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Canadian Minerals Yearbook (CMY) - 2009

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HIGHLIGHTS

- Salt is critical to human and animal health. It (i.e., sodium chloride) is such a common part of our everyday lives that we rarely think of it as a natural resource that must be discovered, boiled/evaporated or mined, processed, and marketed before it is used for various end uses such as a food processing additive and flavour enhancer.
- Canada is a major producer of salt, ranking fifth in the world. Preliminary data indicate Canadian shipments of rock salt increased by 3% (or close to 0.4 Mt) to 14.6 Mt in 2009 valued at \$664.1 million. Total salt exports were 5.9 Mt (valued at \$154.3 million), of which 99.9% was exported to the United States.
- Sifto Canada Inc. (a subsidiary of Compass Minerals International Inc.), located in Goderich, Ontario, recently expanded its capacity from 7.25 million short tons (st) to 8.25 million st/y. A second phase, when completed, will add an additional 750 000 st/y by 2012.
- Spurred by growing demand from the Chinese chemical industry, global demand for salt is expected to grow at an average of 3%/y, reaching over 300 Mt by 2012.

INTRODUCTION

Each human being contains about 113 g of salt. With insufficient quantities, our muscles would not contract, our blood would not circulate, our food would not digest, and our hearts would not beat. The same is true for livestock; therefore, salt is critical to human and animal health.

Although dietary intake can vary for people from various countries, an adult's average total salt intake should be no more than 6 g per day and a child's no more than 4 g. The average person's diet incorporates at least 9 g per day. Dietary sodium is measured in milligrams (mg). The most common form of sodium used is table salt, which is 40% sodium. One teaspoon of table salt contains 2300 mg of sodium.

The salt markets in developed regions such as North America and Western Europe are both stable and mature. The main consuming regions are North America, Asia and the Middle East, and Western Europe. World salt consumption is on the rise, mainly in response to increasing demand in Southeast Asia and other developing nations. China is the world's leading producer of synthetic soda ash (source: U.S. Geological Survey [USGS] 2006 salt review); it uses large quantities of salt as feedstock, and many of China's salt operations have not been able to keep up with the strong demand created by the rise in soda ash production. Soda ash's principal market is in glassmaking. China's glass and soda ash sectors are anticipated to post better-than-expected performance (Source: *Industrial Minerals* (IM) magazine, January 2010 review).

Canada, like many countries, extracts, processes, consumes, exports, and imports salt. It has a vast territory with many known deposits and significant geological potential for new discoveries. Known salt areas are currently exploited by a small number of companies that are large players in the industry. Most of the salt is used for de-icing, chemical production, and domestic (e.g., table, food-grade, livestock feed) consumption.

Major Canadian salt deposits are found in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta. Since similar geological conditions are necessary, many salt deposits have been discovered while exploring for oil and gas and potash. The largest deposits are in western Canada, followed by Ontario and the Atlantic provinces. In western Canada, the salt beds extend from the Northwest Territories down through Alberta, Saskatchewan, and into Manitoba. This immense deposit, averaging 122 m (400 ft) in thickness and covering an area of approximately 390 000 km² (150 000 square miles), contains more than one million billion tonnes of salt.

In Ontario, salt is found along the shores of lakes Huron and Erie. This deposit is part of the known Michigan Basin and is a saucer-shaped formation underlying part of Michigan, part of Ohio, and lakes Huron and Erie.

In Prince Edward Island, a rock salt deposit of undetermined size was encountered at a depth of over 4200 m under Hillsborough Bay on the southern side of the island. Brine springs, usually indicative of a salt deposit, have been found in Newfoundland and Labrador and in British Columbia. Production in most provinces is by two main methods of extraction: underground room-and-pillar mining and brining. Recovery as a co-product of potash mining is also practised.

In the Atlantic provinces, large, thick deposits have been found underlying New Brunswick, Nova Scotia, part of Newfoundland and Labrador, and even the Gulf of St. Lawrence. These deposits occurred in various geologic eras and all of them are the remains of ancient inland seas. The shorelines of these ancient seas, which outline the edges of the salt beds, often indicate the presence of oil, gas, and coal deposits.

Major salt deposits and dry salt production in North America can be viewed on the Internet at www.saltinstitute.org/content/download/561/3308.

Environmentally, the continued use of road salt in Canada is an issue. In April 2004, Environment Canada issued a *Code of Practice for the Environmental Management of Road Salts*. The Code applies to any organization that uses more than 500 t/y of road salts and to organizations that have vulnerable areas in their territory.

PRODUCTION AND TRADE

Salt is a widespread, low-value, bulk commodity. It is relatively easy to extract, and transportation represents a significant proportion of the total delivered price. Many global markets are served by neighbouring salt-producing countries; therefore, long-distance trade is limited (**Table 1**). Nevertheless, even though both Canada and the United States produce salt, some regions on both sides of the border still rely, for economic reasons and convenience of supply, on large quantities of imports.

In 2008, total estimated world production of salt (source: USGS) remained relatively stable at 258 Mt, compared to 257 Mt in 2007.

Canada (source: USGS 2008 salt review) remained the fifth largest producer of salt (**Table 3**) in 2008. Preliminary 2009 data indicate that Canadian salt shipments totaled 14.6 Mt (valued at \$664.1 million), a 0.341-Mt increase from the 14.2 Mt shipped in 2008. This 2009 value reflects the cyclical production level from year to year in response to winter conditions since 1988 (**Table 2**).

Preliminary 2009 data (**Table 1**) also indicate that Canada exported a total of 5.9 Mt (valued at \$154.3 million), of which 99.9% was exported to the United States (valued at \$158.7 million). With exports of almost 4.8 Mt to the United States in 2008, Canada was that country's leading source of salt imports, accounting for about 34% of its total imports (source: USGS, 2008 salt review).

Canada also imports salt. Preliminary data (**Table 1**) show that Canada imported 2.4 Mt in 2009 (valued at \$88.0million), mostly from the United States (66.5%) and Mexico (17.4%).

CONSUMPTION

Of the millions of tonnes of dry salt produced annually in North America, a very small percentage finds its way to the dining table either in commercially processed foods, in home preparation, or in the salt shaker. Globally, the largest markets for salt are for use as brine and dry salt in the chemical industry. Directly or indirectly, salt plays a part in the manufacture of a seemingly endless list of chemicals and chemical products. There are four main end uses for salt: chlorine and caustic soda manufacture in the chlor-alkali industry (38.5%), the manufacture of synthetic soda ash (20%), edible salt for human consumption (17.5%), and de-icing salt (14%); the remaining 10% is used in animal feed and water treatment. End-use patterns vary from a predominance of chemical applications in highly industrialized countries to a market dominated by the use of salt in food and agriculture in less developed countries (Source: Roskill, 12th Edition, 2007).

Consumption patterns differ in North America. On a per-capita basis, Canada is the largest consumer of salt in the world, and this is due mainly to its winter conditions. Canada's per-capita consumption of salt has been estimated at over 360 kg per person. Most of the salt is used as a de-icing agent in Ontario, Quebec, and Atlantic Canada. Roughly 90-95% of Canada's apparent domestic consumption (source: Canadian Salt Institute) is for chemical and de-icing purposes. The remainder is used for water conditioning, food processing, fisheries, and other industrial uses.

Salt consumption details provided by the USGS may well reflect North American consumption patterns. In 2008, the U.S. distribution of salt (source: USGS) by major end use was for ice control (43%), chemicals (35%), distributors (grocery, other wholesalers and retailers) (8%), general industrial (3%), agricultural (3%), food processing (3%), primary water treatment (2%), and other uses (3%).

The U.S. Salt Institute's web site provides an explanation of the many uses of salt. It can be found at www.saltinstitute.org/Uses-benefits.

The industrial chemicals industry uses salt in the manufacture of chlor-alkali such as caustic soda (sodium hydroxide), chlorine, and sodium chlorate. Salt for caustic soda and chlorine plants (i.e., facilities) in Canada is obtained from on-site brining and natural brines. Other plants use mined rock salt or imported solar or evaporated salt. The chlor-alkali industry is by far the largest segment of the chemical sector that uses salt. Other industrial chemical production that requires significant amounts of salt includes sodium bicarbonate, sodium chlorite, sodium hypochlorite,

sodium carbonate (soda ash), and calcium chloride. For example, salt goes into the production of chlorine and into the manufacture of soda ash; in turn, these two products are used in the processing or manufacture of a wide variety of end products ranging from rayon, polyester, and other synthetics to plastics for explosives, fertilizers, glass, and cosmetics. Salt consumption for chemical uses, particularly chlor-alkali manufacture, can fluctuate depending on the demand for chlorine and co-product sodium hydroxide.

Recent factors affecting the demand for chlorine and sodium chloride include reduced demand from the pulp and paper sector and growing sensitivities with respect to its use as a de-icer.

Most pulp and paper mills in Canada have carried out extensive process modifications and improvements in effluent treatment. Several have opted to reduce chlorine usage by installing other bleaching processes such as extended lignification, oxygen delignification, sodium chlorate bleaching, integrated chlorine dioxide with hydrochloric acid recycling, and ozone and hydrogen peroxide bleaching processes.

Sodium chloride, or salt, remains the primary highway de-icing agent. Different de-icers are used in accordance with site requirements. Calcium chloride is the second most used de-icer, being effective at temperatures ranging between -10° and -20°C ; this chemical is usually mixed with salt at a 2-4% rate. Growing concerns over the environment and the corrosion of infrastructure, such as bridge decks and parking lots, have led to numerous experiments with de-icing salt substitutes.

Demand for Canadian brine production has been affected by the move away from the chlorinated bleaching process and, more recently, by the impact of the economic downturn on product demand related to processed salt (i.e., brine) as an ingredient; this is seen in the downward trend (Table 2, Figure 1) from the early 2000s to the present.

CANADIAN SALT PRODUCERS

In 2008 (source: USGS and Table 3), the top eight salt-producing nations collectively accounted for 69.8% of total world salt output of 258.0 Mt. In descending order of quantity produced (Mt), they were: China (59.5), the United States (47.3), Germany (16.4), India (16.0), Canada (14.2), Australia (11.0), Mexico (8.8), and Brazil (6.9). China was the largest salt-producing nation, representing about 23.1% of total world output. Canada's share was 5.5% of total world production.

Preliminary 2009 Canadian data (Table 2, Figure 1) indicate salt production by the following methods: 93.0% was mined rock, 6.0% was fine vacuum, and 1.0% was brine and salt recovered in chemical operations. Production came from major rock salt mines in Ontario, Quebec, and New Brunswick, and from vacuum pan refineries in Alberta, Saskatchewan, Ontario, New Brunswick, and Nova Scotia. Over three quarters of this production was rock salt used primarily for highway de-icing.

A review of the data for the past 20 years (Figure 1, Table 2) reveals a number of interesting trends. Salt shipments, for example, have generally risen over the period 1988-2009. The figure also shows a similar trend for rock salt, which rose from 7.1 Mt to over 13.6 Mt. Vacuum shipments have been relatively constant over the whole period (at around 0.8-0.9 Mt), while brine shipments have fallen significantly (from 2.8 Mt to a low of 0.1 Mt). Since 1990, exports have grown from around 3 Mt to 5.9 Mt. During the same period, imports have ranged from 1.2 to 2.4 Mt.

Two major methods are used to obtain salt from Canada's deposits: underground room-and-pillar mining and brining. Recovery as a co-product of potash mining is also practised. The most important Canadian producers are described below and in Table 4.

In Nova Scotia, The Canadian Salt Company Limited operates an underground rock salt mine at Pugwash in Cumberland County. Most of the salt from this mine is used for snow and ice control. The company also operates an evaporated salt plant where saturated brine is fed into a quadruple-effect vacuum pan; the brine solution is evaporated to produce high-quality salt crystals for use in the chemical and food industries.

Sifto Canada Inc. (a subsidiary of Compass Minerals Group Inc.) has a brining operation at Amherst, Nova Scotia. Its vapour re-compression process produces salt of the highest purity in North America. Sifto's evaporated salt products are sold for table salt, fisheries, and water conditioning. This operation is one of the newest and most modern evaporation plants on the continent.

In New Brunswick, Potash Corporation of Saskatchewan Inc. (New Brunswick Division) produces potash and salt at its underground mine near Sussex. The company extracts salt and sells it mainly to the United States and eastern Canada. It also pumps brine back to the surface for re-use. This brine is produced from the clay slimes, and excess brine slurries from the processing plant are piped underground as backfill where rock salt has been extracted.

In Quebec, Seleine Mines Division (a subsidiary of The Canadian Salt Company Limited, owned by Rohm and Haas Company of Philadelphia, Pennsylvania) is the only operating salt producer. Located on the Magdalen Islands in the Gulf of St. Lawrence, it produces de-icing salt for markets in Quebec and the eastern United States.

Junex Inc., an oil and gas exploration company, discovered a natural brine zone while drilling for gas in Bécancour. In 2001, Junex created Junex Solnat, which operates two natural brine well operations. Its natural brine is sold as a dust control agent for dirt roads (i.e., suppressor) and for ice removal products.

In Ontario, Sifto Canada Inc. operates an underground rock salt mine in Goderich Harbour on the shores of Lake Huron. It also operates an evaporating plant for brine production on the escarpment of the Maitland River. The products serve the home water softeners, packaged icemelts, agricultural salts, food processing, table salts, and industrial salts markets. Compass Minerals International Inc. of Overland Park, Kansas, announced a two-phased plan to increase its rock salt production capacity in Goderich. In 2007, Compass announced details of a two-phase expansion that would increase capacity to 8.25 Mt/y by 2010. Phase I was completed in 2009, raising the mine's capacity to 7.25 Mt/y. Phase II includes upgraded underground material-handling equipment, improved above-ground storage and loading capabilities, and increased hoisting capacity. It is expected to cost about \$70 million with most of the expenditures occurring in 2009 and 2010. The first million tonnes of annual

capacity created by Phase II is expected to be available in 2010. A further 750 000 t/y is scheduled to be added in 2012, creating an annual rock salt production capacity of 9 Mt for winter highway use.

More commonly recognized under the leading consumer brand name of “Windsor,” The Canadian Salt Company Limited is headquartered in Pointe-Claire, Quebec. It produces both rock salt from the Ojibway underground mine and vacuum salt from brine wells near Windsor. Salt products include road de-icing salt and water softening, agricultural, and chemical fine salt.

In Saskatchewan, Sifto Canada Inc. operates a brining operation near Unity for the production of fine vacuum pan salt, which is used for water softening, for agriculture, in food processing, and for the production of some de-icing salt for local use.

The Canadian Salt Company Limited at Belle Plaine produces evaporated salt from by-product brines sourced from an adjacent potash solution mine operated by The Mosaic Company (an amalgamation of IMC Global Inc. and Cargill Crop Nutrition). Most of the production goes towards water softening; other uses are for agriculture, food processing, and ice control.

NSC Minerals Inc. is a leading supplier of industrial mineral products specializing in salt mineral crystals. It produces coarse and fine salt products from potash tailings. The head office for NSC Minerals Inc. is located in Saskatoon. It has two modern operating plants with a total daily production capacity in excess of 6000 t located in Rocanville and Vanscoy, Saskatchewan. The Rocanville plant is located in southeastern Saskatchewan near the Manitoba border and the Vanscoy plant is located in central Saskatchewan approximately 20 miles southwest of Saskatoon. Products are used for a variety of applications such as highway de-icing, livestock feed supplements, hide curing, drilling muds, water softening, road stabilization, and industrial applications.

In Alberta, The Canadian Salt Company Limited at Lindberg produces fine vacuum pan salt that is also used for water softening, agriculture, and food processing; the company also produces some de-icing salt for local use.

Other companies known to produce salt (mainly brine) are as follows:

- In Saskatchewan, Mosaic Potash Esterhazy Limited Partnership (formerly IMC Esterhazy Canada Limited Partnership) supplies by-product rock salt from its potash operation at Esterhazy to Kayway Salt, which distributes it locally for road de-icing. Saskatoon Chemicals (“SaskChem,” a division of Sterling Chemicals Holdings, Inc.) produces brines from wells near Saskatoon for the manufacture of caustic soda, chlorine, and sodium chlorate to be used internally for its pulp chemicals operations.
- In Alberta, Dow Chemical Canada Inc. at Fort Saskatchewan near Edmonton extracts salt brines for the manufacture of chlor-alkali. Nexen Inc. (formerly Canadian Occidental Petroleum Ltd. [Canadian Oxy Ltd.]) and Albchem Industries Ltd. operate solution mines near Bruderheim. They produce sodium chlorate using feed from the large and very pure Upper Lotsberg salt deposit. Their product is mostly used for pulp bleaching in the prairie provinces and western Canada. Ward Chemical Inc. produces calcium chloride from its natural source brine at Calling Lake.

METHODS OF RECOVERY AND APPLICATIONS

Information on methods of recovery and salt applications is available in previous editions of this salt review, available on the Internet at www.nrcan-mcan.gc.ca/mms-smm/busi-indu/cmy-amc/com-eng.htm.

PRICES

Salt has unique production, processing, and packaging factors that determine its selling price. The price of salt depends on the type of salt, location, product form, and type of sale. Generally, salt sold in bulk is less expensive than salt that has been packaged, pelletized, or pressed into blocks. Salt in brine is the least expensive salt form because mining and processing costs are minimal. Vacuum pan salt is the most expensive because of the higher energy costs involved in processing and the high purity of the product.

As no specific prices for salt are available in Canada, examples from other jurisdictions will be used as a reference point. The February 2009 edition of *Industrial Minerals* (IM) magazine reported that salt prices (ground rock salt, 15-20 short ton lots, average price delivered U.K.) were in the range of £20-£30 (converted: C\$35.39-\$53.05). A further price breakdown comparison for North America can be found in Table 8 of the USGS's salt review, available on the Internet at <http://minerals.usgs.gov/minerals/pubs/commodity/salt/myb1-2008-salt.pdf>.

In December 2009, North American Salt Co. and Sifto Canada Corp., both subsidiaries of Compass Minerals, announced a price increase across their range of salt products as the region was preparing for its first significant snowfalls of the year. Compass Minerals is the leading producer in North America and largest provider of de-icing salt in North America and the United Kingdom. On January 4, 2010, prices increased by an average \$6/t on all consumer and industrial packaged and bulk mineral products, including consumer and professional de-icing products, agricultural minerals, salt-based water conditioning products, industrial minerals, pool salt, and food-grade salt (Source: IM).

ENVIRONMENTAL ISSUES

Salt, also known as sodium chloride, comprises two elements: sodium and chlorine. Sodium is a silver-coloured metal that is so unstable it reacts violently in the presence of water, and chlorine is a greenish-coloured gas that is dangerous and may be lethal, yet combined, these two elements form sodium chloride, which is a white-coloured compound essential to life itself (Source: USGS 2008 salt review).

There are four primary de-icing salts, each with specific characteristics. Rock salt, or sodium chloride, is widely available and is most effective between -6 and -8°C. However, it releases the highest amount of chloride ions when it dissolves, which can cause corrosion of metals and pollution in rivers. Calcium chloride is also commonly used in de-icer salt, and continues to be effective in temperatures below -17°C. Although it is more effective than rock salt in colder temperatures, it may cause skin irritation and chemically attack concrete. Potassium chloride can melt

ice when the air temperature is down to -9.4°C, but can work at lower temperatures when combined with other chemicals. It does not irritate the skin or harm vegetation. The other main de-icing salt is magnesium chloride, which can melt ice in temperatures down to -25°C. Magnesium chloride releases around 40% less chlorides into the environment than rock salt and calcium chloride, and is less harmful to vegetation (Source: IM, September 2009).

The effects of salt-spreading on the environment depend on a variety of factors such as weather conditions, road characteristics, traffic loads, winter maintenance methods, and local topography. Environmental effects may include adverse impacts on plant growth and crop productivity in the immediate vicinity of highways, as well as higher salinity levels in streams and groundwater systems. Because of its low price, de-icing salt is the favoured de-icing agent.

Although the benefits of de-icing agents were recognized by the Environment Minister's Expert Advisory Panel on the Second Priority Substances List, the Panel recommended that they be assessed for potential impact on the environment but that "any measures developed as a result of the assessment must never compromise human safety." The overall conclusion of Environment Canada's *Canadian Environmental Protection Act, 1999* (CEPA 1999) report entitled *Priority Substances List Assessment Report – Road Salts* is as follows: "Based on the available data . . . road salts that contain inorganic chloride salts with or without ferrocyanide salts be considered 'CEPA toxic' . . . as defined under paragraphs 64(a) and (b) of CEPA 1999."

In April 2004, Environment Canada issued a *Code of Practice for the Environmental Management of Road Salts*. The Code applies to any organization that uses more than 500 t of road salts per year and to organizations that have vulnerable areas in their territory. These organizations are obliged to prepare and implement a salt management plan that contains best management practices to protect the environment from the negative impacts of road salts. Environment Canada will review the effectiveness of the Code after five years (a Progress Report on the effectiveness of the Code of Practice is due in 2010) and will determine if other steps or programs are needed to further prevent or reduce the negative impacts of road salts on the environment.

WORLD OUTLOOK¹

Globally, rock salt consumption is driven mainly by freezing weather conditions, although other salt by-products (e.g., brine) do not have a significant impact on the salt production industry, even during harsh economic times.

The principal driver behind the increased production has been growing demand from the Chinese chemical industry and, to a lesser extent, from population growth. Over the coming four to five years, global demand is expected to grow at an average of 3%/y to reach over 300 Mt in 2012 (Source: Roskill, 2007).

In common with many other parts of the chemical mineral sector, rationalization and restructuring of the salt industry will likely continue. If the Chinese industry is considered as one enterprise, nine companies control roughly one third of the world's salt production capacity. The four leading salt-producing companies are: China National Salt Industry Corp. (18.7 Mt/y), K+S Group (16.6 Mt/y), Cargill Group Nutrition (14.0 Mt/y), and Compass Minerals Group Inc. (13.7 Mt/y).

The chlor-alkali industry is a significant consumer of salt. It uses salt in an electrolyzing solution to produce chlorine and caustic soda. During the period 2000-2006, chlorine production in China increased by roughly 7 Mt/y. A further 9 Mt/y is forecast to come on stream globally by 2012, of which 8.1 Mt/y is expected to be produced in China, stimulating strong demand for the use of salt.

The consumption of dietary salt will likely grow in line with world and regional populations. The largest increases are expected in Asia and Africa where the largest growth in food consumption is projected.

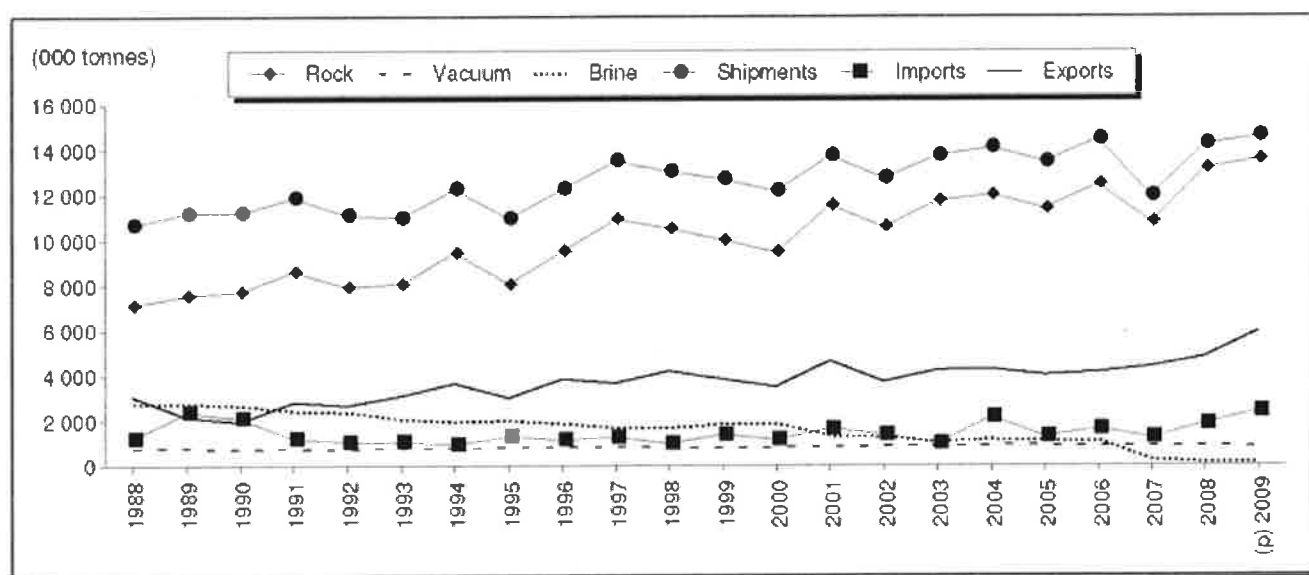
¹ Source: Roskill's web site (www.roskill.com), report on salt.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to the chapter entitled "Definitions and Valuation: Mineral Production, Shipments, and Trade." (2) Information in this review was current as of April 8, 2010. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan-rncan.gc.ca/mms-smm/busi-indu/cmy-amc/com-eng.htm.

Note to Readers

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

Figure 1
Canadian Salt Statistics and Trends, 1988-2009



Source: Natural Resources Canada.

(p) Preliminary.

TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
2501.00	Salt (including table salt and denatured salt) and pure sodium chloride, whether or not in aqueous solution or containing added anti-caking or free-flowing agents; sea water	Free-2.5%	Free	Free	Free	Free-£2.6/1000 kg	..

Sources: Canadian *Customs Tariff*, effective January 2010, Canada Border Services Agency; *Harmonized Tariff Schedule of the United States*, 2010; *Official Journal of the European Union* (Tariff Information), October 31, 2009 edition; *Customs Tariff Schedules of Japan*, 2010. GPT General Preferential Tariff; MFN Most Favoured Nation; WTO World Trade Organization.

.. Not available.

(1) The customs duties applicable to imported goods originating in countries that are Contracting Parties to the General Agreement on Tariffs and Trade or with which the European Community has concluded agreements containing the most-favoured-nation tariff clause shall be the conventional duties shown in column 3 of the Schedule of Duties. (2) WTO rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, SALT SHIPMENTS AND TRADE, 2007-09

		2007		2008		2009 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
SHIPMENTS							
By type							
Fine vacuum salt		889 503	108 013	902 404	112 524	869 748	102 422
Mined rock salt		10 807 936	328 483	13 154 234	419 957	13 550 959	557 320
Salt content of brines used or shipped		272 205	6 349	167 796	4 792	144 951	4 351
Total		11 969 644	442 845	14 224 434	537 273	14 565 658	664 093
By province							
Nova Scotia		x	x	x	x	x	x
New Brunswick		x	x	x	x	x	x

Quebec	x	x	x	x	x	x
Ontario	7 652 398	259 215	9 514 751	324 106	9 870 029	332 584
Manitoba	x	x	x	x	x	x
Saskatchewan	1 162 165	53 266	1 320 836	61 134	1 262 799	54 941
Alberta	281 409	17 024	168 567	15 218	145 407	17 623
Total	11 969 644	442 845	14 224 434	537 273	14 565 658	664 093

EXPORTS (1)

2501.00	Salt and pure sodium chloride whether or not in aqueous solution or containing added anti-caking or free-flowing agents; sea water						
	United States	4 358 208	87 390	4 761 033	120 708	5 908 336	153 728
	Saint Pierre and Miquelon	297	34	413	54	2 445	168
	Barbados	967	134	952	130	1 144	106
	Costa Rica	447	104	21 757	152	650	76
	Trinidad and Tobago	1	...	—	—	437	50
	Jamaica	158	31	164	33	392	38
	Saint Kitts and Nevis	123	25	49	10	224	23
	Germany	—	—	25	5	212	18
	Belgium	76	15	64	13	81	16
	Philippines	78	21	59	12	60	14
	Saint Vincent and the Grenadines	..	...	—	—	171	12
	Netherlands	—	—	—	—	178	12
	Other countries	830	173	495	89	362	34
Total exports	4 361 185	87 927	4 785 011	121 206	5 914 692	154 295	

IMPORTS (1)

2501.00	Salt and pure sodium chloride whether or not in aqueous solution or containing added anti-caking or free-flowing agents; sea water						
	United States	739 217	38 633	1 133 641	43 372	1 600 002	54 441
	Chile	35 914	7 095	146 363	8 768	256 370	15 908
	Mexico	350 209	6 608	414 875	9 938	418 277	9 326
	France	12 124	2 968	36 026	3 587	66 716	3 077
	China	1 868	326	1 436	404	3 339	994
	Greece	1 138	341	548	503	6 309	566
	Ireland	7	345	34	761	17	543
	Italy	1 458	426	1 900	362	30 646	519
	Israel	1 336	231	1 699	295	1 444	400
	Pakistan	736	308	872	311	1 548	310
	South Korea	1 200	201	1 722	243	5 583	284
	Germany	38	89	94	217	3 827	250
	Spain	20	34	7 370	222	799	196
	United Kingdom	168	140	130	843	251	176

South Africa	8	41	519	152	313	167
India	100	59	3 305	105	389	101
Portugal	774	116	392	142	301	101
Other countries	79 124	4 273	108 732	3 669	8 535	602
Total imports	1 225 439	62 234	1 859 658	73 894	2 404 666	87 961
By province of clearance						
Newfoundland and Labrador	23 370	828	35 664	1 327	40	12
Prince Edward Island	—	—	—	—	—	—
Nova Scotia	16	1	11 461	214	..	...
New Brunswick	190	64	195	101	149	67
Quebec	70 033	7 819	210 103	11 573	256 908	15,488
Ontario	698 623	32 761	992 840	39 227	1 443 222	50 036
Manitoba	3 428	653	1 971	581	6 957	1 195
Saskatchewan	3 290	440	1 081	434	1 016	454
Alberta	6 552	1 092	51 351	885	56 106	1 206
British Columbia	419 937	18 580	554 992	19 557	640 268	19 504
Yukon	—	—	—	—	..	...
Northwest Territories	—	—	—	—	—	—
Nunavut	—	—	—	—	..	...
Total	1 225 439	62 234	1 859 658	73 894	2 404 666	87 961

Sources: Natural Resources Canada; Statistics Canada.

— Nil; .. Not available; ... Amount too small to be expressed; (p) Preliminary; x Confidential.

(1) Includes table salt, pure sodium chloride, and seawater salt.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, SALT SHIPMENTS AND TRADE, HISTORICAL, SALT AND SODIUM COMPOUNDS, 1988-2009

Producers' Shipments						
	Mined Rock	Fine Vacuum	In Brine and Recovered in Chemical Operations	Total	Imports	Exports
	(tonnes)					
1988	7 126 762	783 368	2 777 050	10 687 180	1 202 220	3 030 124
1989	7 548 732	821 284	2 788 395	11 158 411	2 360 433	2 137 321
1990	7 704 499	778 428	2 708 458	11 191 385	2 095 324	1 897 816
1991	8 615 755	799 563	2 455 541	11 870 859	1 202 879	2 783 021
1992	7 912 989	770 370	2 404 667	11 088 026	1 041 424	2 650 921
1993	8 073 435	817 859	2 101 711	10 993 005	1 051 029	3 079 298
1994	9 446 002	822 181	1 975 704	12 243 887	940 130	3 638 674
1995	8 077 661	850 676	2 029 047	10 957 384	1 294 994	2 986 802
1996	9 499 189	853 858	1 895 430	12 248 477	1 137 603	3 816 788
1997	10 923 966	863 112	1 709 778	13 496 856	1 262 836	3 634 009

1998	10 517 641	834 944	1 681 710	13 034 295	977 943	4 177 880
1999	10 004 167	823 983	1 857 745	12 685 895	1 375 143	3 808 093
2000	9 458 260	827 630	1 878 179	12 164 069	1 141 063	3 475 755
2001	11 528 499	844 719	1 351 761	13 724 979	1 644 424	4 616 739
2002	10 581 246	870 370	1 284 861	12 736 477	1 375 136	3 689 799
2003	11 739 364	905 096	1 073 362	13 717 822	969 125	4 196 741
2004	12 000 704	923 924	1 171 660	14 096 288	2 148 674	4 247 344
2005	11 404 899	925 437	1 132 689	13 463 025	1 295 008	3 984 162
2006	12 453 922	888 073	1 117 815	14 459 810	1 641 063	4 124 906
2007	10 807 936	889 503	272 205	11 969 644	1 225 439	4 361 185
2008 (r)	13 154 234	902 404	167 796	14 224 434	1 859 658	4 785 011
2009 (p)	13 550 959	869 748	144 951	14 565 658	2 404 666	5 914 692

Sources: Natural Resources Canada; Statistics Canada.

(p) Preliminary; (r) Revised.

TABLE 3. WORLD SALT PRODUCTION, 1999-2008

	1999	2000	2001	2002	2003	2004	2005	2006	2007 (r)	2008 (p)
	(000 tonnes)									
China	28 124	31 280	34 105	36 024	32 424	37 101	46 610	56 630	59 760	59 520
United States (1)	45 000	45 600	44 800	40 300	43 700	46 500	45 200	44 400	44 600	47 300
Germany	15 700	15 700	14 343	15 736	16 424	18 838	19 332	19 846	15 678	16 400
India	14 453	14 453	14 503	14 503	15 003	15 003	15 003	15 500	16 000	16 000
Canada (2)	12 686	12 164	13 725	12 736	13 718	14 096	13 463	14 460	11 970	14 224
Australia	9 888	8 778	9 536	9 961	10 256	11 088	12 444	11 424	10 855	11 000
Mexico	8 236	8 884	8 501	7 802	7 547	8 566	9 508	8 371	8 400	8 809
Brazil	5 958	6 074	5 578	6 109	6 564	6 648	7 079	6 746	6 925	6 900
Chile	6 074	5 083	5 989	3 503	6 213	4 939	6 068	4 580	4 404	6 431
France	7 000	7 000	7 000	6 400	6 673	6 910	6 730	8 718	6 140	6 100
United Kingdom	5 800	5 800	5 800	5 700	5 900	5 800	5 800	5 800	5 800	5 800
Ukraine	2 185	2 287	2 300	2 350	3 863	4 393	4 811	5 996	5 548	5 500
Netherlands	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000
Spain	3 200	3 200	3 200	3 894	3 963	3 993	4 550	4 550	4 550	4 550
Poland	1 623	1 576	1 484	3 558	4 660	5 142	4 190	4 955	4 391	4 390
Other countries (r)	64 626	68 121	70 136	27 938	28 227	27 795	30 235	28 829	42 267	40 076
Total (3)	207 000	209 000	214 000	214 000	225 000	236 000	250 000	262 000	257 000	258 000

Sources: Natural Resources Canada; U.S. Geological Survey.

(p) Preliminary; (r) Revised.

(1) Excludes Puerto Rico. (2) The U.S. Geological Survey is the source for all data, excluding data for Canada, for which the source is Natural Resources Canada.

(3) Totals only were revised.

Note: Numbers may not add to totals due to rounding.

TABLE 4. CANADIAN SALT PRODUCERS, 2008 AND 2009

Company	Location/ Initial Production	Mill/Plant Capacity (t/y)	Remarks
ERCO Worldwide	Hargrave Facility, Man./2002	23 075	Brining to produce sodium chlorate
Canexus Limited	Bruderheim, Alta./1991	2 869	Brining to produce sodium chlorate (salt brine)
Canadian Salt Company Limited, The	Pugwash, N.S./1959	1 879 800	Rock salt
	Pugwash, N.S./1963	1 879 800	Brine made from mined rock salt used to produce fine evaporated salt (rock salt)
	Mine Seleine, Iles-de-la-Madeleine, Que./1982	1 752 000	Rock salt
	Ojibway, Ont./1955	2 803 500	Salt graded and prepared for markets (rock salt)
	Windsor, Ont./1892	238 500	Evaporated salt
	Belle Plaine, Sask./1969	227 238	Plant uses sodium chloride brines produced at the nearby potash solution mine of IMC Kalium Canada Ltd. (evaporated salt)
	Lindbergh, Alta./1968	116 000	Produces coarse and fine salt (evaporated salt)
Mosaic Potash Esterhazy	K1 and K2 mines, Esterhazy, Sask./1962	180	By-product rock salt from potash mine (standard, coarse, and granular grades)
Junex Inc.	Bécancour, Que.	..	Natural brine for de-icing and dust control
NSC Minerals Inc.	Rocanville, Sask./1990	200	Produces coarse and fine products (rock salt)
	Vanscoy, Sask./1988	300	Produces coarse and fine products (rock salt)
Potash Corporation of Saskatchewan Inc.	Sussex, N.B./1983	245 700	Three grades of muriate of potash (KCl) are produced from a flotation circuit and a crystallizer circuit (salt)
Sterling Pulp Chemicals (Sask) Ltd.	Saskatoon, Sask./1979	45 630	Primarily a manufacturer of pulp and water treatment chemicals; brining to produce caustic soda, chlorine, and sodium chlorate
Sifto Canada Corp.	Amherst, N.S./1947	98 890	Brining for vacuum pan evaporation (evaporated salt)
	Goderich, Ont./1959	6 860 000	Rock salt mining
	Goderich, Ont./1872	142 350	Brining for vacuum pan evaporation (evaporated salt)
	Unity, Sask./1949	150 274	Brining for vacuum pan evaporation (evaporated salt)
Rio Petro Ltd.	Airdrie, Alta.	..	Salt content of brine
Ward Chemical Inc.	Edmonton, Alta.	438 000	Calcium chloride

Source: Natural Resources Canada, company surveys.

.. Not available.

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