European Carbonate Resources & Markets

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Editor, Industrial Minerals

Geology & Markets for Value-Added Carbonate Minerals
SME Dreyer Conference
8-11 October 2006, Atlanta

SA Reverte’s Macael-Cobdar marble deposit, Spain
Since 1967, the industry-recognised source for premium information on news and trends in global supply/demand of industrial minerals

“From mine to market: the world’s authority on non-metallic minerals”

Metals, Minerals, & Mining Division, Metal Bulletin, UK

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Industrial Minerals
What we do

IM covers the entire mine to market supply chain

- supply sector
- logistics sector
- consuming market sector
Industrial Minerals
How we do it

- magazines
- newsletters
- on-line
  www.indmin.com
- conferences
- books & directories

Please pick up information from our table
Outline

- Introduction
- Resources
- Production
- Market snapshot
- Summary & outlook
Introduction

“Michaelangelo is the God of Carrara – with hands of a quarry worker, the eyes of an insane, and a yearning for the infinite”
Introduction

GCC WORLD PRODUCTION BY REGION FOR 2004 (57.4 M t)

- North America: 32%
- Africa/Middle East: 2%
- Asia/Oceania: 24%
- South/Central America: 2%
- Europe: 40%

Introduction

GCC WORLD PRODUCTION BY COUNTRIES FOR 2004
(57.4 Mt)
(Eight countries account for 65% of the world's production)

USA 29%
China 10%
Others 35%
Austria 5%
Germany 4%
Japan 4%
Spain 4%
Norway 5%

Introduction

LEADING GCC PRODUCING COMPANIES IN 2004 (TOTAL 57.4 Mt)
(Top 11 Companies account for 70% of the production)

## Some major European calcium carbonate deposits

<table>
<thead>
<tr>
<th>Type</th>
<th>Country</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARBLE</td>
<td>Italy</td>
<td>Carrara – waste from block cutting used</td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>Various deposits in Molde region</td>
</tr>
<tr>
<td></td>
<td>Turkey</td>
<td>Various deposits</td>
</tr>
<tr>
<td>LIMESTONE</td>
<td>Italy</td>
<td>Avezzano – high brightness limestone</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>Bergberg</td>
</tr>
<tr>
<td>CHALK</td>
<td>France</td>
<td>Precy-sure-Oise, Paris Basin</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>Northern Germany</td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>Belograd Region</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
<td>Salisbury and Beverley</td>
</tr>
</tbody>
</table>
Production

EUROPEAN GCC PRODUCERS FOR 2004 (22.2Mt TOTAL)

- Austria: 12%
- Finland: 5%
- France: 10%
- Germany: 11%
- Italy: 9%
- Norway: 14%
- Russia: 5%
- Spain: 9%
- Turkey: 5%
- Others (16 countries): 20%

Production

## Production

<table>
<thead>
<tr>
<th>Country</th>
<th>Production Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Austria</strong></td>
<td>Omya Gummern, 2.5m. tpa marble u/g</td>
</tr>
<tr>
<td><strong>Denmark</strong></td>
<td>550,000 tpa; Faxe Kalk, Omya, Dankalk</td>
</tr>
<tr>
<td><strong>Finland</strong></td>
<td>&gt;900,000 tpa; Sumomen Karbonaati, Lapp. (51% NK:49% OM); Omya (Forby, Molde). Increasing GCC use in paper, 1.4m. tonnes 2004, from 0.47m. tonnes in 1992.</td>
</tr>
</tbody>
</table>
Production

France

>2m. tpa;
Omya, Orgon
limestone, Salses
marble;
Imerys, Precy,
Mareuil;
Provencale SA,
Salses, marble.

Provencale’s plant, S. France
Production

**Germany**
2.5m. tpa chalk & limestone; Omya 90% mkt share

**Greece**
>160,000 tpa marble & limestone; Microfill K. Zafranas, 120,000 tpa, mainly exports.

Microfill's GCC plant, Corinth, Greece
Production

Greece

Huntite CaMg$_3$(CO$_3$)$_4$
Hydromagnesite Mg$_5$(CO$_3$)$_4$(OH)$_2$.4(H$_2$O)
Kozani, N. Greece.
White Minerals
/Ankerpoort, Lefkara

Minelco Hellas SA,
Ultracarb – no mine access

White Minerals’ Lefkara mine, N. Greece
Production

Greece

WM: 500,000 t reserves;
95% products exported

White Minerals’ Lefkara warehouse, N. Greece
Production

**Italy**  
>1.8m. tpa marble & limestone; Carrara marble, waste from sculptoring in 1980s; high brightness limestone at Avezzano, south Italy; Omya, Imerys slurry GCC.

**Netherlands**  
2005: Omya 500,000 tpa plant Moerdijk, marble from Turkey.

Carmeuse’s 300,000 tpa Sacile operation, N. Italy
**Production**

**Norway**

>3 m. tpa marble, limestone, dolomite;

Hustad Group –
  Omya/local family
  Hustadmarmor AS, Molde, 3m. tpa

Verdalskalk –
  Franzefoss (55%), Faxe Kalk (35%),
  Nordkalk (10%)

Norwegian Holding –
  Hammerfall AS, (Omya, 20%), 400,000 tpa dolomite
Verdalskalk:

v. pure low met. limestone at Verdal.
120-220,000 tpa lime Hylla for PCC; 50% exported for paper;
1m. tpa PCC-grade milling plant, Havna, 400,000 tpa.
New 200,000 tpa lime plant at Verdal; mining to rise by 0.5m.
Production

Russia

small domestic supply industry – large market, 500,000 tpa; imports from Turkey, Cz.Rep, Finn.
chalk-based producers in south-west Russia, marble in Urals, limestone and dolomite widespread.
only started using marble GCC recently, paper market undeveloped for GCC, uses imported kaolin and local chalk.

most producers Russian owned, 50-60,000 tpa; SA Reverte stake in JSC Ruslime, chalk, in Belgorod; Omya marble GCC plant in Urals
Production

Spain

>2.0 m tpa; GCC mainly in Barcelona and Almeira areas.

Clariancal SA (Omya): Arbos, Tarragona; Purchena, Almeria

Marcael (Provencale): Arboleas, Almeria

SA Reverte, 1m. tpa: Castellet il La Gornal,; and Albox, Almeria
Production

SA Reverte, Castellet il La Gornal, near Barcelona, Spain
Production

SA Reverte, Albox, Almeria, Spain
Production

Sweden

>350,000 tpa; accounts for 90% mineral output;
50% supplied to cement, rest for paper/metal.

Nordkalk
SMA Group
Imerys
Omya
Production

**Turkey**

some of richest GCC reserves in world; perhaps 35% of Europe’s high brightness marble deposits.

600,000-1.2m. tpa; significant exports of crude and finished GCC to Russia, Ukraine, Europe.

three main producing areas:
1. South & west of Marmara Sea
2. South central Turkey
3. Southwestern Turkey
Production

three main producing areas:

1. South & west of Marmara Sea
2. South central Turkey
3. Southwestern Turkey
### Production

#### Turkey

main players, plus 20 further marble millers.

<table>
<thead>
<tr>
<th>Producer</th>
<th>Plant locations (with supplying mine locations where known)</th>
<th>Production capacities tpa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mikro Mineral (former Dolgu Madderleri)</td>
<td>Kocaeli, near Istanbul (mines in Bursa-Orhaneli-Yakuplar)</td>
<td>130,000</td>
</tr>
<tr>
<td>Esen Mikronize</td>
<td>Göztepe, Istanbul (mine in Yalova, Bursa area)</td>
<td>225,000</td>
</tr>
<tr>
<td>Omya AS – Gebze factory</td>
<td>Kocaeli, near Istanbul</td>
<td>120,000</td>
</tr>
<tr>
<td>Omya AS – Karabiga factory</td>
<td>Örtuluce, Canakkale (adjacent mines plus supply from Manyas area)</td>
<td>300,000</td>
</tr>
<tr>
<td>Omya AS – Kemalpasa factory</td>
<td>Near Izmir (mines in Yatagan)</td>
<td>250,000</td>
</tr>
<tr>
<td>Erciyes Mikron</td>
<td>Kayseri, central Anatolia (nearby mines)</td>
<td>75,000</td>
</tr>
<tr>
<td>Aydin Madencilik</td>
<td>Gemlik-Bursa, near Istanbul (adjacent mine)</td>
<td>70,000</td>
</tr>
<tr>
<td>Nigtas Mikronize</td>
<td>Nigde (nearby mines)</td>
<td>250,000</td>
</tr>
<tr>
<td>Hisar Maden</td>
<td>Aksaray and Aydin (mines in Nigde and Yatagan areas)</td>
<td>200,000</td>
</tr>
</tbody>
</table>
Production

Mikro Mineral, Bursa mine, Kocaeli plant
Production

**Turkey**

- Huntite \( \text{CaMg}_3(\text{CO}_3)_4 \)
- Hydromagnesite \( \text{Mg}_5(\text{CO}_3)_4(\text{OH})_2.4(\text{H}_2\text{O}) \)
- Tuz, Egidir, & Salda lakes, central Turkey
- 2005: Likya Minelco, Salda Lake – 50:50 Minelco:Likya
- 2006: Jeotek Mineral, mag/HT, Horan Golu, SW Turkey

**UK**

- 750,000; chalk and limestone deposits.
- Imerys – Beverley, Humberside, Salisbury, Wilts
- Omya – Humberside, Derbyshire
- Minelco Specialities – Fordamin, Microfine
Markets

GCC MARKETS IN EUROPE, ASIA AND NORTH AMERICA

(BASED ON MARKET SPLIT (2004) FOR PAPER, PLASTICS, PAINT AND OTHERS)

<table>
<thead>
<tr>
<th></th>
<th>North America</th>
<th>Europe</th>
<th>Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>31</td>
<td>61</td>
<td>45</td>
</tr>
<tr>
<td>Plastics</td>
<td></td>
<td>24</td>
<td>36</td>
</tr>
<tr>
<td>Paint</td>
<td>7</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Others</td>
<td>38</td>
<td>20</td>
<td>12</td>
</tr>
</tbody>
</table>

Markets

GCC growth as pre-coat and coating pigment

Increasing use of blended formulations: GCC/PCC/Kaolin

Markku Pelto, global mkt. dir., Paper PCC, SMI, Finland:
“The whole value chain is suffering as a result of increased raw material and energy costs. The key...is total system cost. Pigment solutions are required which offer more flexibility and versatility. Rather than pitching one pigment against another...an important opportunity for intelligent and creative use of pigments” PPI, May 2006
Markets

PAPER

Top coat blend examples:
1. 80% GCC, 20% kaolin
2. 40% PCC, 40% GCC, 20% kaolin

Loading increasing:
Uncoated woodfree 50-100%
Uncoated SC converting from kaolin to carbonates or blends to improve brightness

Paper growth in Europe:
GCC consumption rose from 3.1m. tonnes 1998 to 4.8m. tonnes in 2004

25 new 50,000+ tpa paper plants scheduled for start-up 2006-07 – esp. in Russia, Poland, Estonia, Latvia, Czech Republic, and Spain
Markets

PAINT

Western Europe: nanomaterials in new paints – self-cleaning, scratch-resistant, UV protection, water repellent, antimicrobial; thin film and sophisticated paints driving demand for high-tech GCC

Turkey: centred on Gebze, nr Istanbul; 600,000 tpa paint demand; 11-12% p.a. growth.

Russia: 1.05m. t 2005; 7.1% growth 2005-2010; shortage of high quality raw materials
Markets
PAINT

Central & Eastern Europe: >3m. tpa paint demand;
7.4% p.a. avg. growth, 2009 = est. 4.3m. t paint

Growth rates p.a.:
Russia    7%
Poland    6%
Turkey    11%
Ukraine   10%
Hungary   5%
Cz. Rep.  4%
Uzbekistan 2%

Source: IRL
Markets

PLASTICS

PVC

Breathable films/polyolefin

Turkey, Russia, eastern Europe.

Turkey: large plastics compounding industry for GCC; PVC pipes & profiles, booming domestic construction industry

Breathable film market: 150,000 tpa
U/F GCC, 1-2microns, surface treated
Hygiene, agricultural, and construction sectors
Markets
PLASTICS

Huntite/hydromagnesite/brucite/Mg(OH)$_2$

Flame retardants in plastics eg. wire & cable, laptops, autoplastics

12,000 tpa est. Euro market; future growth as replacement in halogen-free FR.

Limited to high end market, still emerging

Dependent on new technology innovation in use

Auto mkt growth potential: 1-2km W&C/car = 4-6kg polymer compound;
2002 Europe 17m. cars = 68,000 t W&C @50% MHD loading = 34,000 t
2002 Asia 14m. Cars = 56,000 t W&C @50% MHD loading = 28,000 t

Est. 2010, global FR chemicals market = $4,600m.
Summary & Outlook

• Europe will continue to be major area of GCC production

• Paper will remain dominant end market – trend to high brightness, fine grained GCC grades; trend to marble use.

• Emphasis on “solution package pigments/fillers” will drive GCC producers to mineral blends, and therefore expanded production portfolios, eg. GCC/PCC/kaolin; recent Huber PCC buy by Omya

• Turkey will emerge as significant supplier of marble GCC/HT/HYM

• Turkey/Russia/C&E Europe grow in importance as market growth areas in paint & plastics (poss. host new supply sources?)

• FR will remain “holy grail” of MHD suppliers; nanotechnology potential

• China/East Asia to seriously influence future as dominant supplier & market for GCC
Thank you for listening

paper available @ www.indmin.com