Oil and Gas Practice

Perspectives on downstream oil and gas



THE CONUNDRUM OF NEW COMPLEX REFINING INVESTMENTS

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Refiners continue to invest in complex refining capacity despite highly volatile margins and generally low-light heavy differentials. Negative market conditions are not helped by an overall lightening of the global crude slate, which is expected to continue. Changing bunker fuel specifications offer some hope, but not in the near term. So why the level of investment that we are seeing today and should more players be considering it?

REFINERIES CONTINUE TO INVEST IN COMPLEX CAPACITY

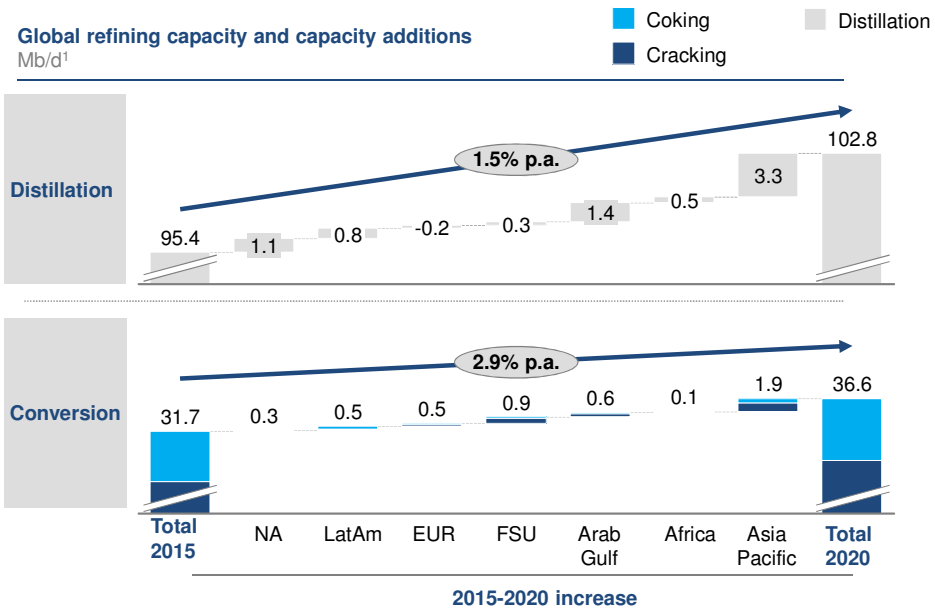
The rate of investment in complex refining capacity remains strong, relative to both light product demand growth and overall refining investment rates. Planned investment in complex capacity, including coking, cracking and hydrocracking, is projected to continue at a rate of 2.9% per annum. This is almost twice the rate of investment in new refining distillation capacity, indicating an overall increase in global refining complexity.

Most of this increased complexity comes from green field refinery investments in developing countries across Asia, the Middle East and Latin America. But at least one of the majors, ExxonMobil also continues to invest.

All of this despite market conditions that have not been particularly favorable for these very high capital investments.

EXHIBIT 1

Conversion capacity additions are outpacing simple capacity growth



1 Barrels per stream day

SOURCE: McKinsey Global Refinery Additions Database

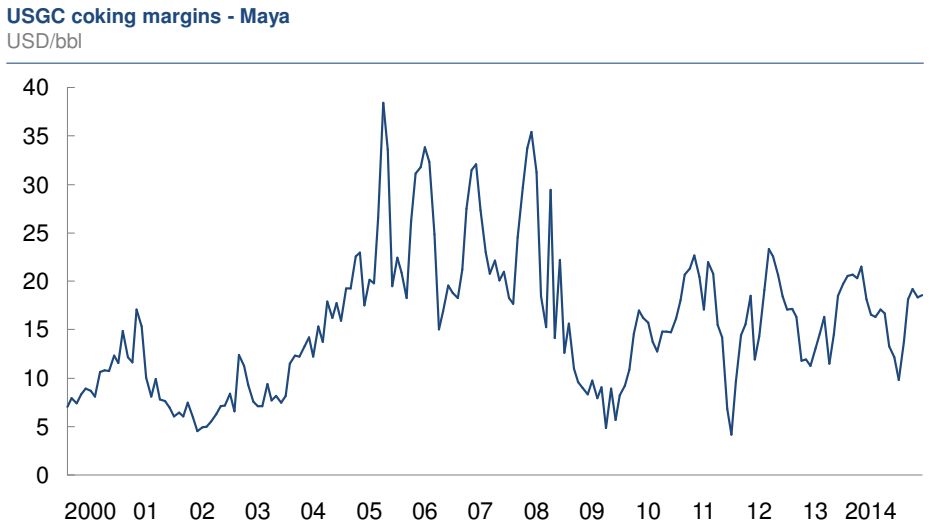
MARGINS ARE CYCLICAL AND DIFFERENTIALS ARE TIGHT

Market conditions have generally not justified this level of investment from a purely economic perspective. Complex refining margins have been highly cyclical over the last two decades. Strong margins in the mid-nineties and the late 2000's led refiners to invest in additional upgrading capacity. With only limited barriers to entry an inevitable overbuild took place. Then the combination of oversupply and economic down turn in 2009 brought margins down sharply.

Since 2009, margins have been largely flat, with only seasonal variability, and a recent uptick due to lower crude prices boosting demand and changing the marginal capacity. The key driver of lower margins has been a consistent narrow light/heavy differential. The light heavy is the spread between light products (such as gasoline and diesel) and heavy fuel oil. Since 2009, resid markets have been tight, keeping residue priced at its “higher value” as a feedstock into refinery conversion units. This has meant persistently “narrow” differentials. Contributing to this has been both weak residue supply from low crude runs into refining and strong demand from growing conversion capacity investment. However, even more dramatic has been the effect from a lightening global crude slate.

EXHIBIT 2

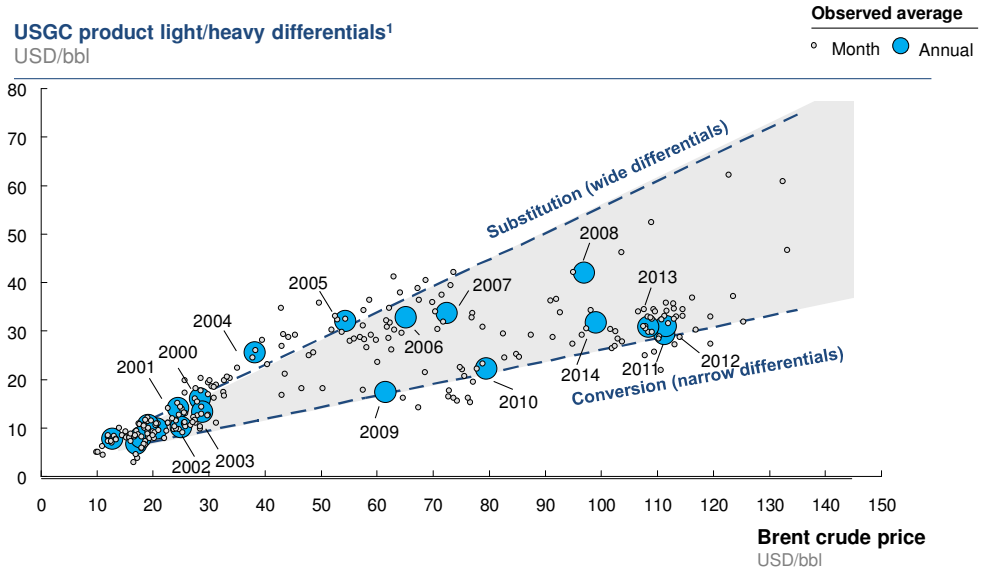
Coking margins have come off cyclical highs and have stabilized on the USGC



SOURCE: Platts; Bloomberg; PIMS; McKinsey analysis

EXHIBIT 3

Light heavy product differential vary between fuel oil pricing at gas substitution and residue conversion economics



1 50% gasoline plus 50% diesel minus 3% residual fuel oil

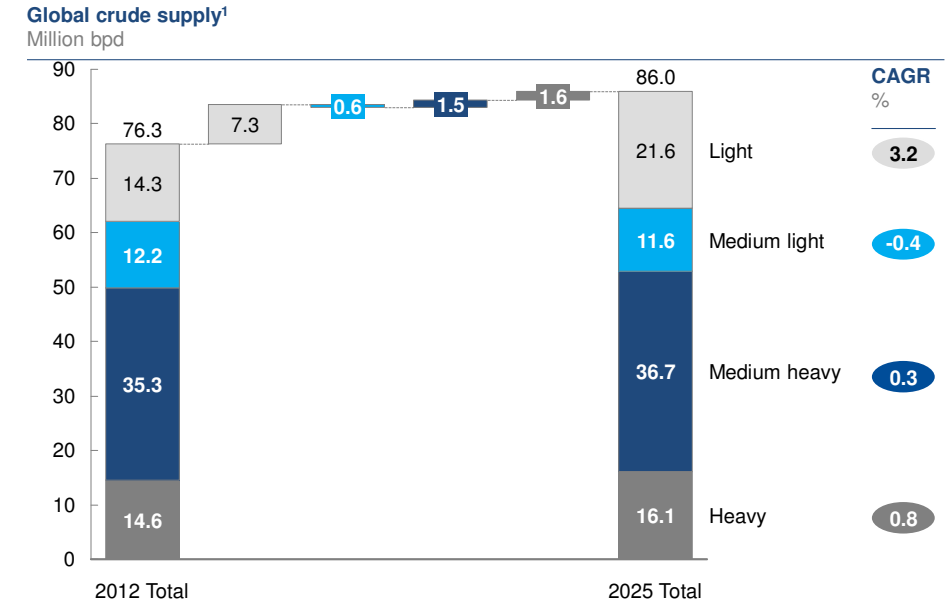
SOURCE: Platts; McKinsey analysis

LIGHT CRUDE WILL CONTINUE TO PLAY A MAJOR ROLE KEEPING LIGHT HEAVY DIFFERENTIALS NARROW

At no point in recent history has there been a higher supply of light crudes and condensates. The biggest driver of this has been the dramatic development of unconventional oil in North America. This has added over 2 million bpd of light and extra light crude to the market. More than enough to satisfy global growth in demand with plenty left over to push down production of more medium-quality crudes.

EXHIBIT 4

Light crude will show the biggest growth



1 Includes condensate

SOURCE: Energy Insights - Global Liquids Supply Model; Global Downstream Model

The increased production of light tight oil in the Americas has eliminated the need to import high API crude from the Americas and caused West African crude to displace heavier crudes in the Asian markets. This has not only shifted the global balances but also adjusted the political cloud countries can cast on West African Nations. The increased supply of light crude has also kept low complexity capacity in the market increasing supply from refineries that should have been closed.

We believe this will continue to rise till past 2020. Even at sustained low prices, there is enough new crude production capacity that is still in the money to drive growth in light crude supply. Not only will this keep a cap on crude prices but also lower the value of light products and thus refining margins.

POST 2020 THE NEW MARINE OIL POLLUTION STANDARD WILL PROVIDE SOME RELIEF FOR DEEP CONVERSION MARGINS

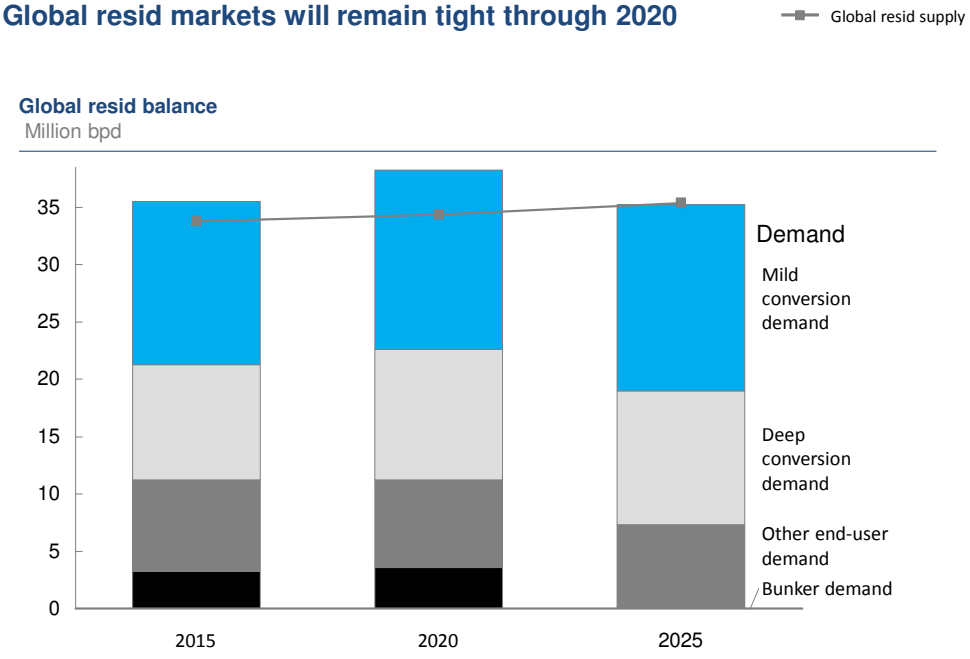
One potential bright spot on the horizon is the potential shift of global bunker fuel demand from heavy residual fuel or to lighter marine distillate. This would be in response to tightening sulfur specifications for the global bunker market.

The marine pollution act (MARPOL 73/78) was established to lower sulfur emissions from ocean going vessels. Coastal shipping emissions were reduced to a fuel equivalent of 0.1% sulfur as of January 2015 and general emissions will go down to a fuel sulfur equivalent of 0.5% by the 2020s. Ship owners have several ways to react to this legislation, one being to switch fuel to lighter fuel, the other to install flue gas filters. It seems that most ship owners are opting for the former and moving to lower sulfur fuels. With the coastal legislation coming into full force in January 2015 we have seen a small bump in light heavy differentials, but insufficient to make a substantial impact on margins.

The MARPOL act has a clause where the requirements will be reviewed in 2018. The belief that there will be an extension of the 2020 limits roughly correlates by region with the more environmentally minded Europeans believing that there will not be an extension, and the market oriented North American and Asian industrial players making little moves to invest in fuel desulfurizing capacity. In any case the North American capacity is heavily geared to coking capacity and fuel production is limited.

EXHIBIT 5

Global resid markets will remain tight through 2020



SOURCE: Energy Insights – Global Downstream Model

Our outlook on global demand for heavy crude is such that we cannot see the balance of heavy materials coming into balance before 2020, at best, and that is assuming that MARPOL fully comes in place by then. Post 2020 many bets are off given the potential for carbon abatement and the continued falling demand in the OECD. This will likely take simple, but not complex, capacity out of the market, predominantly in Europe, flattening the supply curve further.

We see little potential for a widening of light/heavy differentials before the end of the decade. Resid markets will remain tight, keeping resid priced at a conversion value relationship to light products, and conversion margins relatively low. The question is then "Why do companies continue to invest in heavy upgrading capacity?".

INVESTMENTS IN DEEP CONVERSION CAPACITY WILL ONLY PLAY OUT IN A LIMITED NUMBER OF SCENARIOS

There appear to be a number of strategies that are driving continued investment in deep conversion despite relatively tough market conditions.

- **Alternate market view** – Some players are likely motivated by a different view on the market outlook. To support an investment decision to start an upgrading project now, a player would need to expect a widening of differentials by around 2020. While not our view of the most likely outcome, this could happen through a combination of aggressive implementation of MARPOL, a dampening of light crude supply growth rates, and higher than currently expected light product demand growth. If this did play out, the advantage for someone with a high conversion project coming on line just as differentials widened would be enormous. They would benefit from both capturing the full period of higher margins (versus players who wait to invest until after differentials widen) and the availability of lower costs construction during the bottom of the cycle period.

- **Long time view** – For a player with a large portfolio and multi-decade time horizon, it can make good strategic sense to continue investing in capacity that is structurally advantaged over the full margin cycle, even during the low periods. Similarly a player with a lower cost of capital may still invest with limited short term returns.

- **Strategic versus pure economic perspective** – For refiners in markets under threat of capacity rationalization, investment can be critical to avoid being the most likely candidate for shutdown. Adding deep conversion can shift the position of a refinery in the cost curve quite dramatically, ensuring strong positive cash flows in even the worst market conditions. Coupled with a view that the long-term prospects for a market are much brighter than the present, this could be enough of a rationale to support investment sooner than margins alone would support. A big conversion investment by one refiner may encourage refiners in the same geography to exit as their position has deteriorated.

- **Upstream integration** – While the value of upstream-downstream integration have largely disappeared, there still are circumstances when this provides real value, justifying investment. A good example is a producer of a difficult to process crude (e.g., extra heavy, higher TAN, etc.) where the market cannot be relied upon to provide a strong price. Similarly, for a producer of a very large volume of even conventional heavy or medium sour crude, investment in conversion capacity to expand the high-value demand curve can, for periods of time, provide higher overall pricing across all barrels. If the volume is high enough, this can justify investment in even very high capital conversion projects.

The reality is that most players currently investing are probably motivated by a combination of several of these strategies. The fact that many refiners are not joining in, is either a sure sign that that those investing are onto something, or are driven by non-economic factors and will see a payout below capital returns. Time will tell.

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