Our Hankook Titanium Factory in Inchon, Korea

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Glistening white titanium dioxide fills many needs in our highly technological age. Increasing demand for titanium dioxide in Korea for paints, dyes and other products led to the construction of two factories in 1971. Members of the Unification Church acquired the two factories last year. The Unification Church's Tong-ii Industries produces manufactured goods at its industrial complex, and ginseng tea and marble vases for domestic and foreign markets.

Three members of the Seoul Western Center visited the recently acquired Hankook Titanium factory near Inchon to report on this additional business venture. The Inchon factory is the most important of the two factories, producing titanium easily meeting world standards for quality. Further south is the Dongwha factory, somewhat smaller in size and not yet up to that standard.

The first bag of the finished titanium dioxide

Titanium demand increases

Korea is now able to manufacture its own titanium, due to substantial improvements in technology over the past several years. Titanium used to be imported, but today the titanium ore, ilmenite, is brought from Malaysia and Australia and refined in Korea. Moreover, for a long time scientists have surmised that Korea, due to her specific geological formation, should also yield the ore. Although this was confirmed 20 years ago, lack of domestic demand and skill hindered development. Now with the recent industrial boom and subsequent increased demand, the two factories became feasible; Hankook Titanium Industries and mining experts are researching prospects for Korean ilmenite ore on the east coast.

The Hankook Titanium Industries factory near Inchon, while under the management of the previous owner, first began operation in May 1971 but was forced to a standstill because of many financial problems. The cost of titanium dioxide (TiO_2), the finished product was then approximately $400 per ton.

The church took over the operation of the factory just one year ago, October 1972. Since that time, the economic situation has changed dramatically, and the cost of a ton of the finished product has risen to $1,000. The former owner recognizes that Tong-ii Industries has been visited with a great blessing. The managing director, Mr. Dong-Keun Park, is himself amazed. "It's truly a miracle," he said. "All the members work very hard, but we are also very lucky."

The factory itself

The Inchon factory consists of several separate structures, located just off the main highway. One building houses the offices and administrative sections, another produces the sulphuric acid used in production. In the largest building, which has two to five stories, the titanium dioxide is produced and packaged. The total ground area of the factory is 432,000 square feet; the floor area of the building itself

is 85,000 square feet.

At present the factory processes 15,000 kg of raw materials annually, arriving in three or four lots in 5,000-ton ships. After the expansion of the factory, to be carried out between October 1973 and September 1974, 50,000 tons of raw material will arrive each year. Until Korea's own supplies can be used, the ore comes from open-cast fields in Malaysia and Australia. When expansion is completed, the monthly output will increase from the present 270 metric tons to 750 metric tons.

President Seung-Kyung Moon addresses staff on the opening day under new management, March 12, 1972.

The workers

The Hankook factory employs 167 and the Dongwha factory a similar number. This includes secretaries and clerks at the factory office and at the downtown Seoul business office. Although the factory is managed and operated mostly by church members, several of the technical engineers are not church members. The factory operates on three eight-hour shifts a day.

At present the workers rent their rooms near the factory, but in the near future housing will be built for the workers. Manager Park proudly explained that this factory is the only one in Inchon with a tennis court, basketball court and volleyball court.

The president of the factory, Mr. Kyung-Seung Moon, is presently traveling in the United States. Mr. Dong-Keun Park, the managing director, took us to the factory and Mr. Joo-Won Choi arranged our trip. The works manager, Mr. Soon-Jung Hong, and the other directors are intensely dedicated to their work. They work just as hard or harder than others seeking to accumulate a personal fortune, but they do it all for God. Mr. Hong, who had obviously studied his field in depth, explained all the processes in surprisingly fluent English.

The production process

The process is divided into two main stages. First, a secondary building produces the sulphuric acid from imported Canadian Sulphur. The heating and cooling in this process requires much water, drawn from city supplies, since the factory has no independent water system. However, condensing and recycling the water reduces consumption. The Sulphur burns in a furnace at 800 degrees C., producing Sulphur dioxide gas.

Because this is an exothermic (heat producing) reaction, no outside heat is required. When the gas cools down, it reacts (oxidizes) into Sulphur trioxide gas with the ·id of a vanadium catalyst. The gas is then absorbed into sulphuric acid to make additional sulphuric acid ions. After another cooling, the 95 percent concentrated sulphuric acid is stored in two big stock vats, and flows in pipes to two big reducing columns in the main building.

The titanium dioxide itself is produced in seven stages:

1. Twelve tons of ilmenite are dissolved into 20 tons of sulphuric acid, using scrap iron as a reducing agent. Hot steam reduces the time to about one hour.

2. The mixture is transferred into a vat where the solid particles settle to the bottom during six hours of cooling (50 degrees C.-15 degrees C.).

3. The ·solution is further clarified by filtering, cooling and centrifuging, which removes the iron sulphate

and purifies the titanium sulphate.

4. The solution containing titanium sulphite is then concentrated by heating and combining with a large vat of water for hydrolysis. This is the most delicate stage of the process, involving the crystallization of the dioxide.

5. The remainder of the process extracts and purifies pure TiO2 from the solution. After several washings in big baths and several drums, the TiO2 as a bright white mud is sucked onto drums and again washed.

6. The dioxide is reduced gently with tin and acid to remove surface impurities and then transferred to a 200-foot rotating drum, where it is heated to 900 degrees C., to remove all remaining inorganic impurities.

7. The solid dioxide is powdered down to 300 mesh and finally bagged in 25 kg paper bags.

The imported ilmenite contains 60 percent iron compounds and 40 percent titanium compounds. This process extracts 90 percent of the titanium. At each stage a sample of the product is tested in the laboratory. Laboratory chemists are researching uses for the ferrous sulphate, which is removed from the centrifuge and discarded.

The purest possible dioxide is essential in order to prevent an} remaining impurity from affecting its durability and special color qualities. Titanium dioxide is a strikingly white powder.

Directors: Front row, from left to right: Sales Manager, Mr. Joo-Won Choi; General Affairs Director, Mr. Ho-Sun Kim; Managing Director, Mr. Dong-Keun Park; President, Mr. Seung-Kyung Moon; Works Manager, Mr. Soon-Jung Hong; Deputy Works Manager, Mr. Hang-Yun Cho; Chief Technician, Mr. Chang-Suk Kang.

Uses for titanium dioxide

A versa tile chemical compound used over the past 30 years, titanium dioxide will play a greater role in the future. It has numerous uses, of which we mention only a few:

1. Paint -- Added as a base to white paints, titanium dioxide increases stability, lasting for several years against acids, alkalis, weather and temperature. It has high refraction power, and a small amount can cover a large area.

2. Dye -- for china, leather, plastic, rubber, paper, clothing, chemical and synthetic textiles.

3. Medicines.

4. Condensers.

Future plans

The future prospects for the factory seem promising. Titanium can only increase in uses and profits.

The metal itself is used in aircraft and in spaceship construction.

Many Western nations are seeking new sources of titanium dioxide because of rising prices and pollution restrictions in their own countries (by-products of titanium refining include sulphuric acid and Sulphur dioxide and trioxide fumes). The factory's technicians and scientists are developing means of limiting future pollution.