



# Titanium Dioxide Market Research in the CIS

*Sample PDF*

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## II.5. Current standing of the greatest producers of titanium dioxide in the CIS

### II.5.1. PJSC "Crimea Titan" (Armyansk, Crimea, Ukraine)

Due to "TITAN" active participation in economic life of Ukraine, creation and strengthening of its export potential, it can be fairly called one of the enterprises that developed Ukrainian economic history.

Crimea TITAN (Crimean Titanium) is a company with more than 30-year history. On December 28, 1969 a decision to establish Crimean State Industrial Union "TITAN" (CSIU "TITAN") was taken. The construction was stipulated by the necessity of increasing production volume of titanium dioxide, which is a valuable raw material for many industries.

"Crimea TITAN" is situated in the northern part of Crimea peninsula near its border with Kherson region, in the narrowest part of Crimean isthmus, on the shore of Sivash lakes, which is only 7 km away from Karakinitsky gulf of the Black Sea. It occupies the territory of 4,785 hectares. Situated in a steppe, Armyansk with its population of 26 000 thousand is a satellite town of the company. The company and the town are in a close interconnection with each other.

The first years of the company's existence are marked by gradual activating of production complexes for production of ammophos (1971), aluminum sulphate and sodium silicate (1973), red ferroxide pigments (1974) and activating of two shops for making pigment titanium dioxide (1979) with 40 thousand tons annual capacity each.

At the beginning of 90-s, during the perestroika period, prospering "TITAN", just as many other Ukrainian enterprises, experienced difficult times: traditional ties with raw material suppliers and consumers were broken, the construction of new shops was stopped, only 41% of titanium dioxide production facilities were used and plant's debts were growing.

In March 1999, CSIU "TITAN" entered North-Crimean Experimental Economic Area (NCEEA) "Sivash". Earlier NCEEA "Sivash" was the only really functioning NCEEA in Ukraine (the implementation was initiated by the Cabinet of Ministers of Ukraine in Autonomous Republic of Crimea as a local economic experiment on the territory of Krasnoperekopsk region and Armyansk town).

To help the company out of difficult situation a group of highly qualified managers was gathered. Their efforts successfully led the company out of the crisis to a new higher level of its development. In February 2000, on the basis of CSIU Titan, a new company – GAK Titan was found.

In six months the company has increased production volume, activated new equipment and reconstructed existing facilities and managed to raise income as per year totals. In the 1st six months of 2000 sales of products totaled UAH 132.99 thousand, and 25.2% of it fell to export sales. Incomes increased by UAH 13 million 746 thousand compared to the 1st six months of 1999. Production profitability had reached 19.7%.

In September 2001 the term of NCEEA "Sivash" existence came to an end, and all the companies that participated in the experiment, including the "Titan", were permitted to enter the Priority Development Area (PDA) "Sivash".

In September 2004, according to the decree of the president of Ukraine signed on July 7, 2004 about the creation of a technological complex on mining of ilmenite ores and manufacture of TiO<sub>2</sub> with the attraction of the investor the joint venture in the form of the private joint-stock company « Crimea TITAN » with the authorized capital that made 736146895 UAH had been created. The founders of Joint-Stock Company « Crimea TITAN » were GAK "Titan" and RSJ Erste Beteiligungsgesellschaft. The share of "Titan" in the joint venture was 368073448 UAH or 50 % + 1 share, the share of RSJ Erste Beteiligungsgesellschaft - 368073447 UAH or 50%-1 share. On November 30, 2004 State Property Fund of Ukraine by corresponding certificates affiliated to PJSC "Crimea Titan" two enterprises as its branches – Irshansky GOK (Zhitomir region) and Vol'nogorsk State GMK (Dnepropetrovsk region), producing ilmenite concentrate.

PJSC "Crimea TITAN" is the biggest Eastern European and CIS pigment titanium dioxide producer. The main activity of the company consists in manufacturing such pigment titanium dioxide grades as Crimea TiOx-220, Crimea TiOx-230, which main application is for paintwork materials and mechanical rubber goods industries, for plastics making and in many other industries. Moreover, new brands Crimea TiOx-270 and Crimea TiOx-280 have been developed. They are applied for making paintwork materials, coatings with high weather resistance and good decorative properties and also for printing ink manufacturing. Titanium dioxide sales amount to 90% of total sales volume. The company also produces other types of chemical products (iron oxide pigments, mineral fertilizers, sulphuric acid, aluminum sulphate, sodium aluminate, sodium silicate, iron vitriol, phosphogypsum).

First of all, the company activity is focused on production of pigment titanium dioxide. The main performance data and end-uses of titanium dioxide grades, produced by PJSC "Crimea Titan" are presented in Table 8.

**Table 8: The main performance data and end-uses of titanium dioxide grades, produced by PJSC "Crimea Titan"**

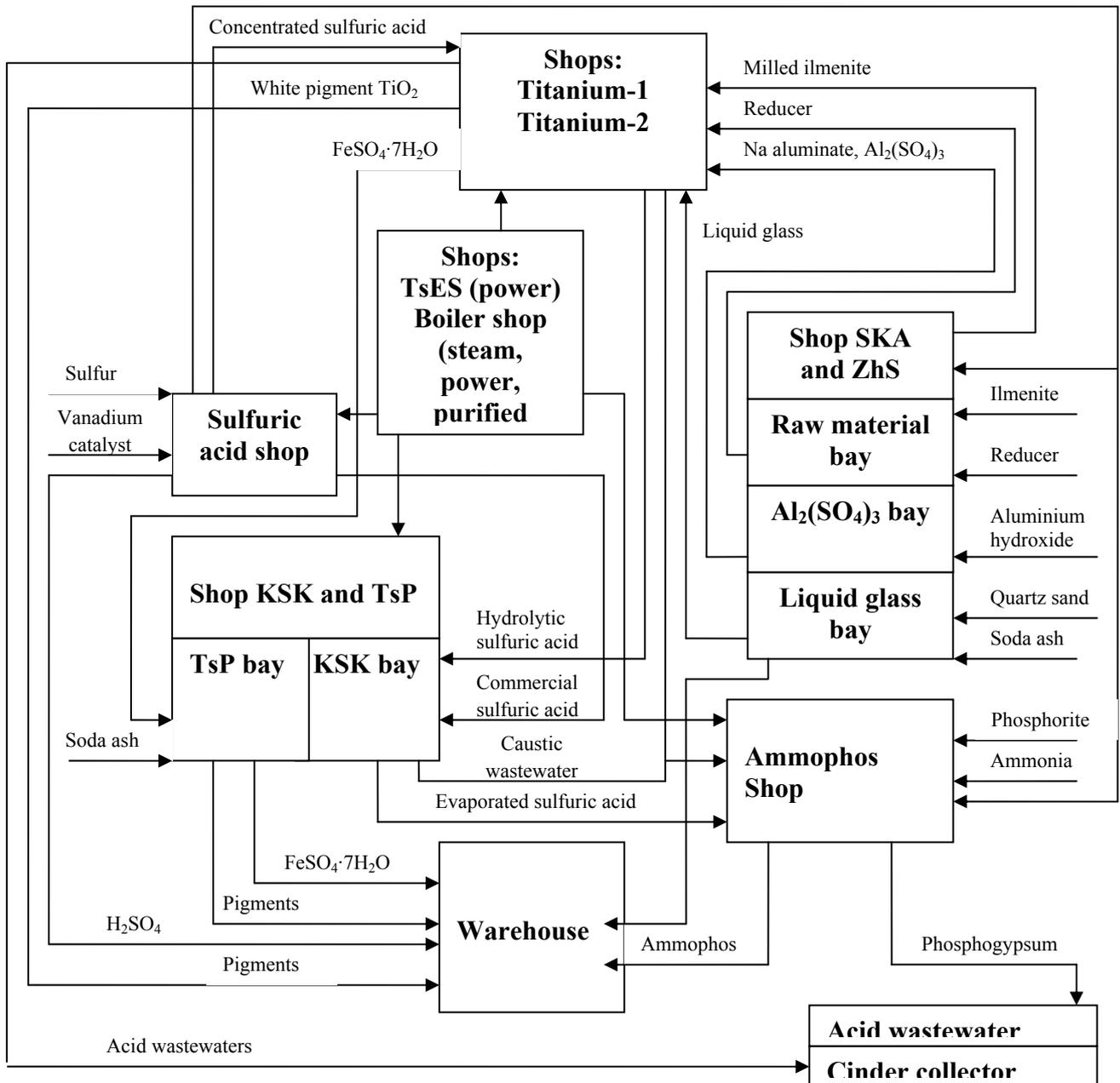
Grade	Whitening ability, c.u., minimum	Whiteness, c.u., minimum	Surface treatment	End-use
Crimea CR-02	1900	95.3	Al <sub>2</sub> O <sub>3</sub> – 2% SiO <sub>2</sub> – 0.8%	Production of paint-and-varnish materials, industrial rubber, plastics, etc.
Crimea CR-03	1940	96.0	Al <sub>2</sub> O <sub>3</sub> – 3%, SiO <sub>2</sub> – 1% Organic compounds- 0.1%	
Crimea CR-07	1960	96.1	Al <sub>2</sub> O <sub>3</sub> – 3% Organic compounds - 0.35%	Production of weather-resistant coatings, printing inks
Crimea CR-08	1990	96.4	Al <sub>2</sub> O <sub>3</sub> – 3%, ZrO <sub>2</sub> – 0.4% Organic compounds - 0.35%	Universal pigment for production of commercial coatings and paints

Source: the company data

Since 2005 the company has started production of a new grade of TiO<sub>2</sub> CRIMEA CR-08 on the basis of shop "Titanium - 2". In December 2004 within the framework of the program on expansion of branded assortment 4 experimental lots of the specified grade on 20 tons were produced. Grade CR-08 is an analogue of grades of leading world manufacturers of TiO<sub>2</sub> «Huntsman Tioxide», "Kronos", "Kemira" (Tioxide TR92, Kronos 2190, Kemira RD3) and has the improved quality characteristics in light resistance and weather resistance. The new grade is used as a universal pigment in manufacturing of industrial coatings and paints. The basic difference from already produced ones is an additional surface treatment by zirconium compounds.

Around 90% in total sales volume of PJSC "Crimea Titan" belong to titanium dioxide. In addition, the company is one of the greatest Ukrainian producers of sulfuric acid - around 550 kt per year (above 35% of the total Ukrainian production). Since 2004, the company modernizes its sulfuric acid shop to expand sulfuric acid output for provision own subdivisions on TiO<sub>2</sub>, ammophos and other products manufacture with the acid. It is planned to construct a new shop on production of sulfuric acid with capacity of 600 kt per year. In the course of further modernization, one of 4 available lines on production of sulfuric acid will be removed from service, and total capacity of the company (including the new planned capacities) will be 960 kt of sulfuric acid per year.

General flow sheet of company is presented in Fig. 6.

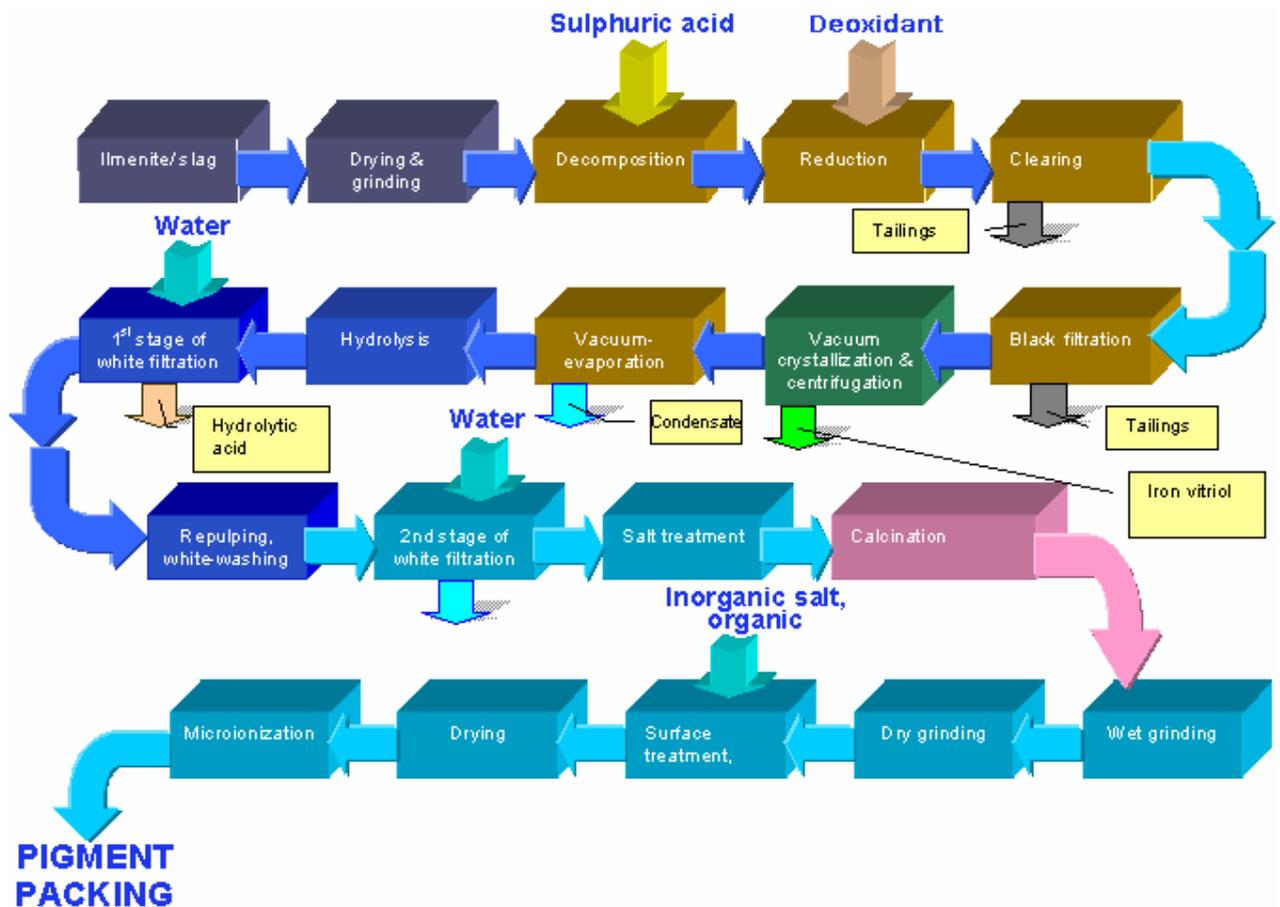
**Figure 6: Flow sheet of PJSC "Crimea Titan"**

Source: the company data

Titanium dioxide is manufactured in two production shops, "Titanium-1" and "Titanium-2", with annual output of 40 thousand tons each.

In November 26, 2001 business plan of GAK "TITAN", as of a PDA "Sivash" participant was affirmed. It was titled "GAK "TITAN" reconstruction of production facilities and technologies upgrade". The main aim of this business plan was to implement a long-term systematic reconstruction and modernization of capital assets. As a result of these activities the production volume was to increase and the quality of all products was to be in compliance with modern international standards. In the process of the plan implementation, most of subdivisions of the company production of titanium dioxide were reconstructed and modernized (Figure 7).

**Figure 7: Flow sheet of production of titanium dioxide by sulfate process in PJSC "Crimea Titan"**



*Source: the company data*

In 2002, owing to objective reasons – introducing 100% customs duty in USA on TiO<sub>2</sub> imports from Ukraine, some decline in world economy, worsening the product conjuncture at world market), the company ought to decrease the production volume and to reorient the export to European markets. On the other hand, the production decline allowed to realize measures on production modernization to improve performance data of pigment titanium dioxide produced.

In 2003 the performance data of the produced titanium dioxide have significantly increased after "white" filtration device reconstruction with drum vacuum-filters replacement by sheet vacuum-filters (Moore filter) and hydrolysis process automation performed in "Titan-2" shop, mounting press-filters for filtration of pre-hydrolysis solutions, etc. The company introduced production of titanium dioxide grades Crimea CR-04 and Crimea CR-07. Besides, the task was set to change gradually from production of universal grades of titanium dioxide to specialized ones (specially and separately for distinct end-uses: enamels, water paints, plastics, PVC sections, automobile paints, etc.).

The company pays much attention to reach internationally-adopted mode of packing TiO<sub>2</sub> that obviously can facilitate expanding exports of the product. In

2004-2006 the company launched new packaging facilities. In 2004, a line for titanium dioxide packing with capacity of 150-250 bags/hour or 3 to 6 tons per hour was launched. It meets all international requirements and standards. It allowed to automate completely packaging process and decrease product losses while filling the bags. In the 1st quarter 2006, in shop "Titanium - 1" the automatic packing line was established (groups of companies "BEUMER" and "HAVER\*BOECKER", Germany) at a cost of 598 thousand Euro. In January, 2005 the company signed the contract with German consortium Haver and Boecker and BEUMER on purchase completely automatic packing system INTEGRA 1W German manufactures in cost of 540 thousand Euro. The system was finally installed in the shop "Titan - 2" and allowed to automate the processes of packing, to lower losses of production at packaging in container. The specified system completely also meets the international requirements and standards. INTEGRA 1W provides packing product in bags, stacking of bags on pallets, packing of the filled pallets in a stretch-sleeve. Productivity of the automatic device on packing the product in 25-kg bags is 220 pieces / hour or 5.5 tph. The automatic device is equipped with the filling horizontal turbine that guarantees the most limiting compression of TiO<sub>2</sub>, and also full absence of dustiness during packing. It is stipulated ultrasonic soldering of the valve of a bag that will allow keeping purity of packing to destination, and also guarantees accuracy of weight. For stacking on pallets the packing system is supplied with robot BEUMER robotpac®. Its productivity makes up to 600 pieces / hour. The chosen type of the robot will allow further expanding the line capacity, adding one more packing automatic device and also to pack up and stack on pallets simultaneously two different products. Besides the technology is stipulated, allowing to compress a cargo on the pallets so that it has the minimal dimensions and at transportation kept packaging. In the system, the automatic packer of ready pallets in a stretch-sleeve is applied, and also the automatic account of the packed and shipped product is stipulated.

By present time, an investment program on the company development for 2006-2010 has been elaborated and is being realized, aimed at expanding *capacities on production of titanium dioxide from 80 kt per year (design capacity of the company be now) to 120 kt per year*. The planned investments volume for the period is \$204.8 mln \$, including \$19.7 mln for environmental and occupation safety measures.

In 2006, a reverse osmosis facility for water demineralization with capacity of 300 m<sup>3</sup>/hour was commissioned to provide the production of titanium dioxide with required volume of treated (purified water). This allowed to improve washing of titanium dioxide, to decrease prime cost of desalted water and to decrease environmental impact at the expense of stopping previously used ion-exchange desalting facility, which generated regeneration solution wastes.

In the 1st quarter in shop "Titan - 1", 5 centrifugal filters were installed to increase the bay productivity to 60,000 tpy in equivalent of titanium dioxide and to improve whiteness of the product at the expense of reducing iron content in it.

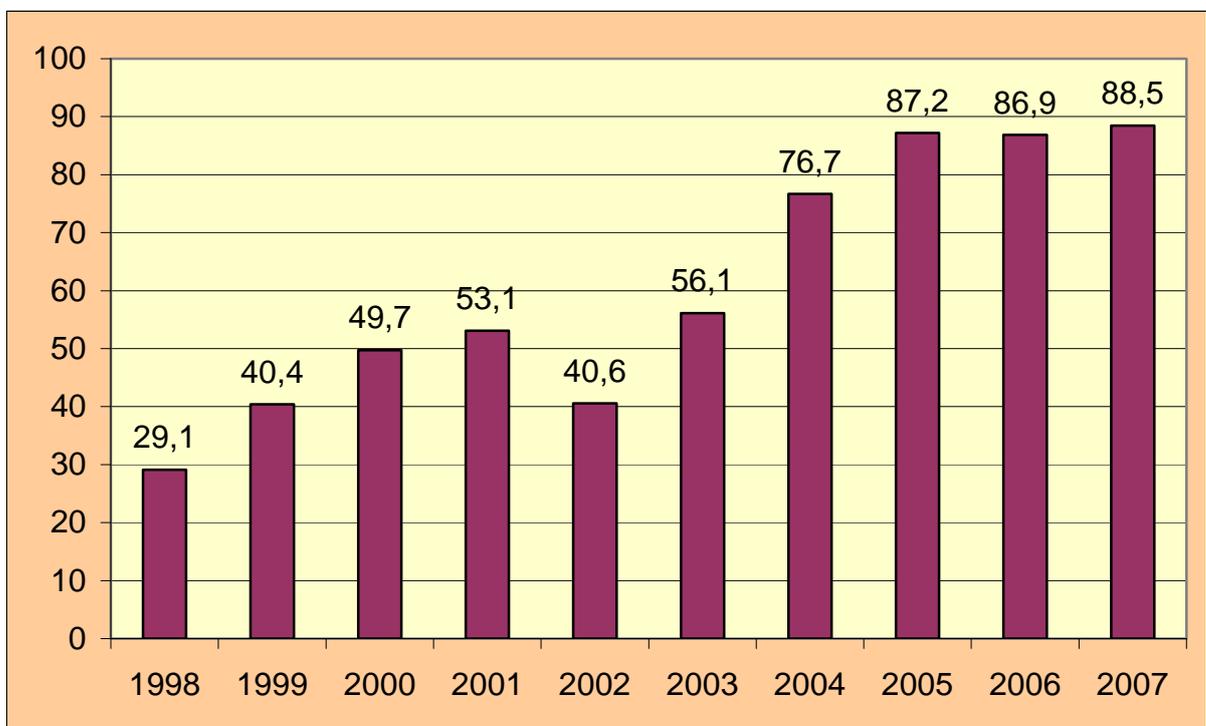
In the 1st quarter 2006, with the purpose of decrease power consumption and increasing capacity of shop Titanium-2 on manufacture of TiO<sub>2</sub>, automatic membrane press-filter (the company « ANDRITZ AG ») were mounted.

In late 2006, PJSC "Crimea Titan" launched, in drying bay of the production of titanium dioxide in shop "Titanium-2", the first de-sintering drier with inert carrier ALLGAIER WS-I-BT 3.00 (Germany), designated for careful drying the finished product (in fluidized bed at 110°C maximum (instead of previously used belt drier at 250-300°C).

In 2007, in the company titanium dioxide production, two automatic membrane press-filters AEHISM 1520 (in controlling filtration bay of shop Titanium-2), a facility on heating desalted water for the production of titanium dioxide (boiler shop), and a facility on drying iron vitriol Allgaier WS-V-R-R-T-K 16.00 with warehouse and shipment facilities (shop KSK-TsP) were mounted and commissioned. The latter measure allows to organise production of 100 kt dried iron vitriol per year, designated for exports to cement producers of European countries.

All these measures, realized in framework of the program on development and expanding of titanium dioxide production up to 120 kt by 2010, allowed to modernize and increase TiO<sub>2</sub> production, which grew from 56.1 kt in 2003 to 76.7 kt in 2004 (+27% y-o-y) and 87.2 kt, above initial design capacity of the enterprise, in 2005 (Figure 8).

**Figure 8: Dynamics of titanium dioxide production by PJSC "Crimea Titan" in 1998-2007, kt**



Source: "InfoMine" on the basis of analysis of data of Federal Service of State Statistics of Russia

Slight decreasing the production of titanium dioxide in 2006 to 86.9 kt was connected with short supply of natural gas (owing to introducing limiting consumption of the resource) and continuing production modernization.

In 2007 PJSC "Crimea Titan" reached historical peak of titanium dioxide production – 88.5 kt, and plans to expand in future the production of titanium dioxide up to 120 kt per year.

The greatest suppliers of resources for production of titanium dioxide to the company are presented in Table 9. The main raw material remains ilmenite concentrate of Irshansky GOK.

**Table 9: The greatest suppliers of resources for production of titanium dioxide to PJSC "Crimea Titan"**

Supplier	Resources
Branch of PJSC "Crimea Titan" - "Irshansky GOK", Irshansk, Zhitomir region, Ukraine	ilmenite concentrate
Eastek LLC, USA	Indian ilmenite concentrate*
LLC "Plant of New Technologies", Ukraine	tinplate cuttings/iron chips
LLC "MetalKhimPromARK", Armyansk, Crimea, Ukraine	tinplate cuttings
LLC "Lumber Complex", Shar'ya, Russia	wood meal
JSC "Azot", Cherkassy, Ukraine	sulfuric acid

\* - is not supplied at present time

Source: the company data

However, according to specialists of PJSC "Crimea Titan", the serious problem remains unstable and low grade of the Irshansky ilmenite concentrate, first of all, in content of iron (component, worsening grade of final product – TiO<sub>2</sub>) – wide variability of the iron content requires special adjusting the sulfate process parameter for each lot and even wagon of the resources that complicates completely the production and makes it more expensive. Content of TiO<sub>2</sub> in the supplied concentrates currently also varies considerably - from 50-52% to 52-65%. Notice that previously, in Soviet era, Irshansky GOK supplied low-weathered concentrates of 4 grades (instead of one grade of low quality now) that allowed to obtain more high-grade titanium dioxide finally.

In 2007, to solve the problem of the concentrate quality stabilization, PJSC "Crimea Titan" purchased electromagnetic separator to be launched in 2008.

Taking into account quality and insufficient volume of supplies of the resources from Irshansky GOK, "Crimea Titan" ought to import ilmenite concentrate. In 2002-2005, the plant imported Indian resources, added in 2005-2006 with pilot lots of titanium-containing resources from other countries (Canada, Australia).

In 2006, the Government of Ukraine transferred 294.4 Ha-land lot in Zhitomir region (in the territory of Lemnenskoe, Irshansky and Mezhdurechenskoe deposits) to PJSC "Crimea Titan" for constructing new quarries (of the 2<sup>nd</sup> turn) in

connection with exhausting reserves in operating quarries. Expected capacities of the allocated land lots (for new quarries) are planned to allow provision of PJSC "Crimea Titan" and JSC "Sumykhimprom" with ilmenite concentrate for the nearest 5-6 years.

The company is situated within an easy reach of highways, railway station and international sea ports on the Black Sea, which provides good logistics for worldwide deliveries. The company has its own distributors network. The company has very strict requirements as for choosing distributors. The choice is for the companies providing sustained distribution, stable prices, performing serious market research and product promotion, and finally, providing the end-users with high-level service. For instance, Crimea Titan has distributors in Russia, Sweden, Finland, Baltic Republics, Poland, Germany, France, South Korea, Iran, etc., with steady expansion geography of the exports. The company's official dealers in Russia are LLC "Center of Optimal Technologies" (Moscow), LLC "Khimelt" (Moscow), LLC "Luxkhim" (Rostov-on-Don), LLC "Khimton" (Moscow).

The greatest foreign consumer of titanium dioxide of PJSC "Crimea Titan"'s production is Russia (21.4% of the total exports in 2007). Share of titanium dioxide of "Crimea Titan" at Russian market is around 30%. Besides, the company regularly exports the product to Great Britain (11.7% of the total exports in 2007), Germany (8.2%), South Korea (8.2%), Cyprus (6.8%).

From data of "InfoMine", in 2006 and 2007 the company (together with traders) exported 78 and 87.6 kt of titanium dioxide, respectively (Table 10). The share of the company exports increased from 89.8 to 98.9%.

Notice that in 2002 USA, which previously consumed 30% of total volume of export supplies of PJSC "Crimea Titan", introduced 100%-import duty on the Ukrainian products that forced the company to decrease the production and to look for new markets.

In 2007 domestic sales of PJSC "Crimea Titan" were 11 kt of titanium dioxide. The main Ukrainian consumers of the titanium dioxide are companies of paint-and-varnish sector - LLC "PP ZIP" (Dneprodzerzhinsk), "Dnepropetrovsk paint-and-varnish plant", PJSC "Lakma" (Kiev), LLC "Lukra" (Lugansk region).

Notice that in latest years, PJSC "Crimea Titan"'s annual sales exceed production volumes. This is owed by sales of stock, accumulated at the company warehouses. In Ukraine, the main supplies of the product to consumers are realized by the company directly via Trade House of PJSC "Crimea Titan".

**Table 10: Export of titanium dioxide by PJSC "Crimea Titan" in 2004-2007, t, %**

Direction	2004	2005	2006	2007	
				Volume, t	Share, %
Russia	16450	17444	12051	18735	21.4
Great Britain	1020	7720	8799	10217	11.7
Germany	636	1000	8301	7158	8.2
South Korea	6289	33	3651	7111	8.2
Cyprus	2201	30548	10240	5993	6.8
Italy	–	–	4600	4820	5.5
Canada	20	212	2245	4190	4.8
Azerbaijan	200	256	1192	3312	3.8
USA	2044	1517	3202	3278	3.7
Iran	1360	1760	1880	2884	3.3
Spain	–	–	1477	2780	3.2
Estonia	31327	10494	8732	2276	2.6
Belarus	616	1886	1700	1908	2.2
Hungary	40	280	300	1379	1.6
China	–	20	749	1255	1.4
Uzbekistan	300	448	612	813	0.9
Syria	200	500	440	780	0.9
Iceland	–	–	83	692	0.8
Turkey	3820	160	140	660	0.8
New Zealand	624	705	580	602	0.7
Kazakhstan	448	328	404	480	0.5
Brazil	2161	220	160	420	0.5
Moldova	175	98	350	308	0.4
UAE	480	840	780	80	0.1
other	373	3367	5360	5426	6.0
<b>Total, t</b>	<b>70784</b>	<b>79836</b>	<b>78028</b>	<b>87557</b>	<b>100</b>
<b>Cost, mln UAH</b>	<b>445.3</b>	<b>560.8</b>	<b>623.2</b>	<b>728.2</b>	
<b>Average price, UAH/t</b>	<b>6291</b>	<b>7024</b>	<b>7987</b>	<b>8317</b>	
<i>Share of export in production, %</i>	92.3	91.6	89.8	98.9	

Source: State Customs Service of Ukraine, "InfoMine"

Production of titanium dioxide refers to power- and material-intensive. Share of power in prime costs of the product ranges 15-18% and is expected to grow further in nearest years. That is why the company pays much attention to realizing measures on decreasing power and natural gas consumption. On the other hand, the government also pays attention to provision of domestic power-intensive enterprises with natural gas. For instance, in spring 2008, Naftogaz Ukrainy signed a contract with JSC Gazprom on supply of natural gas from Middle Asia to Ukrainian

producers in volume of 7.5 bln m<sup>3</sup>. Among the company-consignees are "Rovnoazot", "Crimean soda plant" and "Crimea Titan".

At present time, the Government of Ukraine plans to create State Concern Titanium on the basis of titanium assets of the country – PJSC "Crimea Titan", JSC "Sumykhimprom", Zaporozh'e titanium-magnesium combine, as well as Volnogorsk State GMK and Irshansky GOK.