



The Lake Charles facility is one of the world's newest TiO₂ manufacturing plants and is the only plant site operated by **LOUISIANA PIGMENT COMPANY, L.P. (LPC)**. The plant was built by Kronos at a cost of over \$300 million, and came on-line in early 1992. The facility utilizes the chloride process and is capable of producing over 168,000 metric tons per year of treated TiO₂ pigment.

Several factors played a key role in the selection of Lake Charles as the location for the new plant site: the local deep-water port for transportation of ore, the availability of other raw materials such as chlorine, coke, and oxygen, and easy access to a nearby interstate highway.

In 1993, Tioxide purchased 50% of the facility and the name of the joint venture plant became **LOUISIANA PIGMENT COMPANY, L.P.** The plant furnishes pigment to current owners, **Kronos** and **Venator Corporation**, for their customers in North America and around the world.



The production facility covers 40 acres with an additional 127 acres used for parking, administrative offices, and storage of equipment and by-products. During the construction phase, employment peaked at 2300. The current employment stands at around 450 highly trained, local people, of which 125 are contract employees.

PRODUCT USES



Industry uses titanium dioxide for generating brilliantly hued paints, in the manufacturing of primers and base coats, in automotive finishes, and in coatings for the exterior of buildings. Beyond this, titanium dioxide can be found in high-quality papers, color plastics, furniture panels, textile fibers, glass, ink, porcelain, toothpaste, cosmetics, candy, food coloring, PVC, white sidewall tires, and a growing list of others products.

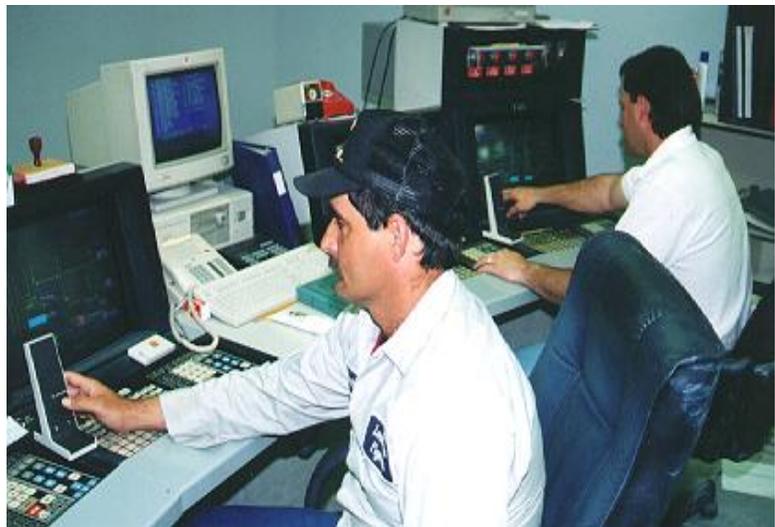
Most appliances and plastic packaging contain large quantities of titanium dioxide. Plastics are transparent and acquire their gleaming whites and opacities through the addition of titanium dioxide. Titanium dioxide also improves the physical properties of many plastics. It absorbs ultraviolet light, making the material more resistant to weathering.

MANUFACTURING PROCESS

In the chloride manufacturing process, TiO_2 is recovered from titanium ore (natural rutile, slag, etc.). This is done by first producing titanium tetrachloride (TiCl_4) as an intermediate product, oxidizing it to form TiO_2 particles, and then washing the TiO_2 particles to the purity required for further processing and finishing treatment. The ore normally contains from 5 to 15% impurities (metal oxides), while the pigment processed in finishing treatment contains less than 0.005% (50 ppm) impurities. The particle size distribution of the TiO_2 pigment upon arrival in finishing treatment is between 0.1 and 1.0 microns, which is a key to quality.

The two steps that most characterize the chloride process are the continuous chlorination of ore in a fluidized bed chlorinator and the continuous oxidation of titanium tetrachloride in the gas phase to titanium dioxide using a burner. These two steps are completely dependent upon each other since the chlorine released by oxidation is recycled to chlorination.

Through the use of analytical measurement and computer control technology, it is possible to optimize essential production variables, minimize down time, and operate machinery at maximum safety standards. On the premise that operating conditions are kept at an optimum for every step of the chloride process, 90-95% of the titanium dioxide contained in the original ore can be recovered and used in the end product.



The entire process can be divided into the following functional units, each unit then being subdivided into the corresponding process steps.

Chlorination with:

- Storage and transport of raw materials (ore, coke, salt).
- Chlorinator.

Dust Separation and Condensation with:

- Quenching of hot chlorination gases.
- Separation of condensed metal chlorides and solid particles and further processing.
- Separation of crude $TiCl_4$ from remaining chlorination off-gases.

Off-Gas Scrubbing with:

- HCl recovery.
- Neutralization.
- Sulfur removal.
- Off-gas combustion.

$TiCl_4$ Purification and Oxidation with:

- Storage of the pure $TiCl_4$.
- $TiCl_4$ oxidation (burner).
- Cooling of the burner products.
- Pigment separation.

Pigment Separation:

- Pigment repulping.
- Milling and classification of the base material.



In the treatment or finishing process, various phases of silica and alumina can be precipitated together or in separate layers onto the particles of CP base material. Other metal compounds are applied as surface treatment to provide the desired chemical and physical characteristics for overall pigment performance. Reagents, ionic strength, pH, and treatment procedure influence the characteristics of the final product.

Following treatment, the pigment must be washed and dried. During drying there is some degree of agglomeration, and grinding is required to reduce the agglomerates back to the particle size distribution originally produced in the oxidation step. Grinding is achieved by a combination of media mill and fluid energy mills. Grinding aids are used to lower partial surface energy and achieve uniform flow. The resulting pigment is then packaged for shipment to customers.

PLANT PERSONNEL



About 450 people are employed at **LPC**. The annual payroll of the facility exceeds \$32 million. Approximately 200 hourly personnel are currently represented by **United Steel Workers Union**.

The plant consists of four major production areas: Chloride Process 1&2, Finishing, and Utilities/Neutralization. Including Maintenance, over 300 people are employed in these areas. In addition, the Quality Assurance Department provides analytical measurements of raw material, process, product, and environmental samples to internal and

external customers. Other departments provide support to plant operations in the areas of Purchasing, Stores, Safety, Medical, Environmental, Training, Human Resources, Accounting, Engineering, PdM, MIS, and Security.

The plant site operates 24 hours per day and uses the 12-hour Rotating Shift schedule for most hourly workers. Personnel are trained in the use of sophisticated computer controls and high-quality instrumentation. Continuous improvement in every area of the plant is a testament to the quality of the people employed at **LPC** and their training, and is supported by the management philosophy. Initial training of the work force involved months spent at the Leverkusen, Germany plant site and countless hours of on-the-job and classroom training.

ENVIRONMENT

LPC is the leader of environmental initiatives within the titanium dioxide manufacturing industry. Utilizing the chloride process, our overall aim is to provide an environmentally secure workplace by employing environmental technology that meets and/or exceeds the regulatory requirements. Furthermore, we combine our technology initiatives with sound performance to support an on-going environmental advocacy effort to enhance the performance within our industry.

LPC operates under several permits including Louisiana Pollutant Discharge Elimination System (LPDES) water permit, Title V and PSD air permits, and solid waste permits. Our water permit includes the neutralization and filtration of our wastewater stream and controlled discharge to the Calcasieu Ship Channel. Through our advocacy effort, the LPC neutralization process has been established as the best demonstrated technology for the treatment of the chloride process waste stream.

HEALTH & SAFETY

Recognizing the importance of maintaining a safe and healthy working environment for all personnel working at our facility, **LPC** provides ongoing programs designed to maintain and enhance our environment and personnel.

These programs include many methods and activities such as:

- Extensive training in our operational processes, maintenance activities, and specific job safety training.
- Providing workplace monitoring to control and identify areas where appropriate personal protective equipment may be necessary.
- Providing state-of-the-art personal protective equipment, available to all personnel working at our facility.
- Utilizing employee input through our employee safety incentive program.
- Conducting daily safety meetings to discuss and provide resolutions to safety concerns.
- Maintaining Environmental Health & Safety Committees, which are utilized to effectively prevent and control occupational hazards, promote environmental responsibility, and continuously improve LPC's EH&S systems.
- Providing an onsite medical department, that conducts annual physicals and provides immediate care for employees in need.

LPC maintains a voluntary onsite emergency response team. This team is comprised of chemical response, fire brigade, structural rescue, and emergency medical members. Each member is initially trained in specific functions within the team and then cross-trained in other functions. Onsite drills provide the team with opportunities to maintain and enhance their skills.

Community awareness plays a major role in our safety program. We are an active member of the Local Emergency Planning Committee (LEPC), the Southwest Mutual Aid Organization, and the Community Awareness Emergency Response (CAER) program. We also interact and provide a means for communication to our local community with programs such as neighborhood visits and an open house at which local residents are welcome to discuss their concerns. **LPC** is an active participant in a local Community Advisory Panel.

LPC is a member of the Louisiana Chemical Manufacturers Association (LCA), and actively supports the American Chemistry Council's Responsible Care Initiative – a public commitment by chemical manufacturers to improve industry performance in health, safety, and environmental quality.

LPC has been certified as a star program in OSHA's Voluntary Protection Program since 2005. The Star Program is designed for exemplary worksites with comprehensive, successful safety and health management systems. Companies in the Star Program have achieved injury and illness rates at or below the national average of their respective industries. These sites are self-sufficient in their ability to control workplace hazards. Star participants are reevaluated every three to five years, although incident rates are reviewed annually.



Maintaining this commitment to our employees and community is an ongoing effort. Continually pursuing opportunities for improvements in our safety programs and community interactions help us to be a responsible member of our Lake Charles community.

QUALITY

The quality system at **LPC** was first certified to ISO 9002 in the fall of 1994, only 2½ years after startup. **LPC** was certified to the ISO 9001 standard in 2002. Continuous improvement of systems, and compliance with the international standard, has become the basis for the fundamental operational philosophy of the plant.

The facility produces some of the best quality TiO₂ found anywhere in the world primarily for use in paints and plastics. Consistency of product quality is high at **LPC** with > 99% on-spec product in an industry where 80-90% is the norm.

The continuous improvement of systems through the daily use of quality principles and statistical tools is the basic philosophy behind the Quality Process at **LPC**. Several sophisticated statistical tools are applied routinely. These tools include statistical process and quality control charting, multivariate statistical analysis, designed experiments, and statistically-based control strategies. The use of these tools has helped produce the continuous improvement that has taken **LPC** into the uncharted territories of record production at higher efficiencies and quality while enhancing safety and environmental compliance.



The dramatic improvement demonstrated over the few years that the plant has been in operation is reflected in the Company's Mission Statement:

“With a dedication to the pursuit of business excellence, we will develop and continuously improve systems throughout our operation with the focus on meeting or exceeding both internal and external customer's needs in a way that

- Develops knowledgeable employees who take ownership.
- Provides a safe work environment.
- Provides an environmentally secure workplace.
- Promotes the use of the quality principles and statistical tools throughout the organization to produce quality products and services.
- Maximizes system capability and flexibility while minimizing total costs.

so that **LOUISIANA PIGMENT COMPANY, L.P.** continuously improves as a supplier of its products and services.”

This policy and a firm commitment to excellence by all **LPC** employees is the key to the world-class quality of TiO₂ pigment produced by **LPC**.