilled tradesmen is more of a limiting factor today to increasing plant capacity, than lack of capital or weaknesses in market demand. While this is a problem that affects many areas of industry it is particularly significant in the machinery sector because of the relatively higher proportion of skilled labour in its work force. Accordingly, the Task Force attaches particular importance to a concerted plan of action by industry, labour and governments to attack the problem on a broad front.

Background Considerations

Since World War II, the Canadian industry has relied heavily on immigrant skilled labour from European countries with a long tradition of excellence in metalworking trades. With increased wage levels and vastly improved living standards in Europe together with more restrictive Canadian immigration policies, this traditional source has dried up. As long as immigrant skilled labour was readily available and immigration was encouraged there was less motivation by industry and government to assume the high costs of effective manpower training.

The industry is at present ill-equipped to provide the required on-the-job training in skilled trades: (i) few firms can be expected to have the range of such disciplines as toolmakers, fitters, machinists, welders; (ii) many companies are either unwilling or unable to assume the high costs of manpower training in view of the risk that the trained employees will be "pirated" by other firms in a position to offer higher wages or more attractive working conditions; (iii) there are particular difficulties in attracting to skilled trades, workers who can command equal or better wages in less skilled occupations that involve a shorter learning process; and (iv) the industry lacks training instruction and monitoring which should be done by tradesmen-teachers whose primary responsibility would be the in-shop training of apprentices.

The "elitist" nature of the Canadian educational system impairs its effectiveness in providing the broad base of support needed by industry in terms of developing basic skills and attracting students to skilled trades. This is largely a reflection of current attitudes in society which seem to emphasize the desirability of academic, professional and white-collar careers while giving less importance to manual work. The deficiencies of the educational system in its role of providing support to industry in the area of manpower training pertain to such aspects as:

(i) the academic orientation of high schools and lesser emphasis on preparing students for careers in industrial plants; (ii) relatively low level of the quality of advice provided by career counsellors in terms of both their knowledge of the industrial environment and their concern for guiding students towards skilled trades; (iii) the short-term training provided by community colleges, vocational and technical schools which is inadequate in meeting the needs of industry, a situation that is further aggravated by the lack of appropriate equipment in such schools; and (iv) the lack of coordination between industry and the educational system in producing a skilled work force.

A further constraint in this area is the question of jurisdictional sensitivities between the federal and provincial governments as well as a lack of interchangeability in provincial trades licensing requirements. In fact, in a number of provinces tool and die workers and machinists are not recognized as trades under apprenticeship training programs. Provincial governments guard their jurisdiction in education and training while the financial contributions of the federal government are often not coordinated. The Task Force also has reservations regarding certain aspects of the current federal government policy regarding the recruitment of manpower abroad for particular occupations.

Recommendations

1. As a first priority, government manpower policy should emphasize long-term training programs to produce fully trained tradesmen.

2. The Task Force recommends the formation of tripartite provincial committees comprising representatives of industry, labour and provincial officials with an advisory role in the formulation and implementation of manpower training policies in the educational system. The scope of the committees' activities would extend to such areas as: (i) the orientation of students towards skilled trades, with improved career counselling services to ensure that students whose capabilities are related to skilled trades are encouraged to pursue these careers; (ii) the development of appropriate training curricula and the provision of an adequate range of machines and equipment in the schools; (iii) the establishment of standards and the recognition and certification of particular trades required in industry; (iv) the coordination and integration of formal training in the schools with apprenticeship training in industry, including the provision of facilities to train in-plant instructors; (v) the commitment of funds to assist deserving students to pursue training in areas where the shortage of skills is more acute; and (vi) the mounting of public information programs to create a better appreciation in society that a career in a skilled trade is rewarding and contributes significantly to the national economy.

3. A national manpower policy coordinating committee should be established which would include representatives of the provincial committees described above, together with federal officials, responsible for developing concerted national policies particularly with regard to the interchangeability and harmonization of provincial trades recognition and certification requirements.

4. A program should be initiated to establish and maintain a national and regional inventory of existing and required skilled manpower by trade, age levels, etc.

5. On-the-job training must recognize the limited availability of disciplines within a particular plant. Industrial training, therefore, must be modular in concept. In this regard, inter-plant mobility may be necessary in order for an apprentice to obtain full training in his trade.

6. Financial assistance should be provided to companies to provide in-plant apprenticeship training. This would apply to firms prepared to undertake a formal approved training program and the assistance could extend to professional expertise retained by a company to set up the training program. This element of subsidization will, to some extent, offset the risks that companies now face regarding the loss of skilled people to other employers before any payoff is obtained from the training provided. Such a measure would be particularly significant for the smaller companies that at present cannot afford the cost of apprenticeship training in view of the risks involved. The Task Force is of the view that this kind of financial assistance could be provided by the federal government without encroaching on provincial prerogatives in the education field.

   At the same time, industry would be encouraged to maintain a minimum ratio of apprentices to journeymen. In addition, the skilled training programs should include upgrading of existing employees as such employees will be a prime source of candidates for skilled trades.

7. The Canada Employment and Immigration Commission should review its current foreign manpower recruitment policies with a view to providing more flexibility in its program. For instance, there is a growing concern in industry over new requirements pertaining to the temporary entry of service personnel to perform repair operations on machines purchased abroad.

8. Apprentices should be covered by a collective agreement where other employees are represented by a trade union in the plant, with special provisions covering layoffs to reduce as much as possible the disruption of an apprentice's training. Unions should also have a role in the establishment of realistic apprentice/journeymen ratios in plants under a collective agreement.

Impact of Recommendations

Benefits to be derived from the adoption of measures such as those outlined above include:

a) provision of an adequate supply of skilled Canadian tradesmen.

b) substantial productivity improvements in the industry. In this regard investments in manpower training are just as important as those in R & D and in fixed assets - plant, machinery, and equipment.

c) social benefits in terms of providing more opportunities for interesting, challenging and rewarding work.

d) reduction in unemployment levels by providing alternative jobs to displaced workers from industry sectors faced with inevitable declining levels of activity.

e) increased mobility of labour through inter-provincial recognition of trades certificates.

f) greater incentives for firms to commit funds of their own to manpower training.

g) providing a better match with extensive training programs available to industry in other countries.

SECTION II - EXPORT PROMOTION

The Task Force recognizes that a sustained strong export performance is required to ensure the continuing growth of the Canadian machinery sector in a market environment that is essentially international in character. In this regard, there is a need to strengthen existing export promotion policies and measures as well as for new approaches aimed at assisting the industry to overcome constraints arising both from the nature of the world trading environment for machinery and from structural constraints within the industry in Canada that affect its ability and willingness to compete in export markets.

Background Considerations

Exports currently represent approximately 35% of the Canadian machinery industry's total production as compared to 20% ten years ago, reflecting the growing specialization, rationalization and international competitiveness of the industry in selected areas. To a large extent, Canadian machinery producers have been successful in countering increased import penetration in the domestic market through increased export sales and have been able to maintain, overall, a rate of growth in production comparable to the increase in total domestic demand over the last ten years.

Continued gains by the industry in the area of exports will be a major contributing factor to ensuring a healthy level of overall performance in the future and should therefore be viewed as a complement rather than an alternative to any significant success achieved by the industry in displacing imports into the Canadian market.

In considering the issue of export promotion a number of specific assumptions have been made regarding the world trading environment that will prevail into the 1980's, as follows:

- The MTN will result in a measure of trade liberalization accompanied by at least modest success in reducing non-tariff barriers.

- No major change will occur with regard to existing trading blocs - e.g. EEC, EFTA, COMECON, which,would exclude Canada from effective participation in multilateral trade due to intra-bloc restrictions.

- International machinery markets will continue to expand at an average rate of 4% to 5% annually in real terms.

- The major contenders for world machinery markets will continue to be the industrialized countries - i.e. North America, Europe and Japan, with no significant increased competition from low-cost developing areas.

- The relative value of the Canadian dollar vis-à-vis U.S. and other currencies will not fluctuate significantly from current levels for a number of years.

Recommendations

1. The federal government should examine the feasibility of introducing specific measures to counteract the effect of foreign export subsidies such as the DISC program in the United States. This could include consideration of such aspects as: (i) the effectiveness of fiscal measures put in place to neutralize the effects of export subsidies such as DISC; (ii) vulnerability to countervailing measures by Canada's principal trading partners; (iii) the possibility that foreign export subsidies may not be significantly reduced following the MTN negotiations; and (iv) the need to ensure that Canada is on as equal a footing as possible with other machinery exporting countries in providing support to its exporters. A number of alternatives were identified by the Task Force which could be the subject of further study, including:

   a) the introduction of a two-tiered tax structure applicable to operating income on production for exports as opposed to production for the domestic market. For example, operating income on production for both the domestic and export markets could be taxed at a rate of 25% but the tax on income derived from exports would be deferred for a period of time, - e.g. 5 years, with the possible further stipulation that savings on the deferred taxes be re-invested in expansion of production capabilities or productivity improvement.

   b) in the event that the DISC program of the U.S. is retained and is shown to increasingly affect Canadian export possibilities, Canada could adopt a parallel DISC patterned closely on the U.S. legislation. This would admittedly be a simplistic and last resort approach which could be adopted if other possible measures run a high risk of countervailing action by the U.S. The U.S. government would find it difficult to impose countervailing duties against an export support program identical to their own.

c) an indirect export promotion feature could be incorporated in a multi-purpose fiscal incentive which would provide variable benefits based on a company's incremental achievements in such areas as increased employment, productivity improvements, R & D, contribution to correcting regional imbalances, manpower training and increased exports.

d) the DIP (IMDE) program of IT&C should be re-examined with a view to either extending similar provisions to non-defence exports or removing its inequities in terms of the exclusive advantages it provides to support the "civilian" production of companies that also engage in defence exports.

2. The high level of support to Canadian exporters by trade representatives in Posts abroad could be made more effective by: (i) reducing the frequency of rotation of Trade Commissioners from one Post to another in order to provide greater continuity of assistance to exporters; and, (ii) more frequent and expanded familiarization tours of Canadian industry by Trade Commissioners to improve their knowledge of Canadian supply capabilities.

3. There is a need for a comprehensive sourcing information system on Canadian supply capabilities, utilizing modern data handling facilities, that could serve to keep Canadian Trade Commissioners and consultants working on projects abroad informed on Canadian products available for export. The Task Force fully supports current efforts by the Department of Industry, Trade and Commerce to set up a system along these lines, and recommends that companies be encouraged to subscribe to the system on a fixed fee basis.

4. Canadian consultants working on capital projects abroad involving funding by government should be required to write equipment specifications on the basis of the kinds of equipment available in Canada, wherever possible. This would counter the existing frequent practice of basing specifications on particular manufacturers' brand names (and, in many cases, foreign machinery). It is also recommended that the Department undertake a campaign to encourage consultants to follow a similar practice in the case of foreign capital projects that are not funded by government.

5. To encourage the smaller firms in the industry to enter into export markets and/or expand their export marketing efforts the assistance provided by the Department under shared cost programs to promote participation in trade fairs, missions and market identification visits should be increased to 75% of costs for small companies as opposed to the current 50% contribution. The definition of small business for this purpose could be the one adopted for special assistance measures recently announced by the Minister of State for Small Business.

6. The Department of Industry, Trade and Commerce should give greater visibility to its existing services to alert Canadian manufacturers of export opportunities available through multilateral (World Bank, Asian Development Bank etc.) and bilateral (EDC, CIDA) financing agencies. This should be accompanied by a promotional campaign, in which the industry could participate, to encourage subsidiaries of multinational companies to participate more actively in export projects which do not involve Canadian government funding.

7. The government has in place a program to assist in the formation of export consortia. However, the small companies face particular difficulties in engaging in concerted activities for export business in terms of lack of financial and human resources. Accordingly, it is suggested that ITC give consideration to the possibility of providing expanded assistance to small firms in terms of expert advice and staff to assist in the formative stages of consortia.

8. The federal and provincial governments should establish a regular consultative mechanism to coordinate their respective export promotion activities in order to maximize the total effectiveness of their programs, eliminate duplication and avoid confusion on the part of the industry.

9. It is recommended that the federal government give full consideration to proposals that will be made by the recently formed Industry Task Force on CANDU Export marketing, in view of the significant benefits to a high-technology area of the Canadian machinery industry as a result of increased CANDU export sales.

Impact of Recommendations

The adoption of measures along the lines of the proposals outlined above should contribute to:

a) ensuring that the machinery sector maintains the high levels of export activity attained in the last decade, takes optimum advantage of possible trade liberalization following the MTN and makes progress in reducing Canada's large trade imbalance in machinery.

b) a greater effort by small companies to enter into and/or further develop export activities. The aim is to provide greater motivation for smaller companies to assume the higher risks and additional expenses involved in pursuing export markets.

c) strengthen the position of the Canadian management of subsidiaries in their efforts to obtain greater export autonomy from their parent firms. This is a particular problem in some instances in terms of pursuing capital projects abroad which do not involve Canadian government funding.

d) redressing an existing imbalance in the export marketing strength of the Canadian industry in terms of the generally stronger international stature of foreign machinery suppliers and more generous export support measures provided by certain foreign governments.

e) increased investments by machinery firms in expanded production capabilities based on expectations of future export opportunities. To a large extent, investment policies of Canadian machinery firms are based primarily on domestic market demand forecasts; export sales possibilities are not a significant factor in companies' investment plans because of the greater uncertainties regarding advantages of continuing to export from a Canadian base in the long term. This applies particularly to foreign subsidiary operations in Canada, but also, in growing instances, to Canadian-owned companies which have the option of establishing subsidiaries abroad to supply foreign demand. Inasmuch as a broader base of support for Canadian exports can be provided companies will be motivated to increase capital investment commitments on the basis not only of expected domestic demands but also on a more realistic assessment of attainable export business on a continuing basis.

SECTION III - IMPORT SUBSTITUTION

The domestic machinery demands met through imports are in the order of some $5.5 billion annually which is equal to the total value of the current annual production of machinery in Canada. In addition, imports now supply more than 60% of Canada's machinery needs as compared to about 50% ten years ago. These considerations underline the need for measures to assist the machinery sector to broaden the base of its production for both domestic and export markets.

Background Considerations

The increasing import penetration in the Canadian machinery market has not so far represented a major threat to individual firms in the machinery sector but has been a deterrent to a greater rate of capital investment. Also, while the large trade imbalance on machinery, by itself, is not a major problem for the industry, it should be of concern to Canada in view of its implications in terms of the total balance of Canadian trade in manufactured products.

Complete self-sufficiency in machinery would not be a realistic goal and it has not been achieved by any industrialized country. However, Canada is lagging behind its major competitors in this area; other industrialized countries that also import a large proportion of their domestic requirements export a greater proportion of their production.

It is recognized that improvements in the industry's international competitiveness that will lead to import substitution will also contribute to an improved capability to compete in export markets. This is a fundamental consideration as well in terms of extending the range of machinery products manufactured in Canada, as, in most cases, the domestic market alone would not be sufficient to justify the investment in new capabilities. Hence the importance of pursuing the dual objective of improving the industry's penetration of both domestic and export markets concurrently.

The Task Force recognized the importance to the economy of making production machinery available to users at the lowest possible cost. Accordingly, the recommendations put forward by the Task Force do not imply subsidization of the industry nor the implementation of measures that would tend to inflate machinery prices. The emphasis is on improvements to the industry's international competitiveness and reducing the traditional propensity to import.

For the medium and long term, the outlook for machinery in Canada is favourable as new developments in areas related to energy, environment, resource developments and transportation needs should provide major new domestic business opportunities for the industry. In addition it appears that significant progress is being made in overcoming recent inflationary

tendencies related to labour and other costs, with the devaluation of the Canadian dollar also emerging as a positive factor. There is also an apparent increased readiness in certain European countries to consider Canada as a North American production base. Increasingly more stringent labour legislation in some countries, combined with new international values of currencies tend to limit export expectations on the part of European manufacturers. As a result there appears to be a greater readiness on their part to consider licence arrangements and joint ventures with Canadian firms. All of these emerging favourable factors enhance the timeliness of positive action to pursue import substitution in the machinery sector on a coordinated and concerted basis.

Specific assumptions made by the Task Force in its consideration of the import substitution issue include the following:

- import competition in the domestic market will intensify as a result of reduced tariff protection following the MTN with serious dislocations in selected areas.

- tariff reductions will be staged over a fairly long period, and this, together with appropriate adjustment assistance measures, will facilitate the process of adjustment to tariff reductions.

- the long-term growth trend in the Canadian machinery market will resume and prevail over the next decade, at an average level between 4 and 5% in real terms.

- energy and materials will become more costly but will remain available during the 1980's.

- positive action will be taken by government on a broad front that will enable the economy to adjust successfully to a changing economic environment that presents new problems not encountered in previous expansionary periods.

Recommendations

1. All levels of government should agree on a "Buy Canadian" policy based on the following features:

   i) Specifications would be based whenever possible on the kinds of equipment available in Canada. (reference: Section II, Recommendation 4).

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ii) Canadian bids would be evaluated on the basis of price, quality and delivery. In this regard, while the Task Force does not advocate an increase in current margins of preference for Canadian content, the bid evaluation process should be such as to neutralize advantages accruing to foreign suppliers from support provided by their respective governments in terms of subsidized or abnormally low interest rates or tied and concessional financing. Further, bid evaluations by governments and public utilities should include a factor to reflect the employment benefits of "Buying Canadian".

iii) Provincial governments should agree on a code which would eliminate "Buy Provincial" practices wherever they exist. In view of the wide dispersion of machinery needs in Canada, the extensive product differentiation characteristic of the industry, and the limitations of the domestic market for each type and size of machinery, the fragmentation of the Canadian market that results from restrictive purchasing policies at the provincial level is viewed as a serious impediment to the growth of the machinery sector and counterproductive in terms of the expansion of machinery production capabilities in individual provinces. Such a code could include agreed-to rules governing the negotiation of offsets in the placing of contracts with plants located outside of the province undertaking the capital project.

iv) The above rules would apply not only to major equipment items but also to components supplied by sub-contractors. This implies the imposition of "Buy Canadian" conditions on prime contractors by government agencies.

v) Canadian industry should be encouraged to develop its own "Buy Canadian" approach parallel to that of government. This could be facilitated by joint government/industry campaigns to encourage voluntary compliance with such a policy, and possibly also by the introduction of a provision in government purchasing codes which would include the "Buy Canadian" record of suppliers as an item in the evaluation of bids.

2. There is a need for a concerted approach to determine the basic factors which currently seem to favour imports over domestic production and develop appropriate means to counter these tendencies. This implies selective approaches by government to Canadian machinery users to identify specific factors pertaining to their own companies regarding the basis for the existing propensity to import machinery as well as an assessment by machinery producers of the effectiveness of their domestic marketing strategies and practices. In this regard, machinery

producers should be encouraged to participate fully in the Business Opportunities Sourcing System currently being put in place by Industry, Trade and Commerce, jointly with provincial governments, as a means of giving greater visibility to their ability to meet the wide range of needs currently supplied by imports.

3. Capital investment assistance should be made available to enable companies to undertake the production of products not available in Canada where such products involve a costly and time-consuming "learning curve" while the new producer endeavours to reduce production costs to levels required to meet import competition. In this regard, it is considered that greater returns can generally be expected in the long run in pursuing import substitution opportunities in machinery product areas involving a significant "learning curve". An alternative approach could be the incorporation of a similar feature in the kind of multi-purpose fiscal incentive described under item 1(c) in Section II of this report, covering export promotion.

4. The Task Force recommends the extension of the Machinery Program approach to additional tariff items such as those covering equipment for mining, oil and gas exploration and refining, and certain construction equipment. Such action would remove inequities in the current tariff structure and provide assistance to industry in increasing the range of products manufactured in Canada, as well as in obtaining a larger share of the domestic market for items already produced here.

5. Governments should expand resources available for the acquisition and dissemination of detailed information on machinery imports. This would cover such aspects as the identification of "clusters" of imports in sufficient quantities of particular sizes and types of machinery to justify economic production in Canada; the sources of imports and their destinations; price levels of imports; and, suitable approaches to interested companies in a position to capitalize on import substitution opportunities. In this regard, it may be necessary to examine the feasibility of amending the Statistics Act if it should prove to be unduly restrictive in terms of information that can be released.

6. The federal and provincial governments should coordinate efforts in providing a continuing program of local exhibitions and showcases to encourage the interchange of information on components presently imported that could be made in Canada. This opens up the possibility of concerted action to develop domestic sources of supply for components, particularly where total demands might be sufficient to justify economic production of certain components if users pooled their requirements. The provinces of Ontario and Quebec have mounted similar campaigns on occasion with some measure of success. What is needed, however, is a joint coordinated program involving all the provinces, with "pooled" funding, as well as financial contributions by the federal government. The industry could participate in cost sharing on a fee basis.

7. The government should encourage the participation of Canadian machinery suppliers in trade fairs and exhibitions within Canada in a manner similar to the assistance provided under the PEMD Program. The cost sharing could be on a lesser basis, e.g., 25% of costs, with possible cost recovery provisions for subsequent sales, and additional restrictions

regarding repeat participation in the same event and the size of company eligible for assistance.

Impact of Recommendations

The above recommendations are aimed primarily at assisting the industry to achieve a level of import substitution sufficient to reverse historical trends which have resulted in imports taking a progressively larger share of the domestic market for machinery. A realistic objective would be a gradual increase in the industry's share of the domestic market from the current 40% level to 50% by 1985, while maintaining the current ratio of exports to production. This means that Canadian machinery production could be some $2 billion higher in 1985 than would otherwise be the case, with a corresponding increase in employment estimated at between 40,000 and 50,000 jobs. It also implies a corresponding increase of some $70 million in the level of investment by 1985.

Other expected results include: (i) a broadening of the domestic market base for Canadian machinery which in many product areas is a prerequisite to maintaining effective participation in both the domestic and export markets; (ii) a more favourable attitude on the part of machinery users with consequent reduction in the traditional propensity to favour imported machinery and/or components over those manufactured in Canada; (iii) improved capability of the industry to counter the extensive distribution networks of foreign suppliers in Canada; (iv) improved access to government procurement; (v) significant benefits to the economy arising from a strong Canadian presence in a high technology area such as machinery; and (vi) improvement in the trade imbalance in manufactured products.

It is recognized that increased import competition resulting from MTN tariff reductions may reduce the overall benefits envisaged. However, this would only lend greater urgency to the need to ensure that the industry adopts positive adjustment action which will strengthen its position in the domestic market through measures such as those proposed above.

SECTION IV - RESEARCH AND DEVELOPMENT

The machinery sector has a high level of technological competence but it is based to a large extent on developments made elsewhere. Continued reliance on foreign technology either in the form of parent-subsidiary technology transfers or through the acquisition of licences, at best, will simply perpetuate the lag in adapting to developments made abroad. Greater R & D efforts must be made by the industry in Canada if significant progress is to be made in extending the range of machinery products made in Canada, expand the industry's export base and overcome certain structural constraints. Accordingly, the Task Force's consideration of this issue has focussed on means to achieve a higher level of R & D activities in Canada given that: (i) significant improvements are not likely to take place without expanded government support; and, (ii) there is a need to increase the effectiveness of existing assistance programs both in terms of the levels of assistance provided and the coverage of activities eligible under existing definitions of R & D.

Background Considerations

The machinery sector has a fairly good R & D record as compared to other sectors in Canada; it has increased its R & D expenditures by an average of 17% per year as compared to 9% for all industries and it now represents close to 8% of the total by industry in Canada, an increase from 4% ten years ago. In addition, R & D outlays by machinery firms have risen from 1% of sales on average in 1965 to 1.5% in 1975. Nevertheless, these expenditures are low in comparison to the level of research activity carried out elsewhere. For instance, it appears that U.S. machinery firms, on average, spend almost twice as much on R & D. In addition, the Canadian industry does not enjoy the spin-off advantages acruing to U.S. manufacturers from the broader base of scientific research carried out in that country such as the technological innovations derived from their space exploration and military programs.

The process of developing and bringing a new product to market includes many aspects, including engineering, design, retooling, start-up, market research and sales promotion. Another aspect peculiar to the machinery sector is that innovation is not confined to new product development but quite often extends to new processes or manufacturing techniques to improve the quality or capability of existing equipment or reduce costs of production to better meet import competition. While these activities are innovative in nature they do not all qualify as acceptable R & D under existing federal R & D programs and fiscal incentives. As a result, it has too often been the experience of firms in the machinery sector to have to forego innovative opportunities that would have extended the range of their production or made it possible to reduce production costs to economically viable levels.

Recommendations

1. The definition of what constitutes acceptable R & D activities under existing incentive programs should be extended to cover the broad range of activities pertaining to new or improved products, processes and manufacturing techniques that are not strictly production costs. This would include, within broadly defined limits, market research and development costs.

2. Qualifying and reporting procedures under R & D incentive programs need to be simplified. This could be accomplished by: (i) manufacturers providing annual projections of proposed R & D objectives, activities and expenses; (ii) an examination by government of the achievements attained (as compared to previously stated objectives) at the time of the claim for tax credit or grant payment; and, (iii) acceptance by government of verification audits for R & D, carried out by the company's own auditors.

3. The "means test" of the federal Enterprise Development Program is considered an impediment to increased R & D activities. It should be replaced by a new approach which would put the emphasis on encouraging companies to commit more of their own funds to R & D than would otherwise be the case.

4. The requirement of the "design" component (formerly IDAP) of the Enterprise Development Program can sometimes unduly increase the costs of design work that could be undertaken by companies on their own. Firms should have the option of either hiring consultants or using their own design resources.

5. Existing R & D support by government could be consolidated through an optional two-tiered approach allowing firms to select between (a) fiscal measures (write-offs and/or tax credits), or (b) shared-cost grant programs. Fiscal incentives would generally be more attractive to larger firms in view of their greater financial resources and the reduced reporting requirements, while small firms might benefit more from the earlier cash flow benefits of grant programs. In addition, fiscal incentives are of little value to firms in a temporary net loss position.

6. The Task Force is of the view that a higher level of overall government support for R & D is justified, particularly in the increasingly competitive economic situation. This implies both an increase in the basic level of tax credit from 5% at present to at least 10% and an increase in the write-off provisions from 150 to 200%.

7. The Department of Industry, Trade and Commerce should prepare and disseminate an up-to-date and comprehensive R & D booklet outlining all the forms of assistance available to support research and development activities, covering both the fiscal and grant incentives.

Impact of Recommendations

It is considered that the adoption of measures proposed above would contribute significantly to achieving the following objectives:

(i) a higher overall level of R & D activities in the machinery sector with significant repercussions in such areas as import substitution, increased exports, reduced reliance on foreign technology and enhanced international stature of the Canadian machinery sector in terms of demonstrated competence in a high technology area.

(ii) increasing the number of small and medium-size Canadian-owned companies engaged in innovative activities. The many examples of successful unique developments by small Canadian machinery firms illustrate the benefits that could be realized through the involvement of more firms in R & D, in terms of the overall enhanced stature of the Canadian-owned segment of the machinery sector.

(iii) strengthen the position of Canadian subsidiaries for both the commitment of more funds to innovative activities and obtaining a larger share of the total corporate R & D programs. What is needed is a competitive package of R & D support by government that will demonstrate to the management of parent corporations the economic benefits resulting from the placing of more R & D activities in Canada.

The Task Force recognizes that the measures outlined above imply a higher level of government funding than exists at present. However, the historical evidence of the economic advantages enjoyed by technologically advanced nations is sufficient to show that the short-term revenue loss to the public purse will be far outweighed by the long-term benefits in terms of government revenues, increased employment and the technological capital that will inevitably result.

SECTION V - MTN ADJUSTMENT

The various measures proposed in areas such as export promotion, import substitution, R & D, investment and taxation policies should contribute to facilitating the process of adjustment in the machinery sector to tariff reductions following the MTN negotiations. The Task Force is also aware that the government is reviewing its existing programs and policies with a view to optimizing their effectiveness in cushioning possible adverse impacts of the MTN on Canadian industry, and is also giving consideration to the need for additional measures to deal with particularly vulnerable sectors. It is also recognized that the MTN is only one (albeit a very important one) of many environmental changes affecting industry which will force the pace of adjustment in the foreseeable future.

It is considered, however, that governments should be made aware of the concern of the Task Force with regard to certain aspects that are particularly relevant to the machinery sector:

(i) Current Canadian tariff rates on most machinery are generally higher than those of the principal machinery-producing countries that Canada competes with. The Canadian industry therefore stands to lose proportionately more in terms of effective protection under the "harmonization" provisions of some tariff cutting formulas tabled in the MTN.

The industry in Canada is also more vulnerable than its foreign competitors in the area of NTB's and the Task Force is not too hopeful that much more than token success will be achieved in the MTN in dismantling foreign NTB's.

(ii) Successful adjustment to the MTN implies for many companies a need to introduce productivity and cost performance improvements which would be difficult to achieve, at least in the short term. This would, in fact, be beyond the financial capability of many small firms with a narrow product range who will be faced with the problem of abandoning their traditional lines and diversifying into new products.

(iii) In many cases the Canadian management of subsidiaries may be faced with particular difficulties in countering tendencies of foreign parent corporations to discontinue or curtail manufacturing operations in Canada if the benefits of maintaining a production base in Canada are less evident following substantial tariff reductions.

Recommendation

On the basis of the above considerations, the Task Force urges the Canadian government to develop a "contingency plan" to deal with special problems of adjustment, affecting both employment and/or production, in selected areas such as those described above. Such a plan should also be announced early enough to permit effective action before decisions made to abandon production in Canada become irrevocable.

SECTION VI - INVESTMENT POLICIES

As pointed out in the Sector Profile appended to this Report, if the industry is to improve its performance in both the domestic and export market, investments in new machinery production capabilities, and in technological upgrading of facilities will have to surpass the level of investments which this sector achieved over the last decade. Otherwise it will not be possible to achieve the dual objectives of improving its penetration of both domestic and export markets concurrently. The result would likely be a continuation of historical trends for this sector - higher exports accompanied by an increased proportion of the domestic market supplied through imports, with no significant improvement in the trade balance and, in the long term, a less diversified and possibly smaller sector compared to its current relative contribution to the economy.

Unfortunately, these additional investment requirements are needed at a point in time when expectations regarding returns on investment tend to discourage decisions by industry and individuals to allocate savings to capital expenditures which will create expansion and improvements in manufacturing.

Recommendations

Many of the recommendations made in this Report will have an impact on encouraging increased capital investments in the machinery sector. In particular, the multi-purpose fiscal incentive described in the section of this Report concerning export promotion, the capital investment assistance measure recommended for new product introduction to support import substitution and the two-tiered optional fiscal/grant incentive for R & D would provide a meaningful stimulus to capital investments. In addition, the extent to which government can influence the creation of a positive investment climate in the economy, through the adoption of appropriate broad economic policy measures will be helpful in achieving this objective. The Task Force has also pointed out that investments in manpower training are just as important as those on fixed assets and has put forward a plan of action aimed at overcoming the skilled manpower shortage that is now prevalent.

APPENDIX I

TASK FORCE ON CANADIAN MACHINERY INDUSTRY

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SECTOR PROFILE

CANADIAN MACHINERY INDUSTRY

CANADIAN MACHINERY INDUSTRY

SECTOR DEFINITION

The machinery sector comprises those companies engaged in the production of the wide range of machinery and equipment required by Canada's resources, processing, manufacturing and service industries. It covers all industrial and service industries machinery including mechanical equipment for power generation and agricultural equipment, but excluding electrical and transportation equipment.

At the present time there are about 2,000 companies in Canada manufacturing machinery and equipment, with a combined production of $5 billion per year and about 120,000 employees.

THE INDUSTRY IN PERSPECTIVE

The machinery sector accounts for approximately six per cent of the total manufacturing production in Canada; eight per cent of Canada's total manufacturing export sales; and seven per cent of total manufacturing employment. It is a specialized industry involved in a high technology area whose products are major inputs in all phases of industrial activity in Canada. The industry provides rewarding employment opportunities in terms of high wages, skills, variety of work, and relatively clean and favourable working conditions. The industry is also a relatively small energy consumer.

The machinery sector is self-reliant in the sense that it does not require large scale government intervention for its continued existence. It is not seriously threatened by any environmental issues expected or currently emerging and it has displayed considerable resiliency in adapting to new and evolving demand patterns, technological developments, and the competitive challenge represented by the dominant position in world machinery markets of large multinational producers with a stronger international structure.

Between 1965 and 1975 machinery industry production increased from $1.8 billion to $5.0 billion, representing an average growth of 11 per cent per year. This is similar to the rate of growth of the domestic market which expanded from $3.1 billion to $8.8 billion. However, imports rose from $1.7 billion to $5.5 billion or a 12 per cent average annual growth rate. As a result, imports have been supplying an increasing proportion of the domestic market — from 50 per cent in 1965 to 60 per cent in 1975. At the same time, Canadian manufacturers increased their exports from $365 million in 1965 to $1.7 billion in 1975, an average annual growth rate of 17 per cent. While, in 1965, 20 per cent of domestic production was exported, by 1975 this proportion had risen to 35 per cent. Nevertheless, the 60 per cent share of the domestic market currently supplied from imports reflects an inability to take greater advantage of a large potential demand at home. Machinery manufacturing is international in nature and Canadian demand for machinery is broad and diversified. Accordingly, both imports and exports will continue as important factors for this sector. However, while it would be unrealistic to seek self-sufficiency in machinery production, much of the industry's future growth will depend on its ability to obtain a greater share of the domestic market.

Capital investments for infrastructure projects, energy and resource developments, as well as new developments in industrial processes should provide major business opportunities for the industry in the medium and long term. However, optimum participation of the industry in future business opportunities will depend on the industry's ability to overcome structural weaknesses in terms of international stature and financial strength as well as on its ability to adjust to changes in the environment such as those that could result from current MTN negotiations.

STRUCTURE

Products

The varied range of capital goods produced by the machinery industry fall into three broad categories on the basis of the kinds of industries that use machinery:

Resource-based Machinery — including agricultural, forestry, mining, power generation and construction equipment;

Plant and Industrial Machinery — such as textile, plastics, rubberworking, packaging, etc.; and general purpose industrial machinery including valves, compressors and materials handling equipment;

Service Industries Machinery — including commercial refrigeration and air conditioning equipment, heating equipment, food preparation, and garage and service station equipment.

Of the industry's total production of $5.0 billion in 1975, approximately 40 per cent consisted of resource based machinery, a further 40 per cent of plant and industrial machinery and the remaining 20 per cent was service industry machinery.

Such groupings, however, can be misleading since they represent users and not clearly delineated or separate sectors of machinery manufacture. Despite the heterogeneous range of products involved, machinery production shares common features which make it logical to consider the industry as a whole. The industry's various outputs are capital goods employed in the production of other goods and services. As such, the demand for machinery is a function of the overall climate for new investment in additional productive capacity throughout the entire range of industrial activities in Canada. Also, a machinery firm may produce machinery which falls into more than one of the user groups listed above because the technology required to manufacture different types of machinery is often quite similar. Machinery technology is responsive to changing requirements in user industries as well as new industrial technological processes. In this sense the machinery industry usually follows rather than leads technological change. Nevertheless, there are instances where an advancement or innovation in machine design creates or permits new industrial processes and methods.

Number and Size of Firms

There are about 2,000 machinery companies in Canada ranging from some of the country's largest industrial corporations to local machine shop type establishments employing fewer than 10 people.

Of these companies, only about 10 per cent could be considered medium to large in size in that they employ more than 100 people each; these firms account for close to 70 per cent of the total value of the industry's production and overall employment. Most of the larger Canadian machinery manufacturers are foreign-owned and generally smaller than their counterparts in the U.S. and Western Europe.

Notwithstanding the fact that large machinery manufacturers in the U.S. generally operate on a larger scale than their counterparts in Canada, it would appear that the average size of machinery companies in the two countries is about the same. In this regard, the following table illustrates the similarities in size between the average Canadian and U.S. companies in the machinery field.

AVERAGE SIZE OF MACHINERY COMPANIES — 1972

Country	*No. of Employees*	*Value of Annual Production*
		($ Million)
Canada	59	1.5
U.S.	40	1.5

Source: Statistics Canada
U.S. Census of Manufacturers

This points out that in the U.S. as well as Canada, there is a wide range of local needs met by smaller manufacturers despite the fact that a few large producers tend to dominate the industry in terms of sales and employment.

In this regard, most firms in the machinery sector are small Canadian-owned operations employing fewer than 20 people and geared primarily to serving local requirements. Whereas the larger firms produce a fairly wide range of machinery products, many of the small to medium-sized companies have specialized in particular product areas on the basis of unique products, distinctive designs and/or ability to serve localized needs.

MACHINERY INDUSTRY — 1974

Number of Employees	*Establishments*		*% of Shipments*
	#	%	
1-19	1,212	60.6	8.0
20-99	574	28.7	26.2
100+	214	10.7	65.8

Source: Statistics Canada

Scale and Specialization

Economies of scale are usually a major competitive consideration for the production of standard or off-the-shelf items of machinery. Much of machinery manufacturing, however, involves custom-engineered equipment where scale of production is generally a less significant factor as orders involve complete systems or a limited number of large machines. Custom-engineered machinery entails design work and the gearing of production to meet a customer's particular needs, with fabrication spread over a fairly long time, sometimes up to two years. As such, "plant scale" is not a significant limiting factor except during periods of unusually high overall economic activity when Canadian companies may have to decline new orders or offer uncompetitive delivery schedules because of their limited capacity. In view of this, the generally smaller size of Canadian machinery manufacturers does not necessarily place them at a major disadvantage when competing for custom-engineered business against larger foreign machinery producers.

In order to remain competitive in markets characterized by a wide range of demands and a large number of suppliers, many machinery companies have gradually reduced the range of machinery products manufactured in Canada, particularly standard types, and concentrated on certain types and sizes of machinery as well as on custom-engineered equipment. Specialization has, in a number of cases, been achieved through rationalization agreements whereby the Canadian subsidiary produces a line of machinery for the corporate group while rounding out its product lines with imports from the parent organization. In other cases, companies have developed unique equipment and capabilities which they have been able to market successfully in Canada and abroad.

Geographic Distribution

Approximately 85 per cent of machinery industry activity is concentrated in the urban centres of Ontario and Quebec.

Region	*Establishments*		*Shipments*		*Employment*	
	#	%	$M	%	#	%
Atlantic	38	1.9	25.0	0.5	1,080	0.9
Quebec	356	17.8	770.0	15.4	23,400	19.5
Ontario	1,128	56.4	3,475.0	69.5	77,160	64.3
Prairies	264	13.2	415.0	8.3	10,800	9.0
B.C.	214	10.7	315.0	6.3	7,560	6.3
Canada	2,000	100.0	5,000.0	100.0	120,000	100.0

Source: Statistics Canada

The average size of establishments in Ontario and Quebec is also significantly larger than in other areas of Canada.

Region	*Average Value of Shipments per Establishment*	*Average Number of Employees per Establishment*
	($,000)	
Atlantic	710.4	39.9
Quebec	2,091.8	88.8
Ontario	2,986.1	92.7
Prairies	1,512.3	55.3
B.C.	1,413.6	47.8
Canada	2,500.0	60.0

Source: Statistics Canada

Machinery industry activity is more heavily concentrated in central Canada, especially Ontario, than is the case for manufacturing industries as a whole. This is probably because the sector is relatively more dependent on large population centres for skilled labour, suppliers of inputs, and proximity to most industrial and service industry markets. The machinery sector has followed the historical pattern of industrial development in the country which resulted in the concentration of secondary manufacturing activities in central Canada.

Nevertheless, many small operations such as machine shops and tool and die makers are spread throughout the country to meet local requirements. There are also some regional centres of machinery industry activity which have developed close to concentrations of resource-based activities — e.g. agricultural implement production in Manitoba and Saskatchewan; oil and gas equipment in Alberta; fish processing equipment in the Atlantic Provinces; and logging and sawmilling equipment in British Columbia.

Ownership and Control

About 225 large firms in the machinery sector are subsidiaries of parent companies located mainly in the U.S. and they account for at least 50 per cent of the sector's total output. The establishment of production facilities in Canada by the large U.S. machinery firms was a gradual process facilitated by a number of factors such as: (i) the high tariffs (e.g. 22½ per cent) on machinery prior to 1968 which encouraged foreign firms to establish production facilities in Canada to supply the domestic market; (ii) lower Canadian labour rates relative to the U.S.; (iii) the opportunity for a Canadian-based subsidiary to take advantage of British Commonwealth Preferences for sales to Britain, Australia, New Zealand, etc.; (iv) the expansionist practice followed by many U.S. corporations in purchasing existing companies; (v) the need in the Canadian industry for managerial, technical, marketing and financial resources to grow past a certain level of production; and (vi) the attitudes of many marginal Canadian-owned firms which regarded foreign acquisitions as the only means for continued viability or possible expansion.

Foreign investment in the Canadian machinery industry has made possible a higher level of overall capability as a result of ready access to the technical, financial and marketing resources of parent corporations. In turn, this has resulted in a broader range of machinery products being produced in Canada than would likely have been the case otherwise. However, foreign control has tended, in some instances, to encourage fragmentation and limit the scope of industrial activities that subsidiaries could undertake in Canada. In recent years, some of these negative aspects have been offset by a number of rationalization agreements. This process of rationalization of production has been beneficial for the industry in that it has led to the establishment of machinery operations internationally competitive in their fields.

Financial Structure

Canadian machinery companies lack the financial stature of the large multinational firms with which they are in competition both in Canada and in export markets. This is particularly true for the smaller Canadian-owned firms but applies also to subsidiaries whose access to parent company

resources is often limited by the product responsibilities and market prerogatives assigned to them. Cash flow problems are common as many companies are usually dealing with only a few clients at a time and production for individual orders extends over several months. In addition, Canadian companies generally are unable to afford a level of promotional activity or a distribution network comparable to that of the large multinational companies. Financial constraints often preclude bidding on large turnkey projects abroad unless EDC or CIDA financing is available. On certain large development projects in Canada the major financial constraint has been the inability to match attractive tied or concessional financing terms available to foreign competition through foreign government agencies or private investors.

Factors of Production

Major items consumed in the machinery production process include: iron, steel and non-ferrous metals (e.g. ingots, bars); iron, steel and non-ferrous metal shapes (e.g. castings, forgings, stampings); finished components such as bearings, electric motors, gears and controls; as well as complete assemblies such as pumps, compressors, transmissions, conveying systems and specialized production components to be incorporated into integrated systems (e.g. food processing lines). Thus, some of the industry's output (e.g. pumps, compressors) is often used as inputs in the manufacture of other items of machinery and equipment.

The availability of materials is not normally a constraint except during periods of unusually high economic activity. This occurred, for instance, in 1974/75 when shortages and delivery bottlenecks developed for particular items, such as castings, as production capabilities were fully utilized and could not be expanded in the short run.

The average level of wages in the industry is above that for manufacturers as a whole because the industry requires a highly skilled labour force in view of the relatively sophisticated production activities characteristic of much of machinery manufacturing. For example, in 1975 the average weekly wage per employee in the machinery sector was about $230 compared to $213 for manufacturing industries. However, despite the higher overall level of wages, the industry has experienced difficulties in recent years in obtaining skilled workers in particular occupations (e.g. machinists, welders, pattern and mould makers). This stems from several factors, including: (i) lack of adequate manpower training and apprenticeship programs; (ii) a reluctance on the part of young people to enter these occupations because of the time required to complete apprenticeships when in recent years less skilled jobs have often attracted comparable salaries; (iii) increasing difficulty in recruiting skilled workers from traditional sources in Europe. For many companies the shortage of skilled workers has become a major constraint to raising plant productivity.

Transportation costs do not consistently confer a competitive advantage to any one area's industry because machinery markets are generally dispersed over widely separated locations and, as such, transportation costs, to some extent, must be incurred by all competitors. Nevertheless, on individual orders, particularly involving large or heavy equipment, transportation costs can become a significant factor for Canadian producers shipping equipment across Canada when competing against U.S. manufacturers with plants located closer to the user.

It should also be noted that, in machinery purchasing decisions, price is a fundamental consideration but other factors such as reputation, financing, servicing and distribution are also important.

Technological Competence

The introduction of new types and sizes of machinery and the development of improved machines generally follows changes in the demand patterns of user industries. Such changes usually occur as the result of trends towards increased automation of industrial processes, the discovery of new uses for various materials, the opening up of new resource areas previously uneconomical to exploit on the basis of existing technology, changing patterns of demand in infrastructures, urban and transportation needs, etc. In some instances, such trends necessitate the development of highly sophisticated equipment and high technology capabilities such as in the production of specialized equipment for nuclear reactors, automotive, aerospace and other technologically advanced sectors. In other areas, the new developments are less dramatic involving mainly the design of faster, larger and more efficient machines.

In this regard, the Canadian machinery industry has a level of technical competence on a par with the U.S. and other industrialized countries. This is largely due to ease of access by subsidiaries to the technological developments of their parents and the ability of Canadian-owned firms to adapt to innovations made elsewhere by the acquisition of licences or through developments of their own. Examples of machinery fields where Canadian firms have developed particular competence include: forest industries equipment, industrial gas turbines, nuclear valves and pumps, materials handling equipment for bulk commodities, packaging equipment, certain items of pollution control equipment, and automotive body and frame straightening equipment.

ENVIRONMENTAL FACTORS

Markets

Market Structure

The predominant characteristic of machinery markets is that they are international. Most industrialized countries have strong machinery producing capabilities and they compete extensively with each other for the broad range of machinery needs characteristic of developed economies. They also compete in third countries that have little or no indigenous machinery production capabilities but are rapidly evolving as important markets for machinery needed by the infrastructure and resource development projects underway in these areas. Competition for machinery markets tends to be dominated by multinational corporations. It is not restricted to price considerations but includes such factors as quality and reputation, engineering services, distribution facilities and financing.

The major machinery manufacturing countries, e.g. the U.S., Japan and West Germany, import machinery to some degree to meet the requirements of their domestic markets, and export some proportion of their domestic production. This reflects the widely diverse and highly competitive nature of machinery markets and, to some extent, the importance of multinationals who, in many cases, have rationalized their production on a worldwide basis.

The extent to which machinery and equipment trade is carried on by all machinery producing countries is illustrated below:

MACHINERY TRADE BY MAJOR MACHINERY PRODUCING COUNTRIES

Country	*% of Domestic Requirements Imported*	*% of Production Exported*
U.S.	10	17
Japan	10	24
West Germany	34	63
Britain	34	50
France	50	45
Sweden	50	59
Canada	60	30

Source: 1973 OECD Market Data.

Canadian Market

The Canadian market is typical of that of other industrialized countries in that it encompasses a broad and diverse range of machinery needs. However, the demands for each type and size of machine are much lower in volume than is the case in a number of countries that are major machinery producers. The total domestic market for machinery and equipment in 1975 was approximately $8.8 billion. Overall domestic demand for machinery increased by close to 11 per cent per annum from 1965 to 1975 in dollar terms, expanding particularly rapidly during the last five years of this period in most cases, even taking into account the large inflationary trends in the last few years.

DOMESTIC MACHINERY MARKET

	1965	1970	1975	% Average Annual Change 1965–75	1970–75
		$ Millions			
Resource-Based	1,197.1	1,309.8	3,503.3	11.3	21.8
Plant and Industrial	1,215.4	1,883.2	3,261.0	10.1	10.4
Service Industries	735.7	1,054.6	2,016.8	10.8	13.8
TOTAL	3,149.2	4,247.6	8,783.1	10.9	15.8

The growth of the domestic market for particular types of machinery, between 1965 and 1975, is shown in Table I.

Domestic demand for resource type machinery displayed pronounced cyclical fluctuations between 1965 and 1975 which are particularly evident in such areas as agricultural, mining and power generation equipment. These types of machinery are especially prone to variations in demand as resource developments are usually undertaken at intermittent intervals. The pattern of domestic demand for this kind of machinery between 1965 and 1975 reflects decisions to enlarge capacity which were made in most resource sectors during the late 1960s and early 1970s.

The domestic market for plant and industrial machinery expanded at a fairly constant rate of 10 per cent per year during the entire 1965 to 1975 period. This kind of machinery encompasses a broad range of items used by the manufacturing and processing sectors and the aggregate demand is not significantly affected by major new developments in any particular field. This relatively constant rate of increase in domestic demand reflects the need to continually replace and update obsolete equipment and the broad trend towards increased automation of industrial processes to achieve higher productivity levels in manufacturing industries generally.

The domestic demand for service industries machinery displayed a continuing upward trend in the period 1965–1975, reflecting the growing significance of the service industries in relation to the overall economy.

Export Markets

The United States is Canada's largest machinery market, accounting for approximately 70 per cent of our total exports. These exports are very diverse, covering practically every type of machinery

TABLE I

	Domestic Market 1965	1970	1975	% Average Annual Growth 1965–75	1965–70	1970–75
		$ Millions				
Agricultural Equipment	383.3	298.1	1,141.9	11.6	– 4.9	30.9
Power Generation Equipment	301.6	341.3	813.9	10.5	2.5	19.1
Forestry Equipment	158.1	247.4	496.7	12.2	9.4	15.0
Mining Machinery	105.7	169.3	282.4	10.4	9.9	11.0
Construction Equipment	248.4	253.7	770.4	12.1	0.4	25.1
Special Industry Machinery	297.9	563.1	895.5	11.7	13.6	9.9
Materials Handling Equipment	236.2	323.0	635.1	10.5	6.5	14.6
Rolling Mill, Metalworking[1]	304.7	472.3	726.2	9.2	9.2	9.2
Pumps, Compressors[2]	259.2	330.7	669.4	10.0	5.0	15.1
Other Industrial Machinery	118.4	194.1	334.8	10.7	10.4	11.5
Commercial Refrigeration[3]	100.6	166.8	314.5	12.1	10.4	13.5
Heating Equipment	84.2	97.3	112.3	3.0	2.9	3.0
Other Service Industries	548.9	800.5	1,590.0	11.2	7.8	14.7
TOTAL	3,149.2	4,247.6	8,783.1	10.9	6.2	15.8

Source: Statistics Canada.

[1] *Rolling Mill, Metalworking and Machine Tools.*

[2] *Pumps, Compressors, Valves and Bearings.*

[3] *Commercial Refrigeration and Air Conditioning Equipment.*

produced in Canada. In addition to such factors as proximity and similarity of standards and business practices, an added stimulus to exports to the U.S. is provided by the close working relationships between parent and subsidiary companies.

Western Europe, together with Australia and New Zealand, constitute the second largest market group for Canadian machinery, particularly for secondary manufacturing and service industries machinery. At the same time, there is growing potential for exports of agricultural equipment and other resource based machinery to Eastern Europe. These market areas represent over 40 per cent of total non-U.S. directed exports of Canadian machinery.

The developing countries present the largest potential for increased sales of Canadian resource based machinery. Growing worldwide awareness of potential shortages in energy and material resources has stimulated increased interest in many developing countries in speeding up plans for resource development projects and the required infrastructure (port facilities, roads, etc.). Of major importance in these market areas are such factors as: availability of EDC or CIDA financing; turnkey capabilities; and consulting and engineering services.

Tariffs and Non-Tariff Barriers

Tariffs

Over the years, Canadian tariff policy on machinery and equipment has attempted to reconcile two objectives: (i) encourage the development and growth of the machinery industry; and, (ii) reduce the cost of capital equipment to users. Beginning in the 1870s the relatively high tariffs on most machinery were modified by the introduction of reduced rates of duty on certain machinery products when of a kind not made in Canada and more provisions of this sort were introduced gradually over the next 50 years. In 1936, the principal machinery tariff item was divided into two parts, with a reduced rate of duty of 20 per cent MFN for machinery of a "class or kind not made in Canada" and 25 per cent MFN for machinery of a "class or kind made in Canada". In 1951, these rates were reduced to 7½ per cent and 22½ per cent respectively and remained at these levels until the Kennedy Round tariff reductions in 1968.

Under the Kennedy Round, the Canadian tariff on most machinery was reduced from 22½ per cent MFN to 15 per cent MFN on January 1, 1968. This coincided with the introduction of the *Machinery Program* — a new approach to industrial development based on individual technical and commercial assessments of the capability of the Canadian industry to supply machinery and equipment to meet the actual needs of machinery users. On the basis of these assessments the duty may be remitted in individual cases when machinery is considered "not available in Canada".

The Machinery Program has been an important industrial development tool in providing a continuing interchange between the Department of Industry, Trade and Commerce (ITC) and machinery manufacturers regarding their capacity to meet users' requirements; in bringing their capabilities to the attention of potential customers; and in identifying the demand for specific types of machines which might profitably be manufactured in Canada. In this regard, many machinery manufacturers have been assisted through the provisions of the program to either increase the range of products manufactured in Canada, expand production facilities, carry out rationalization arrangements, increase Canadian content and/or improve their international competitiveness (through special remissions of duty for production components not obtainable in Canada on an economic basis). For machinery users, the program provides net savings for the purchase of advanced production equipment not available in Canada, through remissions of duty which have amounted to more than $1 billion since the inception of the program.

Prior to the Kennedy Round, the relatively high tariffs on the bulk of imported machinery "of a class or kind made in Canada", e.g. 22½ per cent MFN, was instrumental in the establishment of branch plants in Canada, primarily to serve domestic requirements and to take advantage of the British preferential tariff for exports from Canada to Commonwealth countries. Following the Kennedy Round, the relative importance of tariffs as a restraint to machinery trade declined while other competitive factors such as financing terms, engineering and other support services, and non-tariff barriers assumed increasing importance. The Canadian tariff on most machinery, at 15 per cent MFN, remains relatively high in comparison to other industrialized countries, but the average rate of duty, taking into account duty remissions under the Machinery Program, has been about 7.5 per cent.

However, the Canadian machinery sector obtains little or no tariff protection over a wide range of resource machinery such as for mining, oil and gas, fertilizer production, imported into Canada under

"end use" tariff items. As a result of this long-standing special tariff treatment for resource industries, Canadian machinery manufacturing capabilities in these areas have not been as fully developed as might otherwise be the case. In addition, most agricultural equipment enters Canada duty free.

Non-Tariff Barriers

The principal forms of non-tariff barrier (NTB) that have an adverse effect on Canadian machinery trade include: (a) foreign tied or concessional financing advantages enjoyed by foreign suppliers in respect of large capital projects in Canada which, in effect, often preclude any significant Canadian participation in such projects; (b) government procurement policies such as the "Buy America" legislation in the U.S. and the policy of certain European countries to simply not consider Canadian (or other foreign) bidders in such areas as power equipment, water and sewage treatment equipment, petrochemical, oil and gas and pipeline equipment; and (c) "local content" provisions imposed in certain countries as a condition for Canadian suppliers to obtain contracts, which tend to reduce significantly the volume of equipment shipped from Canada.

HISTORICAL PERFORMANCE

Between 1965 and 1975 Canadian machinery production increased from $1.8 billion to an estimated $5.0 billion. This represents an average increase of close to 11 per cent a year which is approximately the same rate of growth as for the domestic market. However, during this period machinery imports increased at a faster pace (12 per cent a year) from $1.7 billion to $5.5 billion, resulting in a decline in the Canadian industry's share of the domestic market from 46 per cent in 1965 to 38 per cent in 1975.

At the same time, however, a growing proportion of domestic production was directed to export markets. While in 1965 exports were only $365 million (20 per cent of total shipments), by 1975 they had reached $1.7 billion (35 per cent of total shipments).

	1965	*1975*	*Average Annual Growth Rate 1965–1975*
	— $ millions —		
Production	1,814.9	5,000.0	11%
Exports	364.9	1,686.6	17%
Imports	1,699.2	5,469.9	12%
Domestic Market	3,149.2	8,783.1	11%

Since 1965, employment in the industry increased at an average annual rate of 2 per cent to reach a level of 120,000 in 1975, about 7 per cent of total manufacturing employment. During that period employment in manufacturing increased by one per cent per year on average. The industry's wage and salary bill in 1974 is estimated at $1.5 billion or 8.5 per cent of total manufacturing. In addition to the direct employment derived from machinery industry activity, there is a significant "multiplier" effect in terms of employment created in other sectors. In this regard, a study by Dr. Lermer* indicated that a $1 million order for machinery (in 1969) would result in approximately 133 new jobs in other industries.

These performance trends reflect the industry's considerable success in meeting the challenge of an increasingly intensive import competition, through such means as specialization, rationalization of production and export promotion, in supplying markets requiring an ever larger and diverse range of types and sizes of machinery. However, the growing inability of the industry to maintain its share of the domestic market is also evident.

The high level of activity and growth reached in 1975 was followed by a two-year "holding" period with no significant overall changes in levels of production or employment. This reflects a real decline in business investment during 1976 and only modest real growth in 1977. For the medium and long-term, however, the outlook is favourable as new developments in areas related to energy, resource developments and transportation needs should provide major new business opportunities for the industry.

*"*The Canadian Machinery Industry", by Dr. George Lermer, Waterloo Research Institute, September 1973.*

Production

Machinery production in Canada got its first major impetus as a result of the country's was effort in the 1940s and the subsequent rebuilding of European production capabilities. In 1938, domestic machinery shipments were only $60 million; by 1950 shipments had increased to some $460 million; and, in 1975 had reached an estimated $5 billion. In the 10-year period from 1965 to 1975 Canadian machinery production increased at an average annual rate of 10.7 per cent in dollar terms, and moved from 5 per cent of total manufacturing activity in Canada to 6 per cent. In this interval, United States production of machinery increased at an average annual rate of 9.6 per cent.

Canadian machinery production in each of the major user categories increased at approximately the same rate during the 1965–75 period. However, shipments of resource-based machinery followed a pronounced cyclical pattern during this period, exhibiting a rate of growth between 1970 and 1975 which is almost twice the 10-year average. The cyclical nature of demand for resource type capital equipment stems from a narrower range of markets and the sector's dependence on resource development projects which often proceed at intermittent intervals. The relatively steady growth in the demand for secondary and service machinery reflects the broader range of products involved and the fairly consistent growth in the level of overall activity in the manufacturing and service sectors of the economy.

MACHINERY INDUSTRY SHIPMENTS

				% Average Annual Change		
	1965	*1970*	*1975*	*1965–75*	*1965–70*	*1970–75*
		— $ Millions —				
Resource-Based	675.8	827.5	1,950.1	11.2	4.1	18.7
Plant and Industrial	693.1	1,183.3	1,906.7	10.6	11.3	10.0
Service Industry	446.0	675.0	1,143.2	9.9	8.6	11.1
TOTAL	1,814.9	2,685.1	5,000.0	10.7	8.1	13.2

Shipments increased most rapidly in the following machinery areas between 1965 and 1975, as shown in Table II: special industry machinery (12.9 per cent per annum); commercial refrigeration and air conditioning equipment (12.9 per cent); and forestry equipment (12.3 per cent). Because of the cyclical nature of demand for resource-based machinery, however, the 10-year averages obscure some significant trends. For instance, agricultural machinery showed a particularly cyclical pattern in its shipments over ten years. Between 1970 and 1975 agricultural machinery shipments rose by close to 25 per cent per year as compared to the 10-year average of 11 per cent.

The machinery products which exhibited the lowest rates of annual growth between 1965 and 1975 were: heating equipment (2.1 per cent per annum); materials handling equipment (9.0 per cent); and, mining machinery (9.2 per cent).

The overall decline in the proportion of the domestic market supplied by Canadian companies was most pronounced during the last five years and affected the resource machinery areas relatively more than other kinds of machinery.

DOMESTIC SHIPMENTS* AS A % OF DOMESTIC MARKET**

	1965 %	*1970* %	*1975*[e] %
Resource-Based	37.6	35.6	27.3
Plant and Industrial	49.4	51.8	44.0
Service Industry	54.3	52.5	45.6
TOTAL	46.0	46.9	37.7

** Domestic Shipments = Shipments — Exports.*

*** Domestic Market = (Shipments — Exports) + Imports.*

TABLE II
MACHINERY INDUSTRY SHIPMENTS

	Shipments			% Average Annual Change		
	1965	1970	1975[e]	1965–75	1965–70	1970–75
Agricultural Equipment	220.5	201.2	605.9	10.6	– 1.8	24.6
Power Generation Equipment	191.1	249.4	557.0	11.3	5.5	17.4
Forestry Equipment	130.3	204.8	415.7	12.3	9.5	15.2
Construction Equipment	73.4	86.5	225.4	11.9	3.3	21.0
Mining Machinery	60.5	85.6	146.1	9.2	7.2	11.3
Special Industry Machinery	153.1	355.0	516.7	12.9	18.3	7.8
Materials Handling Equipment	173.0	249.3	409.0	9.0	7.6	10.4
Rolling Mill, Metalworking	134.0	256.0	384.0	11.2	13.8	8.4
Pumps, Compressors	148.1	184.3	365.8	9.5	4.4	14.7
Other Industrial Machinery	84.9	138.7	231.2	10.5	9.8	11.3
Commercial Refrigeration	52.4	102.7	176.7	12.9	14.4	11.4
Heating Equipment	78.7	88.6	96.8	2.1	2.4	1.8
Other Service Industries	314.9	483.7	869.6	10.7	8.9	12.4
TOTAL	1,814.9	2,685.1	5,000.0	10.7	8.1	13.2

Source: Statistics Canada.

As illustrated in Table III, the machinery areas which were affected most by import penetration between 1965 and 1975 were agricultural equipment, mining and construction machinery. Three types of machinery — special industries machinery; rolling mill, metalworking and machine tools; and commercial refrigeration and air conditioning equipment — maintained their overall share of the domestic market over the 10-year period on the basis of their performance between 1965 and 1970.

TABLE III
DOMESTIC SHIPMENTS AS A % OF DOMESTIC MARKET

				% Average Annual Change		
	1965	1970	1975[e]	1965–75	1965–70	1970–75
	%	%	%			
Agricultural Equipment	15.3	12.4	5.6	–10.6	–4.3	–17.2
Power Generation Equipment	60.0	54.8	54.3	– 1.0	–1.8	– 0.2
Forestry Equipment	69.6	53.5	53.2	– 2.7	–5.4	– 0.1
Mining Machinery	41.0	32.8	21.7	– 6.6	–4.5	– 8.5
Construction Equipment	22.8	21.4	16.4	– 3.4	–1.3	– 5.5
Special Industry Machinery	39.8	48.8	40.4	0.0	4.2	– 3.9
Materials Handling Equipment	64.2	65.9	52.6	– 2.0	0.5	– 4.6
Rolling Mill, Metalworking	38.2	45.7	39.8	0.4	3.6	– 2.8
Pumps, Compressors	50.8	42.4	57.5	– 2.8	–3.7	– 2.0
Other Industrial Machinery	69.6	67.5	57.5	– 1.9	–0.5	– 3.2
Commercial Refrigeration	52.1	60.1	55.1	0.6	2.9	– 1.7
Heating Equipment	89.9	88.6	82.4	– 0.9	–0.3	– 1.5
Other Service Industries	49.1	47.1	41.1	– 1.6	–0.7	– 2.6
TOTAL	46.0	46.9	37.7	– 2.0	0.4	– 4.4

Source: Statistics Canada.

Exports

Some offset to the impact of intense import competition in the Canadian market has been the growing proportion of domestic production directed to exports. Canadian machinery exports, starting from a small base of $365 million in 1965, increased at an average yearly rate of 17 per cent to $1.7 billion in 1975. Exports now represent close to 35 per cent of the industry's total output compared to 20 per cent 10 years earlier.

CANADIAN MACHINERY EXPORTS

	Value of Exports			Exports as a % of Shipments		
	1965	1970	1975	1965	1970	1975
	— $ Millions —					
Resource-Based	226.0	361.3	991.8	33.4	43.7	50.9
Plant and Industrial	92.3	208.2	472.1	13.3	17.6	24.8
Service Industry	46.6	128.8	222.7	10.4	19.1	19.5
TOTAL	364.9	690.3	1,686.6	20.1	25.7	33.7

Resource-based machinery has traditionally accounted for the bulk of the industry's total exports, representing close to 60 per cent in 1975. In 1975 more than half of Canadian production of such machinery was exported. Canada's success in exporting resource machinery in the last 10 years stems from a number of factors: (i) increased demands in developing countries resulting from accelerated pace of development of resource exploitation projects; (ii) growing Canadian competitive ability and enhanced international reputation in certain resource machinery fields where Canada traditionally has been strong on the basis of a long experience in supplying equipment for the development of domestic resource industries; (iii) the availability of more EDC or CIDA funding for equipment packages associated with large scale capital projects, particularly in developing countries.

In recent years Canadian machinery firms have participated in a number of large resource development projects overseas such as Kwidzyn pulp and paper project in Poland; Gilan forest products complex in Iran; a cement plant in Indonesia; and a steel mill project in Trinidad. (These particular projects represent in total more than $550 million of Canadian machinery sales.) In addition, Canadian firms have obtained substantial contracts for pipeline compressors, valves and portable drill rigs from the U.S.S.R.

From 1965 to 1975 secondary and service industries machinery exports actually increased at a somewhat faster rate, on average, than resource machinery exports. This was particularly due to the fluctuations in the demand for resource type machinery over this period, but it also indicates the industry's growing specialization and international competitiveness in plant and service machinery fields, starting from a relatively small base in 1965.

TABLE IV
EXPORTS AS A % OF SHIPMENTS

				% Average Annual Change		
	1965	1970	1975	1965–75	1965–70	1970–75
	%	%	%			
Agricultural Equipment	73.4	81.7	89.3	2.1	2.2	2.1
Power Generation Equipment	5.3	24.9	20.6	14.7	36.3	– 3.4
Forestry Equipment	15.5	44.3	36.4	9.0	22.7	– 2.9
Mining Machinery	28.4	35.2	58.0	28.3	35.2	59.1
Construction Equipment	22.8	37.3	44.1	22.7	37.3	44.9
Special Industry Machinery	22.5	22.6	29.9	3.0	0.1	– 3.8
Materials Handling Equipment	12.4	14.6	18.3	4.1	3.3	5.0
Rolling Mill, Metalworking	13.1	15.7	24.7	6.7	3.7	9.8
Pumps, Compressors	11.1	23.9	29.8	10.4	16.6	4.5
Other Industrial Machinery	2.9	5.5	16.7	19.1	13.6	24.9
Commercial Refrigeration	n.a.	2.4	1.9	n.a.	n.a.	– 4.4
Heating Equipment	3.8	2.7	4.4	1.7	– 6.6	10.7
Other Service Industries	13.8	24.0	24.7	5.9	11.7	0.5
TOTAL	20.1	25.7	33.7	5.5	5.0	5.9

Source: Statistics Canada.

As illustrated in Table V, the following areas of machinery showed the largest rates of growth in the value of exports between 1965 and 1975: power generation equipment (27.5 per cent per annum); forestry equipment (22.3 per cent); and, pumps, compressors, valves and bearings (20.8 per cent). The

export performance of the power equipment sub-sector must be viewed from the standpoint that very little of this equipment was exported 10 years ago and, even with the large increase in exports since then, it still represents less than one-quarter of the domestic production of such equipment.

Over the last 10 years the U.S. has become increasingly important as the primary market for Canadian machinery exports. In 1975, for example, the U.S. accounted for close to 70 per cent of machinery exports as compared to 52 per cent in 1965. The remaining exports are widely distributed throughout the world, as shown below:

CANADIAN MACHINERY EXPORTS SELECTED COUNTRIES (1975)

	Exports	
	$ Millions	*% of Total Exports*
1. United States	1,136.0	67.4
2. Britain	43.1	2.5
3. Iran	35.1	2.1
4. Mexico	34.7	2.0
5. Australia	30.6	1.8
6. West Germany	20.4	1.2
7. Brazil	19.3	1.1
8. South Africa	17.8	1.0
9. U.S.S.R.	17.0	1.0
10. Japan	16.9	1.0
11. France	14.9	0.8
12. Belgium/Luxembourg	14.2	0.8
13. Netherlands	11.3	0.7
14. Other	275.0	16.3
TOTAL	1,686.7	100.0

TABLE V
MACHINERY INDUSTRY EXPORTS

	Exports			*% Average Annual Change*		
	1965	*1970*	*1975*	*1965–75*	*1965–70*	*1970–75*
	— $ Millions —					
Agricultural Equipment	161.8	164.3	541.3	12.8	0.3	26.9
Power Generation Equipment	10.1	62.2	115.0	27.5	43.8	13.1
Forestry Equipment	20.2	72.4	151.3	22.3	29.1	15.9
Mining Machinery	17.2	30.1	84.8	17.3	11.8	23.0
Construction Equipment	16.7	32.3	99.4	19.5	14.1	25.2
Special Industry Machinery	34.3	80.1	154.6	16.3	18.5	14.1
Materials Handling Equipment	21.4	36.3	75.0	13.4	11.1	15.6
Rolling Mill, Metalworking	17.6	40.1	95.0	18.4	17.9	18.8
Pumps, Compressors	16.5	44.1	108.9	20.8	21.7	19.8
Other Industrial Machinery	2.5	7.6	38.6	31.5	24.9	38.4
Commercial Refrigeration	n.a.	2.5	3.3	n.a.	n.a.	5.7
Heating Equipment	3.0	2.4	4.3	3.7	– 4.4	12.4
Other Service Industries	43.6	115.9	215.1	17.3	21.6	13.1
TOTAL	364.9	690.3	1,686.6	16.5	13.6	19.6

Source: Statistics Canada.

Imports

Imports now supply more than 60 per cent of Canada's machinery needs as compared to 54 per cent in 1965. Approximately one-half of the machinery imported into Canada competes directly with Canadian production, despite a 15 per cent MFN rate of tariff protection. The remainder consists of items for which there is currently no domestic manufacturing capability.

Imports increased significantly in practically all machinery areas between 1965 and 1975 as shown in Table VI, with the sharpest increase occurring in the last five-year period. For instance, imports of resource-based machinery increased by 25 per cent annually from 1970 to 1975 compared to only 3 per cent in the preceding five years. The sectors where imports increased most dramatically in this period were: forestry equipment (17.1 per cent per annum); construction equipment (13.5 per cent); and materials handling equipment (13.5 per cent). Increasing at a slower pace were: heating equipment (8.8 per cent per annum); and rolling mill, metalworking and machine tools (8.8 per cent).

Among industrialized countries Canada is one of the largest importers of machinery and has one of the most pronounced trade deficits in this area.

TABLE VI
MACHINERY INDUSTRY IMPORTS

	Imports			*% Average Annual Growth*		
	1965	*1970*	*1975*	*1965–75*	*1965–70*	*1970–75*
	— $ Millions —					
Agricultural Equipment	324.6	261.2	1,077.3	12.8	– 4.3	32.8
Power Generation Equipment	120.6	154.1	371.9	11.9	5.0	19.3
Forestry Equipment	48.0	115.0	232.3	17.1	19.1	15.1
Mining Machinery	62.4	113.8	221.1	13.5	12.8	14.2
Construction Equipment	191.7	199.5	644.4	12.9	0.8	26.4
Special Industry Machinery	179.2	288.2	533.4	12.9	0.8	26.4
Materials Handling Equipment	84.6	110.0	301.1	13.5	5.4	22.3
Rolling Mill, Metalworking	188.3	256.4	437.2	8.8	6.4	11.3
Pumps, Compressors	127.6	190.5	412.5	12.4	8.3	16.7
Other Industrial Machinery	36.0	63.0	142.3	14.7	11.8	17.7
Commercial Refrigeration	48.1	66.6	141.1	11.4	6.7	16.2
Heating Equipment	8.5	11.1	19.8	8.8	5.5	12.3
Other Service Industries	279.6	423.4	935.5	12.8	8.6	17.2
TOTAL	1,699.2	2,252.8	5,469.9	12.4	5.8	19.4

Source: Statistics Canada.

In addition to complete machines, a significant proportion of Canadian imports consist of components for use in the production of machines in Canada, mainly by subsidiaries producing some of their parent companies' lines. The development of domestic sources of supply for many of these components could assist in reducing the current imbalance in machinery trade. To date, the extent of the problem has been difficult to measure as it is virtually impossible to separately identify the volume of components being imported.

Many of these component imports are items produced in large quantities in plants in the U.S. and other countries, which could not be duplicated at an economical cost in Canada. While it is undoubtedly true that the production of certain machines on a competitive basis in Canada would not be possible without the importation of key components, manufacturers could perhaps make greater efforts to develop local sources for components. While the volume of a particular component imported by each firm is often insufficient to support a domestic source of supply, there could be instances where the volume of demand for a particular component might be sufficient in total to develop a Canadian source, if the manufacturers of equipment could standardize their component requirements and agree jointly to support a local source of supply.

Price Trends

Machinery prices in Canada increased at an average rate of 4.6 per cent a year between 1965 and 1975, which is slightly lower than the rate for manufactured products in general.

The relatively low rate of price increase for machinery was maintained despite relatively sharper rates of price increase for major input costs. For instance, the cost of primary metals, a major material input for the machinery sector, increased at 6.4 per cent per annum between 1965 and 1975, and labour costs in the machinery sector increased at about 8.2 per cent a year.

INDUSTRIAL SELLING PRICE INDEXES

(1961 = 100)

	Year			% Average Annual Change		
	1965	*1970*	*1975*	*1965–75*	*1965–70*	*1970–75*
Industrial Machinery	114.6	126.0	180.6	4.6	1.9	7.4
Manufacturing Industries	103.0	119.1	189.1[e]	6.3	2.9	9.8

Source: Statistics Canada.

The intense import competition in the Canadian market tends to maintain prices of machinery in Canada at international price levels. However, it is difficult to make strict price comparisons of machinery because of the high degree of product differentiation which takes place between manufacturers, and the various ways in which machinery is sold. Price is often the most significant consideration for the purchase of standard or off-the-shelf machinery. However, much of the machinery requirements are for custom-engineered items or lines where a number of factors including design, quality and reputation are considered, along with price, in purchase decisions.

Capital Investment

Capital investments by the machinery sector increased at an average of 11 per cent annually over the last 10 years, from $73 million in 1965 to approximately $200 million in 1975. This is a higher rate of investment than the 9 per cent per year observed for the manufacturing sector as a whole but lower than rates achieved by more capital-intensive sectors such as primary metals and chemicals where capital investments rose annually at 12 per cent and 14 per cent respectively.

Capital investment by machinery firms accounted for about 4 per cent of the value of shipments between 1965 and 1975, which is about the same ratio as that of machinery manufacturers in the U.S. However, it is a lower ratio than the 6 per cent achieved in the Canadian manufacturing sector as a whole and considerably less than the more capital-intensive sectors such as primary metals and chemicals which allocate 10 per cent and 14 per cent of their sales to capital investment respectively.

During the last decade, and in particular since 1970, the industry was often working at close to full capacity and earning good profits but did not make new investments at a rate that could have made possible any serious inroads in import penetration. For example, it has been estimated that the industry would have had to increase its investments by a further 16 per cent, or $32 million, in 1975 in order to have had the capacity to meet even the 46 per cent share of the domestic market it had in 1965. And for the industry to have made significant inroads on the import penetration problem and, say achieve a 75 per cent share of the domestic market in 1975, it would have had to invest an estimated additional $176 million, or almost double its actual investment for that year.

New investments in production capacity or capability upgrading for the purpose of making inroads in a market segment dominated by imports cannot be justified unless a firm is satisfied that, having made the investments, it will have the competitive ability to meet import competition and there will be no new environmental factors which would work against the new Canadian production source. This is particularly true for Canadian-owned companies. The same risk element applies to subsidiaries but not to the same extent in view of their access to the financial resources of their parents. In either case a company will generally only invest more capital in its operation if it considers that this is warranted by the economic environment, production costs and competitive price prospects. In planning new investment most firms base their decision mainly on anticipated demands in the domestic market. Export sales prospects involve more uncertainties and generally do not represent as significant a factor as a basis for new investments.

Machinery firms generally recognize that their competitiveness in any product area is directly related to their investments in advanced production equipment and research and development facilities. As such, new capital investment is recognized as a prerequisite to further growth. However, the view in the industry is that current economic and environmental uncertainties and the relatively higher costs of capital, construction and labour in Canada compared to many other countries, e.g. the U.S., have made investment in new capacity or facilities in Canada a less attractive proposition than in previous years.

Nevertheless, it is obvious that if the machinery sector is to achieve a higher level of production and at the same time improve its position in the domestic market, significantly higher levels of new investments will be required.

Profitability

The machinery industry had profits of $244 million in 1975. These represented some 5 per cent of sales as compared to 4 per cent in 1965. For manufacturing industries as a whole the corresponding ratios were 4.4 per cent in 1975 and 4.9 per cent in 1965. However, current lower levels of demand for investment goods indicate that the profit margins for 1976 and 1977 in the sector will likely be reduced.

In terms of management efficiency, the machinery industry has had a better record than overall manufacturing industries in the utilization of its financial resources over the last 10 years. For example, "profits before taxes as a percentage of capital employed" in the machinery industry were 26.1 per cent in 1975 and 8.1 per cent in 1965. This compares to 15.2 per cent in 1975 and 11.8 per cent in 1965 for all manufacturing industries. From the investors' viewpoint the machinery industry, while showing improvement, has remained relatively less attractive than manufacturing industries as a whole. For example, in the machinery sector, "profits after taxes as a percentage of shareholders equity" were 9.4 per cent in 1975 and 6.5 per cent in 1965. This compares to 12.3 per cent in 1975 and 10.9 per cent in 1965 for manufacturing industries.

The debt/equity ratio in the machinery sector is similar to that for manufacturing industries. The ratio of debt to equity in the machinery sector was 0.2 in 1975 and 0.1 in 1965. This compares to 0.3 in 1975 and 0.2 in 1965 for total manufacturers. This would seem to suggest that the machinery sector is in the same basic position as overall manufacturing re debt financing. This relatively low ratio indicates that debt financing has not generally been used by machinery manufacturers for their capital expansions. On the one hand this may reflect some difficulty for small Canadian-owned establishments in obtaining debt financing at reasonable rates. On the other hand, it might also indicate that certain companies, particularly foreign-controlled subsidiaries, do not need to resort to this form of financing.

Employment and Labour Relations

In 1975, employment in the machinery industry had reached an estimated 120,000 wage and salary earners, approximately 7 per cent of total manufacturing employment in Canada. A significant proportion of these jobs are professional and skilled occupations.

From 1965 to 1975, employment in the industry increased at an average of two per cent per year, which is higher than was the case for manufacturing industries generally. Employment in the machinery sector increased particularly rapidly during the last five years of this period, i.e. three per cent annual average, as the industry responded to a high level of overall demand. This trend has not been maintained in 1976 and 1977 due to lower levels of capital expenditures in the economy.

AVERAGE TOTAL NUMBER OF EMPLOYEES

				% Average Annual Change		
	1965	*1970*	*1975*	*1965–75*	*1965–70*	*1970–75*
		(,000's)				
Machinery Industry	96.0	105.6	120.0	2.2	2.0	3.0
Manufacturing Industries	1,387.5	1,503.7	1,549.1	1.1	1.6	0.6

In the last 10 years the machinery industry has had a better than average record with regard to time lost due to labour problems. Between 1965 and 1975 time lost in the machinery sector represented only about 2 per cent of the total for manufacturing industries, even though the sector accounted for about 7 per cent of total manufacturing employment. This is probably a result of: (i) the lower proportion of factory workers (as opposed to designers, engineers, etc.) employed in the machinery field than in manufacturing industries as a whole; (ii) the rewarding nature of jobs in the machinery sector because of the high percentage of skilled occupations and relatively few monotonous assembly line type jobs geared to mass volume items; and (iii) the generally higher level of wages and salaries. Machinery industry employees are represented by more than 20 different trade unions.

The average wages paid by machinery manufacturers in Canada appear to be higher than those paid in the U.S. For example, in 1976 the average hourly earnings (in Canadian currency) for the machinery sector in Canada were $6.24 as compared to $5.67 in the U.S. This $0.57 per hour margin may overstate the actual differential in the level of compensation paid by industry in the two countries because of differences in reporting wage statistics. Nevertheless, it is in line with comparative wage rate information which a number of major machinery manufacturers in Canada have provided. Accordingly, it is clear that the Canadian machinery industry has lost its traditional labour cost advantage vis-à-vis American producers. Prior to 1974 the average wage rate in Canada had been below that paid in the U.S. The recent drop in the international value of the Canadian dollar has reduced the impact of these wage differentials.

Value added per man-hour in Canadian machinery manufacturing increased at an average annual rate of 5 per cent between 1965 and 1973, which is roughly the same rate as for the machinery industry in the U.S. However, productivity in the U.S. started at a higher level in the beginning of this period, and value added per man-hour was about $14 in the U.S. in 1973 compared to $10 in Canada.

Research and Development

Industrial research and development expenditures in the machinery sector increased from $11.5 million in 1965 to $56.1 million in 1975. This is an average annual rate of increase of close to 17 per cent, as compared to 9 per cent for all industries. Machinery industry expenditures on research and development now represent about 8 per cent of the total by industry in Canada, an increase from 4 per cent 10 years ago. It is also significant that research and development outlays have risen from 1 per cent of the value of the industry's sales in 1965 to 1.5 per cent in 1975. As indicated below, certain other industrial sectors such as electrical and transportation industries still devote more resources to research and development than the machinery industry, but the rate of increase in expenditures by these sectors was substantially less than for machinery.

RESEARCH AND DEVELOPMENT EXPENDITURES

Sector	*1965*	*1975*	*% Average Annual Change 1965–75*
	— $ Millions —		
Machinery	11.5	56.1	16.6
Electrical Equipment	67.2	164.5	9.8
Transportation Equipment	60.3	80.0	2.9
Manufacturing Industries	300.0	590.6	7.0

Source: Statistics Canada.

Although the machinery industry has rapidly increased expenditures on research and development over the last decade, these expenditures are still relatively low in comparison to the level of research activity carried out in the U.S. For instance, it appears that American machinery firms, on average, spend almost twice as much on R & D as Canadians ($48,000 in U.S.; $25,000 in Canada), based on 1972 data. However, this does not mean a lower level of technical competence in Canada as Canadian subsidiaries benefit from the results of research carried out by parent companies, and Canadian owned firms have access to new technology developed elsewhere through licensing arrangements.

The subsidiaries that carry out meaningful innovative activities in Canada are mainly companies with rationalization agreements with their parent corporations under which the Canadian operation has been allocated prime product responsibilities within the corporate organization. This has occurred principally in certain resource areas where Canada has developed strong manufacturing capabilities initially to serve large primary resource developments in Canada.

In addition, several Canadian-owned companies have developed unique products, capitalizing on opportunities arising from the domestic market, which have been marketed successfully both in Canada and abroad.

PROJECTED FUTURE PERFORMANCE

Over the next decade anticipated major new developments in Canada related to energy, resource exploitation, transportation and urban needs, the growth of the service sector as well as the general need to improve productivity levels throughout industry, should provide the main stimulus to growth in the machinery sector.

In export markets, increased demand for Canadian machinery and equipment will likely stem from large new resource development and infrastructure projects. Canadian industry is already pursuing opportunities in foreign markets such as: sawmill projects in Honduras, Czechoslovakia and Poland; port and harbour projects in a number of developing countries; metallurgical projects in the U.S.S.R., Trinidad, Poland, Czechoslovakia and Peru; and cement plant construction in Ecuador and Indonesia. Most of these are expected to get underway in the next few years.

With regard to other kinds of equipment (plant and service machinery), the general level of demand will depend on the conditions prevailing in the Canadian and world economies and the resulting climate for capital investment.

Optimum growth of the Canadian machinery industry in the future will depend on such factors as:

- ease of access to sufficient capital to undertake needed capacity and capability improvements to meet higher levels of demand in selected areas;
- the development of an R & D capability commensurate with the need for technologically-advanced and larger types of machinery required in connection with energy and other developments;
- the willingness and ability of foreign controlled companies to develop more component production sources in Canada;
- the exercise of greater entrepreneurial freedom by Canadian subsidiaries to pursue specialization and rationalization arrangements with their parents to effectively meet new domestic and export market opportunities;
- the ability and willingness of Canadian management to make certain relatively high risk investments to better equip industry for import competition and achieve a significant degree of import replacement;
- increased export orientation of Canadian-owned companies;
- as favourable as possible a market environment in terms of trade barriers following the Tokyo Round of multilateral trade negotiations.

However, there are a number of constraints inherent in the domestic and international economic environment which adversely affect the machinery industry's ability to increase its overall competitiveness and technical competence, including:

- the difficulty in maintaining the Canadian industry's competitive position as a result of (i) relatively high wage rates, compared to major competitors; (ii) the high interest rates prevailing in Canada making access to investment funds more difficult; and (iii) the relatively small domestic market;
- the weaknesses and uncertainties surrounding the Canadian and world economies making it unattractive to invest in major new capital projects;
- the progressively more intensive nature of international competition for machinery markets;
- the lack of a sufficiently large pool of highly skilled manpower.

MAJOR ISSUES

The foregoing analysis of prospects for the machinery industry points to a number of factors which should enable this sector to maintain, in the long run, the strong performance and relatively high rate of growth of the 1965 to 1975 period. The analysis also noted certain requirements to be met and constraints to overcome in order for the industry to realize its full potential. In this regard, there are fundamental issues facing both industry and government related to such aspects as: (i) the trade imbalance; (ii) multilateral trade negotiations; and (iii) the structure of the industry.

Trade Imbalance

Size and Nature of Trade Imbalance

In 1975 Canada's trade deficit on machinery was $3.8 billion as compared to $1.3 billion in 1965. This means that the trade deficit more than doubled, in real terms, during this period. The imbalance is not confined to any particular product area but extends to virtually all major product groups in the machinery sector. It is, however, particularly significant with respect to the following:

	Trade Deficit 1975
Construction Equipment	$545 million
Agricultural Equipment	$536 million
Special Plant Machinery	$379 million
Rolling Mill, Metalworking Machinery and Machine Tools	$342 million
Pumps, Compressors, Valves, and Bearings	$304 million

Approximately half of the imports of machinery consist of products competing with Canadian production while the balance consist of items not produced in Canada. There are also significant imports of component parts for use in the production of machinery in Canada.

Reasons for Trade Imbalance

The propensity on the part of the Canadian industry to import machinery is due to a number of factors, including: (i) the extremely wide range of sizes and types of machinery required by industry, often in small quantities, with the result that it is uneconomical for the domestic industry to attempt to produce all requirements; (ii) the abandonment of production in certain lines in favour of product specialization in other areas in order to maintain international competitiveness; (iii) tied or concessional financing advantages accruing to offshore suppliers, and to Canadian purchasers, on certain major capital projects in Canada; (iv) the tendency of subsidiary firms in all sectors of Canadian industry to purchase their machinery and equipment requirements on the basis of what is currently in place in their parent's facilities while showing an unwillingness to experiment with untried or unfamiliar Canadian equipment; (v) the established reputation of many foreign machinery manufacturers and their well-developed distribution and servicing network in Canada; (vi) the fact that Canadian manufacturers do not supply complete lines of equipment in many areas; (vii) the practice of foreign consultants involved in projects in Canada to specify foreign equipment because they are unfamiliar with Canadian capabilities; and (viii) the tendency, particularly on the part of subsidiary operations, to import production components from the parent organization for assembly in Canada.

Significance of Trade Imbalance

The increasing import penetration in the Canadian machinery market has not so far represented a major threat to individual firms in the machinery sector but in the view of the industry has been a deterrent to a greater rate of capital investment because of the many large orders lost to foreign competitors. To a large extent, Canadian machinery producers have been successful in countering increased import penetration in the domestic market through increased export sales supported by product specialization and rationalization and have been able to maintain, overall, a rate of growth in production comparable to the increase in total domestic demand over the last 10 years. At the company level, this has meant some basic shifts in product mix, as individual producers have tended to concentrate production on items on which they were internationally competitive and/or on developments which could be successfully marketed in Canada and abroad on the basis of unique technology, distinctive designs or high standards of quality.

Between 1965 and 1975, the ratio of exports to imports has been increasing in most product areas. However, in absolute terms imports have increased by $3.8 billion over this period while exports have increased by only $1.3 billion. It would take as much as 35 years to achieve an overall balance on machinery if the trends over this period were to continue.

Complete self-sufficiency in machinery would not be a realistic goal and it has not been achieved by any industrialized country. For instance, France and Sweden import almost as large a proportion of their domestic requirement as Canada (50 per cent for France and Sweden as compared with 60 per cent for Canada); however, they also export a greater proportion of their production than Canada

(Sweden 60 per cent, France 45 per cent, Canada 35 per cent). Even the two largest machinery producing countries, the U.S. and West Germany, import at least 10 per cent of their domestic requirements and both are finding it increasingly difficult to compete against new production capabilities building up in certain third countries for standard types of machine tools. Therefore, it would appear that even though self-sufficiency in machinery production is not a realistic goal, Canada is lagging in this area behind other industrialized countries.

Opportunities for Import Substitution

The domestic demands currently met through imports are in the order of some $5.5 billion annually which is equal to the total value of current annual production of machinery in Canada. For the 50 per cent of machinery requirements made up of products currently not produced in Canada, the first requirement for an increased Canadian share in this market is the identification, with more precision than it has been possible to obtain to date, of clusters of machinery imports in sufficient quantities of any particular type and size to warrant setting up new production capabilities. For the balance, this implies improvement in the competitive ability of Canadian producers as well as a reduction in the propensity to import on the part of Canadian machinery users, recognizing the benefits to the economy of a strong Canadian presence in a high technology area, such as machinery, supported by a broad base in the domestic market.

Export Opportunities

A continuing growth in exports should play an important part in improving Canada's trade imbalance on machinery and equipment. The 35 per cent of the industry's total production that is represented by exports could be increased further, particularly if the MTN negotiations result in new export opportunities for the Canadian industry. However, it is unlikely that the 17 per cent average annual rate of increase in machinery exports achieved between 1965 and 1975 can be maintained in the future: world machinery markets are becoming increasingly competitive and more countries are acquiring machinery production capabilities. It should be noted also that MTN success in reducing trade barriers will not by itself increase the overall world demand for machinery nor will it confer any exclusive advantage on Canadian suppliers as opposed to those from other countries. For Canadian manufacturers to benefit from the trade liberalization effects of the MTN, a particular effort will have to be made to improve their competitive position in world markets through such means as productivity improvement, specialization and rationalization of production.

Multilateral Trade Negotiations

It appears that the Canadian machinery industry could derive some benefit from global tariff reductions — particularly if such reductions were accompanied by meaningful reductions in non-tariff barriers (NTBs). Such reductions could provide a major incentive for firms to improve their productivity and cost performance to take advantage of improved access to export markets. The resulting stronger international competitiveness of the industry should assist in countering increased import competition in the Canadian market.

However, to remain competitive in the face of a large tariff reduction, many firms would be faced with the need to introduce productivity and cost performance improvements which would be difficult to achieve, at least in the short run. Despite the positive aspects that can be expected from the general liberalization of trade in this sector, nevertheless a large tariff cut would also lead to:

- — abandonment of certain product lines where production in Canada is currently marginal and particularly dependent on tariff protection;
- — reduced levels of investment in existing production facilities;
- — transfer of production out of Canada by multi-nationals, on a selective basis;
- — increased import competition, which will make it more difficult to achieve significant progress in import substitution on a broad front.

On the other hand, the possible adverse effects of large tariff cuts would be alleviated if they were: (a) accompanied by significant removal of foreign NTBs; (b) staged over a fairly long period, five to 10 years, to allow production adjustments; and (c) accompanied by suitable adjustment assistance to individual firms facing severe restructuring constraints. In addition, there would be gains in employment in some instances resulting from improved access to export markets.

With respect to these expected results, the period of disruption for this sector would probably last longer than for most other industrial areas because of the traditional lag in machinery industry activity.

Industry Structure

The scope and nature of any initiatives to achieve a measure of import substitution and ensure successful adjustment to possible tariff reductions under the MTN will have to take into account some basic structural elements peculiar to the machinery sector. These include such factors as:

- the predominant position of a small number of subsidiaries that account for the bulk of machinery production as compared to the larger number of generally small and structurally weaker Canadian-owned firms. With regard to the subsidiaries' efforts at achieving more product diversification, access to export markets, increased R & D responsibilities, etc., these imply exerting an influence on foreign management whose motivations may be different from those of Canadian managers. For instance, subsidiaries will have the added task of convincing foreign parents to continue and expand, rather than curtail manufacturing operations in Canada in the event of large tariff reductions following the MTN negotiations. For Canadian-owned companies, initiatives would have to be aimed at strengthening their international stature to ensure they can effectively compete with the large multi-national companies in meeting new demand opportunities in the domestic and export markets.
- the high degree of selectivity in Canadian machinery production capabilities. In this respect, new initiatives will have to take into account: (a) Canada's basic strengths in custom-engineered equipment; (b) current marginal returns in the production of certain standard machinery products; (c) existing limitations in terms of turnkey capabilities and ability to offer complete systems or integrated plant installations; and (d) choices to be made in the pursuit of import substitution opportunities recognizing the fact that it would be impractical for the industry to attempt to meet all of the diverse range of machinery requirements of the Canadian economy.
- the financial constraints that inhibit the industry from realizing its full potential to meet domestic and export demand opportunities and that perhaps constitute the most significant element in the lack of international stature of the industry. These financial constraints apply to both the Canadian-owned companies, whose financial resources are limited, and the subsidiaries, whose access to parent company resources are circumscribed by the scope of activities entrusted to them. While the machinery sector is affected by financial limitations that are common to other sectors (e.g. scarcity of investment capital, high interest rates, high labour cost, etc.) there are certain aspects peculiar to the nature of machinery industry activity such as: (a) the need to tie up working capital in fulfilling sporadic orders for large machines or systems where production may extend over two years or more; (b) large costs for feasibility studies, for design and engineering and for promotional activities in bidding for capital projects in Canada and abroad; (c) the need to maintain large engineering staffs hold on to skilled employees in periods of cyclical downturns; (d) the difficulties in countering foreign suppliers in bidding for large capital investment in Canada; and (e) the higher rate of capital investment by machinery manufacturers, which will be required in the future, in order to increase their capacity and capability to obtain a larger share of both domestic and export markets.

If the industry is to improve its performance in both the domestic and export markets, investments in new machinery production capabilities and in technological upgrading of facilities will have to surpass the level of investments which this sector achieved over the last decade. The extent to which government can influence the creation of a positive investment climate in the economy will be helpful in achieving this objective.

In any event, it seems clear that, unless the level of investments by this sector can be increased over what it has been in the past, it will not be possible to achieve the dual objectives of improving its penetration of both domestic and export markets concurrently. The result would likely be a continuation of historical trend for this sector — higher exports accompanied by an increased proportion of the domestic market supplied through imports, with no significant improvement in the trade balance.

In terms of the overall structure of the industry, this would lead in the long term to a less diversified and possibly smaller sector compared to its current relative contribution to the economy, despite the improved gains it is likely to achieve in export markets.

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