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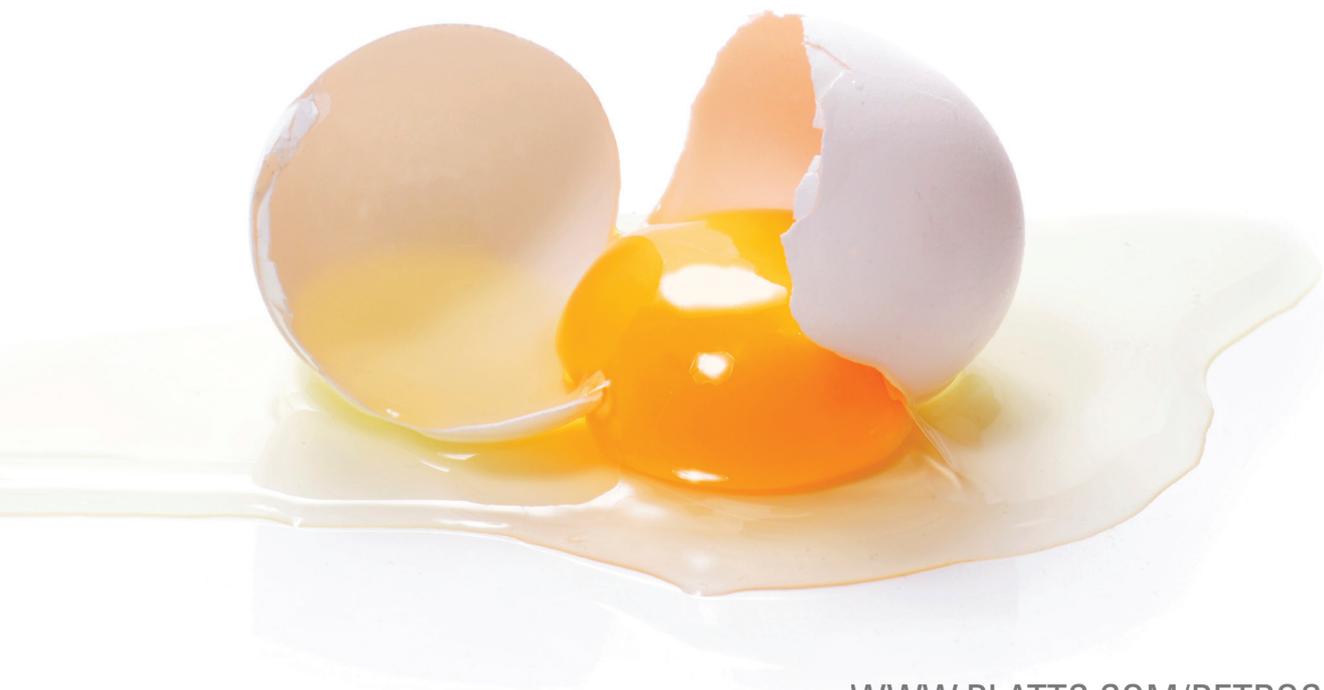


SPECIAL REPORT: PETROCHEMICALS

Time to get cracking

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THIS IS A YEAR OF BIG DECISIONS FOR COMPANIES MULLING WORLD-SCALE ETHYLENE EXPANSION TO CASH IN ON THE US FEEDSTOCK ADVANTAGE. BILLIONS OF DOLLARS ARE AT STAKE AND TIME IS OF THE ESSENCE, ARGUE BERNARDO FALLAS AND PAVEL PAVLOV

For a renascent US ethylene industry itching to cash in on the shale gas advantage, the talk has been talked and now the walk needs to be walked.

Two years after Chevron Phillips Chemical was the first to unveil plans to build a world-scale steam cracker to take advantage of cheap feedstock ethane, seven other companies have announced similar intentions – some with more concrete blueprints than others.

Couple that with the slew of announced expansions through debottlenecks and restarts, and the US could see its ethylene production capacity grow by more than 10 million mt/year – or around 35% of current capacity – by late 2017, according to Platts estimates.

In all, more than 20 greenfield and brownfield projects to increase ethylene capacity have been announced, and already a handful of expansions and a cracker restart have been completed.

“The wave of projects is definitely here,” said Matthew McSorley, vice president, Energy and Chemicals, for Fluor, a major contractor for the energy sector. “It’s coming, and most of these projects – the crackers and derivative plants – will move into [engineering, procurement and construction] beginning in late 2013.”

The ones that end up being built, anyway.

And that doesn’t take into consideration companies including Braskem (Brazil), Indorama (Thailand) and Hanwha (South Korea), which have expressed at least some interest in building ethylene capacity in the US.

It also does not account for Nova Chemicals’ ambitious projects for its Corunna and Joffre complexes or the Braskem-Grupo Idesa’s Etileno XXI joint venture in Mexico that aims to have a 1 million mt/year ethane-fed cracker and polyethylene plants online by 2015.

The Etileno XXI is on track to becoming the first cracker built in North America in more than a decade.

The collective size and scope of these projects beg the question: Can the industry expect all of these projects to see the light of day? Not if it doesn’t want to shoot itself in the foot, say olefin market sources.

Just because it is possible doesn’t mean that it is plausible.

“We believe that somewhere in between four and six crackers will actually be built,” McSorley said of the proposed steam crackers.

To that end, 2013 is shaping up to be a year of big decisions for companies contemplating multibillion-dollar investments.

Take the risk and bring too much production capacity online around the same time, and the market could find itself, in classic overbuild fashion, swimming in ethylene, which would likely depress prices of the prized olefin.

Even if demand were to absorb the added production, there is no guarantee that ethane supply could keep up -- even as its reserves in shale formations across the country are beyond abundant – because of possible logistical constraints.

A recent forecast by Platts unit Bentek Energy projects US demand for ethane to surpass supply as early as 2018 and through at least 2023.

Accounting for the equivalent of six worldscale, ethane-fed steam crackers coming online by 2017-19 — five of them in the US Gulf Coast region and one in the Northeast – the Bentek report projects an ethane demand of 1.810 million b/d against 1.692 million b/d of supply by 2018.

Wells Fargo Equity Research has projected US ethane demand to hit 1.726 million b/d in 2017.

It is necessary to point out that Bentek’s forecast does not include ethane from the Williston Basin, the furthest from the US Gulf Coast and the one with the highest transportation costs.

The Bentek forecast estimates US ethane demand for 2013 at 1,136 million b/d.

Bentek goes on to suggest that should Williston be developed and all potential ethane were to be produced across the US – a big if at this time – ethane supply should keep pace with ethane demand even after the expansions.

Other recent industry forecasts, including those prepared by Raymond James and En*Vantage, also suggest a potential situation in which ethane demand could surpass supply by 2017-18. Such a scenario could lead to a run-up in ethane prices, which in turn could make the much-vaunted cost advantage fizzle.

A high natural gas-to-crude oil price ratio is imperative for companies looking to make these investments. And while that would seem likely, one thing the US petrochemical industry should know well is that nothing in the business is guaranteed.

Just consider the dynamics that shale oil and Canada’s tar sands – should the controversial Keystone XL pipeline project get final approvals – could bring into the crude price equation.

This is not lost on the Bentek report. For example, it projects Henry Hub natural gas average prices to rise slowly yet steadily beginning in 2013 (\$3.46/MMBtu), climbing to \$5.18/MMBtu by 2017 and approaching the \$6/MMBtu mark by 2023.

All the while, WTI crude is forecast to move lower, from around \$91/barrel in 2013 to as low as \$73.88/b by 2017 and back up to around \$85.45/b by 2023, according to Bentek.

And while those levels still would imply a favorable ratio. It won't be nearly as good as what olefins producers have been enjoying lately with natural gas and ethane prices reaching near-record lows as recently as late last year.

Olefins and integrated producers who crack light could see hefty margins over the next four to five years, with ethane prices expected to hover around ethane rejection floor levels, according to industry forecasts.

US spot ethylene prices averaged 56.76 cents/lb (\$1,251/mt) in 2012, up slightly from 2011 (56.02 cents/lb) and more than 25% higher than 2010 (44.60 cents/lb), according to Platts data.

Ethane prices, meanwhile, have plummeted since last breaching the 90 cent/gallon mark in October and November of 2011. They averaged 39.72 cents/gallon in 2012 and have so far averaged 24.41 cents/gal in 2013 while in the midst of a cracker turnaround season.

"As you know, in 2012 the industry grappled with thin-to-negative margins for naphtha-based ethylene producers in Europe and in Asia," Dow Chemical CEO Andrew Liveris said in discussing the ethylene cycle earlier this year. "The dichotomy, of course, is the Americas, which have shown exceptional margin strength as wet shale gas dynamics are fundamentally changing the game for integrated North American based producers like Dow."

Liveris, whose company is investing \$4 billion to expand olefins capacity in the US, said this was evidenced by operating rates in the US and Canada that exceeded 90%, while Asia's and Europe's lingered in the 70s%.

"We reaffirm our view that, even given modest GDP growth in North and Latin America, operating rates and margins in the Americas will rise in the near term," Liveris said. "In fact, before the new US Gulf Coast capacity comes online in the back half of this decade, the Americas may well become a net importer of ethylene derivatives... leading to a step-change in price necessary to attract those imports."

"Further, as global demand outstrips supply in the next few years and world GDP gains further traction, we anticipate operating rates higher than 90% – leading to substantial margin expansion. A double peak, so to speak."

In 2012, US olefins producers using ethane as their main feedstock enjoyed implied cracker margins that averaged more than \$750/mt (34.34 cents/lb), the highest since Platts began tracking cracker margins in 2011, when they averaged just under \$500/mt (22.30 cents/lb).

Cracker margins for both ethane and propane have hovered above the \$1,000/mt (45.35 cents/lb) mark so far in 2013 as feedstock supply is ample and ethane rejection is in full effect. In fact, through the first two months, propane was the highest-margin feedstock because of elevated propylene prices, market sources indicated.

The lower feedstock costs have contributed to ethylene contracts being priced at a steeper discount to spot – contracts averaged just north of 48 cents/lb in 2012 – but even going by those numbers cracker margins remain healthy nonetheless.

Not bad for an olefins industry that sources say just five years ago deemed \$220/mt (10 cents/lb) a good margin.

Houston-based Westlake, a maker of polyethylene and polyvinyl chloride, for example, reported its best year in olefins in the company's history during its February 19 earnings call.

Other chemical makers reported similarly stellar performances by their olefins segments, with cheap feedstock a common theme.

"The growing production of natural gas liquids from shale gas and oil production has caused ethane to become oversupplied as significant capacity additions in gas liquids processing and pipeline infrastructure brought ethane into the market faster than the North American chemical industry can consume it," Westlake Chemicals CEO Albert Chao said in the company's February 19 earnings call.

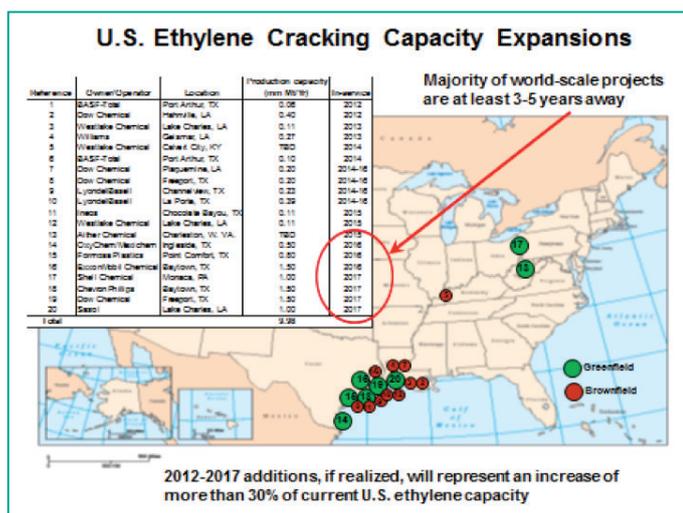
It is then easy to understand why some petrochemical executives including LyondellBasell CEO Jim Gallogly put so much emphasis on the time-to-market element that surrounds this ethylene boom.

Those able to expand capacities first are likely to enjoy the most benefit from the feedstock advantage, Gallogly has said in touting the benefits of his company's debottlenecking projects at two major complexes in Texas. If realized, these projects could expand LyondellBasell's ethylene production by more than 600,000 mt/year by 2016, based on estimates by the company.

This past December, Dow Chemical restarted a 400,000 mt/year steam cracker near Hahnville, Louisiana. The cracker was idled in 2009 because of unfavorable economics.

Dow expects the restart to add \$150 million to its pretax profit in 2013 and cut its US Gulf Coast ethylene purchases in half, Liveris said.

Dow's aggressive expansion plans also include building a worldscale steam cracker in Freeport, Texas, by 2017 as well as debottlenecks at Plaquemine, Louisiana and Freeport in the 2014-16 timeframe.



Westlake carried out a roughly 110,000 mt/year expansion of its 522,000 mt/year Petro-2 cracker in Lake Charles, Louisiana, in January and February.

It also plans an expansion of similar scope at its Petro-1 cracker in Lake Charles, although that work has been pushed back to 2015 from 2014.

On a smaller scale, Westlake aims to expand ethylene capacity at its 204,000 mt/year Calvert City, Kentucky, cracker by approximately 82,000 mt/year by 2014 by converting the unit from propane to ethane feedstock-based. PVC production at the complex is also being expanded.

“All these investments expand our product integration while leveraging our existing asset base to deliver near-term benefits,” Chao said, “and demonstrate our belief that the shale gas advantage will benefit us for years to come.”

Two other expansion projects are scheduled for this year: Ineos’ 110,000 mt/year expansion of its cracker in Alvin, Texas, and Williams’ 227,000 mt/year addition at its Geismar, Louisiana, complex.

On the greenfield side, ExxonMobil Chemical, Formosa Plastics, Chevron Phillips and Dow appear on schedule with their world-scale projects along Texas’ Gulf Coast.

All but Dow have announced polyethylene capacity additions to complement their olefins expansions. That said, it is worth pointing out that overall derivative expansions are lagging when compared to ethylene.

The Occidental Chemical-Mexichem joint venture that last August announced plans to build a 544,000 mt/year cracker in Ingleside, Texas, is now scheduled to come online by 2017, later than originally announced.

Two greenfield projects worth monitoring are Shell Chemical’s proposed steam cracker near Monaca, Pennsylvania, and Aither Chemical’s project in West Virginia.

After touting its proposed worldscale cracker and derivate plants as natural fits for the shale-gas rich region, Shell has been slow to commit to the project, even as Pennsylvania has put on a full-court press of tax breaks and economic incentives – to the tune of more than \$1 billion, according to the Pittsburgh Post-Gazette – in an effort to lure the company to the state.

Shell, which has significant olefins production in Texas and Louisiana, signed an extension on its land purchase agreement with Horsehead Corp. in December that gives the company until June of this year to make a decision. The original agreement was to expire last December 31.

Meanwhile, Aither continues to sell potential investors on proprietary technology it claims will allow it to build ethylene plants in the Northeast at a fraction of the cost of a conventional cracker.

But, as first reported by Platts in early 2011, market sources continue to be divided as to whether either of these projects will see the light of day, with a key concern being ethane supply. By 2017, analysts predict that any company looking to operate a cracker in the region will have to compete for feedstock with Canada’s Nova Chemicals (which this year is investing \$250 million to retrofit its Corunna cracker so that it can consume 100% ethane), Europe and the US Gulf Coast region once the Appalachia-to-Texas pipeline comes online.

Both projects were initially slated to come online by 2016, but industry forecasts now have them starting up in 2017 at the earliest.

By the second half of this year, South Africa-based Sasol is expected to conclude a feasibility study for the construction of a world-scale cracker in Lake Charles, Louisiana, with a decision to follow. Sasol already operates a 430,000 mt/year plant at the complex.

Market sources have suggested tracking the debottlenecks/ brownfield projects’ progress as a way to gauge the likelihood of seeing more than a handful of crackers being built.

Two certainties at this point are that 2013 will be a decision-making year for the industry, and that whether some or all projects are realized, the next three to five years will keep the petrochemical and associated industries busy.

As Fluor’s Matthew McSorley says: “There’s no shortage of things to work on in terms of petrochemicals and olefins.”

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Reference	Owner/Operator	Location	Production capacity (mil mt/yr)	In-service
1	BASF-Total	Port Arthur, TX	0.06	2012
2	Dow Chemical	Hahnville, LA	0.4	2012
3	Westlake Chemical	Lake Charles, LA	0.11	2013
4	Williams	Geismar, LA	0.23	2013
5	Ineos	Alvin, TX	0.12	2013
6	Westlake Chemical	Calvert City, KY	0.08	2014
7	BASF-Total	Port Arthur, TX	0.1	2014
8	Dow Chemical	Plaquemine, LA	0.2	2014-16
9	Dow Chemical	Freeport, TX	0.2	2014-16
10	LyondellBasell	Channelview, TX	0.23	2014-16
11	LyondellBasell	La Porte, TX	0.39	2014-16
12	Westlake Chemical	Lake Charles, LA	0.11	2015
13	Aither Chemical	Charleston, W. VA.	TBD	2016
14	Formosa Plastics	Point Comfort, TX	0.8	2016
15	ExxonMobil Chemical	Baytown, TX	1.5	2016
16	Chevron Phillips	Baytown, TX	1.5	2017
17	Dow Chemical	Freeport, TX	1.5	2017
18	OxyChem/Mexichem	Ingleside, TX	0.55	2017
19	Shell Chemical	Monaca, PA	1	2017
20	Sasol	Lake Charles, LA	1	2017
Total			10.08	

■ On Schedule
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