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## THE TURKISH FIBER-CEMENT MARKET FROM THE 1950's TO 2010

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### Abstract

Fiber-cement was introduced into the Turkish market in the form of imported slates to be used in some monumental buildings in the end of the 19<sup>th</sup> century. However it wasn't until 1956 that the first factory to build fiber-cement was built in Adana.

The production of fiber-cement slowly grew with the industrialization of the country. It reached its peak in the 80's when in most industrial buildings, two layers of fiber-cement was used on the roofs with glasswool in between for heat insulation. After the 90's, production slowly decreased due to worries regarding asbestos and production of alternative materials such as sandwich panels.

Since April 2006, non-asbestos corrugated sheets are the only ones produced in Turkey. It is still early to report on the market reaction to non-asbestos sheets but our outlook is positive. Technical developments are still under way to optimize the production and further lower the costs of the material which is still the least expensive roofing material in the market.

### Introduction

Fiber-cement was introduced into the Turkish market in the form of imported slates to be used in some monumental buildings at the end of the 19<sup>th</sup> century. However it wasn't until 1956 that the first factory to build fiber-cement was built in Adana, a cotton and textiles city in Southern Turkey close to the Mediterranean coast.

The plant (Atermit) had a 2-vat machine from Werhahn and was working one shift per day for three months of the year. Sheets with 5 ¼ corrugations to a width of 92 cm and thickness of 6 mm were produced only. This is still the standard in the Turkish market. The roof of the plant itself was covered with clay tiles, the traditional roofing material of the area! The cement used was imported from Romania in 50 kg bags.

In Turkey, fiber-cement is mostly used for industrial buildings. Lately, percentage used in agricultural buildings has increased because some architects prefer sandwich panels for industrial buildings instead of fiber-cement. Residential usage of fiber-cement is very rare, and thinner (less than 6 mm) sheets or sheets with many smaller corrugations (more than 5 ¼) such as the ones in Thailand or Brazil are not produced in Turkey. Figure 1 shows a graphical representation of fiber-cement end usage in 1950's and 2005.

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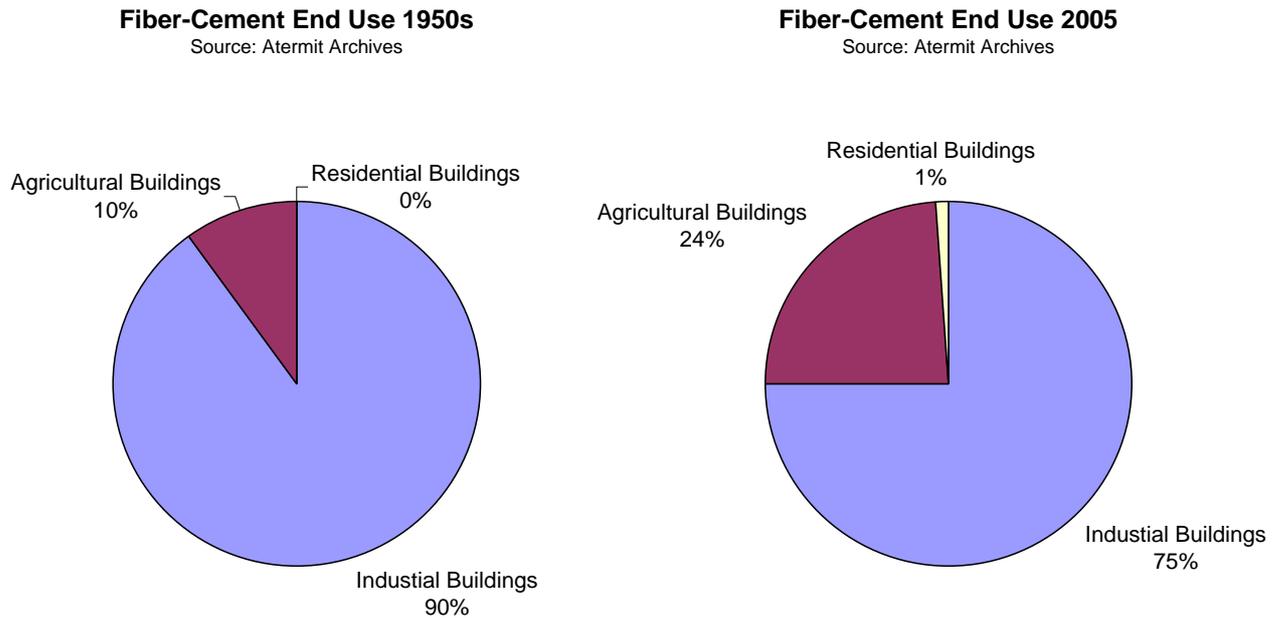


Figure 1: End Use of Fiber-Cement in Turkey, 1950s and 2005

### The 50's to 80s

In the 50's Turkey in most buildings there were two materials used on the roof: clay tiles, mostly for residential roofing, in the center, west and the south of the country and galvanized steel tiles used mostly for agricultural and industrial buildings. Very limited amounts of wood and straw were also used in some residential buildings. In the mountainous east and the Black Sea regions, the most common roofing material is still galvanized steel. In the south-east of the county, most buildings have flat roofs which are used as terraces.

Today a variety of building materials are produced in Turkey. Figure 2 shows the change in the ratios of different roofing materials produced in Turkey in 1950's compared to 2005. The market as a total has grown from 15,000,000 m<sup>2</sup> to 82,000,000 m<sup>2</sup> in the last 50 years.

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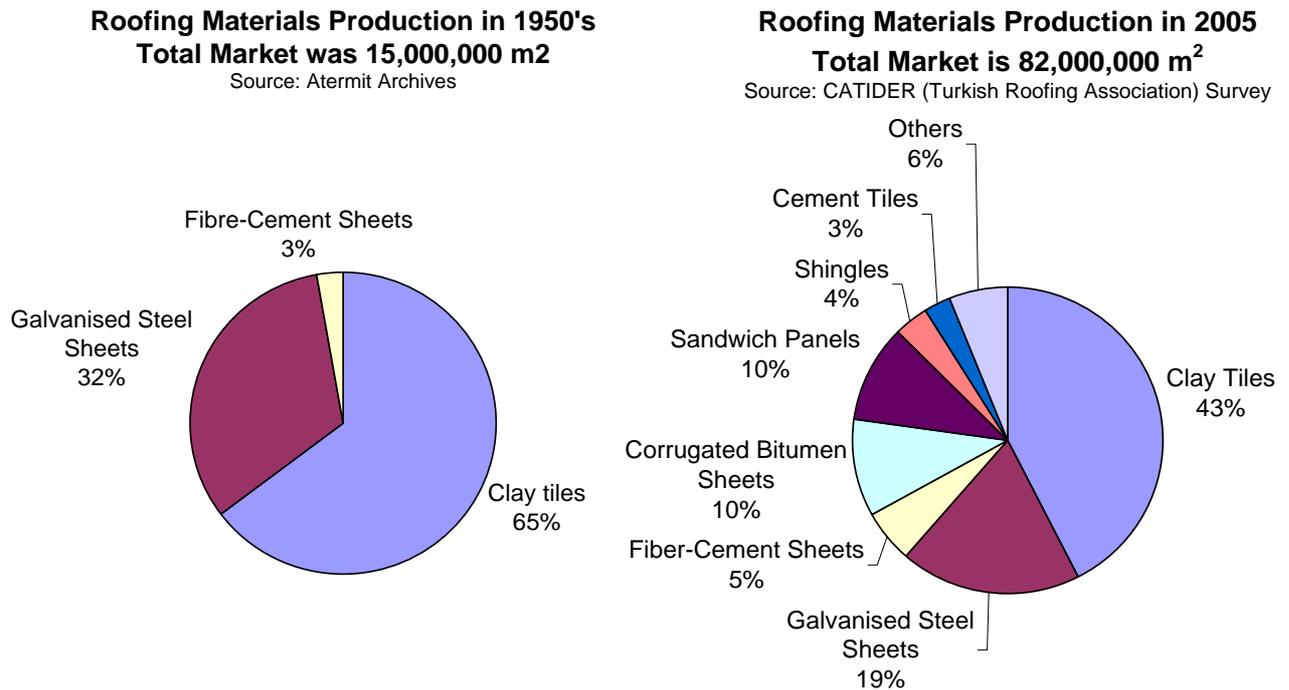


Figure 2: The Comparison of Roofing Materials Produced in Turkey, 1950s and 2005

The second plant that manufactures fiber-cement (Oralit) was built in Istanbul in 1957. This plant built sheets that had widths of 110 cm and the standard thickness of 6 mm.

Until 1965, both plants operated with about the same output of 24 tons per day and only produced sheets for 4 months of the year (total production was 450,000 m<sup>2</sup>/year). There are two reasons for this low capacity: the country did not begin industrialization until 1960s and there was a restriction on foreign currency needed for import of asbestos.

After 1965 until 1971, the production increased in both plants. This is due to the industrialization of Turkey. However, fiber-cement was still only used in industrial and agricultural buildings. The plants were producing 45 tons of material per day and were operating for 10 months.

In 1971, a new company (Superlit) started production with an RCM machine in Istanbul. In 1978, Eternit began production in a joint venture with a Turkish company. The plant was located in Bursa, an industrialized town 150 km away from Istanbul.

The 70's were years of expansion for most plants. Atermit founded a new plant in Izmir (Western Turkey) in 1978. Superlit set up a second production facility in Düzce, about 200 km east of Istanbul. All plants made additions to their machines and turned them into 3-vat machines. In the 70's the total production was around 20.000 tons/year in each plant.

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To overcome the shortage of imported asbestos, all manufacturers acquired asbestos mines in central Turkey, however due to the low quality of the asbestos mined locally, most of the material used was still imported from abroad.

### **Heat Insulation**

The 80's were the best years of fiber-cement production in Turkey. After the oil crisis of 1976, insulation became more common. In Turkey, winter temperatures can go below zero Celsius in most of the country and minus 10 °C is common in central and eastern provinces. Sandwich panels were too expensive and still new (first production was in 1976) so most roofs were insulated with glasswool. The common practice was to use two sheets of fiber-cement with glasswool in between. This led to even more increase in fiber-cement sheet sales since the sheet usage doubled for the roof.

In 1986 Atermit founded the third plant in Istanbul. At this point, there were 7 machines operating in four companies.

In the 90's asbestos health risk issues started to emerge. Blue asbestos was banned. This meant that engineers had to learn a lot more about the production. Blue asbestos which was a panacea to all production and post-production problems was no longer available. In the initial years of production with only chrysotile asbestos, all companies faced problems of reclamations due to post-production edge cracking of sheets.

When asbestos health issues became more widely known (together with news of asbestos related lawsuits) some multinational firms started to use sandwich panels in their roofing and cladding. Even though banning of asbestos was not yet an issue, Eternit stopped production in Turkey in 1992.

Oralit, which belonged to the largest conglomerate in Turkey stopped production in 1998. Meanwhile, sales started to decrease and Superlit closed one of its plants.

Figure 3 shows the rise and fall of fiber-cement production in Turkey along with the increase of sandwich panel production which replaced some fiber-cement used in industrial buildings.

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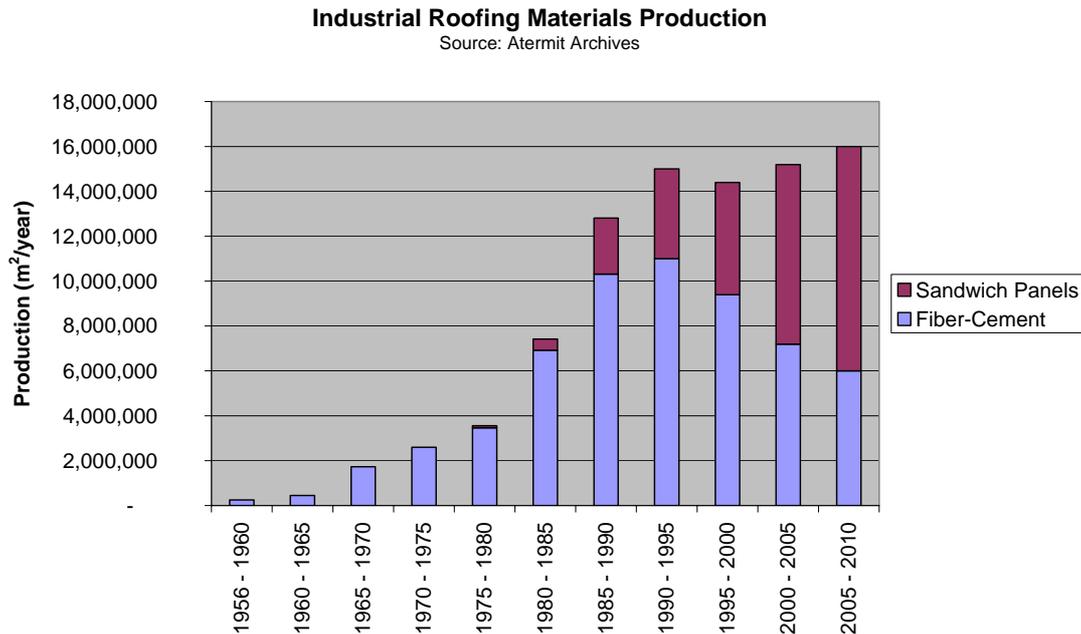


Figure 3: Fiber-Cement and Sandwich Panels in Industrial Roofing in Turkey

### The Asbestos Ban

As Turkey became a serious candidate for the European Union (EU), banning asbestos became a necessity to continue membership negotiations.

In 2006, Superlit also decided to cease production of fiber-cement sheets. In April of 2006 the maximum level of asbestos dust in the production area was lowered to 0.1 fiber/ml which is an almost impossible target and hence an indirect ban. This stopped the import of asbestos fibers into Turkey and the only remaining producer Atermit switched to non-asbestos fiber-cement production.

As of now, there is no asbestos-cement production in Turkey, but import of asbestos-cement sheets is still allowed. For the first time since 1956, asbestos sheets are being imported into the country. However imports of all asbestos containing materials will be banned by January 1<sup>st</sup> 2007 due to CE marking legislation in building materials which is also another EU driven issue.

In Turkey, the manufactured asbestos-cement sheets are used in industrial buildings (80%) and agricultural buildings (20%) only. The sales trend of corrugated fiber-cement sheets in the last 20 years shows us that this balance will change in favor of agricultural buildings in the future.

### Non-Asbestos Fiber-Cement Production

Currently, there is only one producer of fiber-cement corrugated sheets. The company (Atermit) uses in-house developed PVA technology in three plants to produce corrugated sheets.

It is still early to have a sound judgment on the market reaction to non-asbestos fiber-cement. However we are expecting the sales of fiber-cement corrugated sheets to

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increase slightly after the asbestos ban. Already, some customers who were worried about health effects of asbestos have started to use the sheets again. It is also a plus that the new sheets are more flexible and lighter and still the least expensive roofing material in the market.

As for the technical side, Atermit has made some technical collaboration with paint producers to optimize the mixing of powders, paper producers to develop the knowledge of pulp refining and Istanbul Technical University and University of Sao Paulo to analyze the materials produced with the new non-asbestos technology.

Paint mixers have been redesigned to fit the needs of a fiber-cement producer. The resulting mixers produce material that has the ideal dispersion of powders that are added into the slurry.

Engineers involved in paper production have assisted Atermit to lower the electrical costs that have risen with the addition of pulp to the formula. A redesign of the pulp refining plant was done in all three production facilities. Also methods to increase the concentration of pulp in the pulp slurry were employed so that addition of pulp slurry has a minimal effect on the capacities of the cones used to clean the production water. The amount of recycled pulp used has increased as new sources of high quality recycled pulp have been discovered in the vicinity of the production plants.

Future research involves investigating the design of refiner blades on the distribution of fiber lengths and dust in the pulp. Paper producers require some dust in the pulp to add bulk to the mixture; however this is not necessary for fiber-cement. Therefore blade designs which minimize cutting and maximize fibrillation of cellulose fibers is important in fiber-cement pulp production.

This investigation is being done jointly with the machine and mould producing arm of Atermit which also produces refiner blades. The refined pulp is analyzed on a Bauer McNett machine to classify the pulp according to fiber length and dust content.

Research is still going on to understand the effects of sepiolite, a clay used for its rheological properties and the use of starch to aid lamination of layers.

A presentation of the research underway in collaboration with Istanbul Technical University and USP was already given in this conference, therefore it is beyond the scope of this paper.

### **Conclusion**

In the years following the negative publicity that asbestos received, the production and sales of fiber-cement corrugated sheets have decreased in Turkey. As of 2006, the asbestos issue is over, and we believe that this versatile and inexpensive yet durable material will slowly regain its place in the market. However this will only happen if non-asbestos corrugated sheets uphold the quality of asbestos ones while keeping the advantages.

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We strongly believe that this goal can only be achieved with constant research and development along with global cooperation with our colleagues in academia and in the production.

### **References**

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