

---

## Keeps Gettin' Better - Stars Aligning As Gulf Coast Ethylene-To-Alkylate Project Advances

Wednesday, 09/07/2022

Published by: [Housley Carr](#)

The thinking behind Next Wave Energy Partners' late-2019 decision to build a first-of-its-kind ethylene-to-alkylate plant was that a combination of NGL production growth and new ethylene supply — plus increasing demand for alkylate, an octane-boosting gasoline blendstock — would be a win-win-win for ethylene producers, refiners and Next Wave itself. Now, with construction of the plant along the Houston Ship Channel approaching the homestretch, things are shaking out very much as the company had anticipated — even better, in fact. In today's RBN blog, we discuss the progress being made on Next Wave's Project Traveler plant and the market forces validating the company's final investment decision (FID).

Who among us didn't make plans in late 2019 and early 2020 that didn't pan out. Trips to the beach, to the mountains, to Europe. Family get-togethers and weddings. Plans to start new businesses, change jobs or retire. No, COVID reared its ugly head, and wreaked all kinds of havoc (beyond the obvious and sad human toll). The stock market crashed, and so did crude oil prices. Demand for gasoline, diesel and jet fuel tanked, and E&Ps, refiners and petrochemical companies tore up and threw out their 2020 and 2021 playbooks. More shocks followed, especially Russia's February 2022 invasion of Ukraine, which sent crude oil, natural gas and refined-product prices skyward and helped spur a round of inflation the likes of which we haven't seen since the 1970s. And now there's talk of a recession too.

After all the shocks and dislocations of the past two-and-a-half years, however, at least one of the plans made in the months before COVID did come to pass. Or, to put it more accurately, the project we'll discuss in today's blog is well on its way to becoming a reality, and the late-2019 rationale behind its owner's FID hasn't just held up, it's proved to be prescient.

We first looked at Next Wave's plan for a 28-Mb/d ethylene-to-alkylate plant in [Drive My Car](#). In that blog, which we posted in January 2020 (soon after the company took FID), we began with a review of the many factors that, when considered collectively, led almost inevitably to Project Traveler's fruition. These factors fall into three buckets:

- **Trends in the market.** These include (1) rising U.S. NGL production; (2) more Gulf Coast fractionators to separate out the purity products; (3) more ethane-only steam crackers to make more ethylene and other petrochemicals; (4) higher U.S. and international ethylene production and lower ethylene prices; and (5) low and relatively stable U.S. butane prices (butane is a low-cost but high-RVP gasoline blend component).
- **The need for octane.** Refiners and blenders develop gasoline recipes that satisfy the requirements of end-product specs like [Reid vapor pressure](#) (RVP) and [octane ratings](#), with the latter reflecting the degree to which a fuel can be compressed before it self-ignites (causing "knocking"). High-octane, low-RVP and low-sulfur content are three of the most desirable qualities for gasoline blendstocks, and alkylate (typically produced as

part of the crude oil refining process, and representing about 15% of the total gasoline pool) has perhaps the best combo of the three.

- **The desire to hedge.** Ethylene producers — especially those without adjoining polyethylene (PE) and monoethylene glycol (MEG) plants — want to mitigate their exposure to ethylene commodity price risk, and one way to hedge their long position is to explore other potential markets. Alkylate consumers like refiners and blenders may, in turn, want to hedge their short positions by locking in at least a portion of their supply of the octane booster.

Two other things are worth mentioning here. One is that while overall demand for gasoline in the U.S. has remained close to flat over the past several years, mostly due to improved fuel efficiency, an increasing share of vehicles sold here require the use of higher-octane fuel — that is, gasoline with a 91 or 93 octane rating — and, as you'd expect, an increasing portion of the gasoline sold is premium. The other is that in recent years U.S. refineries have been increasing their use of abundant, domestically produced light crude oils, which, when refined, produce more low-octane naphtha than heavier crudes do. Because naphtha has a low octane number, it needs to be “blended up” with the addition of more high-octane components like alkylate.

Next Wave looked at the big, complicated picture we just described and thought — and we're paraphrasing here — “What about developing a project that converts a small portion of the ethylene being produced into a best-in-breed alkylate, using readily available isobutane to help make that happen?” Figure 1 shows how the tried-and-true conversion process works. Project Traveler's dimerization unit (blue boxes to left) reacts ethylene to form butylene, and its alkylation unit (blue boxes to right) reacts isobutane with butylene to form pure alkylate (its trade name is Optimate), with no material by-products.

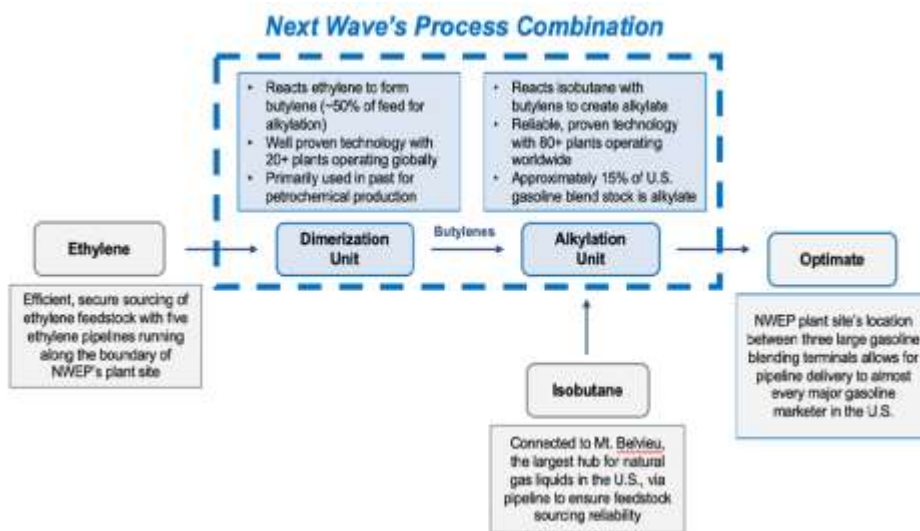


Figure 1. Ethylene-to-Alkylate Production Process. Source: Next Wave

Our understanding is that Next Wave's alkylate will have an octane rating of 96.5 — more than 3 points higher than the average 93-octane alkylate produced at refineries — with an RVP of only 3 pounds per square inch at atmospheric pressure (psia), compared with 5.5 psia for refinery-produced alkylate, and less than 5 parts per million (ppm) sulfur content, versus up to 15 ppm for refinery alkylate.

Next Wave took a midstream approach to the commercial side of the project. Like the developer of a new pipeline, fractionator or export terminal, it sought to line up long-term customers for the vast majority of the plant's nameplate capacity to minimize the company's exposure to the risks associated with commodity prices — in this case, ethylene and alkylate. Prior to taking FID, Next Wave entered into a number of agreements under which steam-cracker owners committed a small portion of their ethylene output (a total of nearly 1 billion pounds per year) and gasoline blenders committed to buying specified volumes of alkylate — locking in most of their spread. Through these deals, the commodity price risk is allocated to the ethylene suppliers and alkylate consumers looking to hedge their own long and short positions, respectively.

This structure also provides the project with long-term commitments for ethylene supply and alkylate offtake that ensure the plant's capacity will be highly utilized. It's possible that the plant's actual output will exceed its 28-Mb/d nameplate capacity by a considerable degree, which would enable Next Wave to both receive more ethylene from steam-cracker owners and produce more alkylate for its customers. The project also has been designed to allow for a capacity expansion if demand warrants.



Next Wave's Project Traveler. Source: JG Industrial Contractors, Inc.

As shown in the photo above, construction of the plant (near side of blue line) is progressing, and Next Wave has said it expects the facility to be up and running for the 2023 driving season. For redundancy's sake, ethylene will be delivered to the plant via as many as five of the ethylene pipelines that already run along the plant site's boundary and isobutane will be delivered by pipes from both Mont Belvieu and the Sweeny/Clemens area. As for the alkylate produced at Project Traveler, Next Wave will transport it on two company-owned pipes to two large, close-by gasoline-blending and marine-terminal facilities in Pasadena, TX, one owned by Kinder Morgan and the other by Intercontinental Terminals Co. (ITC). Kinder Morgan's facility is the largest gasoline blender by volume in the U.S.

As we said in our introduction, the market trends and other factors that helped spur the development of the project (see bullets above) remain as true today as they were back in late 2019. In fact, the value of octane has increased since then, and the rise in natural gas prices around the world (especially in Europe) has helped to keep U.S. refinery crack spreads high, leading to high U.S. refinery utilization rates — and strong demand for alkylate. Also, U.S.

production and exports of butane are even higher than Next Wave had been anticipating, an indication that the cost of isobutane (used in the project's alkylation unit) will remain relatively low.

You might be wondering about the timing of a major refining-related project now, just as the energy transition is beginning in earnest. Two things. First, as we said earlier, octane demand is on the rise, and is likely to remain strong as an increasing share of cars and SUVs run on premium versus regular (87-octane) gasoline. Second, and more important, Next Wave is making plans to allow a feedstock shift, over time, from conventional, NGL-based ethylene to chemically identical bioethylene derived from ethanol, which would allow production of renewable alkylate and sustainable aviation fuel (SAF). We'll discuss that part of the company's strategy in an upcoming blog.



"Keeps Gettin' Better" was written by Christina Aguilera and Linda Perry and appears as the 12<sup>th</sup> song on Christina Aguilera's first greatest hits album, *Keeps Gettin' Better: A Decade of Hits*. Made specifically as a new song for the hits album, it was released as a single in September 2008. It went to #7 on both the Billboard Hot 100 and Dance Club Songs Singles charts. The electro-pop tune was produced by co-writer Linda Perry. Personnel on the record were: Christina Aguilera (vocals), Linda Perry (programming), and Marc Jameson (drum programming).

*Keeps Gettin' Better: A Decade of Hits* features songs recorded between 1998 and 2008. Produced by Walter Afanasieff, Christiana Aguilera, Glen Ballard, ChakDaddy, DJ Premier, E. Dawk, Missy Elliott, Ron Fair, Rob Lewis, Balewa Mahammad, Linda Perry, Charles Roane, Guy Roche, Rockwilder, Scott Storch, and Sol Survivor, the album was released in November 2008 and went to #9 on the Billboard 200 Albums chart. It has been certified Gold by the Recording Industry Association of America. "Keeps Gettin' Better" was the only single released from the LP.

Christina Aguilera is an American singer, songwriter, actress, and television personality. She got her start as a professional entertainer as a member of *The Mickey Mouse Club* on the Disney Channel. She signed with RCA Records and released her debut studio album in 1999. Aguilera has released nine studio albums, six compilation albums, one soundtrack album, three EPs and 54 singles. She has sold more than 75 million records worldwide. Aguilera has appeared in nine motion pictures and 18 television shows and was a coach/judge on the television talent search program *The Voice* for six seasons. She has won four ASCAP Awards, five BMI Awards, three Golden Globe Awards, five Grammy Awards, one MTV Video Music Award, and has a star on the Hollywood Walk of Fame. She continues to record and tour.