Turkish Ceramic Industry & Raw Materials in Turkey

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Turkish Ceramic Industry
The Turkish ceramic production began in the 1950’s and grew up with an increasing momentum starting after 1980’s. By using new production technologies and bringing modern production lines, Turkey ranked up to the ninth in worldwide tile production and in export, Turkey has taken fourth place in the world on the back of China, Italy and Spain according to the data in 2014. In the field of sanitary-ware, our country has become Europe’s largest producer and exporter. The Turkish ceramic industry employs totally 246,000 people in the field of production, design, sales and marketing.

In 2015, the established capacity of ceramic tiles reached up to 411 million m², the produced amount is 320 million m² and the exported amount is 77 million m². The established capacity of sanitary ware is 23 million pieces, produced amount is 20 million pcs and exported amount is 8 million pcs.

Sanitary Ware
The raw materials that mainly used in sanitary ware industry are; Clay, Kaolin Feldspar, Quartz, quartz sand. In 2015 the production amounts were;

<table>
<thead>
<tr>
<th>Sanitary Ware Raw Materials</th>
<th>Amounts (ton/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>96,000</td>
</tr>
<tr>
<td>Kaolin</td>
<td>75,000</td>
</tr>
<tr>
<td>Feldspar</td>
<td>90,000</td>
</tr>
<tr>
<td>Quartz, quartz sand</td>
<td>39,000</td>
</tr>
</tbody>
</table>

Usage of Raw Materials in Turkish Ceramics
Clay
In Ceramic Tiles, clay is a crucial raw material in terms of technological features and in amount of use. They are intensively used as raw material in floor and wall tile manufacturing for ceramic industry.

Ceramic tile plants are the biggest consumer of raw material in Turkey. In sanitary-wares, generally refined clays and kaolin are used, whereas raw-clays are more prevalent in ceramic tiles industry. Refined clays are generally produced by the process of refinement and enrichment of sandy clays in Bilecik region.

The clay reserves of Turkey, especially for ceramic and refractory productions are estimated to be nearly 200 million tons. Nearly half of these reserves are not very efficient to use in ceramic industry for today. But we believe, these inefficient clays will be used after continuous R&D studies, thus will be very necessarily used for the sector.

Importance of Clay-Sand Basin in Istanbul-Şile Region
Since 1980’s, the Neogene basin of Şile has become a very important region by hosting the clay reserve of Turkey as a demand for raw material, especially in the ceramic industry.

Approximately 90% of the clay reserves of Turkey which are estimated to be nearly 200 million tons is deposited in Şile-Istanbul region.

Regarding the mineral exploration researches of both (government) General Directorate of Mineral Research & Exploration Turkey (MTA) and private corporations, no significant clay deposits have been found up to now except Şile-Istanbul Basin.

Furthermore, clay deposits have to be produced in various depths because of the various physical and chemical properties. Therefore, forestry clearance land of clay deposits spread on a large area than other mining processes. Here are some statistical information about ceramic raw materials export and import amounts for the last 20 years.

Raw Material Demands of Turkish Ceramic Industry
Ceramic Tiles (Floor and wall tiles, granite tile)
The raw materials that mainly used in ceramic tiles industry are clay, feldspars, aplite, and pegmatite etc., kaolin, quartz, quartz sand. In 2015 the production amounts were;

<table>
<thead>
<tr>
<th>Ceramic Tiles Raw Materials</th>
<th>Amount (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>2,048,000</td>
</tr>
<tr>
<td>Feldspars, aplite, pegmatite etc.</td>
<td>1,792,000</td>
</tr>
<tr>
<td>Kaolin</td>
<td>768,000</td>
</tr>
<tr>
<td>Quartz, quartz sand</td>
<td>512,000</td>
</tr>
</tbody>
</table>
Recent view of mining field which is rehabilitated in 2012 after operated for 21 years (Muğla, Milas, Olukbaşı Old Feldspar Mine-Matel AS)

Exported clay amount is 994,000 tons, while imported clay amount is 5.4 million tons for the last 20 years.

**Kaolin**

Kaolin reserves of Turkey are estimated to be nearly 89 million tons, composed of 15-37% Al₂O₃ content.

Bulgarian Kaolin, Ukrainian Kaolin and Refined English Clays are also imported for sanitary ware and porcelain industry in Turkey.

Exported kaolin amount is 3 million tons, while imported kaolin amount is 2.5 million tons in last 20 years.

**Quartz, Silica Sand**

Silica Sand is used as a raw material in ceramic, chemistry, concrete plant and iron casting industries. It is produced over 4 million tons/year from Şile region and is refined by the following processes of washing, enriching and grading. Quartz and quartz sand (silica-sand) raw materials are also widespread and can be found easily in Turkey.

Sand reserves of Turkey for the industries such as ceramic, casting, construction etc. are estimated to be nearly more than 100 million tons in Istanbul Şile Region.

Exported quartz-silica sand amount is 3.1 million tons, while imported quartz-silica sand amount is 5.9 million tons for last 20 years.
**Feldspar**

Feldspar reserves in Turkey are estimated to be 330 million tons (visible & potential). Important feldspar reserves are located in Aydın/Çine and Muğla/Milas in the southwest of Turkey. Increasing the production of white body tile and granite tile also caused more demand for feldspar. Most of the feldspar is produced by the private sector and 75% of the production is exported. Feldspar exports started in 1990 and it reached approximately to 70 million tons at the end of June 2016. Italy, Spain, Russia, USA and Poland were the most important markets for Turkish feldspar. Exported feldspar amount is 66.6 million tons, while imported feldspar amount is 605,000 for the last 20 years. High quality K-Feldspars are being imported from India, Egypt and Spain due to insufficient reserves of Turkey. From the quarries, removal of the large amount of feldspar ore and its transportation to plants, stock areas and port, leads to environmental problems.

These problems are dust, image, the road distortion and traffic jam in the touristic places in Turkey. Because the environmental regulations are so strict in Turkey, if the necessary measures are not taken quarries might stop working. These problems also force the companies. One of the example of above problem is as follows; the olive groves are damaged by dust from the stocks, the production plants are closed which belong to export companies near Gülük Port by Municipality of the town and Administrative District in the year 2011. Therefore the companies are forced to stop their facilities and carry their operations near to quarries and to make high-cost investments for stocking of feldspar ores in a confined area.

In local markets, 25 million tons of feldspar is consumed. Totally 95 million tons of feldspar excavated without overburden. The mining of the elongated feldspar veins due to its geological formation requires to open deeper quarries. Huge material that is removed during the mining activities, form hills of overburden. The long distances between quarries and waste disposal areas due to filled up dump areas near quarries created the image pollution in the environment and forests forest areas. Therefore, government agencies such as Ministry of Environment and Urbanization (MEU), which administers the mining sector has more rigid and stricter laws. The mining companies have to take precautions about the environmental protection, occupational health and the safety with new regulations.

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Views from some feldspar mines from Turkey.

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Another view from a feldspar mine from Turkey.
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On the other hand, totally 95 million tons of feldspar (nearly 1/3 of the total reserves) produced from the beginning of the feldspar mining in 25 years. Double of this amount about 190 million tons of overburden have been taken. Totally 150 million m³ material was excavated from original surface. This means that forest, olive groves and fields were affected. Recently, the depth of the feldspar is under 100-150 meters in average from the surface. This means that a wider area will now be excavated than before. Financials of such operations and their environmental impacts will be different. Exported amount of feldspar increased 16% in the first half of the year 2016. For the next 8 years we can make an estimation like that; if the export amount increase 10%, total excavated amount will be about 105 million (80+25) tons or if the increasing amount is 6% total excavated amount will be about 81 million (61+20) tons. The result is deeper quarries and exponential increase in production costs. As a result, in order to continue sustainable mining, it is important that buyers should cooperate with the producers.

This report is presented by the author at the “International Market of Ceramic Raw Materials in Europe” meeting at Rimini Tecnargilla Exhibition in Italy on 28 September 2016.
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