

# THE MINERAL INDUSTRY OF DENMARK AND GREENLAND

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## Denmark

In 1996, Denmark's relatively small mineral industry had a thriving industrial mineral sector. Employment in all aspects of the minerals industry (mining and quarrying, basic metal industry, etc.) accounted for about 2% of total employment in Denmark.

Private ownership and exploitation of minerals are allowed under Danish law. In 1996, a tax of \$0.91<sup>1</sup> per cubic meter was levied against all extracted minerals, regardless of type or ownership. However, this tax is exempted if the mineral is exported. The permitting procedure for mineral production is executed by individual counties, and the environmental regulations are at a level comparable to the other European Union (EU) member countries.

The mining and metal's industry works closely with the Ministry of Environment, local and community governments, and citizen groups to minimize any adverse effects to the environment. A common goal of the steelworks and other industrial concerns is to make use of as much raw material taken into the plant as possible and to maximize the use of any byproducts, such as flue dusts.

Continued close cooperation with the other member countries of the EU is very important for Denmark because these countries remain the major export markets. For example, more than 80% of steel produced in Denmark was exported and of that total, more than 50% was shipped to EU countries. The same is true for other minerals and mineral products such as cement, of which almost three-quarters of Danish production was exported.

There was a decrease in crude steel production compared with that of previous years. The weakening of the market was attributed to considerable EU imports of steel from Eastern Europe and other non-EU countries. Denmark's steel industry is small compared with the majority of other EU countries and, as a result of its size, was not affected by the proposed cuts being studied by the European Commission in its efforts to make the EU steel industry more competitive with those of other countries. (See table 1.)

The Geological Survey of Denmark and Greenland (GEUS) conducted a limited investigation of heavy mineral potential in middle, southern, and western Jutland. Two types of heavy mineral environments were identified by GEUS. One

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<sup>1</sup>Where necessary, values have been converted from Danish kronas (Dkr) to U.S. dollars at the rate of Dkr 5.5=US\$1.00.

environment was associated with marine sediments and contained ilmenite, rutile, and zircon. The ilmenite was reported to contain approximately 52% titanium dioxide (TiO<sub>2</sub>). The other occurrence was associated with a palaeo-beach environment and contained ilmenite, rutile, zircon, and a small amount of leucoxene. The TiO<sub>2</sub> content was reported to be about 58%. (Industrial Minerals)

Denmark has no known economically exploitable reserves of metallic ores, but does have large reserves of nonmetallic materials such as chalk, diatomaceous earth, limestone, and sand and gravel. Denmark's industrial minerals sector is based on easily accessible materials such as chalk and limestone and is well developed. Cement, chalk for paper filler, ground limestone, burnt lime, and agricultural limes are produced.

Denmark is the only commercial producer of moler, which consists of a natural mixture of diatomite and from 20% to 25% smectite clay. This product has a variety of applications. Moler is an important ingredient of insulation bricks.

Aalborg Portland A/S, Denmark's sole cement-producing company, signed an agreement with a nearby powerplant to supply chalk slurry for flue gas desulfurization (FGS). The company would receive the FGS gypsum in return for use in cement production. The company also reported an \$8 million investment to fully utilize its advanced white kiln system.

Petroleum production continued to exceed consumption, allowing Denmark to stay self-sufficient in petroleum. An increase in natural gas production allowed the continued exporting of about 20% of Denmark's production.

The structure of the Danish mineral industry, listing its major components, is shown in table 2.

## Faroe Islands

The Faroe Islands, a self-governing overseas administrative division of Denmark, has no known mineral reserves. The economy remains dependent on fisheries, which collapsed in the early 1990's, causing an economic crisis. However, this could change if a dispute with the United Kingdom over a wide strip of sea between the Faroe Islands and the Shetland Islands, that has continued for the past few years, is eventually settled in favor of the Faroes. The dispute concerned the boundary of the economic zone of the Faroe Islands and the Shetland Islands and intensified during 1994 as a result of oil having been discovered in the Shetland zone less than 20 kilometers (km) from the present boundary and in the disputed zone. Companies that have conducted exploration in the area have suggested that there might possibly be as much as 3,500 million barrels in place.

The principal involvement of the Faroe Islands in the international minerals industry has been as a market for imported materials to support the local fishing-based economy. The imports are principally fuels, fertilizer materials, and building products such as cement.

## **Greenland**

Since the cessation of mining activities in 1990, Greenland, a self-governing overseas administrative division of Denmark, has been looking for a means of diversifying its economy, which is presently based almost entirely on fishing and hunting. Recent legislation created favorable licensing terms and investment rules, and this together with a varied geology has resulted in increased mineral exploration in Greenland.

In 1996, several companies conducted exploration under 45 licenses over more than 28,000 square kilometers. Exploration has been directed toward base metals, diamonds, gold, industrial minerals, iron, nickel, and platinum-group metals. Both the Danish and Greenland Governments are actively encouraging mineral exploration activities.

Nunaoil A/S, owned by the Danish and Greenland Governments, reported it has outlined four areas of primary gold mineralization near the town of Nanortalik. In particular, one 800 meter (m) long outcrop of gold-bearing quartz veins was reported to have an average grade of 50 grams of gold per ton. The gold-bearing veins are hosted in fine to medium-grained mafic metavolcanics. Exploration drilling continued in 1996 in the above areas and also on the island of Storø in the Nuuk region (Mining Journal Supplement, 1996).

RTZ Mining and Exploration Ltd. was reevaluating the Isukasia iron ore deposit, first discovered in 1965 by the Cryolite Co., and reported exploration drilling through the Inland Ice had demonstrated the presence of hematite in banded iron formations within a regional supracrustal belt that stretches under the ice sheet. RTZ continued with exploration efforts in 1996 (Mining Journal Supplement, 1996).

Platinova A/S continued exploration, in 1996, of its massive sulfide deposit at its Peary Land zinc project in the northeast of

Greenland. After three seasons of drilling, the company had defined a 3 km by 10 km mineralized trend representing a resource of an estimated 25 million metric tons grading about 7% zinc and 1% lead (Mining Journal Supplement)

Feasibility studies continued on the construction of a 170,000 metric-ton-per-year zinc refinery near Nuuk that would treat Canadian, and possibly Irish concentrates, that are currently being treated in Europe. The refinery would use locally available hydroelectric power, and the use of pressure-leach technology and underground waste storage would minimize environmental pollution.

The recent discovery of diamondiferous kimberlites in Canada's Northwest Territories has led to a reappraisal of Greenland's diamond potential. RTZ completed a kimberlite exploration program in northwest Greenland with reported negative results and Quadrant Resources Ltd. was conducting exploration for diamond indicator minerals within the Archean craton in southwest Greenland.

There have been some indications of petroleum deposits in the southwest area of the Nuusuaq Peninsula off the central western coast of the island and of natural gas reserves in water depths ranging from 200 m to 1,500 m.

Denmark has a well developed modern transportation system. There are standard gauge rail lines totaling 2,770 km in length. Highways consisted of 66,482 km, of which 64,551 km were paved. Inland waterways totaled 417 km. Principal ports were Ålborg, Århus, Copenhagen, Esbjerg, and Frederica. There were numerous secondary and minor ports.

Denmark and Greenland have had a long relationship, both political and administrative. Both governments are actively seeking to develop the country's mineral resources in order that mining can once again become an important sector of the economy.

## **Reference Cited**

- Industrial Minerals, Jan. 1996, no. 339, p. 55.  
Mining Journal, 1996, Greenland: Mining Journal Supplement, v. 326, no. 8367, p. 6-7.

TABLE 1  
DENMARK: APPARENT PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1992	1993	1994	1995	1996 e/	
Aluminum metal, secondary	15,200	14,000	15,000	14,000 e/	14,500	
Cement, hydraulic	2,072,000	2,270,000	2,430,000	2,584,000	2,628,528 2/	
Chalk	355,000	386,000	414,000	366,000	359,378 2/	
Clays:						
Fire clay	2,040	13,400	1,530	2,000 e/	1,800	
Kaolin e/	3,503 2/	3,500	3,500	3,500	3,000	
Other	1,470	267	224	6,000 e/	8,050	
Moler e/	95,000	95,000	95,000	95,000	90,000	
Extracted moler 3/	thousand cubic meters	190	190	186	185	
Gas:						
Manufactured e/	terajoules	1,700	1,700	1,700	1,700	
Natural:						
Gross 3/	million cubic meters	6,200	6,350	6,900 e/	6,320 e/	7,500
Marketable	do.	3,850	4,270	4,630	4,700	5,710 2/
Iron and steel metal, steel: 3/						
Crude	591,000	603,000	722,000	654,000	600,000	
Semimanufactures	525,000	527,000	638,000	621,000	575,000	
Lime, hydrated and quicklime	128,347	123,531	125,000	117,000	108,628 2/	
Natural gas plant liquids e/	thousand 42-gallon barrels	43,500	48,000	48,000	46,000	45,000
Nitrogen, N content of ammonia e/	1,500	1,770 2/	1,700	1,600	1,600	
Peat	194,983	188,709	190,000	205,000	204,465 2/	
Petroleum:						
Crude 3/	thousand 42-gallon barrels	58,200	63,500	68,800	67,858	76,034 2/
Refinery products:						
Liquefied petroleum gas	do.	1,450	1,700	1,600	1,600 e/	1,600
Gasoline	do.	16,200	12,800	11,700	12,000 e/	12,000
Naphtha	do.	1,910	1,210	1,200	1,200 e/	1,200
Mineral jelly and wax	do.	4	4	4	4 e/	4
Jet fuel	do.	1,180	1,630	1,930	1,800 e/	1,800
Kerosene	do.	171	109	110 e/	100 e/	100
Distillate fuel oil	do.	28,700	31,400	28,400	28,000 e/	28,000
Refinery gas e/	do.	1,700	1,700	1,700	1,700	1,600
Lubricants	do.	324	300 e/	260	300 e/	300
Residual fuel oil	do.	13,300	15,600	13,700	13,500 e/	13,500
Bitumen and bituminous mixtures	do.	63	60 e/	52	50 e/	60
Petroleum coke e/	do.	3	3	3	3	3
Total	do.	65,005 e/	66,516	60,659	60,257	59,897 2/
Phosphates, crude, gross weight	--	1,480	1,270	1,200	1,200	
Salt, all forms	528,429	591,055	583,000	603,000 e/	600,000	
Sand and gravel: e/						
Onshore	thousand cubic meters	20,000	20,000	20,000	20,000	18,000
Offshore	do.	5,000	5,000	5,000	5,000	5,000
Total	do.	25,000	25,000	25,000	25,000	23,000
Of which, sand, industrial (sales)	do.	125	125	25	50	50
Stone:						
Dimension (mostly granite) e/	25,000	26,000	24,800	25,000	27,198 2/	
Limestone:						
Agricultural	806,000	584,000	703,000	826,000 e/	695,380 2/	
Industrial	217,000	220,000	252,000	250,000 e/	250,000	
Sulfur, byproduct	6,982	10,357	10,100	8,000 e/	7,465 2/	

e/ Estimated.

1/ Table includes data available through March 1997 based on estimated sales of domestically produced mineral commodities.

2/ Reported figure.

3/ Production.

TABLE 2  
DENMARK: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Aalborg Portland A/S	Plant at Rordal	3,000
Chalk	A/S Faxe Kalkbrud	Quarries at Stevns and Sigerslev	250
Diatomite (moler)      thousand cubic meters	Skamol-Skarrehage A/S	Quarries on Mors and Fur Islands	115
Do.	Dansk Moler Industri A/S	Quarries on Fur Island	80
Kaolin	Aalborg Portland A/S	Mine and plant on Bornholm Island	25
Lime	A/S Faxe Kalkbrud (Aalborg Portland Holding A/S)	Plant at Stubberup, near Faxe, on Zealand Island	200
Natural gas              million cubic meters	Maersk Olie og Gas A/S	Roar and Tyra Gasfields, Danish North Sea	2,550
Petroleum:			
Crude                      barrels per day	Dansk Undergrunds Consortium	Dan, Gorm, Rolf, and Tyra, Danish North Sea	127,000
Refined                    do.	A/S Dansk Shell	Fredericia	55,000
Do.                        do.	Kuwait Petroleum Refining A/S	Gulfhavn	56,500
Do.                        do.	Statoil A/S	Kalundborg	65,000
Salt	Dansk Salt I/S	Mine (brine) at Hvornum, plant at Mariager	600
Steel	Danish Steel Works Ltd. (Det Danske Stalvalsevaerk A/S) (30% Government owned)	Plant at Frederilsvaerk	750