

Past the Tipping Point

Record oil prices require new
supply chain strategies to enable
future high performance

By Robert Gosier, David Simchi-Levi, Jonathan Wright, and Brooks A. Bentz



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The cost of petroleum-based fuels is surging. And not only is there no letup in sight, there is no end of consequences for companies that import, export, ship or manufacture goods. Even companies that just consume indirect or MRO materials are affected, as are retailers and other direct-to-consumer entities. In many respects, fuel costs are the "universal influencer" of business strategy and activity.

Further complicating the issue is fuel cost's unpredictability. There is no way to know where the top of the price-rise spectrum is or, for that matter, whether prices might even fall in the near or not-so-near future. Predictions—like those affecting global companies—are all over the map. But even if they can't know the future, companies can't afford to do nothing. The consequences are too extreme and too far reaching. And the likelihood is too high that competitors will respond

creatively, and thus gain a competitive insurmountable edge over those that are slow to react.

The supply chain, and supply chain decision makers, are the front line—charged with devising and implementing strategies for dealing with the impact of fuel cost fluctuations on their company's business dealings. Their task is supply-chain wide: from product- and market-development to service and end-of-life. But in between, scores of supply chain functions must take individual and collective action. Five such functions— network strategy; sourcing and procurement; planning and forecasting; transportation and distribution—are discussed in this point of view. Our goal is to examine how higher fuel prices affects each function, how the function must change as a result, and what specific things supply chain leaders must do now. Throughout the discussion, two

points are implicit:

- Every supply chain function has a role to play in helping a company address its fuel-cost concerns.
- To respond most effectively, companies must view the situation as a significant opportunity to get a leg up on competitors that are slower to react.

"Strategies such as just-in-time, lean manufacturing and even low-cost country sourcing must be re-valuated in light of fuel prices. In every respect, we have entered a new era where different supply chain strategies are needed to engender high performance."

Fuel for Thought

Most supply chains were designed in an era of significantly lower fuel prices. Global sourcing and manufacturing decisions traded off longer transport distances for cheaper labor. Inventories were kept low, with materials shipped in smaller batches via faster but more fossil-fuel-intensive modes. Distribution models emphasized consolidation, with fewer facilities and longer transport distances. Each of these supply chain strategies depended on (and assumed) reasonably priced transportation.

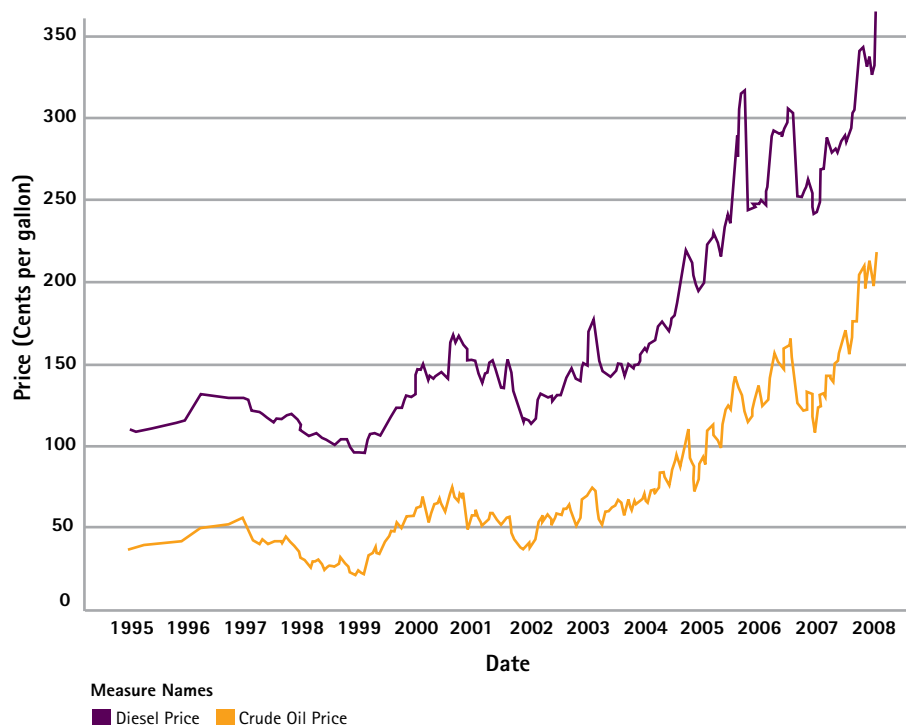
However, oil has reached \$135 per barrel and is estimated by analysts and investment banks to reach \$200 by 2010, gasoline has exceeded \$4 per gallon in the United States (Figure 1), supplies are becoming less predictable, and the growing popularity of "green" alternatives is redrawing the demand and regulatory

pictures. As a result, each of the supply strategies noted above is being undermined. Transportation decision makers now must reevaluate their mode-selection strategies. Distribution network modelers must rethink their inventory and warehouse-placement approaches. Sourcing and procurement professionals must think more "hemispherically" and less about dollars saved in far away regions with low labor costs. And planning and forecasting must rethink everything.

The following five sections look closely at the supply chain's core components and discuss what changes must be implemented now to avert problems and seize opportunities. Every solution, of course, has industry-specific connotations: Producers of lower-value, commodity-type products will respond differently from manufacturers of low-volume, high-

value products. And because increases in freight costs can't be spread over large shipments, companies that send individual orders to consumers generally will be hampered more severely than those shipping in bulk to retailers or distributors. But the fact remains: high fuel prices are affecting everyone. And supply chain expertise and innovation are, in one way or another, a key to the solution.

Figure 1: U.S. diesel and crude oil prices over time.



1. Network Strategy

"A great deal of network modeling used to be focused on consolidating warehouses and manufacturing plants. Now fuel costs are rising precipitously and there's a push toward more facilities located closer to the customer."

But network strategy's implications are more profound than "more, larger and nearer." High fuel prices could also signal the need to reconsider relying on long-term (e.g., "five-year") network strategies. With costly energy and unpredictable labor rates, the mantra must be flexibility. A dynamic (rather than static) supply chain strategy becomes more important in the face of rising oil prices.

To raise flexibility, most companies should perform network analyses more frequently—gathering inputs say, on a quarterly basis, to rebalance priorities, develop multiple scenarios and model flow paths. How effectively they do this depends on their ability to 1) analyze flexibly (identify trigger points, such as fuel-price increases, that suggest a need for strategic shifts) and 2) execute flexibly (launching the right network changes quickly and cost effectively). To make both happen, we recommend that they:

- Work more closely with third parties. This can help minimize

distribution assets and enhance the ability to rapidly scale or relocate inventory.

- Design more flexible supply chain infrastructures. It may be necessary to position plants and warehouses to produce and store multiple products, while serving markets in closer proximity.
- Design regional networks. Regional network strategies can provide particularly attractive benefits for companies that make or buy in a few far-shore locations for supply to many countries. In these cases, a regional supply chain management center might be responsible for:
 - Strategic sourcing and regional procurement of commodities
 - Consolidation of country demand forecasts into a regional demand plan.
 - Regional sales, operations and inventory planning.
 - Supply and shipment plans for each manufacturing site and contract

manufacturer.

- Supply chain analytics, such as cost-to-serve.
- Coordination of leading practices, performance reporting and skills development.
- Demand similar levels of flexibility from product and transportation suppliers. This is a potentially radical shift, since most suppliers count on consolidated buys and high volumes. Yet all parties must work together to find solutions and vary services.

High Fuel Prices = New Network Strategy

A U.S.-based company has manufacturing facilities in Philadelphia, Omaha and Juarez, Mexico. Not surprisingly, the Juarez facility is the lowest-cost operation. The company also has five U.S. distribution centers. Facing rising fuel prices, it undertook a network design study to:

- Identify the right number and location of distribution centers (DCs) and appropriate assignment of customers to DCs.

- Determine the best allocation of products across the company's manufacturing and distribution facilities.

- Understand how the network should change as oil prices fluctuate.

The study revealed a significant need to reduce outbound transportation costs by utilizing more DCs that stock more inventory. This is illustrated in Figure A: the effect of increasing the number of DCs from five to seven as oil costs rise from \$75 per barrel to \$200.

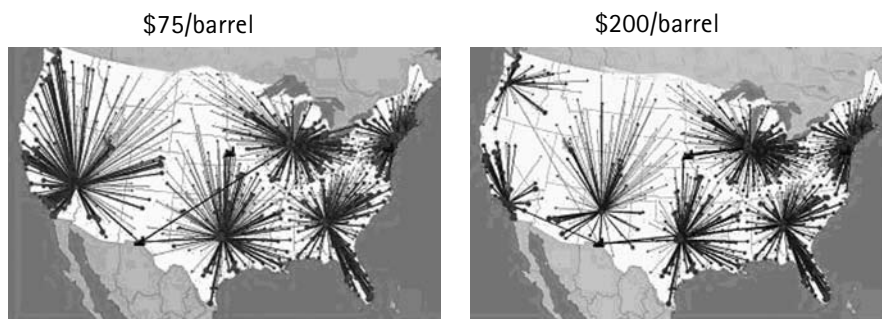


Figure A: Moving from \$75 per barrel to \$200 per barrel changes the optimal number of DCs from five to seven. In particular, Las Vegas is replaced by Los Angeles, Albuquerque and Portland.

The study also showed that, as oil prices increase, so does the need for production to move nearer to demand. In this case, the advantages of low cost manufacturing in Mexico are offset by higher transportation costs (Figure B).

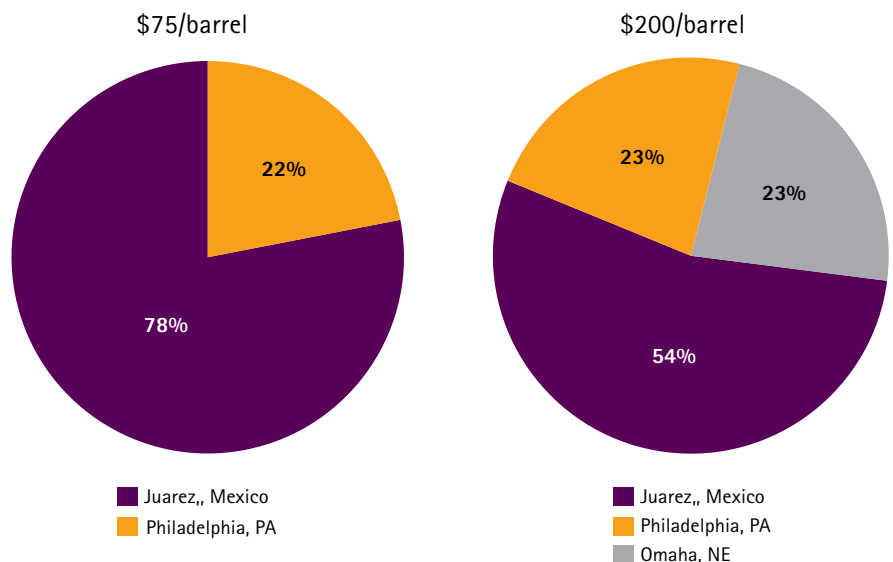


Figure B: As oil prices rise, it becomes more important to locate manufacturing nearer a company's markets.

2. Sourcing and Procurement

"Record-high fuel prices fundamentally change most companies' net landed cost calculations. But even more important, record prices demand that every company excel at net landed cost calculations. A wide variety of needed changes in sourcing and procurement won't be effective without landed-cost expertise."

When it comes to net landed cost calculation, Accenture knows high performance is nearly synonymous with comprehensiveness—the ability to identify and analyze all of an item's acquisition and life cycle costs:

- Acquisition costs consist mainly of purchase price, but also include transportation and fuel; materials handling and storage; supplier qualification and training; and supplier retooling (for new or customized products).
- Life cycle costs include maintenance and spares; warranty coverage and administration; software; quality management; ease of doing business with suppliers; political and service risks; and end-of-life asset disposition.

For most companies, a net landed cost analysis will confirm that high fuel costs have affected their purchase of nearly everything. The core issue, not surprisingly, is the relationship between savings associated with "low-cost-country" sources and the rising expense of moving purchased goods from those

sources. This paradigm was the basis of a recent analysis performed by MIT and ILOG. As shown in Figure 2, team members discovered that, in the U.S., a \$10 per barrel increase in crude oil price produces a 24-cent-per-gallon increase in diesel fuel. And since the standard methodology is to increase transportation surcharges by one cent

per mile for every six-cent increase in diesel fuel, a \$10 increase for a barrel of crude oil produces a four-cent-per-mile increase in transportation rates. Figure 3 then details the relative impact of oil-price changes on transportation from 2006 into the future.

Change in Per Barrel Oil Price	Relative change in diesel price (per gallon)	Standard fuel surcharge adjustment (cost per mile)	Cost impact on 500 mile shipment
\$10	\$.24	\$.04	\$20

Figure 2: Typical fuel surcharge methodology (U.S.) and the impact of oil price changes per barrel.

Date	Oil price (per barrel)	Relative change in diesel price (per gallon)	Standard fuel surcharge adjustment (cost per mile)	Cost impact on 500 mile shipment
2006	66.02 ¹	NA	NA	NA
2007	72.32 ¹	.15	.02	\$10
2008 (May)	122.00	1.44	.24	\$120
Projected	150.00	2.02	.33	\$165
Projected	200.00	3.22	.53	\$265

Figure 3: Analysis of fuel impact on transportation costs since 2006.

¹Source: Energy Information Administration.



In Europe, the cost impact of oil-price changes are even more dramatic: a \$10 per barrel increase in crude oil price produces a 12-to-15-cent-per-liter increase in diesel fuel, depending on the country. So a \$10 increase for a barrel of crude oil could produce a seven-to-nine-cent-per-mile increase in transportation rates depending on the country.

The study's implications are clear: Component and raw material sourcing, manufacturing, transportation and distribution will all be affected as crude oil price rises. As illustrated in the case study in the Network Strategy section, the increase in crude oil price forces companies to rethink where they source and produce their products. As transportation costs increase, manufacturing and sourcing activities close to market demand—"hemispheric supply markets"—become more attractive. Adding more high-priced fuel to the fire is the fact that labor costs—long the staple of low-cost-country sourcing—are rising in

many areas. This is causing companies to rely less on volatile labor arbitrage and to place a greater premium on shorter transport distances.

As transportation costs increase, it also becomes more important to increase manufacturing flexibility. When transportation was cheap, it was more appropriate for plants to specialize in a few products, and thus reap the scale-based benefits associated with low production costs. But the more oil prices increase, the more manufacturing facilities must be able to produce a greater variety of products, with each plant capable of serving demand in close proximity.

Net landed cost analyses may also reveal that existing sourcing contracts are no longer justifiable since baseline costs have changed. Thus more contractual flexibility—ensuring the ability to adapt to changing market conditions—is essential. This lends credibility to the development of a dual sourcing strategy, where multiple

regional suppliers are used to hedge against the dynamics of changing transportation cost structures. Companies that excel at calculating net landed cost could derive significant savings from this approach.

Other sourcing and procurement approaches should also be explored. One is the increased control associated with factory gate pricing (moving away from prepaid freight to collect). Tools that enhance supply chain visibility may also be needed to understand shipment status, as well as what percentage of a shipment is the result of fuel-cost increases and how much is vendor profit. Different sorts of procurement relationships may hold further sway. A good example is moving from sourcing models that leverage trading agents, joint ventures and wholly owned foreign enterprises and toward international procurement offices (IPOs).



4. Transportation

"To weather the fuel cost storm, most companies will need a different transportation paradigm that emphasizes better utilization through fewer shipments over shorter distances, with more quantity per shipment and less empty miles."

Organizations for which transportation represents a high percentage of cost of goods sold will obviously be more focused on this goal than other types of companies. But as shown in Figure 4, a new or revised transportation model should be in the offing for most shippers, distributors and retailers. Chances are good that such a strategy will involve some retreat from fuel-intensive modes such as road and air, and toward slower but more economical choices such as rail and water. In fact, a deep understanding of intermodal options and opportunities could become a core tenet of supply chain mastery.

But even companies that (colloquially speaking) "keep their eyes on the road" should plan on a fundamental repositioning of transportation resources. For some, the key will be realignment of store-service contracts—pushing, for example, for more factory-direct shipments, larger inventory minimums or wider delivery windows that let the shipper hold freight until a truck is full. Organizations may also consider working together to consolidate shipments to low-density areas.

For many companies, however, private fleets will simply become less justifiable—replaced by contract carriers and third party logistics services providers (3PLs) that can

keep costs down by running full-truckloads, minimizing one-ways and deadheading, and amortizing technology investments over a larger asset base. This reality will make "intelligent sourcing and buying" an elevated priority, anchored by a standardized methodology that ensures company-wide approaches to calculating total landed cost, investigating alternative carrier and mode selection, and developing new transportation strategies. Consider, for example, that high energy costs are putting the transportation industry's small owner-operators at a serious disadvantage. This makes it a good time for shippers to lock in transportation contracts—before the market tightens.

Interestingly, the antithesis of a long-term contract could also be worth investigating. Take Kimberly Clark, whose European operation has developed exceptional spot-buying capabilities—sourcing transport literally on a day-to-day basis. Via a "transport desk," the company puts out proposal requests almost continuously, and accepts bids from carriers that are prepared to offer a low price for one

particular lane on one particular day. This approach—albeit not widely practiced (and seldom recommended for a company's entire transportation operation)—also has the potential to minimize deadheading and other empty-mile scenarios.

Most companies, however, should think long and hard before eschewing transportation relationships—which is what happens when spot rating takes the place of longer-term contracts and value-added services. Perhaps, a combinatorial bid package (where carriers can view the totality of a company's shipping needs) is the best way to mingle relationship- and commodity-based sourcing.

Lastly, it should be noted that many carriers have developed contracts with surcharge conditions that protect them against fuel price jumps. They've made sure that costs are pushed back on the shipper, and that the shipper cannot back out or restructure the deal when confronted by fuel-price surges. The onus is now on shippers to develop strategies that—as much as possible—provide them with similar levels of protection.

Traditional Priorities

- Just-in-time inventory strategy
- Maximum transport speed
- Local sourcing/buying of transportation services
- Low-cost-country material sources trump high transportation cost



New Priorities

- Slower, cheaper transportation
- Better capacity utilization
- Company-wide approaches to sourcing/buying transportation services
- More user of shared services and 3rd parties
- Near-shore material sources to reduce transportation cost

Figure 4: Rising fuel costs have created an altogether new transportation paradigm.



Leveraging Transportation Technology

Transportation strategy shifts can be formidably supported by new technology. Take GPS telematics—enabling companies to track vehicle locations (to within six to eight feet) in real time. The principal benefit is that—by optimizing dispatching and routing capabilities—total miles traveled can be reduced. Telematics also makes it possible to remotely monitor speed, breaking and gear shifting, which can result in greater fuel economy.

Other transportation-technology innovations include wide-base tires and automatic tire-inflation systems, both of which minimize roll resistance and aerodynamic drag. The U.S. Environmental Protection Agency believes that using wide-base tires on a long-haul truck can save more than 400 gallons of fuel per year, while cutting CO₂ emissions by more than four metric tons. Low-viscosity lubricants have been found to create similar benefits.

Advances in tractor-trailer aerodynamics also affect fuel consumption. Here, the EPA has determined that tractor-roof fairings, cab extenders and side fairings can significantly reduce wind resistance, thus improving fuel economy and annually eliminating up to five metric tons of CO₂ emissions.



5. Distribution

"Every facet of distribution—receiving goods and materials, managing inventory, preparing orders for shipment to consumers and retailers—is affected by rising fuel prices. Accordingly, every characteristic of a distribution operation could change as well: order size and frequency, number and location of facilities, facility size and optimal inventory levels."

Of course, every facet will be affected differently. As an example, Amazon.com could not ship in bulk to a customer who orders one book, so 100 percent of a fuel-price increase would need to be absorbed by each shipment. However, Amazon could rethink and reformulate its storage and inbound-supply strategies to potentially reduce shipment quantities and limit materials handling expenses. On the other hand, a company like Costco would have the ability to spread cost increases over larger quantities, redo most of its distribution strategy by changing inbound and materials management practices and package or palletize fewer, yet larger, outbound shipments. And both sides will have to decide at what point fuel costs must transfer to another player in the supply chain relationship.

Most companies should also reconsider the quantity, scope, design and layout of their distribution centers. And many will conclude that the emerging need is for more and bigger DCs that can offset fuel costs with higher inventories, and better break-bulk, cross-docking and block-stack capabilities. In the process, "building now for later" should also be considered: Incorporating more flexible designs makes it possible for companies to accommodate future increases in requirements, while potentially making their facilities more attractive to tomorrow's buyers.

Still, many companies will conclude that, even with higher fuel prices, the creation of more, larger and more-proximate distribution centers cannot be justified. For this reason, shared- or outsourced distribution services deserve a closer look. Working with distributors, renting space, sharing space and pre-locating space all make greater sense in an environment of higher and largely unpredictable fuel costs. In fact, the flexibility, predictability and assured

quality associated with shared- and outsourced services could make this a good move regardless of higher fuel costs.

No matter what direction they take, companies cannot sit on the sideline or over-analyze the problem for too long. Issuing a Request for Proposal, evaluating bid responses and then inaugurating a six-month implementation plan won't cut it. In this period of rising fuel prices, rapid analysis and on-boarding of new distribution capabilities will be critical. Choosing partners that can get the analysis done and assist with getting a DC up and running in a very short time can mean the difference between a winning strategy and a failed one.

Lastly, technology will continue to play a critical role. For example, as warehouse size and complexity increase, many companies may be impelled to upgrade their warehouse management systems (WMSs) to improve picking, replenishment and putaway functions. This investment can also produce significant dividends by reducing labor costs, raising storage capacities, increasing inventory accuracy and improving service.

High Performance in a Fuel-constrained World

Over the past several years Accenture researchers have looked extensively at "high performance"—the nature and characteristics of companies that consistently outperform their industry peers. Among our key findings is the exceptional value of supply chain mastery.

Not surprisingly, the world's rising fuel prices point directly to the need for many of the characteristics for which supply chain masters are known: end-to-end operating models that align with corporate strategy; aggressive, measurable goals focused on continuous improvement; savvy technology investments that revere integration, visibility and flexibility.

However, the most important tenet of supply chain mastery could be flexibility, and every supply chain function has a role to play. To deal with fuel price uncertainties, sophisticated network strategists build flexibility into their designs. Procurement specialists recognize the need for flexibility when tapping new sources to reduce supply risk. Transportation and distribution planners depend on flexibility to provide consistent economical service to customers during times of shifting assets and priorities. And in planning and forecasting, flexibility permeates—if not dominates—every decision. In short, no-one will be better positioned than supply chain

masters to turn rising fuel prices from an onus to an opportunity for high performance.

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