

4D
9999
C95
K3.

BEEG

ASSESSMENT OF OPPORTUNITIES FOR THE
MANUFACTURE OF HIGH PRESSURE GAS
CYLINDERS IN CANADA

1005-1615

Department of Regional
Economic Expansion

February 1973

David A. Dotchin

Kates, Peat, Marwick & Co.

PRIVATE

February 20, 1973

Mr. W. Peter B. Caldwell
Industrial Development Branch
Department of Regional
Economic Expansion
66 Slater Street
Ottawa, Ontario
K1A 0M4

Dear Mr. Caldwell:

The attached report summarizes our findings on high pressure gas cylinders on which we conducted a brief marketing survey, and feasibility report.

First, our report briefly reviews the important details of gas cylinders. Then, we provide data on Canadian consumption of these products, together with information on the origin of them, i.e. whether domestically produced or imported. Included here also is information on key trends and growth possibilities.

In the following section on manufacturing, we discuss the Canadian production of these items, and significant cost elements such as labour, raw materials and tariffs. In addition, we consider the importance of geographic location on plant viability.

. 2

Finally, we summarize the key information in the report and discuss potential opportunities for new or increased Canadian production of these items.

We take pleasure in submitting this report to you, and are grateful for the opportunity of working on this assignment.

Yours truly

Kates, Peat, Marwick & Co.

ASSESSMENT OF OPPORTUNITIES FOR THE MANUFACTURE
OF HIGH PRESSURE GAS CYLINDERS IN CANADA

TABLE OF CONTENTS

	<u>Page</u>
<u>CONCLUSIONS</u>	I-1
<u>INTRODUCTION</u>	II-1
Approach	II-1
<u>THE MARKET</u>	III-1
The Product	III-1
Size of Cylinders	III-1
Method of Construction	III-2
The Canadian Market	III-3
<u>COSTS</u>	IV-1
Manufacturing Costs	IV-1
Tariffs	IV-1
<u>LOCATION</u>	V-1
Transportation as a Locational Factor	V-1
Linkage Patterns	V-2
<u>CONSTRAINTS AND STRENGTHS</u>	VI-1
 <u>FIGURES</u>	
1. Canadian Imports and Exports - Equipment Containing Gas Cylinders	
2. Imports of Metal Cylinders and Parts, for Gas, Into Canada (Statistics Canada 1962-1971) By Value	
3. U.S. Foreign Trade of Domestic Merchandise	
4. Canadian Production of All Industrial Gases	
5. Domestic Production of Industrial Gases at Ex-Works Prices (1961-1967 DBS) and Projections to 1972	
6. Canadian Factory Shipments of Manufactured Oxygen - 1963-1970	
7. Canadian Factory Shipments of Manufactured Oxygen	

I - CONCLUSIONS

The Canadian market for high pressure gas cylinders is extremely small, amounting to approximately 55,000 to 65,000 cylinders per year, of all sizes, based on current levels of consumption.

As of this moment, no Canadian manufacturing facility exists, but in the very near future, Marison Cylinder Co. will take possession of a new facility in the Braneida Industrial Estate in Brantford, Ontario and will commence manufacture of high pressure cylinders of all industrial sizes.

Marison Cylinder Co. will be utilizing the hot-spinning process in this facility, using steel tubing as a raw material. This process is probably less rapid than the pierced billet method of manufacture utilized by the Pressed Steel Tank Co. of Milwaukee, Wisconsin, one of the three major U.S. manufacturers, but has the advantage that capital expenditure may be considerably reduced. The offsetting disadvantage is that raw material purchases for the hot-spinning process would be considerably higher because steel tube is a finished product, while steel billet is only semi-finished.

When a pierced billet process is involved, a production facility of approximately 25,000 sq. ft. would be expected to produce approximately 15,000 to 20,000 units a month for a capital investment of approaching five million dollars. A hot-spinning process would involve a smaller plant, and much less capital outlay. Even if the hot-spinning process gives a production rate 50 per cent of that of the pierced billet plant, then the new Marison facility which is fairly close to 25,000 sq. feet. will be able to produce 90,000 to 120,000 units a year at full production, and thus the

new facility can easily supply the total Canadian requirement, and still have sufficient capacity to export significant volumes. The management states that exports are planned into Commonwealth countries.

On this basis, it is clear that no justification exists to encourage new ventures to manufacture high pressure gas cylinders in Canada.

II - INTRODUCTION

This report presents the results of a brief analysis of the Canadian market for high pressure gas cylinders, with the objective of determining whether adequate Canadian production facilities exist for the manufacture of these cylinders, and if not, whether the market size would justify the establishment of such a facility.

APPROACH

The amount of publicly available statistical information relating to this industry is extremely limited, and is further very general in nature. Because of the nature of the market for both high and low pressure gas cylinders, where in each particular segment only one or two major companies operate at the most, the policy of Statistics Canada in guaranteeing the confidentiality of their sources makes specific manufacturing data for high or low pressure gas cylinders unavailable, and effectively means that any data available is an aggregate figure for the total market, both high and low pressure.

As a consequence, the examination of this market was conducted largely by personal interviews with manufacturers of cylinders both in Canada and the United States, major utilizers of gas cylinders in Canada, trade associations of the various gas manufacturers and certain provincial departments of industry.

As a means of assessing the growth potential of the industry

as a whole, statistical tables and graphic presentation of the same tables are included relating to the total Canadian production for industrial gas, (in terms of dollar value) and Canadian factory shipments of oxygen gas in both dollars and millions of cubic feet. For the purposes of forecasting growth in the industry and relating such growth to the market for gas cylinders, the production of oxygen in millions of cubic feet is a most useful indicator, as it minimizes the effect of both price increases and economic inflation, although obviously as price increases, demand would be expected to decrease marginally due to elasticity of demand.

III - THE MARKETTHE PRODUCT

A high pressure gas cylinder, for the purpose of this survey, is considered to be a metal tank or cylinder or container which contains a gas or gaseous mixture at a positive pressure differential relative to standard temperature and pressure at sea level (STP). Given that this definition would encompass not only high pressure but also low pressure gas cylinders, then for the purposes of this specific study, a high pressure gas cylinder is deemed to be a cylinder containing gases at pressures of more than 500 pounds per square inch above atmospheric pressure (psig).

SIZE OF
CYLINDERS

The market for high pressure gas cylinders appears to be differentiated by manufacturers within the size classification large and small. The large gas cylinders are primarily for use in industrial applications, and in particular the supply of industrial gases to manufacturing and service establishments. Within this large cylinder classification, the bulk of the market appears to be made up of cylinders containing 122 cubic feet and 240 cubic feet. In addition, some manufacturers are now utilizing greater numbers of cylinders containing 330 cubic feet. Average price of this size of cylinder is approximately \$45.00.

The small cylinder segment of this market is made up of cylinder capacities less than 122 cubic feet, and these cylinders are supplied for such uses as underwater diving apparatus, aircraft oxygen supply and cabin pressurization systems, and the supply of medically pure

gases to hospitals. Average price of this size of cylinder is approximately \$25.00.

METHOD OF
CONSTRUCTION

High pressure gas cylinders, while being defined as cylinders containing gases at pressures in excess of 500 psig, normally contain gases at pressures in excess of 1,800 psig. As such, these cylinders represent a considerable explosion risk if exposed to fire hazards, and consequently the methods of construction and standards of transportation of the cylinders are carefully regulated both in Canada and the United States by Government agencies. In Canada, the responsible agency is the Dangerous Commodities Branch, Railroad Committee of the Canadian Transport Corporation (CTC). Both Canadian and American standards for the manufacture of these cylinders are very similar, which is unsurprising in view of the fact that the Canadian regulations are patterned on the standards developed by the American Railroading Association.

In the case of high pressure gas cylinders, the regulations pertaining to the construction of these cylinders state that the cylinders must be of completely seamless construction with no welds whatsoever allowed on the body or in the construction of the cylinder. Where any such welding occurs even inadvertently, the cylinder must be scrapped and destroyed. Such specifications relating to manufacture have obvious implications in terms of applicable manufacturing methods, necessary labour skills, and minimum scale of production.

THE CANADIAN
MARKET

The Canadian market for high pressure gas cylinders may be reasonably termed as small, at least insofar as it compares to the typical production rate of a cylinder manufacturing facility. We estimate that the total Canadian market for high pressure cylinders will lie between 55,000 and 65,000 cylinders per annum, of which 35,000 to 40,000 would be for the large type of cylinder going to industrial gas manufacturers, and 10,000 to 15,000 would be for the small type of cylinder going to manufacturers of underwater breathing equipment, refrigerants and propellants, aeronautical applications, and medical gases.

The primary consuming companies in Canada for industrial cylinders are four, namely, the Linde Division of Union Carbide, Canox Limited, Liquid Air Company Limited, and the Liquid Carbonic Corporation Limited. It is estimated that these companies consume approximately 85 to 95 per cent of the total cylinders sold in this particular segment of the market. The major consuming company within the hospital and medical gases field is the Ohio Medical Products Division of Air Reduction Canada Limited.

Existing
Canadian Production

As at this moment, there are no producers of high pressure gas cylinders in Canada. However, this situation will change very rapidly in the near future. The Marison Cylinder Company, a major manufacturer of high pressure cylinders in the United States, is on the verge of establishing a Canadian manufacturing facility at the Braneida Industrial Park

FIGURE 2

IMPORTS OF METAL CYLINDERS AND PARTS , FOR GAS, INTO CANADA
(STATISTICS CANADA 1962-1971) BY VALUE

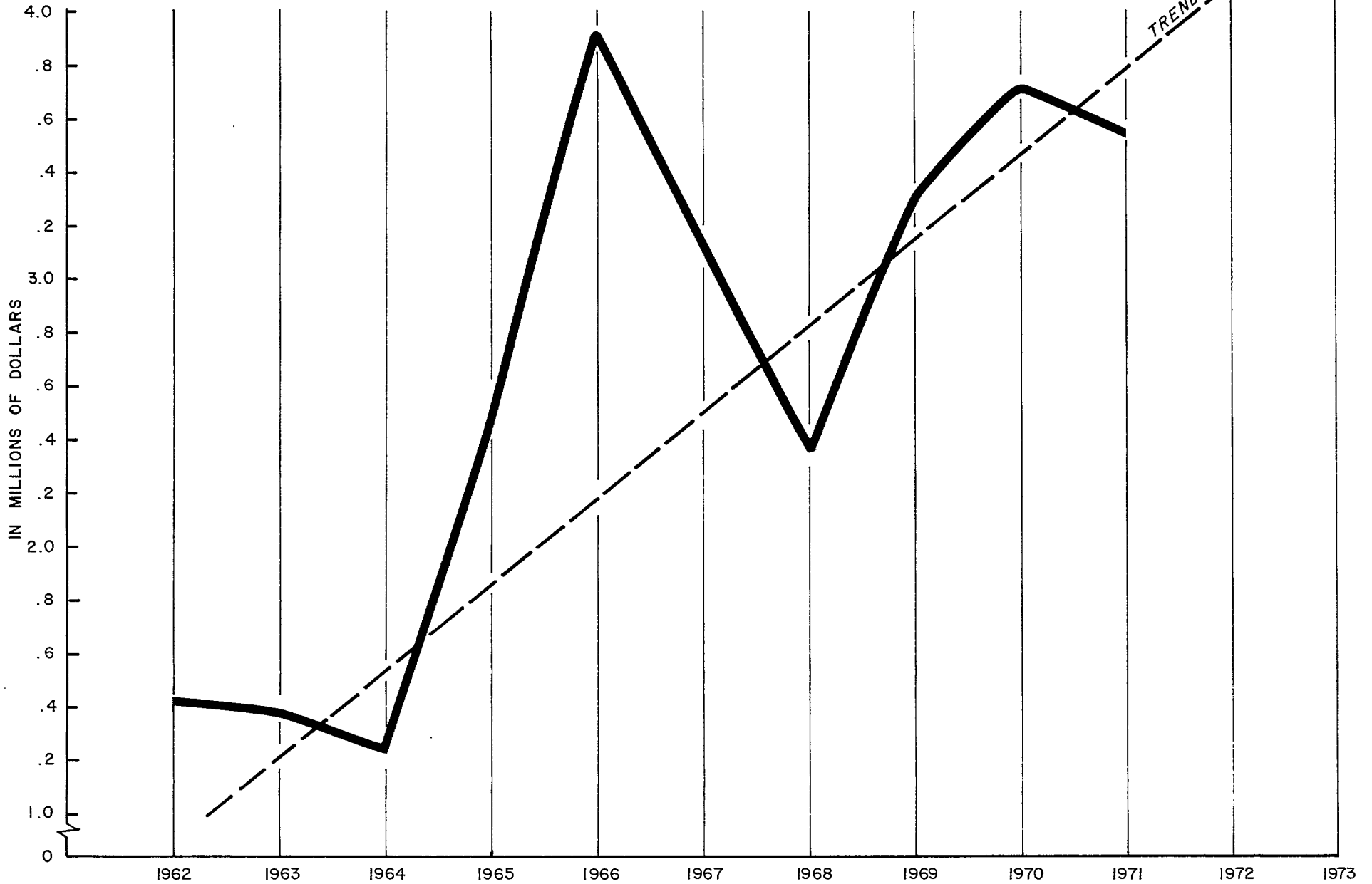


FIGURE 1

CANADIAN IMPORTS AND EXPORTS - EQUIPMENT CONTAINING GAS CYLINDERS

	1962		1963		1964		1965		1966		1967		1968		1969		1970		1971	
	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value	Units	\$000 Value
<u>IMPORTS (65-007)*</u>																				
Metal Cylinders & Parts for Gas (Classification 950-24)	1,426		1,369		180,426	1,230	171,799	2,454	164,391	3,935	183,367	3,091	151,308	2,346	119,503	3,320	107,010	3,727	138,445	3,542
Hand Fire Extinguishers & Parts (Classification 720-44)					45,082	1,060	56,281	1,257	70,836	1,237	80,361	1,469	90,880	1,244	107,336	1,283	133,889	1,843	144,074	1,869
Fire Fighting Equipment & Parts NES (Classification 720-49)						2,375		2,981		3,665		3,201		3,501		3,980		3,867		4,893
Skin Diving Tanks & Regulators (Classification 832-80)																				1,029
TOTAL:	1,426		1,369		225,508	4,665	228,080	6,692	235,227	8,837	263,728	7,761	242,188	7,091	226,839	8,583	240,899	9,437	282,519	11,333
<u>EXPORTS (65-004)*</u>																				
Fire Fighting Equipment & Sanitation (Classif. 779-19)	530		749			799		1,219		1,774		2,890		3,370		4,037		4,525		6,226
Shipping Containers & Parts, Metal (Classif. 950-29)					TOO BROAD A CLASSIFICATION TO BE USEFUL															

* Statistics Canada Publication

in Brantford, Ontario. The physical plant is fully constructed and awaiting the occupancy of the tenant, but such occupancy is being delayed pending clarification of unspecified legal matters. We have spoken with the management of this company, and although they are an associate company of the U.S. corporation, they are not a subsidiary company, and appear to be planning to operate independently. Initially, they will be importing semi-finished components from their affiliate in the United States, and will be completing them in Canada. Thereafter, they have stated that they plan to produce the entire cylinder from start to finish utilizing Canadian raw materials.

In conversations with major manufacturers in the United States, with particular reference to the capacity and size of a facility in relation to its production throughput, it would appear clear that the facility now erected in Brantford will be adequate to fully service the Canadian market, and will have more than sufficient capacity to enable it to sell its product in export markets.

Imports

Imports of gas cylinders into Canada of all sizes are detailed numerically in Figure 1, opposite, and graphically in Figure 2, opposite. Item 950-24 will relate wholly to gas cylinders and parts while the remaining items will contain only some high pressure cylinders. In particular, most fire extinguishers will be chemical reaction type, water type extinguishers or low-pressure type gas cylinders. Fire fighting equipment and parts NES will contain some large, high pressure gas cylinders on wheels, and skin diving tanks and regulators will contain small, high pressure gas

FIGURE 3

U.S. FOREIGN TRADE OF DOMESTIC MERCHANDISE

U.S. EXPORTS OF DOMESTIC MERCHANDISE - FT610-T1 - SIC BASED PRODUCT
 CODE BY WORLD AREA - 34434 - COMPRESSED GAS CYLINDERS - FILLED OR UNFILLED
 OF IRON AND STEEL OR ALUMINUM

<u>YEAR</u>	<u>NET QUANTITY</u>			
	<u>EXPORT TO ALL COUNTRIES</u>		<u>TO CANADA</u>	
	<u>LBS.</u>	<u>\$</u>	<u>LBS.</u>	<u>\$</u>
1965	25,204,830	10,380,355	4,573,466	3,963,276
1966	699,079	9,870,457	201,306	3,138,415
1967	626,216	9,434,874	157,147	2,762,147
1968	1,449,031	8,355,043	385,059	2,291,795
1969	<u>UNITS</u> 1,291,319	8,667,418	<u>UNITS</u> 378,240	3,068,369
1970	1,148,969	9,444,249	400,311	3,297,002
1971	908,755	9,801,837	287,238	3,428,423

U.S. IMPORTS OF FOREIGN MERCHANDISE - FT210 - T1 - SIC BASED PRODUCT
 CODE BY WORLD AREA - 34434 - COMPRESSED GAS CYLINDERS - FILLED OR UNFILLED
 OF IRON AND STEEL OR ALUMINUM

<u>YEAR</u>	<u>NET QUANTITY</u>			
	<u>IMPORTS FROM ALL COUNTRIES</u>		<u>FROM CANADA</u>	
	<u>NO.</u>	<u>\$</u>	<u>NO.</u>	<u>\$</u>
1965	242,170	95,537	76,307	60,950
1966	60,633	178,781	59,176	28,910
1967	90,016	48,350	83,713	9,313
1968	173,113	67,712	63	4,947
1969	40,808	211,974	14,408	108,715
1970	111,113	150,577	459	4,485
1971	948,776	243,886	22,948	2,510

cylinders as well as the demand regulators.

Since no high pressure cylinders are currently manufactured in Canada, then any exports of these cylinders must be re-exports, and as such, little could be accomplished by discussion of exports.

Also detailed opposite, in Figure 3, are details of the external trade of the United States in compressed gas cylinders, in terms of total imports and exports, and imports from, and exports to Canada. The large discrepancy between quantities of tanks imported between U.S. export figures and Canadian import figures should be noted, but is not important as far as high pressure tanks are concerned because our assessment of the Canadian market is based on industry estimates rather than statistics. However, the discrepancy could have a major significance in any analysis of the market for low pressure tanks, both in terms of quantity, and in terms of price. This is particularly so because the 55,000 to 65,000 high pressure cylinders imported account for a large part of the dollar value of all imports. This will be discussed at greater length in the low pressure cylinder report.

Exports

As previously discussed, no useful purpose is served by a detailed discussion of exports because, assuming any exports occur, they must all be re-exports.

Total

Since there is no domestic production, total consumption is derived wholly from imports, and the figure of 55,000 to 65,000 may be considered the total market.

FIGURE 7

CANADIAN FACTORY SHIPMENTS OF MANUFACTURED OXYGEN

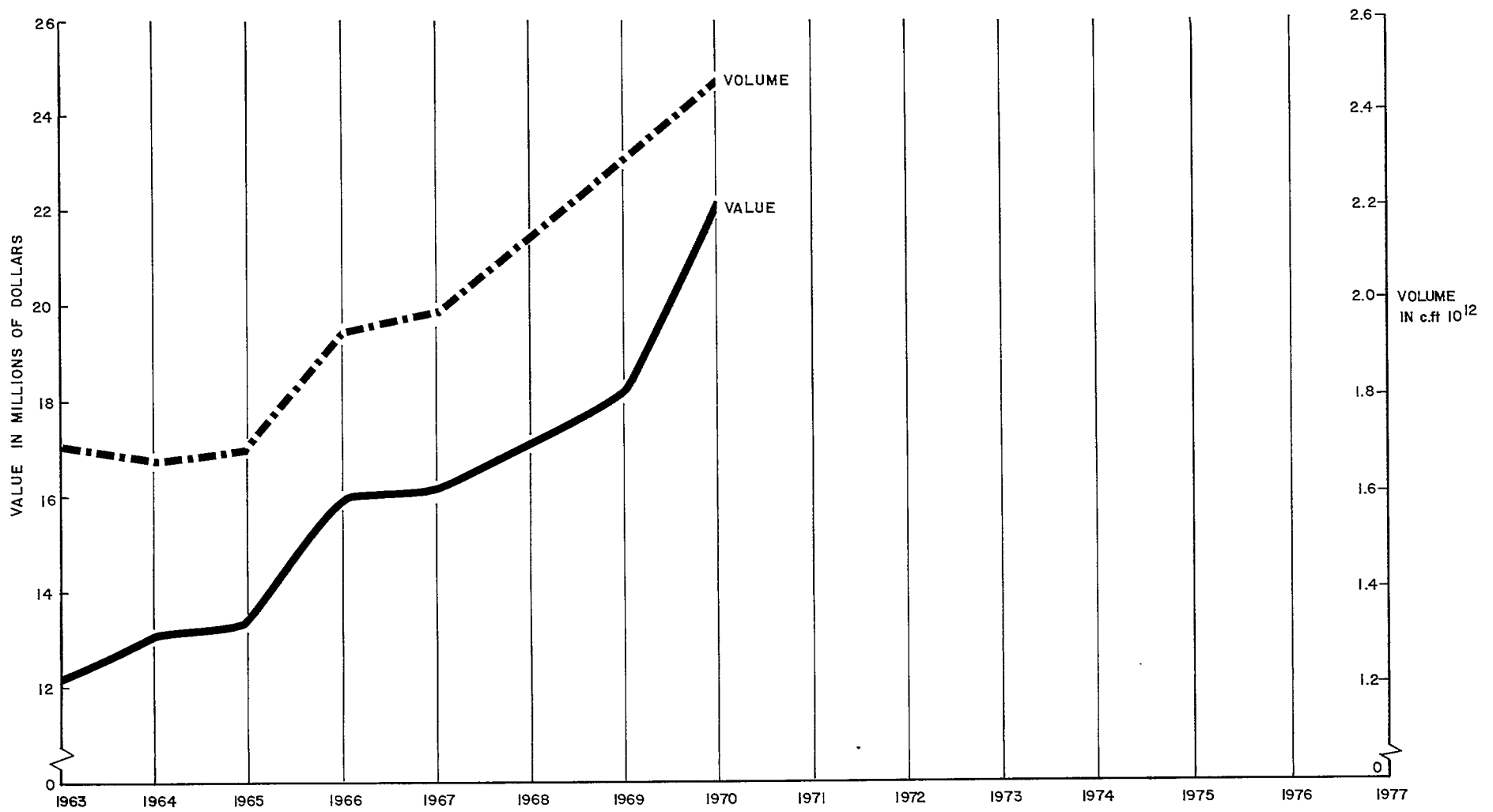


FIGURE 6

CANADIAN FACTORY SHIPMENTS OF MANUFACTURED OXYGEN - 1963-1970

Year	<u>QUANTITY</u>	<u>VALUE</u>
	M. Cu. Ft.	\$000
1963	1,704,637	12,244
1964	1,677,809	13,062
1965	1,708,540	13,799
1966	1,941,286	16,145
1967	1,979,748	16,234
1968	2,162,844	17,303
1969	2,315,918	18,527
1970	2,475,442	22,279

SOURCE: Statistics Canada Publication 46-219

FIGURE 5

DOMESTIC PRODUCTION OF INDUSTRIAL GASSES AT EX-WORKS PRICES
(1961-1967 DBS) AND PROJECTIONS TO 1972

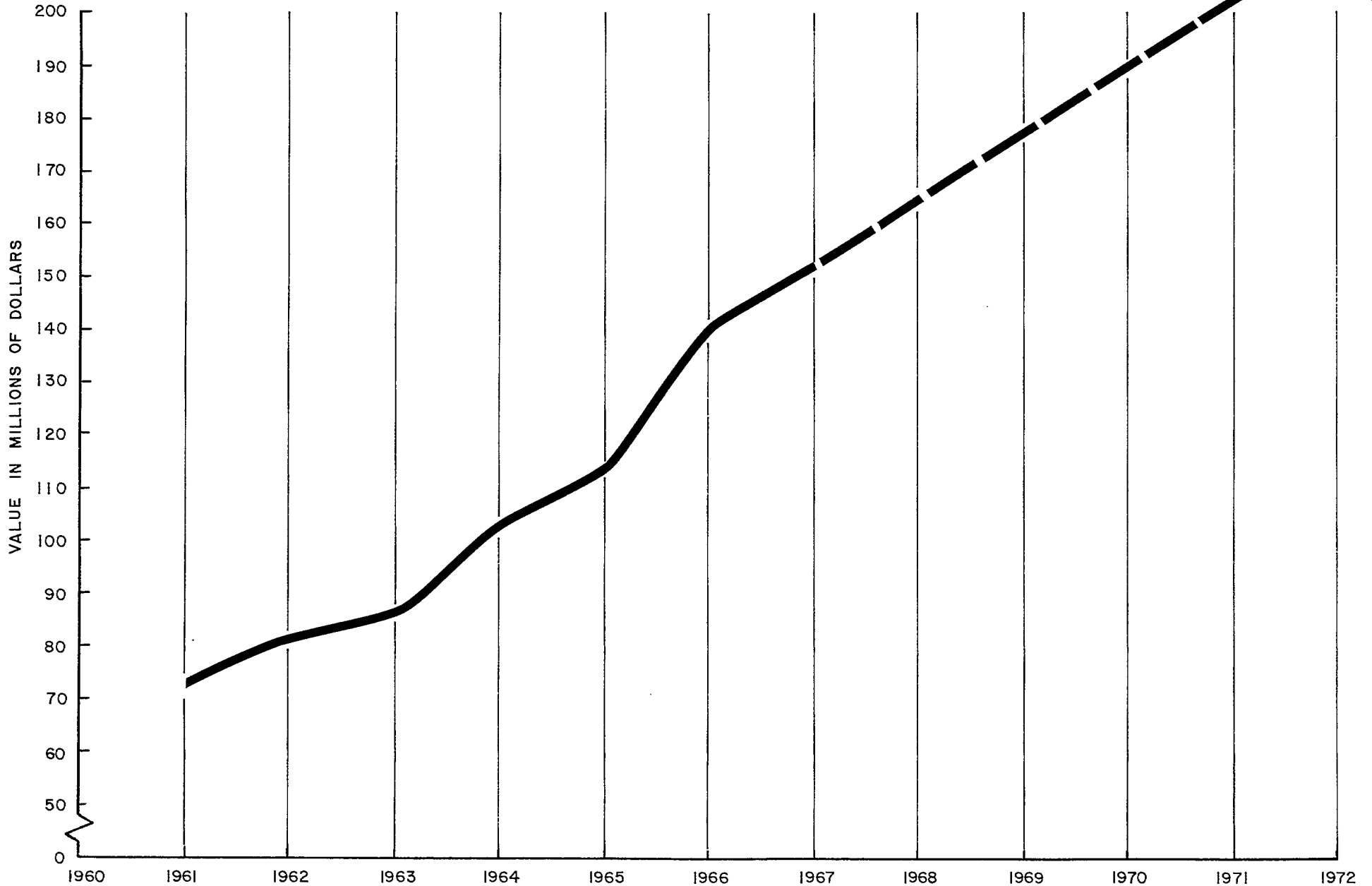


FIGURE 4

CANADIAN PRODUCTION OF ALL INDUSTRIAL GASES

	1961	1962	1963	1964	1965	1966	1967
	Value	Value	Value	Value	Value	Value	Value
	\$000	\$000	\$000	\$000	\$000	\$000	\$000
FACTORY SHIPMENTS OF INDUSTRIAL GASES (ALL TYPES) AT EX-WORKS PRICE	74,030	81,782	86,380	102,722	112,207	140,077	151,647

Note: Statistics not available after 1967 to protect the confidentiality of contributed data.

Source: Statistics Canada Publication No. 46 219 - Manufacturers of Industrial Chemicals.

Consumption
Growth

The growth of the market for high pressure gas cylinders is related to the production and consumption of industrial gases, as shown in Figure 4, opposite, which depicts numerically the growth in value of factory shipments of all industrial gases, while Figure 5, opposite, depicts these same figures graphically. However, since all industrial gases include those bottled at low pressures, then they will only indicate the trend of the total market for gas cylinders, as opposed to the market for specifically high pressure cylinders.

Figures 6 and 7 opposite, indicate the domestic growth of factory shipments in manufactured oxygen, numerically and graphically respectively. Oxygen is a gas bottled at high pressure, and if the growth of factory shipments is projected five years hence, based on volumes manufactured, a useful indication of future growth may be obtained. Thus, from Figure 6, it appears reasonable to expect that factory shipments of oxygen will amount to some 3.60 million cubic feet by 1977, an increase of 30 per cent over the expected 1972 production (2.77 million cubic feet). If this trend can be translated directly into growth of demand for high pressure cylinders, then by 1977, this demand should be for 84,500 units, and it will be seen that the productive capacity of the Marison facility should still be adequate to meet the expected demand.

Regional
Consumption Patterns

The four major consumers of high pressure cylinders all appear to have regional distribution centres, but the headquarters and gas production centres are either in Toronto or Montreal, and the very high cost of transporting the cylinders in relation to their total cost has caused cylinder manufacturers to locate as close to their major accounts as is reasonable, to cut down these transportation costs.

As an example, Canox Limited, has two gas manufacturing facilities, in Ontario and in Quebec. This is also where the bulk of their markets lie. Their sphere of operations extends from B.C. to Quebec, and, as is common practice throughout the industry, in outlying areas where they do not manufacture, the gas is purchased in bulk liquid form from the competition, and regasified and bottled in their own small facility in the distribution centre. New bottles are shipped direct to the distribution points, but such a large percentage of bottles is utilized in Ontario and Quebec that shipments out of these two provinces are relatively small.

Conclusion

It appears obvious that the Marison plant, assuming that no last minute conditions cause them to cancel their plans, will open in the near future and should be adequate to meet demand across Canada for the next five years at least. Therefore, little justification can be found for the establishment of a new facility in Canada with the aid of the Canadian Government.

IV - COSTSMANUFACTURING COSTS

According to manufacturers contacted in Canada and the U.S.A., the two methods of producing high pressure cylinders, namely hot-spinning, or pierced billet method, have widely divergent cost structures.

The hot-spinning method entails less capital expenditure, but also has a slower production rate, and higher raw material costs. As an indication of the costs associated with this method, industry sources indicate the following approximations are reasonable:

Raw Material	40 per cent - finished steel and valves
Labour	20 per cent
Value added	40 per cent

It would appear obvious from the amount of value added that there is considerable scope for profits, given a reasonably efficient operation.

No figures on cost components are available for the pierced billet method, except that with a higher production rate and capital cost, and lower raw material costs, then value added will be higher, but break-even volume will also be higher due to depreciation charges.

TARIFFSImports

Tariffs on cylinders entering Canada are based on material of

manufacture, pressure rating, and sometimes, end use.

Thus: All high pressure, of steel or aluminum:

- Most favoured nation (including U.S.A.)	17-1/2% - Item 446-12-1 steel
	17-1/2% - Item 354-00-1 aluminum
- From Britain	Free - Item 446-12-1 steel
	15% - Item 354-000-1 aluminum

Some cylinders enter Canada strictly for hospital use under Item 433-00-1, in which case tariffs are at a reduced rate or free.

Exports

Rates into U.S. only:

Empty metal pressure cylinders	5% - Item 640-1
Stainless steel cylinders	7-1/2%

V - LOCATIONTRANSPORTATION AS A
LOCATIONAL FACTOR

From the foregoing analysis and conclusions, it would appear clear that market demand will be more than adequately filled by the Mar-ison facility over the next five to seven years, even assuming a consistent total growth of the market of 30 per cent over the five years. On this basis, locational factors are academic. Nevertheless, discussion of locational determinants is still of some use.

It is clear that site selection is market oriented, and for this reason, two existing low pressure cylinder manufacturers and the one planned high pressure cylinder manufacturer are located either close to Toronto or close to Montreal.

Filled or unfilled bottles have a high volume/weight ratio which prevents economical transportation rates, as these are based on weight of full loads.

In fact, transport costs are such a major consideration that gas manufacturers endeavour, where possible, to ship gasses in bulk for storage in custom manufactured installations at the sites of larger users, rather than make many shipments of bottles to the same facility over a regular delivery period.

LINKAGE
PATTERNSUse of End
Product

The gas cylinders are utilized for industrial and hospital purposes, fire extinguishers, aircraft oxygen systems, propellants, refrigerants, and in vending machines. Any manufacturer is well aware of all of these end uses, and is always searching for new applications. In most cases, manufacturers of these ancilliary products buy their cylinders from the existing cylinder manufacturers rather than manufacture themselves.

Manufacturing Methods

The production machinery is relatively expensive for the billet piercing method, but less so for the hot-spinning method. High technical competence seems necessary for the hot-spinning method.

Nevertheless, it seems clear that anyone with heavy duty hot-spinning machinery or with pierced billet extrusion machinery would have machinery and labour skills which could be adapted to the manufacture of gas cylinders. Such companies could be low pressure cylinder manufacturers, hot water tank manufacturers, etc.

VI - CONSTRAINTS AND STRENGTHSConstraints

The manufacture of high pressure cylinders is dominated by approximately four manufacturers in North America, who appear to operate as a tightly knit group. They are well established with consumers, and a new entry into the field would encounter very strong, well entrenched opposition unless one of these major companies were involved in the venture, and in the case of Marison, one is involved. Moreover, the high cost of the machinery would be an inhibiting factor, especially in view of the small absolute size and the growth (5.4 per cent on a compound annual basis) of the Canadian market.

Strengths

The major strength of a new company would be that marketing effort could be extremely economical because of the few consumers of any note in that field, and because, once established, it is unlikely that any competition would emerge over the next five to seven years because of the size of the market. In addition, British cylinders, although small in terms of numbers, currently enter duty free, and accession of Britain to the EEC should remove this duty free status.

