

## DENMARK

*By Flemming Jacobsen  
Ministry of Environment and Energy, Denmark*

**M**ineral production in Denmark includes the extraction of sand, gravel, stone, clay, chalk, limestone, peat and salt, plus oil and gas from the seabed. Sand, gravel and stone are extracted by dredging. Total production of raw materials, excluding oil, gas and salt, was 40.5 million m<sup>3</sup> in 2000, or 7.6 m<sup>3</sup> per inhabitant. In 2000, the production of oil was 17.7 Mt, or 3.3 t per inhabitant. The corresponding figures for the production of gas in 2000 are 7.9 billion Nm<sup>3</sup> or 1,490 Nm<sup>3</sup> per inhabitant. Recycling of construction waste for use instead of natural resources has been quite successful.

The pioneer material in recycled waste products in Denmark has been fly ash from coal-fired power plants. The main market for fly ash are cement and concrete, and approximately 35% of the fly ash is re-used in industrial products. The production of flue-gas desulphurisation (FGD) gypsum has been steadily increasing, and FGD gypsum has achieved an even greater penetration into the market than fly ash, 100% being utilised in plasterboard, cement etc. The level of re-use of waste from building and construction activities has increased to about 92% over the decade to 1999.

After some years of decline, the production of land-based minerals reached a nadir in 1993 of 24 million m<sup>3</sup>, after that time slightly increasing over the years to a production in 1997 of 31.5 million m<sup>3</sup>, slightly declining to 30.6 million m<sup>3</sup> in 1998. In 1999, the production reached 35 million m<sup>3</sup>, declining slightly to 33.6 million m<sup>3</sup> in 2000.

In the same period, the sea-based production rose from 4.3 million m<sup>3</sup> in 1993 to 8.6 million m<sup>3</sup> in 1997, one of the reasons being the supply of raw materials for the connection between Denmark and Sweden (part tunnel,

part bridge), before declining to 7.0 million m<sup>3</sup> in 1998 due to the end of the construction work on this connection. In 1999, production reached 12.8 million m<sup>3</sup> of which 7.0 million m<sup>3</sup> were used on one big harbour project. This project is now finished and the sea-based production of raw materials fell to 6.9 million m<sup>3</sup> in 2000.

The main part of the total land- and sea-bed production of raw materials (some 80%) are sand, gravel and stone. Chalk and limestone represent the second biggest group, with about 10% of the total production of raw materials.

The total quantity of land-based industrial minerals sand, gravel, chalk limestone, peat and clay produced in Denmark in 1998 reached 30.6 million m<sup>3</sup>. In 1999, the production increased to a total of 35.0 million m<sup>3</sup>, exceeding the production from 1990 to 1997 (which ranged from 28.5 – 31.4 million m<sup>3</sup>, falling slightly to 33.6 million m<sup>3</sup> in 2000).

The production of sand, gravel and stone reached 24.9 million m<sup>3</sup> in 1998. In 1999, the production rose to 28.4 million m<sup>3</sup>, falling to 27.4 million m<sup>3</sup> in 2000, but yet exceeding the production from 1990 to 1997 (22.5 – 24.9 million m<sup>3</sup>).

Most of the sand, gravel and stones is used for roads and construction, accounting for around 65%, with a further 30% for concrete and mortar.

In 1998, the output of chalk and limestone was 3.5 million m<sup>3</sup>, of which 2.3 million m<sup>3</sup> was white chalk used in the cement production and 0.4 million m<sup>3</sup> was for agriculture purposes. In 1999, the total production reached 3.3 million m<sup>3</sup>, and 3.4 million m<sup>3</sup> in 2000. Production for 1990 – 1997 ranged from 2.9 – 3.9 million m<sup>3</sup>.

Clay production (used for bricks and cement) declined in 1998 with an output of 779,000 m<sup>3</sup>, matching the production from 1990 to 1997 (462,000 – 803,000 m<sup>3</sup>). In 1999, the production increased to 828,000 m<sup>3</sup>, decreasing to 788,000 m<sup>3</sup> in 2000.

The production of moler (a diatomaceous deposit used for insulating purposes and granulates) reached 256,000 m<sup>3</sup> in 1998. In 1999 the production went down to 196,580 m<sup>3</sup> increasing again in 2000 to 227,000 m<sup>3</sup>, getting back to the interval of the production from 1990 to 1997 of 195,000 – 248,000 m<sup>3</sup>.

The production of quartz sands declined to 191,000 m<sup>3</sup> in 1998. Production rose to 279,000 m<sup>3</sup> in 1999, making a remarkable step to 479,000 m<sup>3</sup> in 2000.

Expanded clay (for insulating materials and light expanded aggregates) amounted to 325,000 m<sup>3</sup> in 1998. The production increased again during 1999, reaching 352,000 m<sup>3</sup>, but returned to the 1990-97 interval (303,000 – 366,000 m<sup>3</sup>) declining to 313,000 m<sup>3</sup> in 2000.

Production of peat declined to 336,000 m<sup>3</sup> in 1998 continuing this tendency through 1999 to a total of 253,000 m<sup>3</sup> and 247,000 m<sup>3</sup> in 2000, thus falling through the 1990-97 low of 399,000- 430,000 m<sup>3</sup>.

On behalf of the Dansk Undergrunds Consortium (DUC), Maersk Olie and Gas A/S produced oil and gas from off-shore fields in the North Sea. In 1989, production took place from five fields, gradually extended by seven fields to a total of 12 off-shore fields operating in 1997. In 1998, production started from the 13th field in the North Sea. At the end of 2000 oil and gas was produced from 16 fields.

In 1998, oil production was 11.8 Mt, reaching 14.9 Mt in 1999, thus exceeding the 1990-97 production range of 6.0-11.2 Mt. In 2000 production increased further to 17.7 Mt.

In 1998, the production of gas declined slightly to 7.4 billion Nm<sup>3</sup>, going up to 7.8 billion Nm<sup>3</sup> in 1999. In 2000, production was 7.9 billion Nm<sup>3</sup>. Production 1990 – 1997 ranged from 3 – 7.7 billion Nm<sup>3</sup>.

The tax rate for non energy raw materials is DK5/m<sup>3</sup>, leading to a collection on mineral rights from land-based minerals of DK153 million in 1998. DK175 million in 1999, and DK168 million in 2000. The corresponding collection for sea-based production was DK35 million in 1998, DK64 million in 1999 and DK34.5 million in 2000.

Tax and royalties from the oil and gas rights made DK2.9 billion in 1998, reaching DK3.9 billion in 1999, and DK8.3 billion in 2000.