Sulphur

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Preliminary figures for 2000 show Canadian sulphur production was down by 1.3% when compared to the previous year's level. Total sulphur production was estimated at 9.8 Mt. Of this amount, elemental sulphur accounted for 8.0 Mt. Nearly all of this came from the production of natural gas, with the remainder derived from the refining of high-sulphur crude oil and heavy oil. An additional 1.1 Mt of sulphur, in the form of sulphuric acid and liquefied sulphur dioxide, was recovered from the smelting of metallic sulphides and the roasting of zinc sulphide concentrates. Most sulphur production occurs in Alberta, followed by British Columbia and Saskatchewan. Other provinces produce small amounts of sulphur, mostly from oil refining.

At an estimated 5.5 Mt, Canadian sulphur offshore exports[1] in 2000 were about 3.6% higher than in 1999. Losses in some destinations like Mexico, Morocco, India, Indonesia and Israel were more than compensated for by increased deliveries in Australia, Brazil, China and Senegal. Canadian sulphur was sold to about 20 countries.

In addition, Canada exported about 2.0 Mt of sulphuric acid, nearly all of it to the United States, as well as a small amount of sulphur dioxide, all of which went to the United States. Canadian sulphur imports continued to be minimal and were mostly from the United States.

Most elemental sulphur is used in the form of sulphuric acid, for which the single largest use is in the manufacture of phosphate-based fertilizers. An estimated 2.3 Mt of sulphuric acid were used in Canada in 1999 (a 6% decrease over 1998), the latest year for which statistics are available. About 43% of the acid used was for agricultural chemicals and fertilizers. The next largest use was for the pulp and paper industry, followed closely by industrial inorganic chemicals.

[1] The trade numbers used are from industry, which differ from Statistics Canada's numbers.

NEWS AND DEVELOPMENTS

Canada

In 2000, most if not all of the activity related to sulphur in Canada took place in the oil sands. As a result of this increased activity in the oil sands, and in light of sulphur's future strong importance regarding its contribution to Canada's oil industry, the National Energy Board issued a report entitled *Canada's Oil Sands: A Supply and Market Outlook to 2015*. This report provides a good summary of the current situation and future possible developments. One of the main conclusions of the report is that, by 2015, more than 50% of Canada's crude oil production will come from the oil sands. Since oil sands contain between 5% and 7% of sulphur, the oil sands industry is also expected to be a major contributor to Canadian production of sulphur in the future. The current elemental sulphur production could be increased by up to 2 Mt yearly by 2015. In all, nearly 60 projects valued at $34 billion are planned for the period 1996-2010, some of which are described below.

In August 2000, Syncrude Canada Ltd., the largest Canadian source of crude oil and the world's largest oil sands producer, announced the official opening of its Aurora mine as part of its Syncrude 21 Program. It is located 35 km north of the Mildred Lake site and is the first remote mine/extraction facility in the oil sands industry. The new technology developed by Syncrude researchers and engineers will improve both production efficiency and environmental performance. In 2000, total capital investment in the Syncrude 21 Program was $510 million. In 2001, about $900 million will be spent. By the end of the project in 2007, $8 billion will have been spent. The Syncrude project is a joint venture operated by Syncrude Canada Ltd. and owned by AEC Oil Sands, L.P., AEC Oil Sands Limited Partnership, Athabasca Oil Sands Investments Inc., Canadian Occidental Petroleum Ltd., Canadian Oil Sands Investments Inc.,

Gulf Canada Resources Limited, Imperial Oil Resources Limited, Mocal Energy Limited, Murphy Oil Company Ltd., and Petro-Canada. Syncrude also pursued its underground storage trials with Alberta Sulphur Research Ltd. (refer to the 1999 Sulphur chapter for further details).

Work continued on the $2.8 billion second phase of Suncor Energy Inc.'s Project Millennium, which is designed to increase oil sands production capacity to 225 000 barrels per day by 2002. In January 2000, the company announced its plans to invest $750 million to add a commercial-scale in-situ plant at its Firebag lease and bolster its upgrading capacity with an upgrader expansion. This upgrading expansion will allow production of approximately 260 000 barrels of oil per day in 2004 and result in the doubling of Suncor's current sulphur production to about 220 000 t/y.

Work at the Athabasca Oil Sands Project has started. This project is a partnership between Shell Canada Limited (60%), Chevron Canada Resources Limited (20%) and Western Oil Sands Inc. (20%). The project includes $1.8 billion for the development of the Muskeg River mine located 75 km north of Fort McMurray, Alberta, and is expected to begin production in 2002. In addition, the project requires $1.7 billion for the Scotford Upgrader located beside Shell's Scotford refinery north of Fort Saskatchewan, Alberta. When the project is completed by 2004, it will add about 450 000 t of sulphur to Canadian production on an annual basis. The project is expected to have a 30-year life.

In September, Petro-Canada announced a $290 million plan to develop its MacKay River oil sand property, with production expected to start in late 2002. The company is also looking at the possibility of building an upgrader at its Edmonton refinery. This upgrader could produce an estimated 600 t/d of sulphur.

In November, Canadian Natural Resources Limited (CNRL) announced its $6.5 billion plan to develop, by the end of the decade, its Mic Mac project 70 km north of Fort McMurray, Alberta. CNRL acquired the lease for Mic Mac from BP Canada in 1999.

TrueNorth Energy (formerly Koch Petroleum Canada Ltd.) continued its exploratory program at Fort Hills, 90 km north of Fort McMurray, where it plans to build a $2 billion mine, processing facility and on-site utilities and infrastructure.

The opening of two new uranium mines in Saskatchewan is likely to result in increased use of sulphur. The MacArthur River mine is operated by Cameco Corporation and the ore will be processed at the Key Lake plant. The McClean Lake mine is operated by COGEMA Resources Inc. and will have new milling facilities along with a new sulphuric acid plant, which will replace Cameco's Rabbit Lake plant. Another project is also being developed at Cigar Lake. Any production from Cigar Lake will be processed at McClean Lake.

Marsulex Inc. has signed two 10-year contracts with Petro-Canada and Shell Canada for their Montréal refineries.

United States

The biggest news out of the United States is without a doubt the closure of the Main Pass Frasch sulphur mine on August 31, 2000. The closure of the mine by McMoRan Exploration happened almost six months ahead of schedule and was due to reduced demand, low prices and increased production costs. The mine was operated by Freeport Sulphur. It was the only remaining Frasch sulphur operation in the United States after the closure of the Culberson mine in 1999. The Main Pass 299 deposit was discovered in 1989 and started production in late 1991. It had its best production years in the mid-1990s with an average yearly production of about 2 Mt. Sulphur production in the United States now comes entirely from petroleum refineries, natural gas-processing plants and coking plants.

PRICES

Entering 2000, sulphur price quotations on a free on board (f.o.b.) Vancouver basis were between US$35 and $39/t. Quotations quickly reached a plateau of US$40-$42/t in February and then remained at that level until June when they started to show some weakness. By the end of 2000, they had decreased to US$30-$36/t. This decrease was largely due to increased competition from sulphur producers in the Middle East in some of Canada's traditional markets.

USES

The principal use of all sulphur consumed in the world is as a process agent in the manufacture of fertilizers such as superphosphates, ammonium phosphate and ammonium sulphate (60% of world demand). The second-largest consuming sector is the chemical industry where sulphur is used as sulphuric acid in products ranging from pharmaceuticals to synthetic fibres. Other consumers of sulphur include manufacturers of pulp and paper, iron and steel, nonferrous metals, and titanium dioxide pigments. These consuming industries use sulphur in the form of sulphuric acid, which accounts for almost 90% of total sulphur use. (Some 60% of sulphuric acid use is in fertilizers.) Manufactured products that require sulphur in non-acid form in their production include insecticides and fungicides, pulp and paper, photography, leather products, rayon and rubber.

OUTLOOK

In 2001, the world sulphur market is expected to perform at a level equal to or slightly better than that of 2000. Exports of Canadian sulphur to China are expected to continue to grow, but at a much slower rate than in 2000, which saw a 25% increase over 1999. This is due largely to the desire of Chinese users to diversify their supply sources as they move away from the pyrite process. In the coming years, Canadian producers can expect further competition from the former Soviet Union, Iran and Saudi Arabia.

In 2000, Canadian sulphur production is expected to remain at its 1999 level or to be up marginally. Prices are expected to continue to decrease and stabilize around the US$20/t level.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of March 31, 2001. (3) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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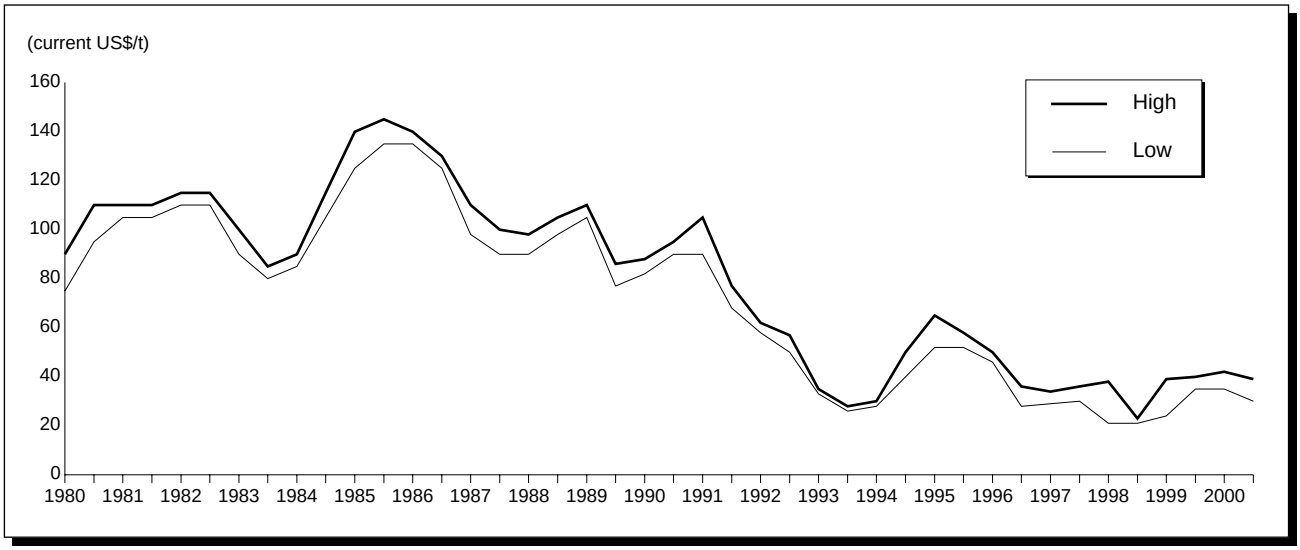
Figure 1
Canada, Offshore Sulphur Price Quotations, 1980-2000
f.o.b. Vancouver Contract



Source: Compiled by Natural Resources Canada from trade magazines and specialized subscriptions.

TARIFFS

Item No.	Description	Canada			United States
		MFN	GPT	USA	Canada
2503.00.00	Sulphur of all kinds, other than sublimed sulphur, precipitated sulphur and colloidal sulphur				
2503.00.00.10	Crude or unrefined sulphur	Free	Free	Free	Free
2503.00.00.90	Other	Free	Free	Free	Free
2802.00.00	Sulphur, sublimed or precipitated; colloidal sulphur	Free	Free	Free	Free
2807.00.00	Sulphuric acid; oleum	Free	Free	Free	Free
2811.23.00	Sulphur dioxide	Free	Free	Free	Free

Sources: *Customs Tariff*, effective January 2001, Canada Customs and Revenue Agency; *Harmonized Tariff Schedule of the United States*, 2001.

TABLE 1. CANADA, SULPHUR SHIPMENTS AND TRADE, 1999 AND 2000

Item No.		1999		2000p	
		(tonnes)	($000)	(tonnes)	($000)
SHIPMENTS[1]					
	Sulphur in smelter gases[2]	1 072 577	73 616	1 140 499	73 261
	Elemental sulphur[3]	8 143 976	93 776	7 996 263	94 922
	Total sulphur content	9 216 553	167 392	9 136 762	168 183
PRODUCTION[1]					
	Sulphur in smelter gases[2]	1 159 812	. .	1 159 162	. .
	Elemental sulphur[3]	8 812 609	. .	8 679 770	. .
	Total sulphur content[2]	9 972 421	. .	9 838 932	
EXPORTS					
2503.00.00.10	Sulphur, crude or unrefined				
	China	1 287 299	63 642	1 455 744	84 387
	Brazil	661 455	38 216	789 842	53 665
	South Africa	546 536	27 827	367 880	22 411
	Mexico	469 885	23 786	378 769	21 015
	Cuba	154 692	14 902	181 663	18 608
	United States	370 399	16 628	445 146	16 336
	Australia	175 925	8 594	281 706	16 058
	Morocco	608 668	35 883	231 838	13 673
	New Zealand	144 878	7 339	149 350	8 655
	Israel	354 656	13 370	165 250	8 590
	Senegal	37 672	3 180	97 768	7 398
	Indonesia	89 019	5 668	72 750	5 223
	Philippines	70 686	3 016	89 308	4 688
	Chile	32 000	2 967	64 061	2 845
	Argentina	–	–	24 473	1 802
	Guatemala	2 608	138	6 150	361
	Spain	–	–	4 000	228
	Salvador	2 200	117	3 850	223
	Costa Rica	–	–	1 000	58
	Tunisia	26 251	1 082	–	–
	Japan	15 000	574	–	–
	Total	5 049 829	266 929	4 810 548	286 224
2503.00.00.90	Sulphur, n.e.s.				
	United States	48 219	4 770	30 942	2 668
	China	–	–	1	. . .
	South Africa	4 665	168	–	–
	Total	52 884	4 938	30 943	2 668

TABLE 1 (cont'd)

Item No.		1999		2000p	
		(tonnes)	($000)	(tonnes)	($000)
EXPORTS (cont'd)					
2802.00	Sulphur, sublimed or precipitated; colloidal sulphur				
	Ireland	–	–	3	10
	United States	20	10	88	7
	Mexico	20	37	–	–
	Total	40	47	91	17
2807.00	Sulphuric acid; oleum				
	United States	865 270	35 127	808 104	31 141
	Mexico	29 372	740	63 800	1 443
	Chile	–	–	37 754	1 142
	Hong Kong	–	–	131	20
	Norway	–	–	183	17
	Iceland	–	–	9	14
	Saint Lucia	–	–	3	13
	Italy	–	–	70	9
	Cuba	–	–	1	...
	Croatia	122	18	–	–
	Lebanon	79	10	–	–
	Sudan	1	15	–	–
	China	14	151	–	–
	Total	894 858	36 061	910 055	33 799
2811.23	Sulphur dioxide				
	United States	50 101	13 020	46 087	11 639
	Chile	1	1	–	–
	Total	50 102	13 021	46 087	11 639
IMPORTS					
2503.00.00.10	Sulphur, crude or unrefined				
	United States	19 673	2 842	18 641	2 724
	South Africa	–	–	1	...
	Total	19 673	2 842	18 642	2 724
2503.00.00.90	Sulphur, n.e.s.				
	United States	29 134	4 675	28 568	4 990
	Finland	566	97	172	32
	France	294	47	101	24
	Germany	24	4	235	20
	China	57	16	63	19
	South Korea	–	–	315	13
	Japan	4	...	2	...
	South Africa	1	...	1	...
	Malaysia	2	...	–	–
	Uruguay	3	1	–	–
	United Kingdom	1	...	–	–
	Total	30 086	4 840	29 457	5 098
2802.00	Sulphur sublimed or precipitated; colloidal sulphur				
	United States	170	117	518	280
	France	431	230	190	132
	United Kingdom	...	...	59	48
	Germany	5	2	31	21
	China	–	–	6	2
	Japan	1	...	1	1
	Indonesia	–	–	4	1
	Netherlands	4	2	3	...
	Total	611	351	812	485

TABLE 1 (cont'd)

Item No.		1999		2000p	
		(tonnes)	($000)	(tonnes)	($000)
2807.00	Sulphuric acid; oleum				
	United States	138 081	10 037	157 538	11 232
	India	127	9	488	40
	United Kingdom	14	1	71	5
	Germany	13	1	35	3
	Canada	126	15	4	. . .
	Spain	–	–	2	. . .
	Sweden	1	. . .	1	. . .
	Switzerland	. . .	. . .	2	. . .
	South Africa	–	–	2	. . .
	Netherlands	50	2	2	. . .
	Taiwan	–	–	2	. . .
	Belgium	3	. . .	–	–
	Italy	2	. . .	–	–
	China	377	38	–	–
	Japan	6	1	–	–
	Mexico	7	1	–	–
	Total	138 807	10 105	158 147	11 280
2811.23	Sulphur dioxide				
	United States	2 659	436	7 441	1 365
	Germany	6	1	9	2
	Canada	171	23	–	–
	Total	2 836	460	7 450	1 367

Sources: Natural Resources Canada; Statistics Canada.
– Nil; **. .** Not available; **. . .** Amount too small to be expressed; n.e.s. Not elsewhere specified; **p** Preliminary.
1 Data compiled regardless of origin (i.e., domestic and foreign source materials). **2** Sulphur in liquefied SO_2 and H_2SO_4 recovered from the smelting of metallic sulphides and from the roasting of zinc sulphide concentrates. **3** Producers' shipments of elemental sulphur produced from natural gas; also included are small quantities of sulphur produced in the refining of domestic crude oil and synthetic crude oil.
Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, SULPHUR SHIPMENTS AND TRADE, 1983-2000

	Shipments[1]			Imports[2]	Exports[2]
	In Smelter Gases	Elemental Sulphur	Total	Elemental Sulphur	Elemental Sulphur
			(tonnes)		
1983	678 286	6 631 123	7 309 409	2 365	5 670 275
1984	844 276	8 352 978	9 197 254	3 019	7 326 847
1985	822 359	8 102 163	8 924 522	3 167	7 848 380
1986	758 141	6 953 298	7 711 439	10 763	6 257 054
1987	783 115	7 322 791	8 105 906	24 711	6 571 800
1988	867 800	8 106 641	8 974 441	21 825	7 384 160
1989	831 503	6 868 930	7 700 433	18 311	5 514 059
1990	879 149	6 873 495	7 752 644	13 203	6 057 523
1991	883 565	6 937 884	7 821 449	9 026	5 845 372
1992	914 978	6 393 932	7 308 910	8 645	5 653 506
1993	856 236	5 220 304	6 076 540	7 532	4 193 877
1994	1 025 561	5 791 482	6 817 043	1 979	4 983 257
1995	1 074 206	7 089 297	8 163 503	25 593	6 077 414
1996	1 033 348	7 433 112	8 466 460	24 345	6 026 287
1997	1 060 743	7 900 926	8 961 669	46 370	6 497 753
1998	1 048 169	7 406 276	8 454 445	53 123	5 253 364
1999	1 072 577	8 143 976	9 216 553	49 759	5 102 713
2000p	1 140 499	7 996 263	9 136 762	48 099	4 841 491

Sources: Natural Resources Canada; Statistics Canada.
p Preliminary.
1 Shipment data compiled regardless of origin (i.e., domestic and foreign source materials). **2** Includes only elemental sulphur in a crude or refined form.

TABLE 3. CANADA, SULPHURIC ACID PRODUCTION, TRADE AND APPARENT USE, 1986-2000p

	Production	Imports	Exports	Apparent Use
		(tonnes, 100% acid)		
1986	3 536 062	29 127	755 606	2 809 583
1987	3 436 977	44 623	803 178	2 678 422
1988	3 804 856	40 078	851 622	2 993 312
1989	3 718 578	28 433	978 190	2 768 821
1990	3 829 570	71319	1 280 502	2 620 387
1991	3 675 839	79 207	1 265 740	2 489 306
1992	3 776 086	86 284	1 340 213	2 522 157
1993	3 958 416	95 806	1 629 054	2 425 168
1994	4 055 165	68 261	1 645 406	2 478 020
1995	4 276 383	70 816	1 732 522	2 614 677
1996	4 355 592	76 016	1 596 343	2 835 265
1997	4 314 773	95 551	1 602 468	2 807 856
1998	4 611 311	129 201	1 581 604	3 158 908
1999	4 282 151	138 807	894 858	3 526 100
2000p	. .	158 147	910 055	. .

Sources: Natursal Resources Canada; Statistics Canada.
. . Not available; p Preliminary.

TABLE 4. CANADA, SULPHURIC ACID, REPORTED USE BY END USE, 1997-99

End Use	1997a	1998a	1999p,a
		(tonnes)	
Agricultural chemicals and fertilizers	1 164 570	1 186 560	1 021 928
Pulp and paper	490 822	480 082	522 359
Industrial inorganic chemicals	459 483	498 981	489 816
Nonferrous smelting and refining	116 502	123 416	119 016
Uranium mines	102 159	90 031	57 988
Crude and refined petroleum products	54 445	32 041	31 588
Soap and cleaning compounds	x	x	x
Other mines, metal and nonmetal	30 160	17 442	13 834
Metal rolling and extruding	9 120	8 770	11 940
Electrical products	3 577	4 131	4 237
Food, brewery and distillery	x	2 286	2 890
Plastics and synthetic resins	x	x	x
Leather and textile	–	x	x
Other end uses	35 794	38 664	49 464
Total1	2 485 013	2 497 166	2 341 727

Source: Reports from producing companies, compiled by Natural Resources Canada, 2001.
– Nil; p Preliminary; x Confidential.
a Confidential numbers are included in the totals.
1 Reported use does not include imported acid.
Note: Numbers may not add to totals due to rounding.

TABLE 5. WORLD PRODUCTION OF SULPHUR, 1997-99

	1997r		1998r		1999p	
	All Forms[1]	Elemental	All Forms[1]	Elemental	All Forms[1]	Elemental
	(000 tonnes)					
WESTERN EUROPE						
Finland	728	40	768	50	806	60
France	1 200	945	1 099	849	1 051	790
Germany	2 443	1 623	2 620	1 761	2 690	1 823
Italy	527	354	557	393	569	436
Netherlands	475	364	539	418	580	453
Spain	1 106	175	1 069	190	1 013	205
Others	1 237	741	1 249	762	1 135	651
Total, Western Europe	7 716	4 242	7 901	4 423	7 844	4 418
CENTRAL EUROPE						
Poland	1 974	1 710	1 559	1 290	1 425	1 145
Others	604	195	647	210	485	220
Total, Central Europe	2 578	1 905	2 206	1 500	1 910	1 365
FORMER SOVIET UNION	5 765	4 465	6 993	5 678	7 885	6 482
AFRICA						
South Africa	503	231	489	227	472	221
Others	148	5	118	5	86	10
Total, Africa	651	236	607	232	558	231
NORTH AMERICA						
Canada	9 481	8 408	9 694	8 541	9 972	8 813
United States	13 125	10 460	12 813	10 070	12 458	10 000
Total, North America	22 606	18 868	22 507	18 611	22 430	18 813
LATIN AMERICA						
Mexico	1 392	923	1 393	912	1 368	856
Others	1 694	567	1 997	692	2 334	763
Total, Latin America	3 086	1 490	3 390	1 604	3 702	1 619
MIDDLE EAST						
Iran	845	815	861	861	895	895
Iraq	425	425	475	475	575	575
Kuwait	591	591	650	650	639	639
Saudi Arabia	1 690	1 701	1 880	1 880	1 940	1 940
Unitd Arab Emirates	900	900	980	980	1 090	1 090
Others	399	255	489	336	527	394
Total, Middle East	4 850	4 687	5 335	5 182	5 666	5 533
ASIA						
China	7 810	230	7 041	228	6 612	370
Japan	3 457	2 013	3 514	2 083	3 592	2 059
South Korea	952	617	1 143	669	1 194	670
Others	1 250	663	1 433	812	1 728	702
Total, Asia	13 469	3 523	13 131	3 792	13 126	3 801
OCEANIA	444	60	449	50	476	49
Total, World	61 165	39 476	62 519	41 072	63 597	42 311

Source: British Sulphur Consultants, 2000.
p Preliminary; r Revised.
1 All forms includes elemental sulphur, sulphur contained in pyrites, and contained sulphur recovered from metallurgical waste gases, mostly in the form of sulphuric acid.