Downstream oil and gas industry players are used to market shifts. The key is taking advantage when they occur.

External market shifts are not new to the downstream oil and gas industry. Changes in environmental regulations, fluctuating natural gas prices, and the recent sharp decline in crude oil prices have caused ripple effects for downstream players. These external shifts can generate major new opportunities, but require refiners to be nimble and proactive as they re-optimize to the “new normal.”

Consider how incentives have altered in the US gasoline and distillate markets during the past decade. These markets traditionally were well balanced with relatively similar gasoline and diesel pricing, with only seasonal swings toward one or the other being at a premium. However, in the past five years, the market has seen a structural shift, with diesel now significantly and consistently out-pricing gasoline. This change is part of a global adjustment driven by two primary factors:

- **Accelerating diesel demand growth in developing markets.** As global oil demand growth has shifted to developing economies in Asia and Latin America, it has biased growth toward distillates. Developing economies have a higher share of commercial (trucking demand), which tends to bias demand and demand growth toward diesel.

- **Decreasing gasoline demand in developed markets.** In developed markets, demand has been declining in the light-duty passenger sector due to increasing vehicle efficiency (largely driven by stricter fuel efficiency regulations) and growing penetration of alternative fuels. These trends have disproportionately hit gasoline demand since it is traditionally favored in the light-duty vehicle sector. This structural shift has caused refineries to focus year-round on optimizing for diesel and jet-fuel production at the expense of gasoline and naphtha. In addition, capital projects that capitalize on this price spread—which may not have made sense five to ten years ago—could be highly profitable in this new distillate market.

“Time is money” as the market shifts: our experiences suggest that refineries that are able to react and optimize its production kit even two to three months faster than its peers can capture significant incremental margin (often $10+ million).
Incentives and opportunities can be large
While market shifts are not a surprise to refiners, finding the specific “margin levers” to capitalize on changes can be a challenge. For instance, a complex refinery may have 10 to 20 significant processing units, but typically we see the largest value created in crude units, FCCUs, hydrocrackers, and delayed cokers. For example, Exhibit 2 shows a hydrocracker unit that is running sub-optimally as a result of market shifts.

Exhibit 1

USGC diesel has been more profitable than gasoline in the last 5–10 years.

Exhibit 2

Mapping a client’s hydrocracker unit showed several ways to maximize diesel yields.

Illustrative process flow diagram.
Relative USGC pricing in winter 2013–2014; actual pricing varies.

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So what can be done? In this example, we identified three main sources of value:

1. **The fractionator system was not fully optimized for diesel production.** The unit experienced excessive low-value naphtha production due to its overhead temperature not being truly minimized, as well as higher-than-expected unconverted oil production due to a loss of feed preheat. Both of these factors caused sub-optimal diesel yields.

2. **Several streams of Vacuum Gasoil (VGO) feed were incorrectly routed to the FCCU instead of the hydrocracker.** Given FCCU yields favor gasoline and hydrocracker yields favor diesel, this was indirectly overproducing gasoline at the expense of diesel.

3. **No ability existed to blend low value naphtha into diesel product.** A simple “jump-over” piping project was identified years ago, when diesel margins were relatively low, and had not been re-evaluated since. Armed with updated margins and operating guidelines from the workshop, the company’s engineering staff followed a structured root-cause analysis to debottleneck diesel production in the three opportunity areas above to increase diesel production by 10 to 20 percent, and drive significant margin uplift.

**Optimizing operations to capture and sustain value**

In our experience, adopting a structured approach to delivering operations improvement means employing a series of rigorous margin-capture workshops to identify and size the full suite of margin opportunities in each of the main processing units.

**Exhibit 3**

A structured ‘margin tree’ identifies the exhaustive list of improvement opportunities.

This margin tree approach quickly distills the highest priority areas to focus on and drive capital or operational improvements within weeks. To capture these opportunities, refineries
can launch a series of “grade the shift” optimization cycles that utilize visual management and strong engagement from console and outside operators to drive hour-by-hour optimization across the refinery.

Optimizing at the front line requires a tailored approach to ensure good engagement from operators. Our experience is that refiners typically struggle to deeply engage operators on short-term optimization decisions, while hourly operations staff are also usually surprised and excited to be so explicitly involved in capturing margin every shift. There are several success factors to make “grade the shift” successful:

1. **Select a manageable, but real, list of margin drivers to optimize.** There will typically be three to six margin drivers for a large process unit that are dynamic throughout a shift and provide a console operator the opportunity to (safely) deliver superior margin performance. For each driver, show the “size of the prize” in $/bbl margin uplift, and discuss with the unit managers how the number was calculated.

2. **Install clear visual management.** Experience shows that white boards are superior to complex electronic displays, especially at the beginning of the journey. Anyone who enters the unit should know, from looking at the board, how much uplift/bbl is available for each driver, and how successful the last few shifts have been in capturing available margin.

3. **Create an atmosphere of friendly competition.** With clear process safety guidelines, operators who believe they have the ability to impact the unit’s margin contribution can produce consistent, positive results. One operator at a recent engagement texted the transformation team “I just made $80,000 last shift! Can shift three match it?” This structured approach was recently employed with a USGC refiner and delivered over $2/bbl margin improvement on each barrel of crude over a six-month period.

To test if a good margin program is in place, refiners should ask themselves eight questions:

- Do we have a clear view of the highest margin products, with a conversation on the “top five barriers” to increase production in a daily meeting?
- Are daily margin performance dialogues around clear KPIs being used at each unit, each shift?
- How many unit operators could rattle off the current margins for each major product stream on their unit, and what their constraint is?
- Could every employee at the refinery tell whether we “won or lost” each day on margin, in simple financial terms?
- Does our leadership teams have simplified yet detailed margin trees and schematics that are used on a daily basis to remove constraints?

- Is our LP updated weekly with current price sets, and does it clearly tie product streams and transfer prices across our refineries?

- Does the speed of execution (idea to on line) of our capital projects process allow us to react nimbly to the market?

- Does our refinery reliability program focus its efforts on the highest margin units?

If you answered “no,” “maybe,” or “I don’t know” to any of these questions, there is likely substantial value being left on the table.

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