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## From four aging refineries around Philadelphia, Sunoco crafting modern giant

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When US downstream major Sunoco bought El Paso's Eagle Point refinery in New Jersey in January for \$111-mil, plus inventories, it did not just pick up a bargain-priced 150,000 b/d light-sweet crude plant.

Sunoco also created what amounts to the single largest US petroleum refinery, and what could be one of industry's most financially and operationally efficient.

Spread along a 20-mile stretch of the Delaware River around Philadelphia, Sunoco's Northeast Refining Complex (NRC) now encompasses four venerable plants in three states totaling 655,000 b/d of nameplate crude capacity and 2,000 employees. Together, they now eclipse ExxonMobil's 557,000 b/d Baytown plant near Houston as the industry size leader.

Despite their age and years of neglect by various prior owners, Sunoco is gradually cobbling together the four plants into the functional equivalent of one massive, integrated refinery. And it has done so for what appears to be a net capital investment of well under \$2,000 per daily bbl of crude capacity, or less than half the price of the last dozen US refinery deals.

"Economies of scale: That's what this is all about," explains Joel Maness, Sunoco senior vice president for refining and supply. "Stand-alone, each of these plants would have a difficult time surviving. Their size would make them marginal," said Maness, a 27-year Mobil veteran and briefly with ExxonMobil before joining Sunoco in early 2000.

The combined NRC plants now have six crude stills, four "cat" crackers, four reformers, four alkylation units (one idle) and three aromatics units. Overall conversion capacity to upgrade and reformulate gasoline and diesel is now 265,000 b/d, with more than a dozen grades of fuel and components being produced.

Two cumene units feed byproducts into Sunoco's big phenol and other petrochemical operations. And with more than 1 gigawatt of owned or affiliated cogeneration capacity now or about to come on line, NRC should be one of the country's more energy-efficient refining complexes.

"The bad news is these are old refineries, in three locations," says Vincent Kelly, vice president in charge of NRC.

"But they're close to each other, with pipeline, barge, rail and truck connections. And the region is short two-thirds of its product requirements," with the difference supplied by imports or by pipeline from the Gulf Coast.

"In scale we can outperform the local competition. And Texas refineries and imports have significant transportation costs," notes Kelly, another Mobil veteran. Bottom line, he crows: "We kick butt in PADD I."

Along with this focus on building scale in the hardware, Sunoco top management under Exxon veteran CEO John Drosdick has adopted more rigorous, systematic big-company focus on steady, flawless operational performance. A "plan, do, check, act" system has been inculcated for a "five fingers" agenda: safety, reliability, environment, utilization and optimization. "There's more structure and discipline; a military style," says one Sunoco manager.

"We have very clear targets and goals and people are held accountable," says Kelly, with all NRC plants rewarded as one: "Similar mission, similar fate."

Even before the Eagle Point addition, Sunoco's NRC was starting to perform on a par with the most efficient Gulf Coast refineries. Last year it ran at 95% of its crude capacity and 97% of conversion capacity, up every year since 2000. Adjusted for complexity, the plant cluster ran at 87% utilization of equivalent distillation capacity last year to rank in the top quartile of large US refineries.

Tying together more units should further boost utilization. "In the past, when we took down a large unit it would force you to shut other units," Kelly explains. "When we took down a reformer (whose hydrogen byproduct is used to desulfurize distillate) it would take us out of the diesel business." Now the redundancies should avoid plant-wide idle time, he says: "It's best to do smaller (maintenance) shutdowns."

Eagle Point is upstream and across the river from Philadelphia, with one crude still. Downstream on the other side is Sunoco's original 1902 refinery at Marcus Hook on the Pennsylvania-Delaware border, rated at 175,000 b/d with two crude units and a dock able to take specialized shallow-draft VLCC loads of crude.

Carved in granite under Marcus Hook are three large storage caverns for butanes, which let the complex store those valuable light ends in summer when environmental rules limit their use in gasoline.

In between Eagle Point and Marcus Hook is Sunoco's 330,000 b/d Philadelphia complex, with three crude units. It is made up of the old but serviceable Point Breeze and Girard Point refineries on 1,400 adjoining acres where the Delaware and Schuylkill rivers meet.

Point Breeze is the original Arco plant and dates from the 1870s, when it processed coal oil (kerosene). It was bought by Sunoco in 1988 from entrepreneur John Deuss' Atlantic Petroleum, along with 1,000 retail outlets, for \$513-mil plus inventories.

Sunoco converted Point Breeze from heavy-sour crude to match Marcus Hook's light-sweet configuration, built a 15-mile pipeline system between the two plants and linked them to the Philadelphia airport for jet fuel deliveries.

As much as 100,000 b/d of butanes and gasoline blending components now move by a three-pipe system tying Point Breeze and Girard Point to Marcus Hook and on to the airport. Since most of that pipe runs on the New Jersey side of the Delaware River, a mere five-mile onshore extension will connect Eagle Point, with plans afoot to convert the jet line to share hydrogen between the plants for sulfur removal.

Barges move cat cracker feed from Philadelphia to Marcus Hook. Lighters let the Marcus Hook VLCC deliveries also serve Philadelphia and Eagle Point to cut crude transit costs. Until the pipeline tie-in, truck and rail can deliver gasoline ingredients to Eagle Point and haul off summer butane. "Our goal is to optimize," says Sunoco planner Ray Toto. "El Paso (alone) didn't have access to blending components" and had to sell its summer butane at a discount, notes Toto: "We can mix and match."

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Girard Point was built in the 1920s along with a similarly designed big plant at Port Arthur, Texas, as the original Gulf Oil refineries. It was bought by Sunoco in 1994 from 1980s Gulf acquirer Chevron for \$170-mil, including inventories. Sunoco unified its operations with Point Breeze a year later.

Like Marcus Hook, it was geared to process mostly light, sweet domestic or Saudi crudes now coming mainly from West Africa. And Sunoco has steadfastly resisted the industry trend to overinvest in heavy, sour crude-handling capacity, holding its capital employed to a minimum.

"At times we've considered changing the facilities for high sulfur, but we've decided the investment was not worth it," says planner Toto. "Our view is that the availability of low-sulfur crude is not an issue. We don't see supply as any kind of concern for us."

## Neglected plant

Eagle Point was built in 1949 by Texaco on a 1,000-acre former munitions dump and then sold to Coastal in 1985 for \$42.5-mil to resolve anti-trust issues in Texaco's purchase of Getty Oil. When Coastal agreed to be taken over by El Paso in early 2000, Eagle Point was quickly marked for sale. Maintenance, hiring and profitability languished.

"It's a good facility with hard-working people," says Sunoco's Eagle Point manager and Chevron alum Steve Herzog, "but it has suffered from a lack of capital investment and its energy efficiency is lousy."

On an industry index standard of 100 points, Eagle Point's energy use was a high 120 when Sunoco took ownership in January, compared to the low 80s for Marcus Hook and Philadelphia.

After \$700,000 to fix steam leaks, clean neglected heat exchangers and other chores, Herzog has saved \$2-mil a year and Eagle Point's energy-use index is under 115, despite the start-up of new air blowers that upped the throughput of Eagle Point's millisecond cat cracker to 61,000 b/d from 55,000. Getting to an energy index of 100 would save \$15-mil a year, he notes.

Adding to Eagle Point's problems was a costly blunder by El Paso to run the 250 MW cogen plant Coastal had built there, at a cost of some \$300-mil, as a stand-alone merchant power peaking plant rather than as an integral part of the refinery. That deprived the refinery of a steady steam source and an outlet to burn hydrocarbon-rich waste gas, forcing El Paso's orphan refining group to build a separate new \$70-mil boiler unit that came on line in early 2002.

Compounding this debacle, the stand-alone cogen plant then had to meet much stiffer air pollution limits, which required costly new controls and equipment that broke down soon after startup last summer. The cogen plant thus missed last year's peak season and has been idle since last August.

Sunoco is leasing the cogen plant and has the right to buy it as soon as El Paso settles a contract dispute with New Jersey utility PSE&G. It hopes to restart the cogen unit using natural gas until it can recombine it with the refinery's more lenient air quality permit to burn waste gas.

Sale terms are still being negotiated between Sunoco and El Paso, along with a \$31-mil argument over the value of Eagle Point's inventories when the plant was sold. Any way you calculate it, however, Sunoco got a bargain. Its entire \$111-mil purchase price is less than just the cost of the new boilers and \$40-ml of other upgrades there in recent years.

Meanwhile, Florida power major FPL has built a massive 750 MW cogen plant in the middle of the Marcus Hook refinery that will assure ample steam supply and fuel-gas disposal, at no capital cost to Sunoco. FPL had eyed a similar huge unit in Sunoco's Philadelphia complex but pulled back from those plans last year. Alternate developers will be considered, Sunoco says.

Of about \$78-mil a year of cost cuts targeted at Eagle Point, Sunoco figures it already has reaped \$14-mil with another

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\$10-mil of one-time savings, mainly on energy use. Safety also has improved dramatically.

That does not count savings at Eagle Point on clean-fuel upgrades by simply adding a fourth unit to Sunoco's existing order for three cookie-cutter gasoline desulfurization plants slated for Marcus Hook, Philadelphia and its Toledo, Ohio, refinery.

In a Mar 4 securities filing Sunoco said it expects to spend \$400- to \$500-mil through 2006 to meet Tier II gasoline and diesel specifications for under 30 parts per million of sulfur. Each of the new units would cost about \$100-mil, one-third for engineering and design. Buying four identical models will thus save almost \$100-mil and speed installation.

Similarly, when Marcus Hook neighbor General Chemical abruptly quit processing its sulfur stream to acid and filed bankruptcy last year, Sunoco quickly bought off-the-shelf sulfur recovery units of its own, trimming 18 months off the usual time line.

Surprisingly, Sunoco's NRC improvements have not involved major job cuts. Nearly all of Eagle Point's staff (non-union) were hired by Sunoco. Most got a pay raise to match union workers at Marcus Hook and Philadelphia.

In fact, Sunoco has been hiring, and getting good response to ads in Houston for specialist slots. "The pool of good people is increasing," says Kelly. "People here can work in three different refineries without moving or changing jobs," he says: "We've become the employer of choice."

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