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# THE NON-FERROUS SMELTING AND REFINING INDUSTRY IN CANADA, 1942

The Non-Ferrous Smelting and Refining Industry, as defined by the Dominion Bureau of Statistics, Ottawa, comprises those firms engaged primarily in the smelting of non-ferrous ores or concentrates and the refining of metals recovered therefrom.

The net value added by the industry in the processing of crude or semi-crude material during 1942 totalled $125,881,047 compared with $119,736,294 in the preceding year. Refined products included gold, silver, nickel, copper, lead, zinc, aluminium, tin, magnesium, indium, antimony, bismuth, cobalt, cadmium, selenium, tellurium, radium salts, uranium compounds and sulphur; other end products of individual plants or companies were copper-nickel matte, cobalt salts, nickel salts, nickel and cobalt oxides, arsenious oxide, sulphuric acid, platinum metals residues, zinc dust, zinc oxide, and blister and anode copper.

The net value added by the industry in the treatment of various ores, metals, etc., in 1942 represents a 5 per cent increase over the all-time high record of $119,736,294 established in 1941. This continued increase realized by the smelters and refineries reflects the unabated effort of Canada to provide to her full capacity the essential materials for the successful waging of a total war. The production of the light metals was particularly impressive--aluminium output was far greater than in any previous year and the recovery of magnesium metal reached an important volume. The greater part of the production of this latter metal comes from the new plant of Dominion Magnesium Ltd. It is also worthy of note that the commercial recovery of indium in Canada was recorded for the first time in 1942. Not included with the products credited to the non-ferrous smelting and refining industry was an important production of quicksilver in British Columbia. This metal is produced at or near the mines and statistics relating to its production are included with those of the miscellaneous metal mining industry. The production of chrome-bearing ferro-alloys in Ontario, principally from foreign ores, is classified under Manufacturing and the data relating to same are therefore not included in this survey.

The total cost of ores, concentrates, matte and other material treated in all Canadian non-ferrous metallurgical plants during 1942 was estimated at $258,903,818 compared with $213,542,005 in 1941. In this regard, it should be noted that companies operating both mines and smelters may vary from year to year the nominal values of crude ores, etc., shipped from their mines to their own smelters, with the result that in some years the mining industry proper is favoured at the expense of the non-ferrous smelting and refining industry and vice versa. The total annual net income of the nation as a whole is, however, not affected by these arbitrary (internal) evaluations. Fuels and purchased electricity consumed by the industry in 1942 totalled $35,748,639 and the value of chemicals and various

other process supplies used amounted to $27,083,695.

Capital employed in 1942 was reported at $356,052,965, which figure includes the value of land, plant, materials on hand and in process, finished products and operating funds. Employees totalled 21,162 compared with 16,014 in 1941 and salaries and wages aggregated $37,340,556 as against $27,482,689 in the preceding year. Female wage-earners in 1942 averaged 185.

Table 1 - PRINCIPAL STATISTICS OF THE NON-FERROUS METALLURGICAL INDUSTRY IN CANADA, 1940 - 1942

| | | 1940 | 1941 | 1942 |
|---|---|---|---|---|
| Number of companies | | 9 | 9 | 10 |
| Number of plants | | 13 | 13 | 15 |
| Capital employed | $ | 234,826,742 | 309,963,342 | 356,052,965 |
| Number of salaried employees | | 1,558 | 1,750 | 2,625 |
| Salaries | $ | 3,661,048 | 4,117,398 | 5,286,755 |
| Number of wage-earners | | 11,908 | 14,264 | 18,537 |
| Wages | $ | 18,105,149 | 23,365,291 | 32,053,801 |
| Value of plant products (gross) (x) | $ | 305,360,547 | 379,322,270 | 447,617,199 |
| Estimated cost of ores, concentrates, etc., treated (a) | $ | 174,274,655 | 213,542,005 | 258,903,818 |
| Cost of fuel and purchased electricity (b) | $ | 19,510,664 | 26,771,809 | 35,748,639 |
| Process supplies, other than items (a) and (b) | $ | 13,515,941 | 19,272,162 | 27,083,695 |
| Value added by smelting (net) | $ | 98,059,287 | 119,736,294 | 125,881,047 |

(x) The gross value of production should not be interpreted as the utlimate sale value of finished metal only, as it represents the combined values of all industry (smelting, refining, etc.) end products (blister, copper matte, etc.)

Table 2 - NUMBER OF WAGE-EARNERS, BY MONTHS, 1932 and 1939-1942

| Month | 1932 | 1939 | 1940 | 1941 | 1942 | |
|---|---|---|---|---|---|---|
| | | | | | Male | Female |
| January | 5,496 | 11,138 | 11,225 | 12,927 | 15,778 | 31 |
| February | 5,400 | 11,123 | 11,297 | 13,052 | 16,298 | 32 |
| March | 5,355 | 11,334 | 11,298 | 13,102 | 16,434 | 34 |
| April | 4,750 | 11,371 | 11,403 | 13,617 | 16,617 | 39 |
| May | 4,297 | 11,380 | 11,691 | 14,275 | 17,223 | 53 |
| June | 4,475 | 11,390 | 11,794 | 14,503 | 18,297 | 68 |
| July | 4,205 | 11,486 | 12,102 | 14,634 | 18,900 | 75 |
| August | 4,160 | 11,476 | 12,256 | 14,788 | 19,346 | 81 |
| September | 4,198 | 11,454 | 12,251 | 14,815 | 19,091 | 206 |
| October | 4,326 | 11,327 | 12,316 | 14,995 | 20,076 | 424 |
| November | 4,316 | 11,401 | 12,481 | 15,055 | 20,953 | 570 |
| December | 4,274 | 11,424 | 12,771 | 15,371 | 21,239 | 605 |
| AVERAGE | 4,604 | 11,360 | 11,908 | 14,264 | 18,352 | 185 |

Table 3 - FUEL AND ELECTRICITY USED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1941 and 1942

| Kind | Unit of measure | For light and power | | For metallurgical purposes | |
|---|---|---|---|---|---|
| | | Quantity | Cost | Quantity | Cost |
| | | | $ | | $ |
| **1 9 4 1** | | | | | |
| Bituminous coal - | | | | | |
| Canadian | short ton | 65,366 | 394,900 | 382,234 | 2,551,242 |
| Imported | short ton | 134,260 | 1,046,407 | 364,099 | 2,503,822 |
| Anthracite coal - | | | | | |
| United States | short ton | 20 | 391 | ... | ... |
| Coke | short ton | 1,652 | 16,851 | 361,475 | 3,732,416 |
| Gasoline | Imp.gal. | 134,517 | 34,660 | 134,445 | 41,733 |
| Kerosene or coal oil | Imp.gal. | 7,184 | 1,480 | 1,879 | 410 |
| Fuel oil and diesel oil | Imp.gal. | 24,507 | 3,575 | 32,325,731 | 1,983,346 |
| Wood (cords of 128 cubic feet) | cord | 25 | 190 | 5,540 | 34,910 |
| Gas - Manufactured | M cu.ft. | ... | ... | 2,676 | 2,748 |
| Natural | M cu.ft. | ... | ... | 460 | 303 |
| Other fuel | ... | ... | ... | ... | 16,141 |
| Electricity purchased | K.W.H. | 727,466,562 | 1,862,831 | 4,949,131,252 | 12,543,451 |
| TOTAL | ... | ... | 3,361,285 | ... | 23,410,524 |
| Electricity generated for own use (x) | K.W.H. | 9,141,923 | ... | 256,177,056 | ... |
| Process supplies used, chemicals, etc. | $ | | 19,272,162 | | |
| **1 9 4 2** | | | | | |
| Bituminous coal - | | | | | |
| Canadian | short ton | 51,187 | 145,250 | 363,579 | 2,641,001 |
| Imported | short ton | 53,827 | 402,330 | 589,103 | 4,405,409 |
| Anthracite coal - | | | | | |
| United States | short ton | 3 | 45 | 69 | 1,020 |
| Other | short ton | ... | ... | 40 | 436 |
| Coke | short ton | 1,258 | 12,255 | 372,737 | 4,099,027 |
| Gasoline | Imp.gal. | 220,474 | 78,637 | 148,368 | 47,385 |
| Kerosene or coal oil | Imp.gal. | 8,623 | 1,847 | 2,045 | 480 |
| Fuel oil and diesel oil | Imp.gal. | 178,509 | 20,804 | 39,588,391 | 2,579,779 |
| Wood (cords of 128 cubic feet) | cord | 505 | 4,258 | 5,687 | 23,589 |
| Charcoal | lb. | ... | ... | 853,565 | 12,883 |
| Gas - Manufactured | M cu.ft. | ... | ... | 3,138 | 3,207 |
| Natural | M cu.ft. | ... | ... | 429 | 348 |
| Electricity purchased | K.W.H. | 848,227,671 | 2,362,001 | 7,439,533,174 | 18,906,148 |
| TOTAL | ... | ... | 3,027,427 | ... | 32,721,212 |
| Electricity generated for own use | K.W.H. | 9,915,356 | ... | 249,908,225 | ... |
| Process supplies used, chemicals, etc. | $ | | 27,083,695 | | |

(x) In addition, 23,473,768 K.W.H. valued at $93,691 were generated for sale by the industry.

Table 4 - POWER EMPLOYED IN THE NON-FERROUS SMELTING AND REFINING INDUSTRY, 1942

| Description | Ordinarily in Use | | In Reserve or Idle | |
|---|---|---|---|---|
| | Number of units | Total horse power | Number of units | Total horse power |
| 1. Steam engines and steam turbines ... | 34 | 14,836 | 1 | 1,074 |
| 2. Diesel engines ..... | 7 | 1,430 | 1 | 75 |
| 3. Gasoline, gas and oil engines, other than Diesel engines ..... | 318 | 2,367 | ... | ... |
| 4. Hydraulic turbines or water wheels.. | 11 | 51,125 | ... | ... |
| 5. Electric motors (except those reported under item 7) - | | | | |
| (a) Operated by purchased power ... | 10,268 | 368,365 | 1,240 | 27,149 |
| Total (1), (2), (3), (4) and (5a) ..... | 10,638 | 438,123 | 1,242 | 28,298 |
| (b) Operated by power generated by 1, 2, 3 and 4 ..... | 338 | 4,448 | 31 | 354 |
| 6. Stationary boilers ..... | 45 | 27,763 | 9 | 5,850 |
| 7. Motor generator sets ..... | 119 | 85,658 | 11 | 6,255 |

Table 5 - AVERAGE ANNUAL METAL PRICES, IN CANADIAN DOLLARS, 1929-1942

| Year | Gold | Silver | Copper | Lead | Zinc |
|---|---|---|---|---|---|
| | Troy oz. | Troy oz. | Pound | Pound(∠) | Pound(∠) |
| | $ | $ | $ | $ | $ |
| 1929 ..... | 20.67 | 0.530 | 0.130(x) | 0.050 | 0.054 |
| 1930 ..... | 20.67 | 0.381 | 0.130(x) | 0.039 | 0.036 |
| 1931 ..... | 21.55 | 0.298 | 0.0837(x) | 0.027 | 0.025 |
| 1932 ..... | 23.47 | 0.317 | 0.0638 | 0.021 | 0.024 |
| 1933 ..... | 28.60 | 0.378 | 0.0745 | 0.024 | 0.032 |
| 1934 ..... | 34.50 | 0.475 | 0.0742 | 0.024 | 0.030 |
| 1935 ..... | 35.19 | 0.648 | 0.0780 | 0.031 | 0.031 |
| 1936 ..... | 35.03 | 0.451 | 0.0948 | 0.039 | 0.033 |
| 1937 ..... | 34.99 | 0.449 | 0.131 | 0.051 | 0.0490 |
| 1938 ..... | 35.17 | 0.435 | 0.0997 | 0.034 | 0.031 |
| 1939 ..... | 36.14 | 0.405 | 0.101(∠) | 0.032 | 0.031 |
| 1940 ..... | 38.50 | 0.382 | 0.101 | 0.034 | 0.034 |
| 1941 ..... | 38.50 | 0.3826 | 0.101 | 0.034 | 0.034 |
| 1942 ..... | 38.50 | 0.4216 | 0.101 | 0.034 | 0.034 |

(x) Based on New York; 1932-1942 based on London.

(∠) Based on London; prices controlled by Government since 1939 and subject to revision.

The agreement made in 1939 by the large base metal producers and the Imperial Government, by which the producers were to supply the Imperial Government with copper, lead and zinc at prices which prevailed shortly before the outbreak of the war, was continued with some adjustments or revisions for increases in prices due to the increased cost of labour and materials. Canada can now furnish large quantities of these metals in the refined state, whereas in 1914 no refined copper, nickel or zinc and only a comparatively small amount of refined lead were produced in this country.

Data relating to imports and exports of non-ferrous metals were not published since 1939; also, statistics in detail as relating to Canadian output and consumption of these metals have not been released since 1939.

Tables of world metal production were omitted from this report due to the fact that recent data for most countries were unobtainable or conjectural in nature; also, data relating to capacities of Canadian metallurgical plants have been withheld for confidential use only until the termination of the war.

The following information has been abstracted from the 1942 annual reports of some of Canada's more important mining and metallurgical companies:

Falconbridge Nickel Mines Ltd. - "Full effect of the expansion program commenced in 1941 was not realized until the end of the second quarter when it was finally completed. However, full advantage was taken of all units as they became available and the substantial increase shown in ore treated and metals produced records the greatest production effort of any year in the history of the company.

"Early in 1942, after fully exploring the possibilities, it was decided to further increase the production capacity by additions to the smelting plant. It was hoped that the second project could be completed by the end of the year but unexpected delays have upset the schedule to such an extent that little gain can be expected from it before the end of the first quarter of 1943."

International Nickel Company of Canada Limited - "All of the Company's works ran continuously throughout the year and considering the shortage of labour and the difficulty in securing supplies, the operating results were satisfactory. ..... The expanded production of nickel already attained, coupled with conservation in its applications and organized salvage of nickel-bearing scrap, has eased a threatened shortage of supply. It would now appear that a sufficient tonnage of this strategic metal is available to meet all vital requirements of our armed services. While in no way lessening its war efforts, the Company has long been formulating plans in preparation for the post-war period."

Noranda Mines Limited - "Production at the Horne mine was at full capacity as permitted by sound and safe mining practice and limitations of the capacity of the smelter and of the customs refinery operated at Montreal East by the Company's subsidiary, Canadian Copper Refiners Limited. Since the commencement of the war, the production of copper and zinc by another subsidiary, Waite-Amulet Mines Limited, has been greatly expanded and the combined copper-zinc production of Noranda and Waite-Amulet has been a very important contribution to Canada's war effort. The copper refinery at Montreal East operated at full capacity during 1942. The estimated copper and gold content of the ore indicated in the Horne mine above the 2,975 foot level, as of January 1, 1943, is sufficient to maintain production of these metals for fifteen years at the 1942 rate of production."

Hudson Bay Mining & Smelting Co. Limited - "The capacity of the copper smelter was further increased during 1942. The tonnage of pay charge of Hudson Bay material and of customs ore and concentrates was an all-time high, and the year's production of gold, silver, and copper from all sources reached a new peak. A fifth copper roaster was installed and placed in operation early in May.

"There were slight increases in the tonnage of zinc concentrates treated, the average zinc assay per ton of zinc concentrates treated, and the percentage of recovery of zinc from concentrates treated to slab zinc produced. The year's production of slab zinc was the highest on record. The cadmium plant treated all available precipitates from the zinc purification plant. The cyanide plant again treated a greater tonnage of flotation tailings than had been treated in any previous year. Women are now being employed on various types of work in the metallurgical and other surface plants and over 200 farmers worked for the company

during the winter."

Consolidated Mining & Smelting Co. of Canada Limited - "The metallurgical and chemical plants at Trail, British Columbia, were operated in 1942 at full capacity. Recoveries were satisfactory, but costs were slightly higher.

"The cooperation of the company was invited by the British and Dominion Governments in connection with the production of certain chemicals for war purposes. The company's directors agreed to place at their disposal all technical and engineering information in possession of the company, together with such facilities as might be required to plan, construct and operate these plants on the basis of actual cost. Expenditures amounting to approximately $16,000,000 were undertaken. Construction estimates were not exceeded and operations were commenced within the time specified. It is a matter of much satisfaction to record that production has been greater than rated capacity and costs per unit below estimates. The construction and operation contracts with the governments in connection with these plants do not include any remuneration to the company. .....Most of the company's production of lead and zinc were still under contract to the British Government. The balance of the output, together with the company's other metal and fertilizer production, was practically all required directly or indirectly for war purposes."

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The Aluminum Company of Canada Limited reported continuous operations throughout 1942 at its Arvida ore plant and at both the Arvida and Shawinigan Falls reduction plants. The new reduction plant of the company at La Tuque, Quebec, came into production in November.

At Deloro, Ontario, the plant of the Deloro Smelting & Refining Company Limited was operated steadily during the year under review. The company treated both Canadian and foreign ores and products included silver, arsenic and cobalt and nickel in various forms.

Dominion Magnesium Limited conducted operations at its new property located near Renfrew, Ontario, from August; magnesium metal is produced in the company plant by the ferrosilicon process. The metal is recovered from dolomite rock which is quarried near the plant.

Operations at the refinery of Eldorado Gold Mines Limited, located at Port Hope, Ontario, were continuous throughout 1942. Pitchblende concentrates shipped from the company's mine situated at Great Bear Lake, Northwest Territories, are treated in this Port Hope refinery for the recovery of radium and uranium in various forms.

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