Taming manufacturing complexity with advanced analytics

Patrick Briest, Valerio Dilda, and Ken Somers

A chemical maker uses advanced analytical techniques to identify—and seize—opportunities across its value chain. Better collaboration is a side benefit.

Manufacturers with complex operations often struggle to optimize production. Large chemical makers are a prime example. They face complexity in spades—such as volatile costs and prices, the need to manage multiple plants, and the reality that many products can be made from diverse (and often nonlinear) combinations of inputs. Advanced data modeling recently helped one global chemical maker to cut through all these problems in its flagship plant. Company experts in sales, production, and optimization assembled raw-material and product price curves, market-size forecasts, historical equipment-performance data, and more than 600 decision variables into a mathematical model describing the plant's production yields under various operating conditions.

The resulting model offers managers a precise understanding of the effects that variations anywhere along the value chain can have on the production network as a whole. The company can now, for example, easily fine-tune the mix of raw materials and finished products, as well as the routing of manufacturing flows, in real time—while constantly identifying opportunities for improvement (exhibit). All told, these changes increased the plant's EBIT[1] returns by more than 50 percent, and the company is now applying this model across its full factory network so that production capacity can shift in modular fashion. A major side benefit: better cross-unit collaboration, since business decisions that were formerly siloed and subjective are now made with a clearer sense of the constraints and trade-offs involved. ○
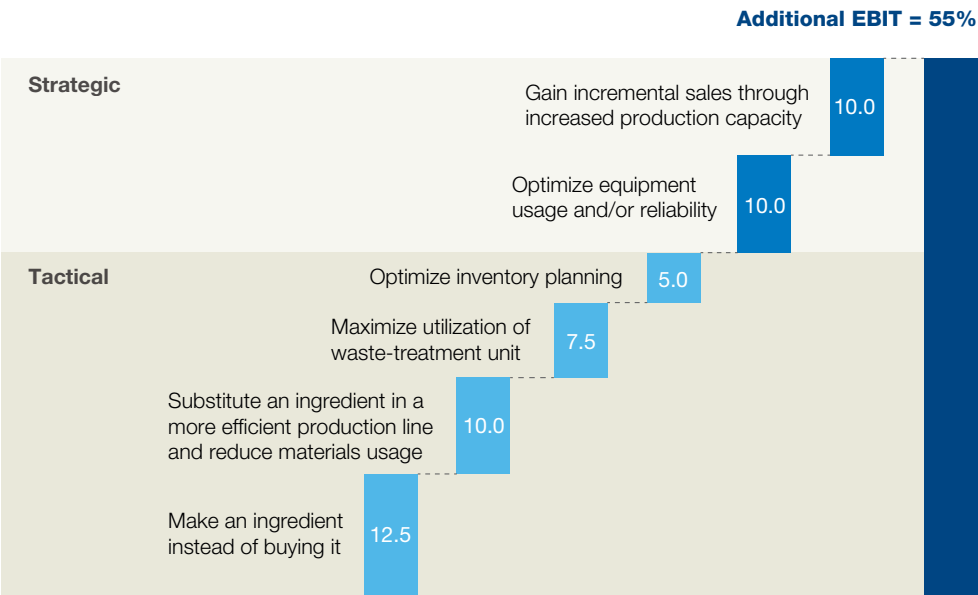
[1] Earnings before interest and taxes.

Patrick Briest is a specialist in McKinsey's Düsseldorf office, **Valerio Dilda** is an associate principal in the Paris office, and **Ken Somers** is a master expert in the Antwerp office.

Exhibit

In one case, data modeling identified opportunities to increase earnings by 55 percent.

Value captured by data-modeling levers, example of global chemical maker, % of increased EBIT[1]

Additional EBIT = 55%

Strategic

Gain incremental sales through increased production capacity — 10.0

Optimize equipment usage and/or reliability — 10.0

Tactical

Optimize inventory planning — 5.0

Maximize utilization of waste-treatment unit — 7.5

Substitute an ingredient in a more efficient production line and reduce materials usage — 10.0

Make an ingredient instead of buying it — 12.5

[1] Earnings before interest and taxes.

Source: McKinsey analysis