REPORT R80/2009

SPECIAL CLAYS INDUSTRY IN THE REPUBLIC OF SOUTH AFRICA, 2009

DIRECTORATE: MINERAL ECONOMICS

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

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1. INTRODUCTION

The aim of the study is to research and report on the clays industry in South Africa. The report will focus on clays termed special clays namely attapulgite, bentonite and kaolin.

The term clay is somewhat ambiguous unless specifically defined, because it is used in three ways: as a diverse group of fine-grained minerals, as a rock term, and as a particle size term. As industrial minerals, clays are a complex group that consists of several mineral commodities, each having somewhat different mineralogy, geologic occurrence, technology and uses. The most complete definition for the term clay was proposed by the Association Internationale Pour l'Etude des Argiles (AIPEA) stating that clay is a naturally occurring material composed primarily of fine-grained minerals, which shows plasticity through a variable range of water content, and which can be hardened when dried and/or fired.

Clay has plasticity properties when mixed with water at certain proportions; which makes it suitable for making pottery. It is also used in ceramics, bricks, cooking pots, art, dishware and musical instruments. Industrial uses of clay are in paper making, cement production and chemical filtering. Recent studies have investigated clay's adsorption capacities in various applications such as the removal of heavy metals from waste water and air purification. In environmental studies it is important to know the adsorption process of heavy metals in clay minerals, since they are able to immobilize these metals. It was found that natural bentonite could be used effectively for the removal of zinc ions from aqueous solutions.

Clay minerals are typically formed over long periods of time by gradual chemical weathering of rocks, usually silicate-bearing, by low concentrations of carbonic acid and other diluted solvents. Clay deposits may be formed in place as residual deposits, but thick deposits usually are formed as a result of a secondary sedimentary deposition process after they have been eroded and transported from their original location of formation.

2. ATTAPULGITE

Attapulgite is a magnesium aluminium phyllosilicate with formula $(Mg,Al)_2Si_4O_{10}(OH)\cdot 4(H_2O)$ which occurs in white or greyish colours (Fig.1 and 2). Alternative names are palygorskite and fuller's earth. Attapulgite has gelling, sorptive and bleaching properties. Attapulgite and sepiolite are the principal fuller's earth deposits along with some montmorillonite-based bentonite clays. Attapulgite is a hydrated alumino-magnesium silicate with an elongate morphology and an ideal formula with Mg partially replaced by Al or even Fe.

FIGURE 1: ATTAPULGITE CLAY

Source: mindat.org

FIGURE 2: ATTAPULGITE

Source: mindat.org

2.1. World Occurrences

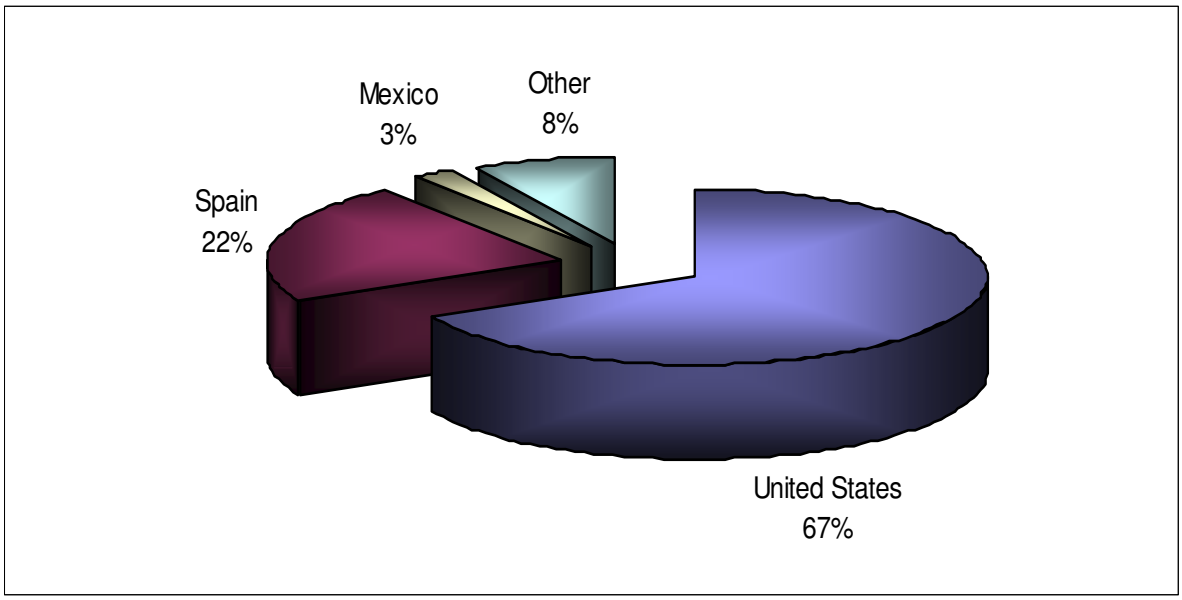
Resources of attapulgite form in various geological environments. They occur from Mediterranean-type climate prevalent during certain geological terms, as chemical sediments or from the construction of clays during diagenesis, in open oceans by hydrothermal alteration of basaltic glass, volcanic sediments or clays and in marine deposits by slumping and turbidity currents transporting near-shore materials.

Reserve information is relatively sparse for active deposits but no companies have indicated that they will run out of reserves any time soon. Large resources have been identified in China and a few other locations so those should prevent shortages in the distant future, if developed. Countries with the largest reserves are United States (US), Spain, Senegal, India, Russia, Australia and Ukraine, with small production from Turkey, South Africa and France.

2.2. World Supply and Demand

World Attapulgite production was estimated at 3.9 Mt in 2008. Major producers are United States (67 percent) and Spain (22 percent) – Fig.3. The leading exporter is United States with small volumes from Senegal and Australia. Major importers are Canada, Netherlands, United Kingdom, Italy, Germany and Japan.

FIGURE 3: WORLD PRODUCTION OF ATTAPULGITE, 2008



Source: USGS, 2008

2.3. World Trade

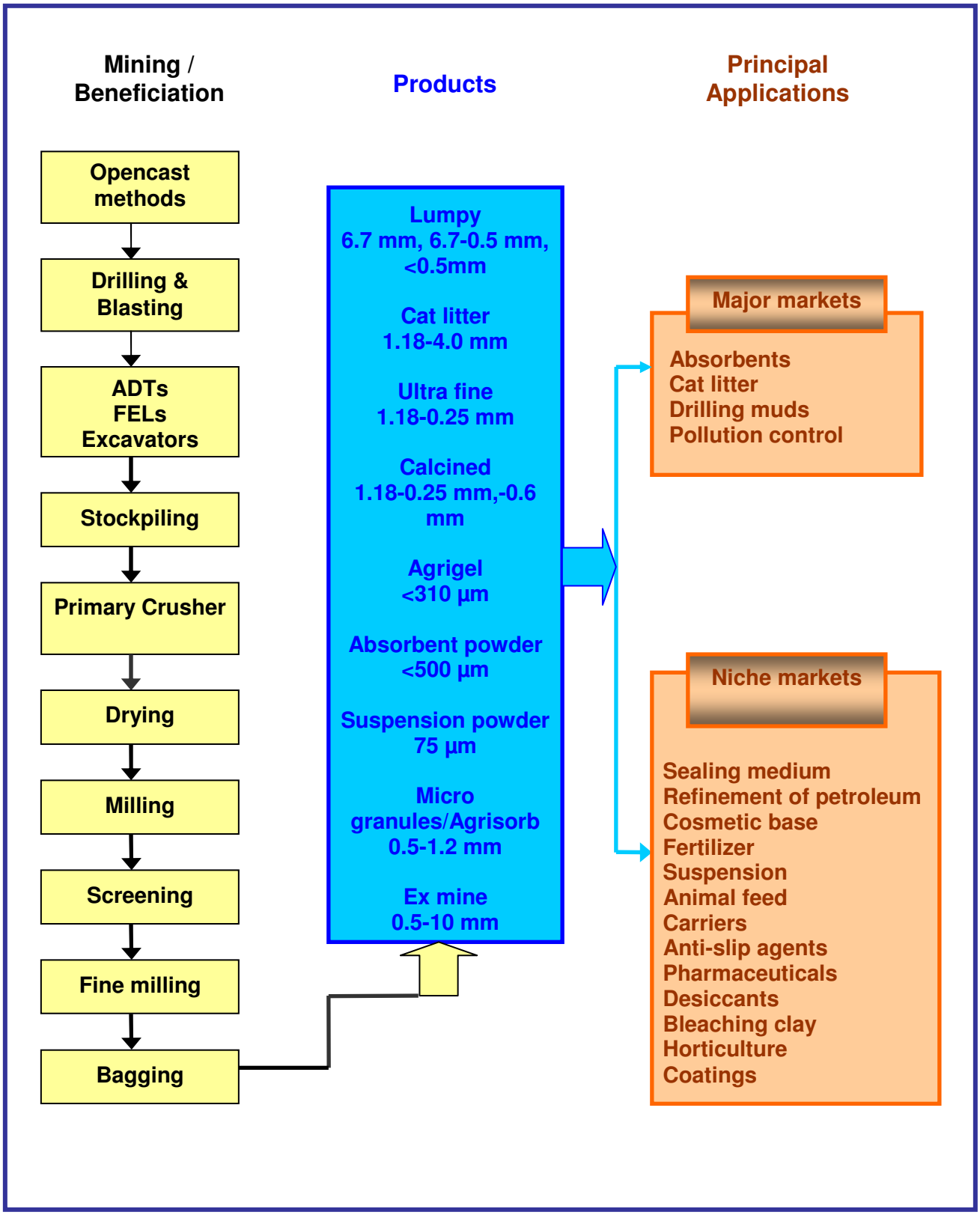
Attapulgite is included under a general Harmonized Tariff Schedule code for fuller's earth and decolorizing earths. Consequently, it is not possible to know if the trade is for montmorillonite-type fuller's earth, attapulgite, or sepiolite. Producers in Spain and Senegal were reported to focus on the European market. Production in Australia reportedly focuses on Asian markets. U.S. producers service mainly North American markets but probably also some in South America.

2.4. South African Production and Markets

In South Africa the biggest attapulgite producer is Atta Clay in Lydenburg, Mpumalanga Province. Other attapulgite producers are Arleco Mining (owned by Meyers Minerals) in Mokopane, Limpopo Province, Matutu Absorbents and Dwaalboom Attapulgite (owned by G & W Base and Industrial Minerals) in Rustenburg, North-West Province.

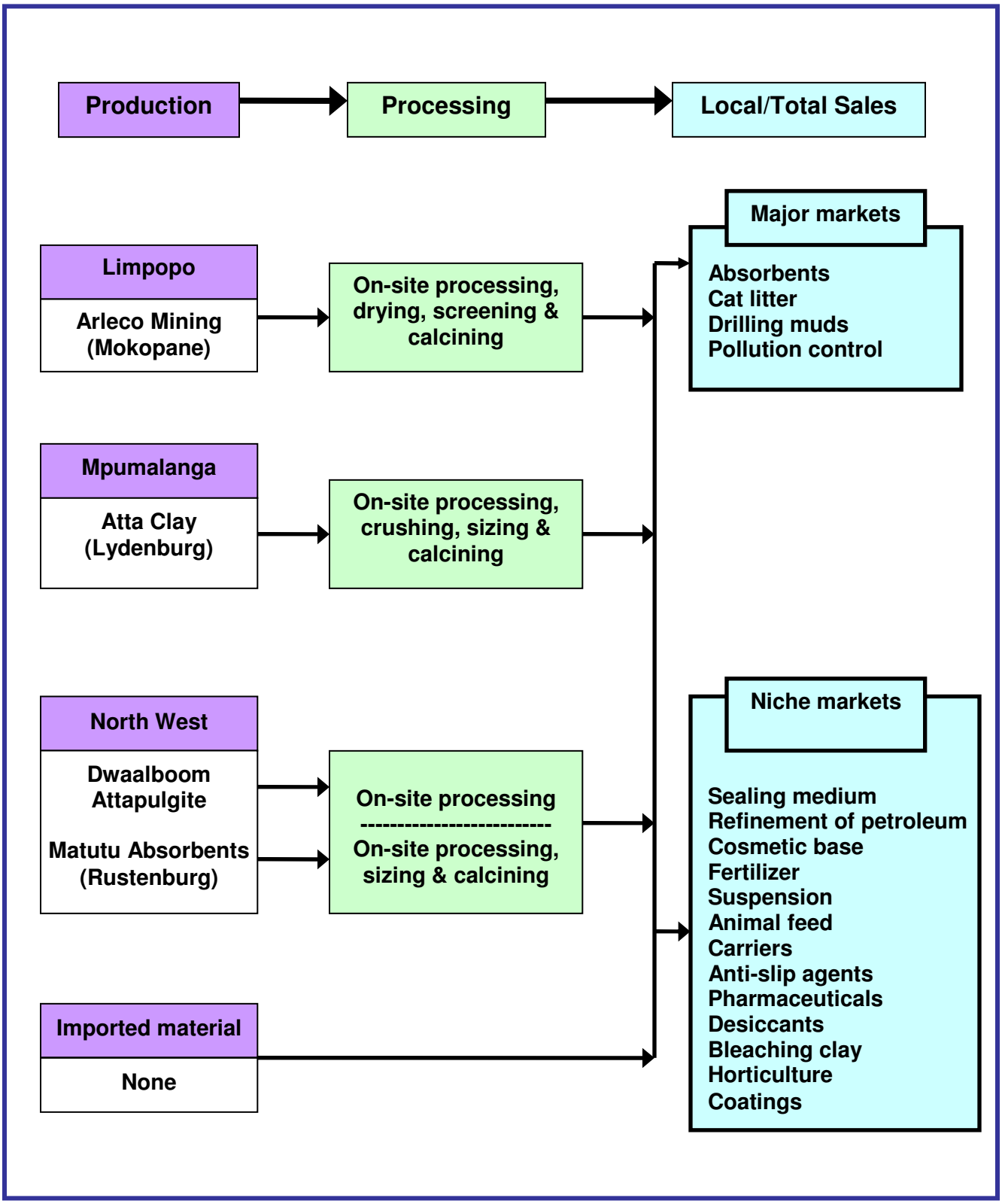
Processing is done by simple methods of crushing, drying, classification and pulverization; after processing the product is often divided into gellent or colloidal and sorptive grades. Additional treatment may include extrusion to improve viscosity in drilling muds, heating to yield low volatile clay for improved sorbent properties and ultra fine pulverization to enhance suspension properties in pharmaceuticals (Fig.4). The properties of attapulgite influence their applications or uses. Main applications are in drilling muds, coatings, pet litter, animal feed, floor absorbents, horticulture, pharmaceuticals, dessicant, bleaching clay, fertilizer, oil pollution control, carriers and anti-slip agents (Fig.5).

FIGURE 4: ATTAPULGITE INDUSTRY FLOWCHART



Source: DME Mineral Economics

FIGURE 5: ATTAPULGITE INDUSTRY AND COMPANY STRUCTURE

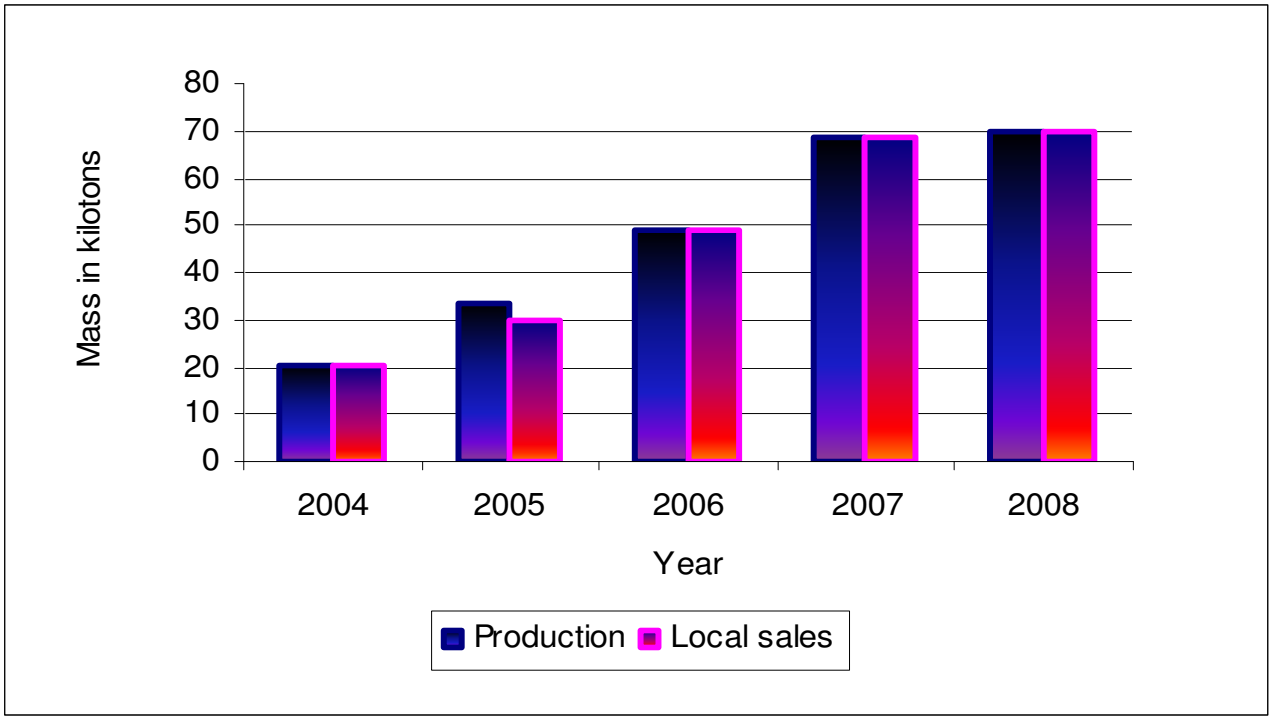


Source: DME Mineral Economics

2.5. South African Supply and Demand Trends

South African production of attapulgite increased at an average annual growth rate of 31.7 percent over the last 5 years and reached 69.9 kt in 2008 and this is attributed to ferrochrome pelletising (Fig.6). Local sales mass increased by an average annual growth rate of 33.1% over the past five years.

FIGURE 6: SOUTH AFRICAN ATTAPULGITE SALES BY VOLUME, 2004-2008



Source: DME Mineral Economics

3. BENTONITE

Bentonite is a colloidal, alumino-silicate clay derived from weathered volcanic ash and largely composed of montmorillonite (Fig.7). Bentonite consists of aggregates of flat platelets that have a high specific surface area, high plasticity, expand when wet; and are inert and non-toxic. Uses of bentonite include thickening and/or suspension agents in drilling muds, sealants, paint pigments, clarifying agents and pesticide carriers; as a binder in metallurgical uses, and as an absorbent in cat litter applications.

FIGURE 7: BENTONITE

Source: wikipedia bentonite

3.1 World Occurrences

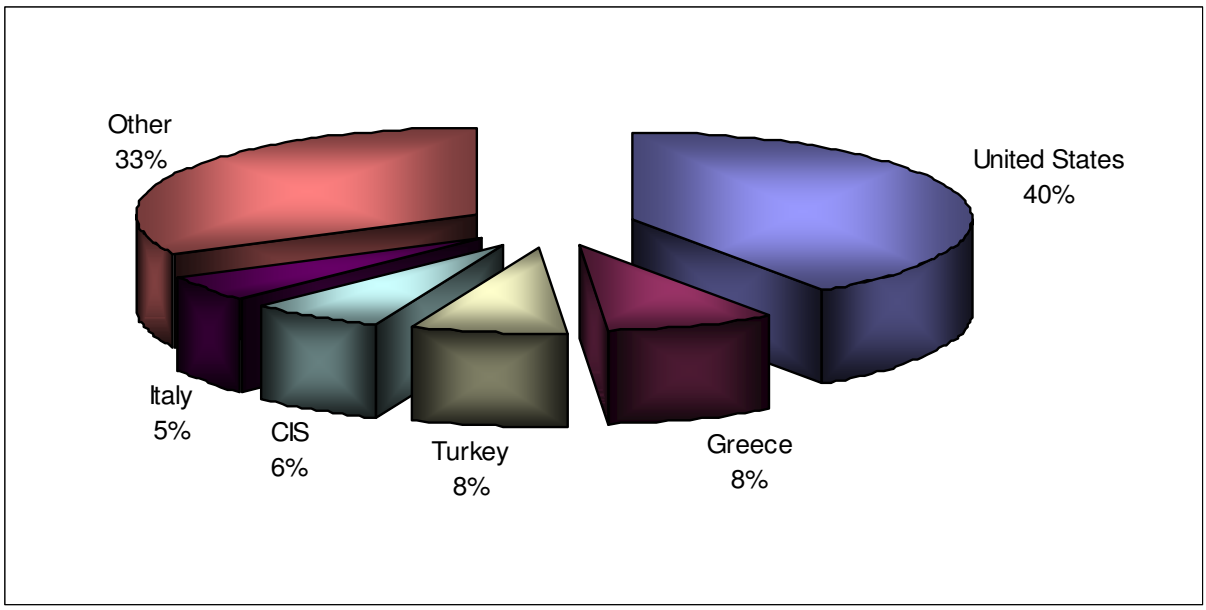
Bentonite is typically found as beds in marine and non-marine strata ranging in age from Jurassic to Pleistocene. These beds which tend to be parallel to the overlying and underlying strata, range in thickness from several centimeters to tens of meters and can be geographically very extensive. Bedded bentonite can also occur as small lens shaped bodies with a limited lateral extent. A less common occurrence of bentonite is as irregular shaped bodies that grade into unaltered host rock.

Bentonite ranges in color from white, yellow, olive green, brown and blue. It is characterized by its soapy texture and waxy appearance. Bentonites form through the in situ alteration of silica-rich volcanic rocks, possibly through deposition of volcanic ash in seas or lakes, the weathering of tuffs, or the reworking of bentonite in alkaline environment.

3.2. World Supply and Demand

World bentonite production was estimated at 12.0 Mt in 2008. US (40 %) is the world's biggest producer followed by Greece (8%) and Turkey (8%) – Fig.8.

FIGURE 8: WORLD PRODUCTION OF BENTONITE, 2008



Source: USGS, 2008

The major world and US bentonite producer is American Colloid Co. (Amcol), producing over 2 Mt per year of bentonite from all of its US operations; the second largest producers in Europe are Silver and Baryte Industrial Minerals of Greece and Sud-Chemie of Germany, producing over 1 Mt per year each. The principal world markets for bentonite are in foundry, oil drilling and cat litter uses. Car manufacturing and infrastructure projects drive the foundry markets in India and China, while high tech products drive the European foundry markets, especially in Germany. Global eating trends towards healthy foods means bleaching earths gain as customers consume more vegetable oils rather than animal fats, while clarification of biofuels emerges as another potential markets. Major exporting countries, in descending order of volume, are Greece, USA, Italy, the Netherlands and China, accounting for about 65% of world bentonite exports.

Companies worldwide have idled a lot of capacity due to lower demand resulting for recessionary market conditions.

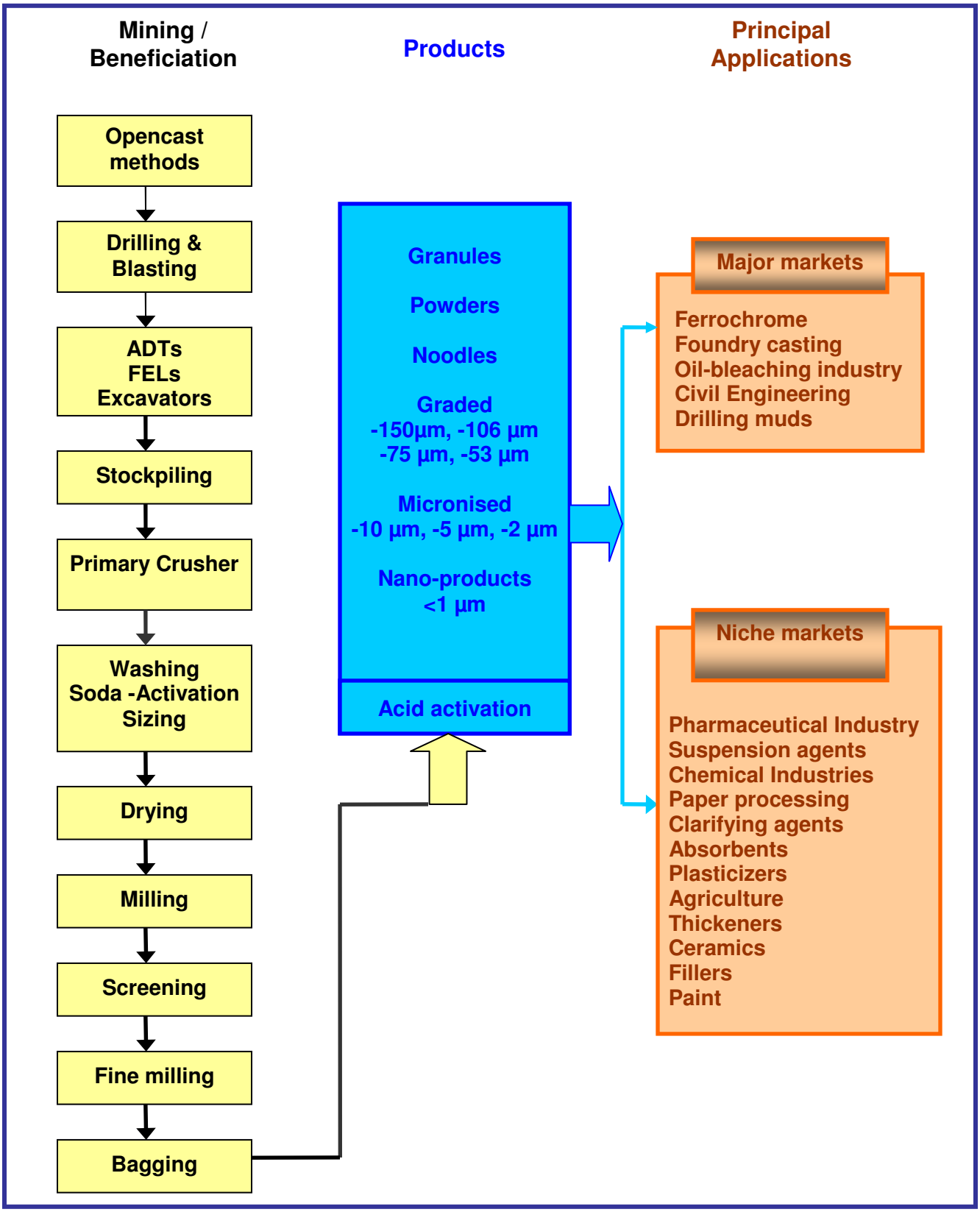
3.3. South African Production and Markets

Production centres are limited to the Koppies (Free State) and Heidelberg (Western Cape) regions at present. The remote location of bentonite mines has attracted secondary processing plants as well as depots/ warehouses to be positioned much closer to major consumers, particularly chrome producers and foundries.

Mined bentonite is stockpiled to reduce water and other volatiles before drying, then grinding using roll and hammer mills or rods in the rotary dryers. Most bentonite is shipped as a 90 % minus 75 microns product although further treatment is done at some stages. Treatment is done with organic acids to dissolve impurities to form acid-activated montmorillonite with open platelet edges, increased pore diameter and enlarged surface area (Fig.9).

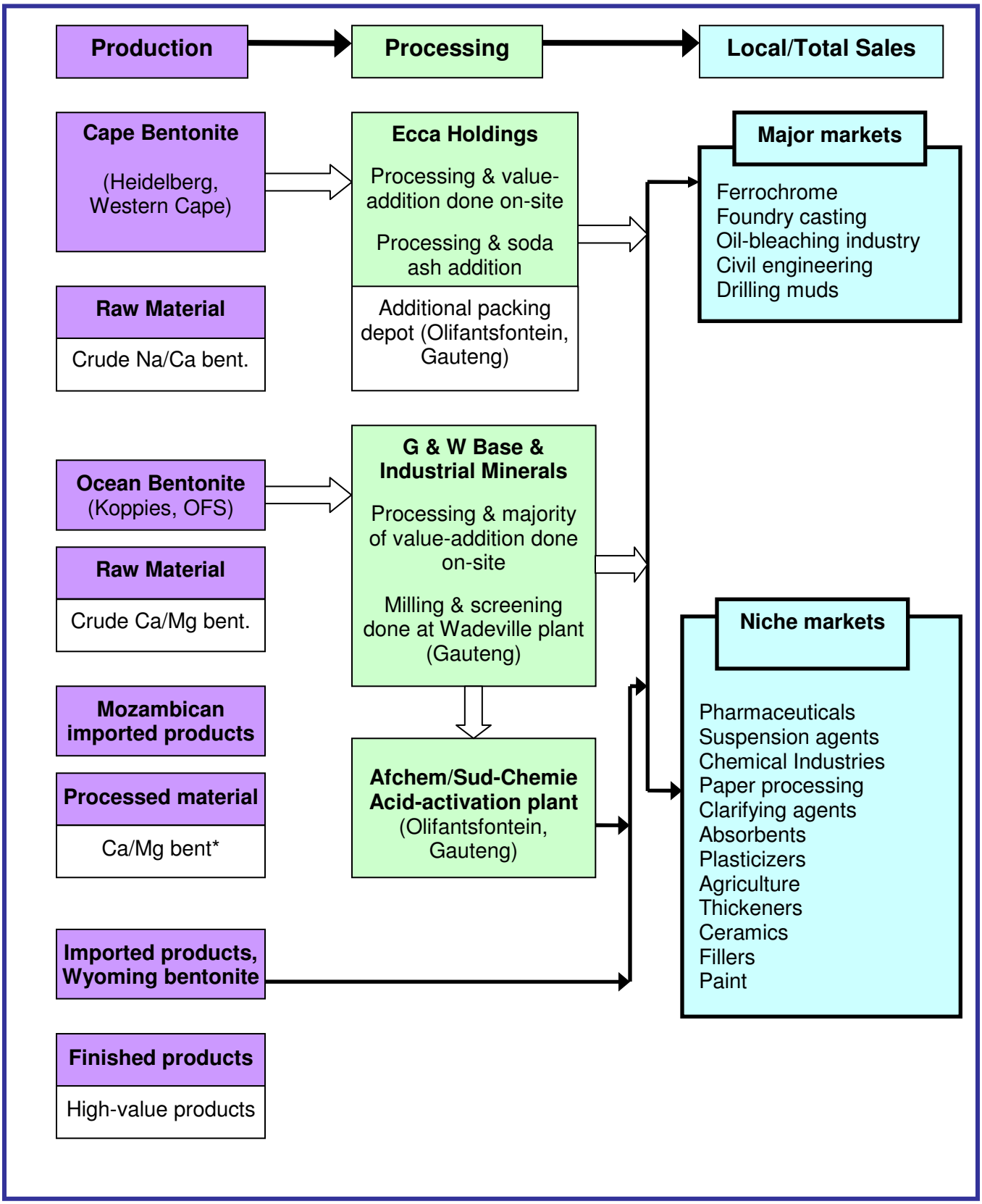
Major markets are the ferrochrome, foundry, drilling muds, civil and oil bleaching applications, which account for 91% of total sales. Growth markets include civil/ environmental (particularly import replacements, water retention and treatment), medicinal, aquamarine, nanoplastics, fibre technologies, pulp and paper manufacturing and composite material manufacturing that includes TiO_2 composites (dye-removal), copper citrate composites (wine-clarifying) and bentonite sandwiches (civil applications) that will ensure real sales growth over the next 5-10 years (Fig.10).

FIGURE 9: BENTONITE INDUSTRY FLOWCHART



Source: DME Mineral Economics

FIGURE 10: BENTONITE INDUSTRY AND COMPANY STRUCTURE

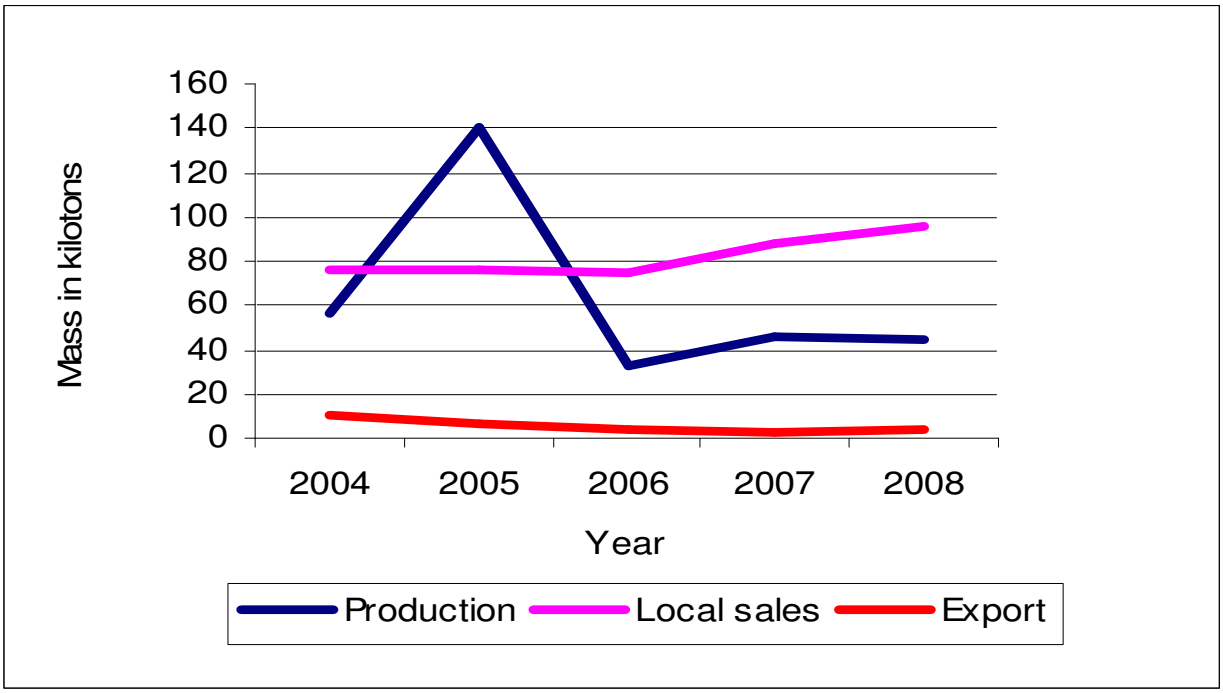


Source: DME Mineral Economics

3.4. South African Supply and Demand Trends

DME statistics indicate that bentonite production growth trends for the past five years declined by 15.9 percent from 55.9 kt in 2004 to 44.1 kt in 2008 because of suspension of Plettenberg mine, as a result of deposits being too deep (Fig.11). Local sales volume increased by 6.2 percent from 75.4 kt in 2004 to 96.1 kt in 2008 and local sales value increased by 15.2 percent from R35.7 million in 2004 to R64.7 in 2008 due to the demand in ferrochrome industries, where bentonite is used to make pellets (Fig.11 and 12). Local sales is more than production due to campaign mining, whereby producers mine and stockpile, them stops production for a certain period, then after process from the stockpile.

FIGURE 11: SOUTH AFRICAN BENTONITE SALES BY VOLUME, 2004-2008



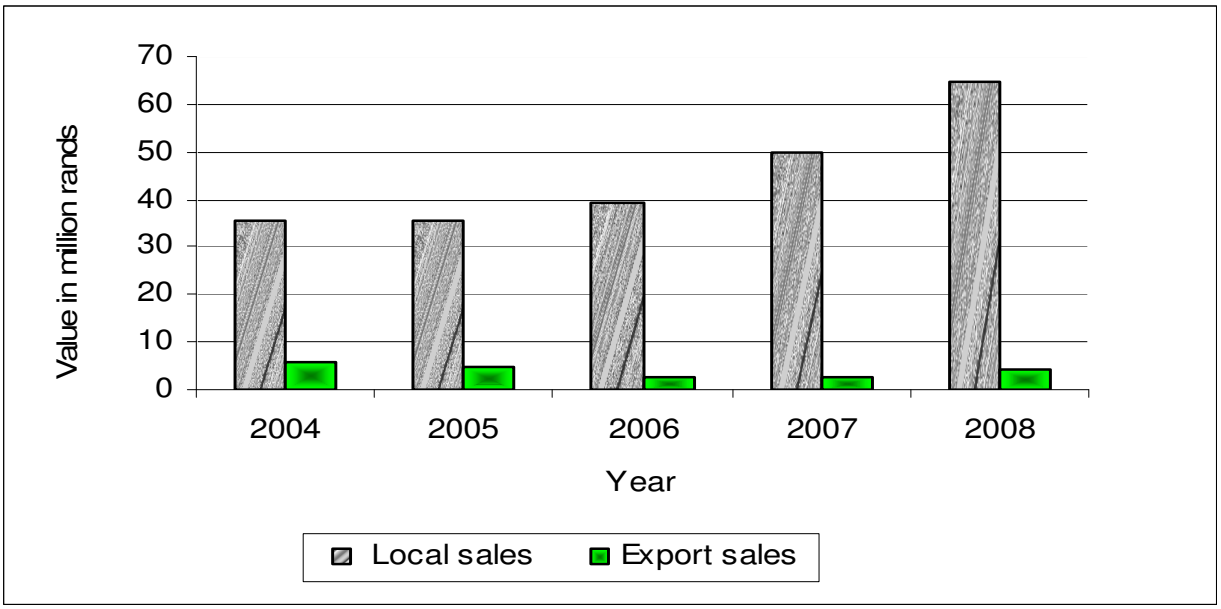
Source: DME Mineral Economics

Exports sales volume declined by 30.1 percent from 10.5 kt in 2004 to 3.4 kt in 2008. Similarly, exports sales value also declined by 12.8 percent from R6.0 million in 2004 to R4.4 million in 2008 (Fig.11 and 12). The decline was attributed to stiff competition from cheaper Chinese products on world markets

More than 75% of bentonite consumed in South Africa is produced by two opencast mines – Cape Bentonite (owned by Ecca Holdings) near Heidelberg, in the Western Cape and the Ocean Bentonite mine (owned by G & W Base & Industrial Minerals) near Koppies, in the Free

State. The Plettenberg Bay mine (part of the G & W Base group) near Knysna (Western Cape) officially closed in 2001 is being rehabilitated. Reserves of bentonite are in excess of 8 Mt although not all of it is considered to be economically mineable.

FIGURE 12: SOUTH AFRICAN BENTONITE SALES BY VALUE, 2004-2008



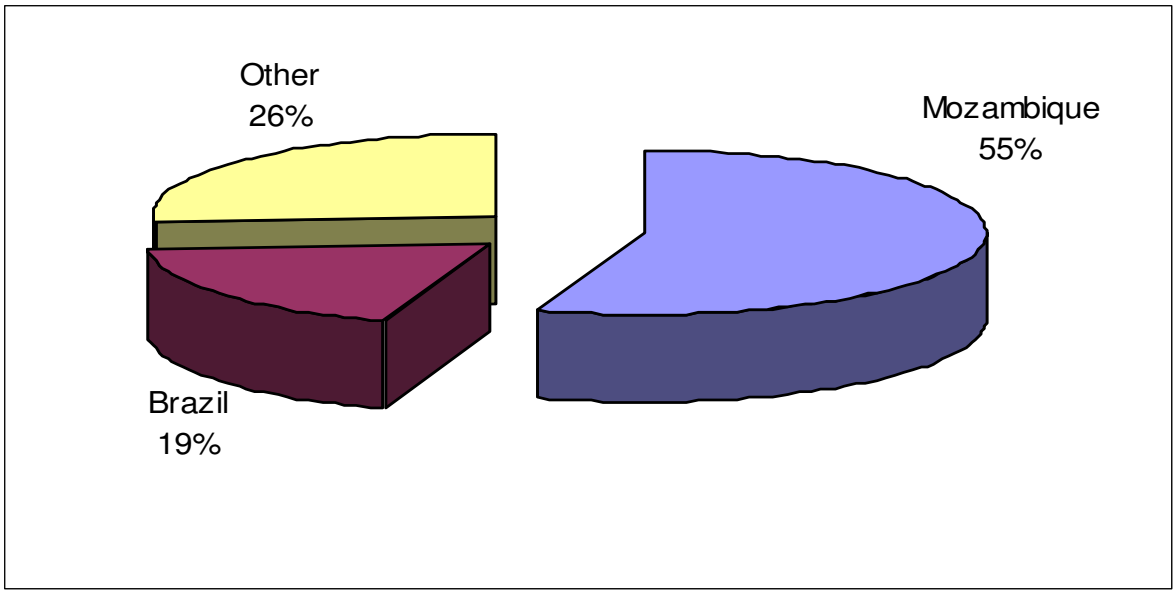
Source: DME Mineral Economics

3.5. South African Trade

South Africa's exports are negligible compared to world totals. In 2008, bentonite exports amounted to some 3.4 kilotons with a value of R4.4 million. Target markets include the oil and civil industries. Exports are shipped to France, United Kingdom, Congo and Angola. About 60% of locally manufactured, acid-activated clays are exported – major markets include sunflower- and mineral oil refining.

Bentonite imports mass increased by 7.7 percent to 19.6 kt in 2008, compared to 2007, while imports value increased by 13.5 percent to R38.4 million compared with R33.9 million in 2007. Major imports, in descending order of magnitude, were from Mozambique and Brazil (Fig.13). Protea Chemicals is the importer of bentonite into South Africa.

FIGURE 13: IMPORTS OF BENTONITE, 2008



Source: SARS

4. KAOLIN

Kaolin is a soft, white, plastic clay, comprising several minerals, the most important being kaolinite (Fig.14 and 15). All kaolin minerals are hydrated alumino-silicates and generally occur along with varying amounts of impurities such as feldspar, mica, quartz and iron oxide. There are numerous separate but very similar minerals such as montmorillonite, pyrophyllite and allophane. Kaolinitic clay would undergo additional processing after washing. Hydro-cycloning and classifying may be used. The fine kaolin is then retained for the paper industry and the coarse kaolin for the filler industry.

FIGURE 14: KAOLIN

Source: mindat.org

FIGURE 15: KAOLIN ROCK

Source: mindat.org

4.1. World Occurrences

Kaolin group minerals include kaolinite, by far the most common, along with dickite, nacrite and halloysite, all hydrous alumino-silicates, and are all in the monoclinic or triclinic crystal classes. One of the important mineralogical characteristics of kaolin clay in industrial applications is its softness or lack of abrasivity.

Kaolinite occurs as micron size (one micron is one-thousandth of a millimeter) pseudo-hexagonal crystal plates, Kaolinite may also occur as thick stack-like crystals which may be many times longer that their diameter, at times even in a strange vermicular shapes.

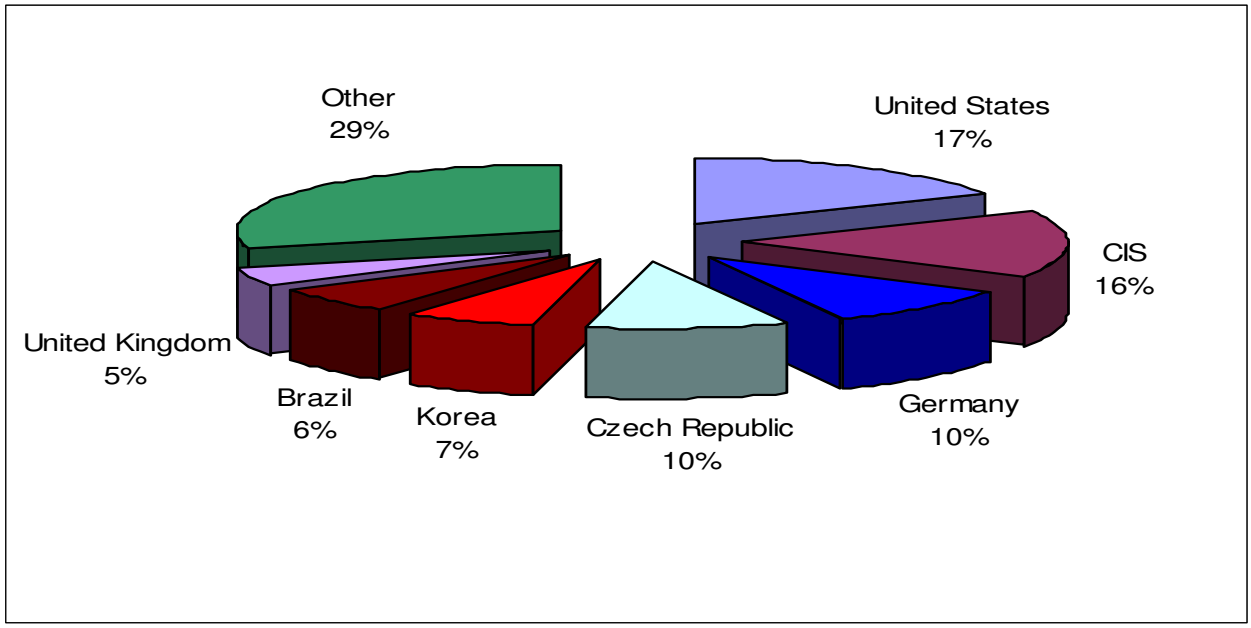
Kaolin forms through the alteration (kaolinization) of anhydrous aluminium silicates in feldspar-rich rocks like granite by weathering or hydrothermal processes. Final composition of kaolin depends on the parent rock and the type and degree of alteration.

4.2. World Supply and Demand

Total world kaolin production declined by 0.7 percent as a result of lower demand in world paper markets and lower construction activity.

South Africa is ranked 30th in the world production of kaolin and contributes 0,2 percent to world production. The USA, CIS, Germany and Czech Republic are the largest kaolin and together, account for about 53 percent of world production (Fig.16). In 2008, the major kaolin exporters, in descending order, were the USA, UK, Brazil and China. The major world kaolin producer is Imerys of the US, which has a production capacity of nearly 5 Mt per year. Other major kaolin producers include Huber Engineering materials and Engelhard (both in the USA) and CADAM and Para Pigmentos (PPSA) in Brazil.

FIGURE 16: WORLD PRODUCTION OF KAOLIN



Source: USGS, 2008

World kaolin consumption is influenced by the paper market (and indirectly print advertising), which accounts for 45% of world demand. Three kaolin production areas dominate the world markets. These are the sedimentary kaolins in Georgia and South Carolina (both in the USA); the primary kaolins in the Cornwall area (England); and the sedimentary kaolins in the lower Amazon basin (Brazil).

4.3. South African Production and Markets

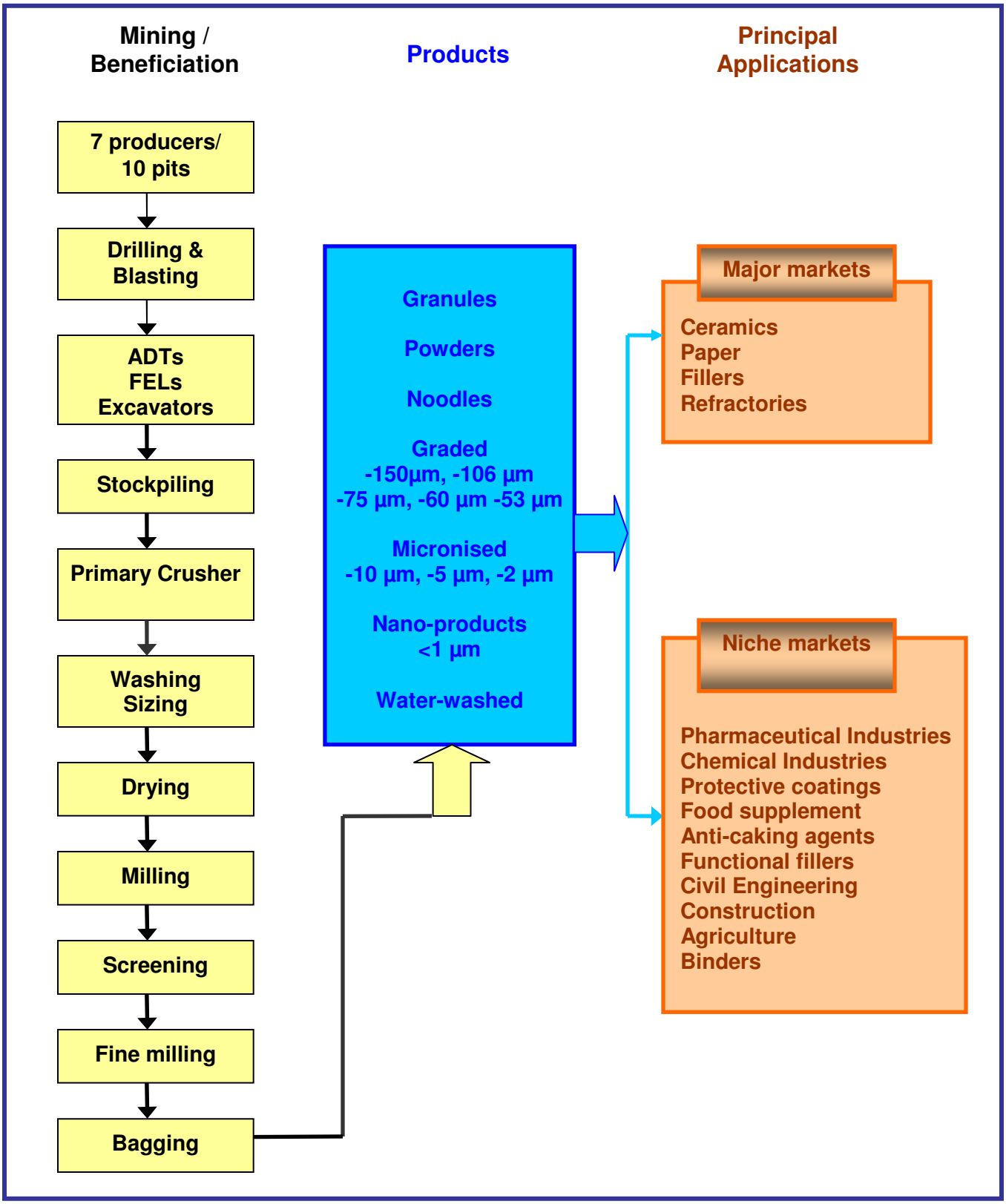
South African kaolin biggest producer is Strowan Kaolin (owned by G & W Base & Industrial Minerals) in Albany, Eastern Cape Province. Other producers are Leolorde Farming and Mining in Bronkhorstspruit, Gauteng Province, Mayfield Mine (owned by East Cape Quarries) in Albany, Eastern Cape Province, Ndebele Mining in Bronkhorstspruit, Gauteng Province, Atlas Clay in Potchestroom, North West Province, Glenhoek Mine (owned by East Cape Quarries) in Albany, Eastern Cape Province and Kleihoogte Mine in Albany, Eastern Cape Province.

Kaolin is processed by crushing, drying, pulverizing, and air flotation whereby kaolin is pulverized and separated from its abrasive grit mineral impurities on a moving column of air. Wet processing or water washing removes the non-kaolin minerals from clay slurry minerals. After brightening by chemical, magnetic, flotation or flocculation methods, the kaolin is re-

blunged, re-dispersed and spray dried to prepare the final products which are shipped as either dry powder or 70% solids slurry (Fig.17).

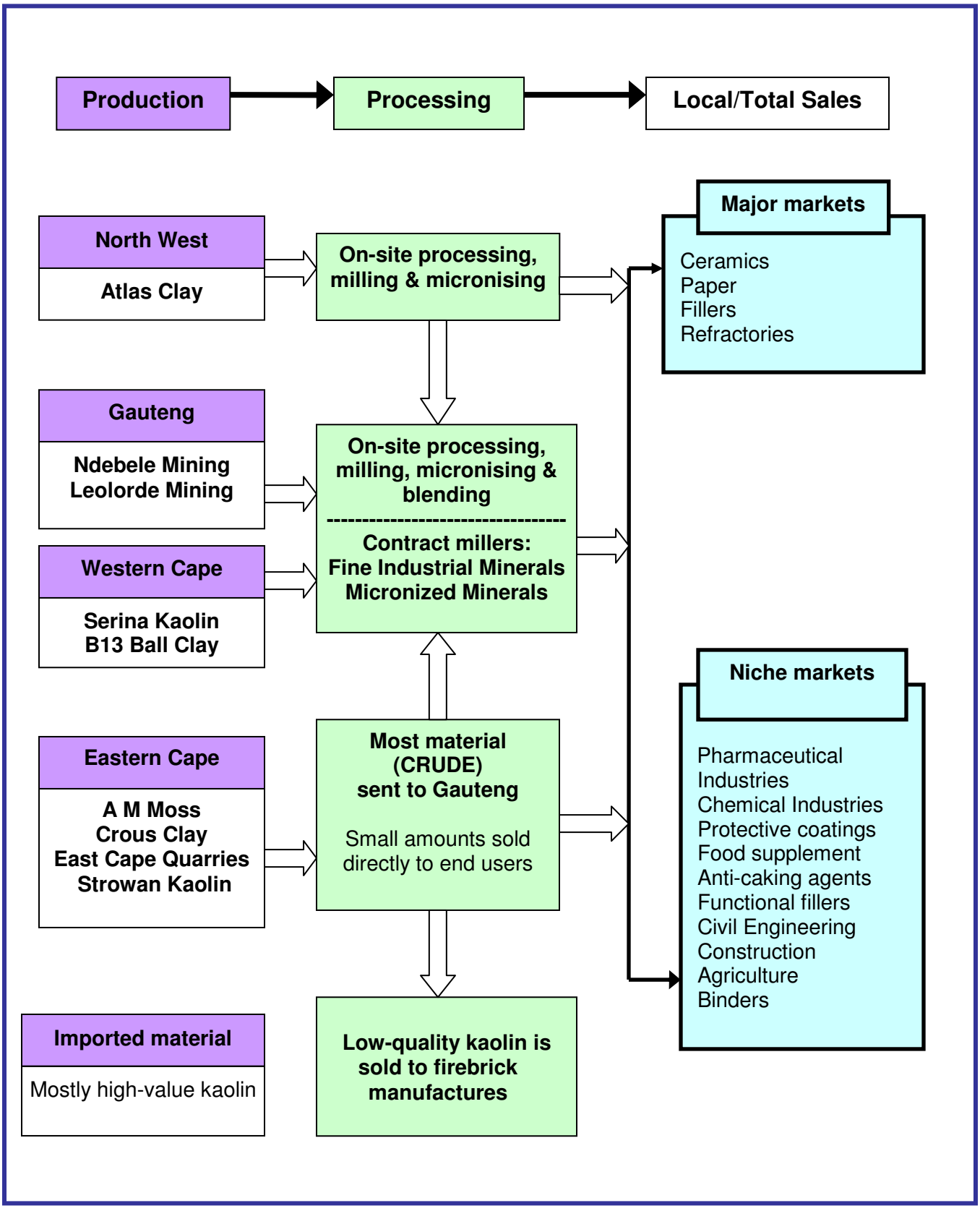
Kaolin is used as filler in paper, plastics, paint, rubber, soap and adhesives; as a carrier of chemicals and cosmetics; and in the ceramic and refractory industries. Various properties, such as colour (whiteness and brightness), rheology, grain-size distribution, dry and green strengths, loss on ignition, pH, moisture absorption and modulus of rupture are some of the important properties considered when evaluating kaolin products and deposits. Several new growth markets include fuel cell applications, ceramic armour protection, industrial coatings and wear/ chute linings, nano-composites, acid functional fillers and additives, reinforced fillers, composites, and optical brightening agents (Fig.18).

FIGURE 17: KAOLIN INDUSTRY FLOWCHART



Source: DME Mineral Economics

FIGURE 18: KAOLIN INDUSTRY AND COMPANY FLOWCHART



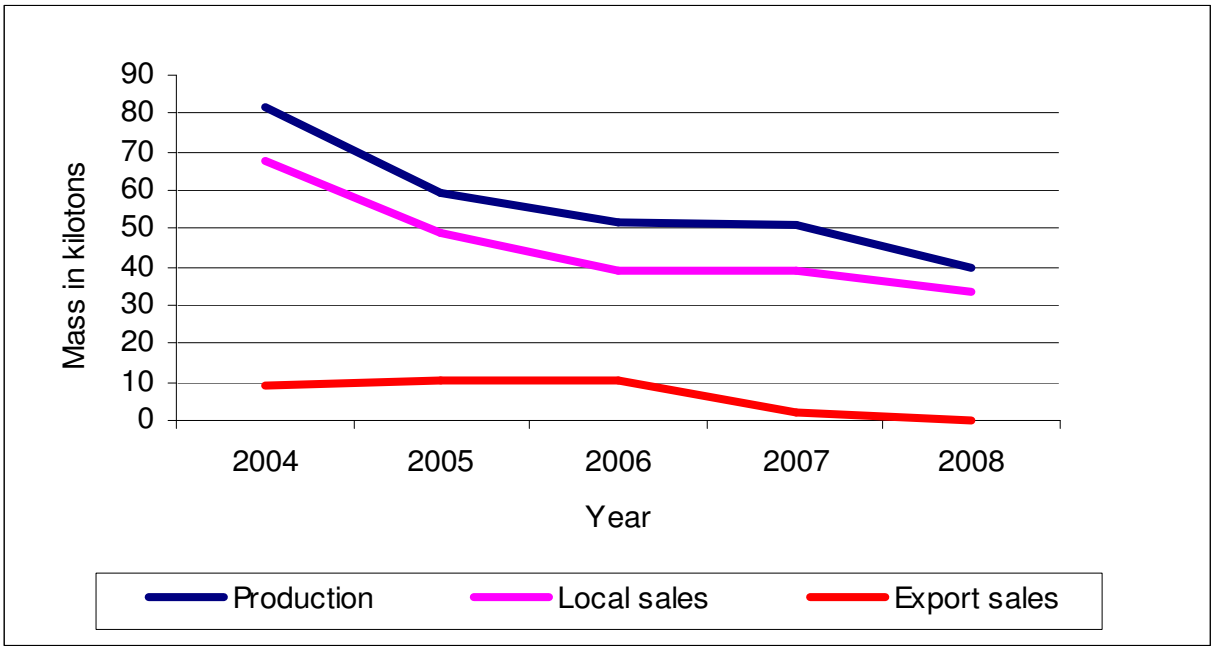
Source: DME Mineral Economics

4.4. South African Supply and Demand Trends

Kaolin production fell by 16.1 percent from 81.9 kt in 2004 to 39.5 kt in 2008 (Fig.19). Local sales volume declined by 16.1 percent from 67.8 kt in 2004 to 33.8 kt in 2008, while local sales value declined by 39.8 percent from R42.9 million in 2004 to R9.2 million in 2008 (Fig.19 and 20). Calcium carbonate, classified into Ground Calcium Carbonate (GCC) and Precipitated Calcium Carbonate (PCC), is proving to be a tough contender to kaolin and other traditional products.

The significant decline in supply from 2004 onwards is because of mass substitution, the closure of several large ceramic manufacturing plants and an increase in imports of raw, semi-processed and finished products. The latter would include alumina and bauxite products, high-quality kaolins, chinaware, tableware, earthenware, tiles and sanitaryware. Most producers are operating at 40 - 65% of their installed plant capacity. Several producers are applying just-in-time techniques to minimise inventories and have switched over to campaign mining to minimise mining costs.

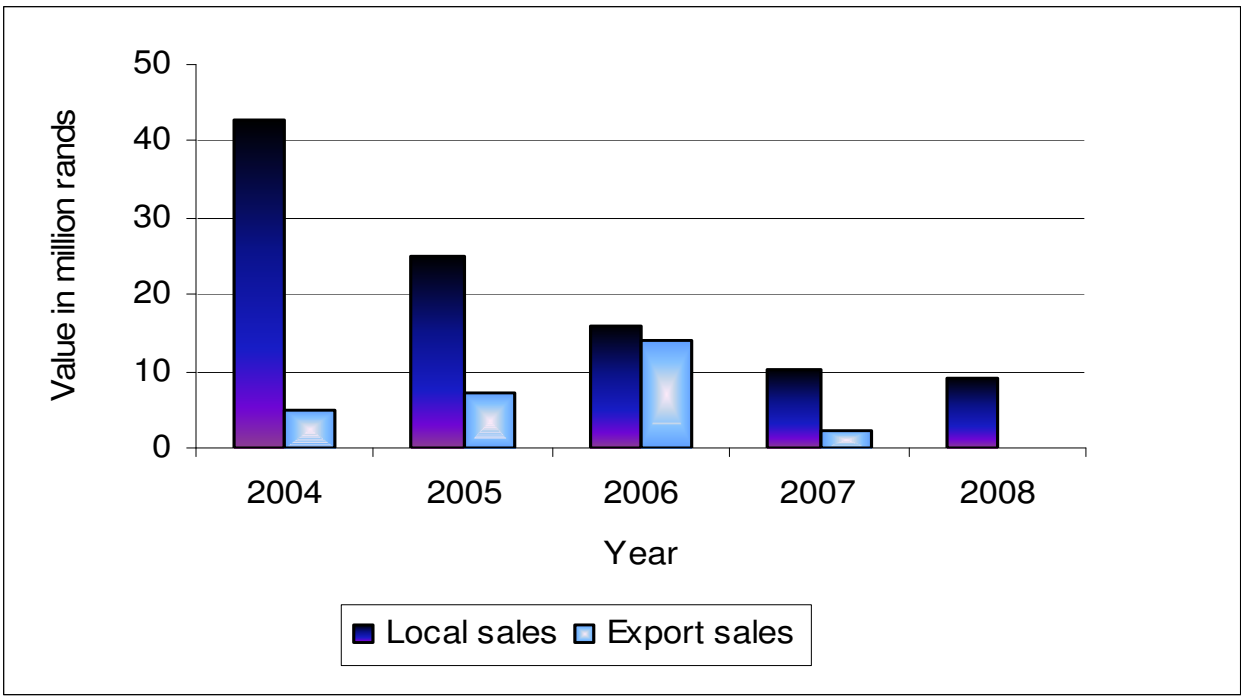
FIGURE 19: SOUTH AFRICAN KAOLIN SALES BY VOLUME, 2004-2008



Source: DME Mineral Economics

Paper industry which forms major end use industry from kaolin, is moving towards calcium carbonate due to the latter's high adaptivity to alkaline technology and cost effectiveness (Fig.19 and 20).

FIGURE 20: SOUTH AFRICAN KAOLIN SALES BY VALUE, 2004-2008



Source: DME Mineral Economics

Fillers and ceramics are the major market drivers for kaolin (kaolin is not used as paper filler since May 2005). The rapid decline in production volumes has been attributed to several factors namely: escalating transport costs to Gauteng, the closure and/ or consolidation of many local ceramic plants and an oversupply of cheap Chinese imports (both raw material and finished articles). Kaolin substitutes are application specific and include: ground calcium carbonate (GCC) replacing kaolin fillers in the paint, plastic and rubber industry; precipitated calcium carbonate (PCC) in paper fillers and coating applications, plastic clays and fireclays in ceramic bodies and refractories.

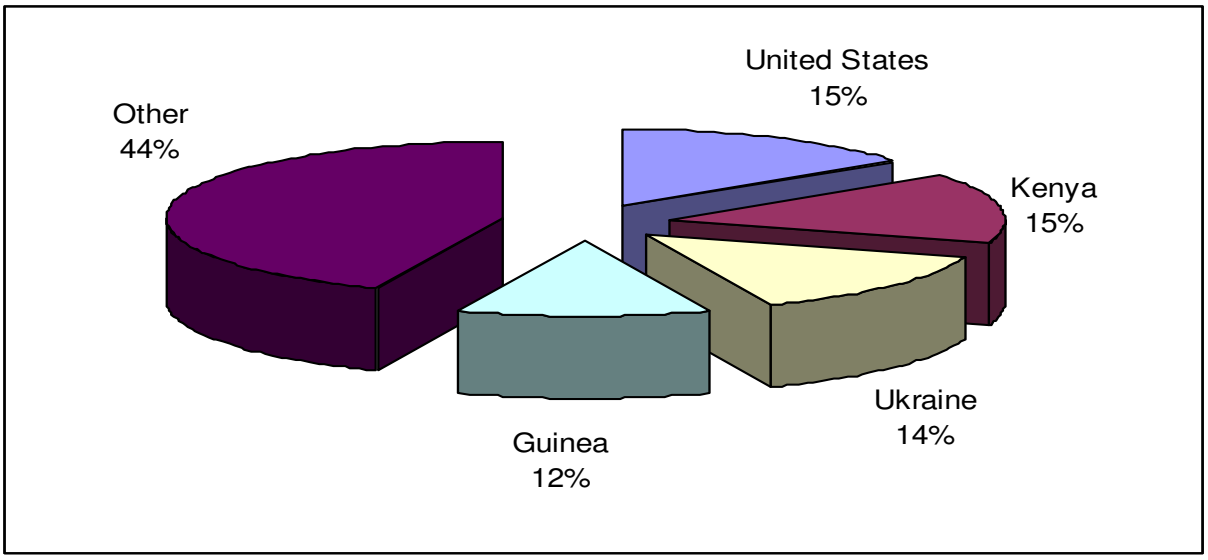
Demand for kaolin depends on the paper market which accounts for 62 percent. All kaolin is beneficiated in some form before it is sold to the consumer. Clay demand for tiles and sanitaryware has increased significantly in the last few years due to capacity increases in the tile and sanitaryware industry (e.g. the recently-commissioned Pegasus tile factory), a major increase in bathroom upgrades by middle-income home-owners and new product ranges in specialised ceramics, tile and sanitaryware components. Kaolin consumption has diminished significantly over the last 15 years.

From April 2005 onwards, no local kaolin has been used in any paper manufacture because of shift away from kaolin to calcium carbonate. Niche markets that could increase kaolin demand include: Ceramic composite tiles (a sacrificial glass layer fused onto a ceramic tile at high temperature) used in wear chute linings; high performance ceramics (ceramic fibres woven to form a ceramic-type glass fibre); engineered and reinforced ceramics; cellular ceramic substrates for catalytic converters; industrial coatings, agricultural coatings and anti-caking agents.

4.5. South African Trade

There was no kaolin exports recorded for 2008 as is being replaced by calcium carbonate in the paper markets.

FIGURE 21: IMPORTS OF KAOLIN, 2008



Source: SARS

Major imports, in descending order of magnitude, were from USA (15%), Kenya (15%), Ukraine (14%) and Guinea (12%) (Fig.21). Kaolin imported decreased by 35 percent from 15.8 kt in 2007 to 10.2 kt in 2008. Imports value declined by 7.7 percent from R27.9 million to R25.7 million in 2008.

Low-value products were imported from China (<R973/ ton), whilst the highest-value bulk tonnages (> 0,5kt) were from the USA, priced at R3 448/ ton. Super-grade kaolin from the Netherlands fetched prices of R26 000/ ton or more. South Africa is unable to exploit these high prices because of its lack of super grade kaolin.

5. SMALL SCALE OPPORTUNITIES AND BENEFICIATION

Clay generally occurs closer to the surface making it less costly to access. It also lends itself to being easily beneficiated into bricks, pottery, artifact, tiles etc. Such products are easily produced meaning levels of skill required are not demanding relatively. Capital requirements to initiate projects that utilize clay are low and as a result of that, barriers of entry are low which makes it easier for small scale miners to establish clay related operations.

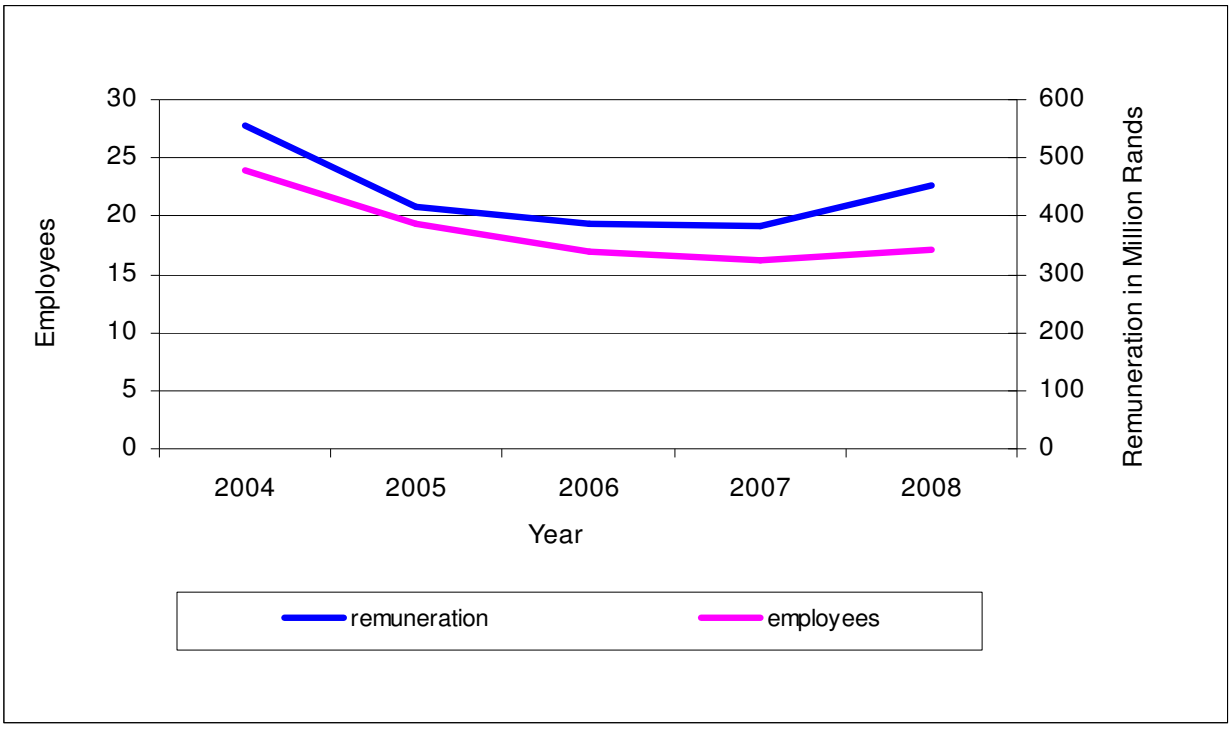
The products that can be produced from kaolin are mostly ornamental household goods and other household utensils like plates and cups. Other products include pots in various sizes and plant pots. To prevent production of low quality output, quality control measures in the mixing and separation of undesirable material should be implemented. Ceramic products and face bricks are produced from kaolin and other forms of clay. Small Scale Mining (SSM) of kaolin is at Ndwedwe, near Durban where the product is also utilized. Research has also shown that this product can be used as an ingredient in paint and other industrial products.

Other SSM clay sites are in Newcastle, Northern KZN and Qwaqwa, Eastern Free State where small scale miners dig clay for brick making purposes. These sites produce low quality bricks and requires upgrading to enable the Small Medium and Micro Enterprises (SMME's) to access formal markets i.e. government or municipal housing projects.

The Department of Mineral Resources (DMR) initiated clay beneficiation programmes with the intent to stimulate business development and employment among communities where the mineral occurs in abundance. The Ndwendwe Ceramics is a project based in Kwazulu Natal, initiated to provide employment opportunity to the community of Verulam. Sikhululiwe Bawo is a ceramic project based in Matatiele, established by DMR in 2006. The projects products are ceramics such as plates, ornamental goods and tiles.

6. EMPLOYMENT

FIGURE 22: EMPLOYMENT OF SPECIAL CLAYS, 2008



Source: DME Mineral Economics

The annual average rate of number of employees and total remuneration was 5.8 percent and 4.8 percent respectively (Fig.22). Number of employees and remuneration has been decreasing from 2004 due to closing down of mines and deposits being too deep to process further. The Plettenberg Bay mine (part of the G & W Base group) near Knysna (Western Cape) officially closed in 2001 is being rehabilitated.

Serina Kaolin lost its major supply contract in 2005; then the company began winding down operations in 2006 and the mine was completely shut down on 31 March 2007, which resulted in the retrenchment of 50% of the staff and other cost cutting measures. A new company, Serina Trading imports kaolin to supply local customers.

7. IMPACT OF THE RECESSION ON SPECIAL CLAYS

The recession has had some affect on the industry. Absorbent applications probably have declined in 2009 because of the decline in heavy manufacturing where industrial (oil and grease) absorbents would be required. Paint and some other filler and extender applications were affected because of the decline in housing and commercial construction. These markets consume large quantities of paint, joint compounds, caulks and sealants, etc. that may contain attapulgite (palysgorskite) as a filler and extender. While the recession probably hasn't directly affected drilling mud applications, the decline in oil prices in 2009, compared to 2008 has had an impact. Sales of attapulgite, which is used in salt water drilling, probably have declined in 2009 because the number of the offshore drilling rigs has declined relative to 2008. Pet litter markets may have been marginally affected by the recession, while other markets have shown no signs of significant impact.

The recession has affected both the kaolin and bentonite industries. With bentonite, sales for pelletizing iron ore dropped dramatically because of the decline in steel production. Sales for drilling mud applications also declined because of the decline in oil consumption and oil prices, both of which were indirectly affected by the recession. With the decline in heavy industry as the result of the recession, sales of bentonite for foundry sand bond also have declined.

Kaolin also has been affected. The paper industry, which has been slow for more than 5 years, declined even further as the result of the recession. That affected kaolin sales considerably since paper is the major market for kaolin. Sales for construction materials, such as kaolin for fiberglass manufacture; kaolin extenders for paints, caulks, putties, etc.; and kaolin for sanitaryware, ceramic sinks and tile, etc., all have been affected by the decline in the construction of residential and commercial buildings.

8. OUTLOOK

With predictions for only a very slow recovery from the recession, growth in the clay industry for the next few years will probably be very low. World demand for bentonite and fuller's earth is forecast to rise by an average 2.2 percent to 22.4 Mt in 2012. Consumption of bentonite is closely linked to drilling activity, which in turn is linked to oil and gas prices. High prices encourage exploration and greater use of bentonite and other minerals in drilling fluids. Competition from alternatives, is expected to reduce demand for bentonite in drilling muds in the longer term.

Local demand for South African special clays depends on growth in the national economy. In the medium to long term, the industry should benefit from expansions in industries that consume clay, e.g. the ferrochrome industry. Clay prices are sensitive to logistical costs, which results in price increase. Growth market potential is in the ferrochrome and civil industries because they are the only window for 2010 stadiums and construction applications.

Bentonite output is expected to grow by about 6-8 percent year-on-year for the next 4 years – based on a local demand increase of about 5 percent and a significant growth in exports. Growth will be focused primarily on the foundry and pelletising industries, particularly in the short and medium term (with market saturation in the next 4 years). Strong growth is expected as: all ferrochrome plants are now utilizing Outukumpu- and Premus-type pelletising; most ferrochrome producers have approved plant and furnace capacity expansions.

Strong growth is expected in the foundry industry, particularly in green sand moulding. Car exports are set to increase significantly with the awarding of large international contracts to local automobile manufacturers. This will result in higher throughput at large-scale foundries and thus a proportional increase in bentonite consumption.

The expansion of new niche markets in the following applications: civil/ environmental (particularly import replacements, water retention and treatment), medicinal, aquamarine, nano-plastics, fibre technologies, pulp and paper manufacturing (retention/ drainage aids) and composite material manufacturing for dye-removal, wine-clarifying and civil applications will ensure real sales growth over the next 5-10 years.

Although South Africa has substantial kaolin resources, producers are limited to certain market segments due to the low quality of local kaolins. Profits have been maintained through cost cutting initiative and an increase in exports – local kaolin is exported to over 30 countries

worldwide. Pro-active research and the development of niche markets are bearing fruit for some producers. However, the market size and income generated from upgraded, premium-quality local kaolin products does not justify the capital costs incurred, e.g. no kaolin producer in South Africa sells a coating-grade or calcined product. Thus, most producers are employing new, low cost technologies to add value to their products, these include: improved, fine milling techniques, the use of whitening additives, moisture inhibitors, driers and better packaging.

Future technologically developments include the production of superfine and nano-fine size fractions, narrow particle distributions and improved functionality. Substitution of imported kaolin used in ceramic armour protection, industrial coatings and wear/ chute linings for industrial slags must be researched. Several new growth markets include fuel cell applications, nano-composite technologies, industrial coating applications, acid functional fillers and additives (including filler surface modification), reinforced fillers, composites, and optical brightening agents that can replace TiO2 pigments.

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