Is Your TiO$_2$ Supply Strategy Sustainable?

By Joe Maas, The ChemQuest Group, Inc.

Introduction
With over 30 years of experience working in the titanium dioxide industry, ChemQuest Director Joe Maas’s knowledge spans TiO$_2$ technologies and substitutes, global supply logistics (including channels/distribution), end uses, customers and regulations. In this issue of Coatings World, Joe Maas shares his perspective on the global TiO$_2$ supply/demand trends and drivers that are likely to affect paint and coatings’ stakeholders through 2020.

1. Hypothetically speaking, how would the absence of titanium dioxide affect humanity?
Admittedly, titanium dioxide pigment (TiO$_2$) is not as essential to human life as oxygen and water, given that humans managed to survive without it until the 20th Century. Since its inception, however, TiO$_2$ – comprising properties that extend the lifecycle of thousands of products – has become an integral part of modern life. Less measurable but equally important to our quality of life, colors could not be properly developed without TiO$_2$, which would detract from the beauty of our world, making it less vibrant, drab and dull; unquestionably, a somber place. Practically speaking, pharmaceutical colorants with TiO$_2$ facilitate a patient’s ability to distinguish between pills and medications.

Over the past 100 years, approximately 300 million metric tons of TiO$_2$ have been produced and consumed. TiO$_2$ has positively impacted the lives of nearly every man, woman and child in the industrialized world and remains one of the safest and most useful materials ever developed. For many such reasons, I believe it is essential.

2. Which end uses consume the most TiO$_2$?
Annual global TiO$_2$ demand is estimated to be over six million metric tons split among key end-use markets. As Figure 1 depicts, sixty percent of the annual global demand is consumed by paints and coatings, followed by plastics at twenty-five percent.

3. How would you describe TiO$_2$’s current market dynamics?
Assessing the current global TiO$_2$ market requires some background on the 2008/09 economic crisis. Following the worldwide economic collapse, TiO$_2$ production was severely curtailed, with producers slashing capacity and postponing plant expansions. In recovering economies, TiO$_2$ supplies struggled to meet a pent-up demand for the products formulated with TiO$_2$, quickly depleting producer inventories. The ensuing shortage drove prices up to near historical highs. The turning point came in mid-2012: growing supply coupled with waning demand ended the TiO$_2$ shortage. For the next three-and-a-half years, prices plummeted nearly to pre-recession levels, as shown on Figure 2.

Beginning in mid-2016, demand picked up when the
Chinese government cracked down on highly polluting (mostly small) TiO₂ operations, which severely decreased supply. In early 2017, Huntsman’s Pori Finland plant (~130,000 metric ton capacity) suffered a catastrophic fire that further curtailed TiO₂ supply, driving up prices worldwide. Between 2017 and 2018, quarterly price increases were passed through the supply chain, albeit this successful price pass-through may be short lived as the preceding inventory shortfall continues to be offset, not only by increased Chinese capacity, but by overall increases in global production through 2019.

4. What is the supply/demand outlook for the near future? Growth indicators for North America, Europe, China, and Brazil underpin steady demand for TiO₂. Examples include GDP increases, U.S. manufacturing capacity utilization benchmarked by the Federal Research System (see Figure 3), and the purchasing managers’ index (PMI). The key is high capacity utilization, which will likely temper price increases in 2018 and beyond. Potentially, TiO₂ could enjoy an extended period of steady profitability and stable pricing. Yet, I am only cautiously optimistic because historically such a trend would invariably lead to overbuilding of capacity and subsequent oversupply.
5. Are pending regulations likely to be a headwind for TiO₂ supply?
Pressure is mounting in Europe to label TiO₂ as a potential human carcinogen based on inhalation. European authorities will likely announce their ruling later this year. If enacted, the European legislation’s overall impact may be muted due to TiO₂’s limited direct contact with consumers (as it is typically encapsulated in liquid or solid media as in paints and plastics). Conceivably, regulators may scrutinize the continued use of TiO₂ in food and cosmetic applications. TiO₂ growth is in non-respirable forms such as water slurries in paints/inks, plastic compounds and decorative laminate papers.

6. Any advances in TiO₂ process and product development?
TiO₂ is a mature industry having recently celebrated its 100th year of commercialization. Many innovations have transformed this product from its original properties to today’s forms of TiO₂, which are highly efficient at providing opacity, tint strength, high durability and color stability. Notwithstanding its maturity, while TiO₂ technological developments are mostly limited to tweaks, there is growing interest in developing potential uses involving nanoparticles and photocatalysis (yielding niche volumes, at least for now). Continuous improvement in process has primarily focused on cost reduction through automation and energy reductions.

7. What is happening with TiO₂ Feedstocks?
Through more sophisticated purchasing terms and supply contract language, independent feedstock suppliers have recently become better aligned with the supply/demand and pricing maneuvers of TiO₂ producers, many of whom enjoy captive feedstock supplies (which, depending on ever-changing supply/demand dynamics, can be either a blessing or a curse). When demand for TiO₂ is high, access to feedstocks is assured, but when TiO₂ supplies are long, feedstock values drop in tandem with TiO₂, exacerbating the risk of integrated ownership.

8. What are your recommendations for TiO₂ buyers?
Faced with the vicissitudes of the TiO₂ supply/demand cycle, it is imperative that consumers not only do their technical homework to approve various suppliers and TiO₂ grades for ease of substitution, but also build mutually beneficial relationships with their suppliers.

9. Are there viable substitutes for TiO₂?
Significant price increases in TiO₂ usually spark a common refrain from buyers, “We will replace TiO₂!” While optimization of TiO₂ usage is an option, complete replacement or majority replacement is a dream. The reason is simple: TiO₂ boasts the highest refractive index of any commercially-available material (no material can match its efficiency at bending light waves away from the surface of a substrate, creating the highest opacity in the thinnest gauge film). Spacer and extender pigments such as calcium carbonate improve the spacing of TiO₂ to optimize its opacifying effect. Likewise, certain resins optimally space TiO₂ in a film. While products such as ROPAQUE™ provide a modicum of opacity, they can have significant drawbacks in typical end uses. Bottom line is that besides death and taxes, one can also count on TiO₂!

10. What are the trends with industry consolidation?
Consolidation will likely continue as TiO₂ producers attempt to leverage greater volume and lower costs for improving profitability and competitive advantage. TiO₂ and feedstock producers are in the unenviable position of being, by far, more heavily invested than any other player in the TiO₂ value chain, while only periodically reaping attractive returns. Compared to their end user counterparts who are utterly dependent on TiO₂ for end products’ key properties, TiO₂ and feedstock producers invest 100-fold to add plant capacity versus building a paint plant or plastics’ blending operation. Likewise, distribution outlets for the end products (the Big Box outlets and company paint stores) enjoy low overhead compared to TiO₂ and feedstock producers. Leveraging their end customers’ shifting design tastes and color preferences, coatings and distribution outlets can command a larger portion of the value. Whereas the only option for long-term prosperity in the TiO₂ value chain is consolidation and integration with feedstock suppliers. CW

Joe Maas is a director at The ChemQuest Group Inc. and ChemQuest Technology Institute. For more information, visit www.chemquest.com.