The frugal manufacturer

Regulatory issues set the agenda (part 3)

CHRISTOPHER WATTS – Industrial production is set to continue expanding in the coming decades. Yet, at the same time, growing concern about climate change is leading to pressure on industrial companies to minimize their environmental impact. The results of a recent survey of industrial executives, commissioned by ABB and researched and written by the Economist Intelligence Unit, identified the critical importance of energy efficiency to long-term profitability and identified several barriers to investments in energy efficient technologies by industry. Despite the barriers, most executives participating in the survey indicated that they expect to increase investments in energy efficiency in the coming years; however, this will not result from the adoption of voluntary energy efficiency programs, but rather from the implementation of new regulations, that will put increased pressure on their companies to improve energy efficiency.

Regulation is already beginning to emerge as a major theme driving investment in improvement of industrial energy efficiency.

In the third and final part of "The frugal manufacturer" series → 1–3, we look at what will drive industry to invest in energy efficiency measures. While the majority (58 percent) of surveyed executives indicate they increased their investments in energy efficiency in the past year, versus the prior year, a very significant proportion (42 percent) say their investments were static or fell in the past year. Even among those that did increase their investments, almost half (48 percent) did so by 10 percent or less → 4.

On a positive note, manufacturers in high energy-intensity industries are more likely (15 percent) to have increased investment very significantly (defined as 30 percent or more year-on-year) than lower energy-intensity manufacturers (10 percent) or power producers (5 percent). Apollo Tyres is one example: The company says its investments in energy efficiency have grown 50 percent year-on-year (from a low base), due to new waste heat recovery equipment at its plant in Vadodara in western India. It's possible that some other energy-intensive manufacturers are now taking steps to mitigate a return to the peak energy prices seen in 2008, as economic conditions gradually stabilize and restrictions on capital expenditure begin to ease.

While, on the whole, growth in investment in energy efficiency remained modest in the past year, executives appear confident that their companies will increase spending on improvements in efficiency in the next three years. Seventy-three percent of all respondents expect their company to spend more in the coming three years. Of these, about 13 percent expect a very significant increase. In Western Europe, a slightly higher proportion (16 percent) than average expects a very significant increase, perhaps in anticipation of intensifying regulatory pressure in the European Union → 5.

Indeed, regulation is already beginning to emerge as a major theme driving investment in improvement of industrial energy efficiency. For now, it does not appear that industry managers consider energy regulation to be a heavy burden. Asked how they would describe industrial energy efficiency regulation in their home countries, 50 percent say "modest, not onerous," compared with 40 percent who say it is "somewhat stringent" or "very stringent." Power firms are more likely (45 percent) to consider regulation stringent than manufacturers (39 percent). And while more respondents in developed economies (45 percent, with Western Europe as high as 53 percent) are likely to take this view than in developing markets (32 percent), one exception is North America, where just 31 percent consider regulation to be stringent → 6.

Title picture
ABB supplied motors, drives, transformers, switchgear and more to improve energy efficiency at the Aitik copper mine in Sweden, which finalized the modernization of its entire operation in 2010, enabling mine operator Boliden to double its production capacity and extend the life of the mine.

1 The frugal manufacturer

This series of articles published in *ABB Review* presents the findings of a report commissioned by ABB and researched and written by the Economist Intelligence Unit.

The survey collected input from 348 senior industry executives, mostly in North America, Asia-Pacific, and Western Europe, asking them about their plans to invest in improving energy efficiency in production processes, the issues they face as they consider these investments, and the factors that are likely to influence industrial energy efficiency in the coming years.

In addition to the online survey, the study conducted 15 in-depth interviews with senior business executives, policy makers, and other experts in industrial energy efficiency.

2 Summary of part 1: industry leaders recognize the importance of energy efficiency

The first part of the *ABB Review* series, "The frugal manufacturer: Using energy sparingly," was published in *ABB Review* 3/2011 (pages 7 to 12). The findings include:

- Eighty-eight percent of respondents say industrial energy efficiency will be a critical success factor for their business in the coming two decades.
- Seventy-two percent "agree strongly" or "agree somewhat" that energy efficiency is a critical success factor for manufacturers today.
- Fifty-nine percent say that in making the financial and business case for investments in efficiency, the energy price is one of the biggest factors.
- Twenty-six percent see improving their company's image as another reason to invest in energy efficiency.

3 Summary of part 2: analyzing industry's commitment to improvement

The second part of the *ABB Review* series, "The frugal manufacturer: Analyzing industry's commitment to improvement," was published in *ABB Review* 4/2011 (pages 55 to 59).
The findings include:

- Only 40 percent of survey respondents say they have invested in capital, plant and equipment to improve energy efficiency within the past three years.
- Forty-six percent of firms do not have a company-wide energy management system in place to track and optimize energy use.
- Just 34 percent of companies have conducted an energy audit across the entire company or group.
- Seventy-seven percent of survey respondents agree that "industries need clearer benchmarks for what constitutes energy efficiency" in their sectors.

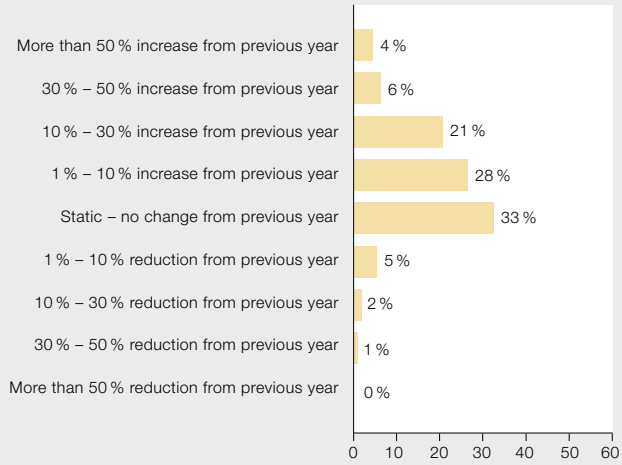
A light regulatory framework

Until recently, few businesses have been subject to mandatory energy efficiency requirements. More widespread are opt-in schemes, such as the Energy Star program in the United States, or the Energy Efficiency Opportunities (EEO) program in Australia, which provide a basis for companies to improve their industrial energy efficiency. The EEO, for example, calls on participating companies to identify, assess and report on potential energy savings improvements. "It doesn't mandate we actually do any of them," says Ian Gilmour, safety, health and environment and manufacturing manager at Orica, an Australian chemicals manufacturer. "But it requires us to do the audit, and it requires us to give sight to directors of the [efficiency improvement] opportunities. I actually think that's reasonably helpful."

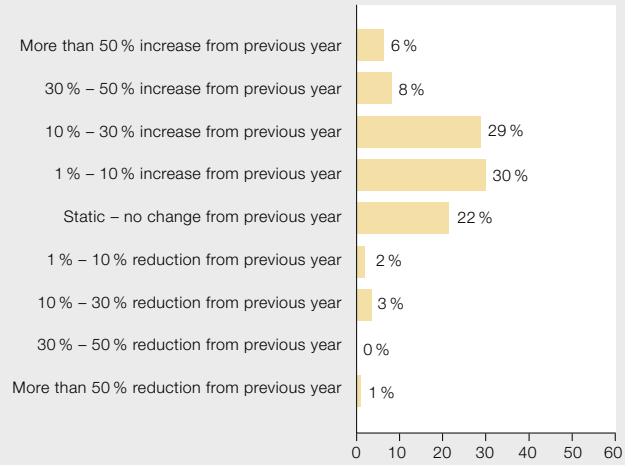
> Executives appear confident that their companies will increase spending on improvements in efficiency in the next three years.

As policy makers across the globe address climate change issues, voluntary industrial energy efficiency frameworks, such as those in the United States and Australia, are increasingly being joined by mandatory regulations. In the United States in 2010, for example, new regulations came into force under the Energy Independence and Security Act, which stipulate the minimum energy efficiency of new industrial motors sold in the United States. Canada, Mexico, and Brazil have introduced similar requirements; and in mid-2011 the European Union adopted related regulation in three stages. Meanwhile, in April 2011, India launched the Perform, Achieve and Trade

4 Over the past year, how much, if at all, has your company's investment in industrial energy efficiency changed over the previous year?



5 How do you expect your company's investment in industrial energy efficiency to develop over the next three years?



scheme as part of the country's National Action Plan on Climate Change → 7.

These regulations specifically target industrial energy efficiency. Industry managers are also anticipating other pressures that will require them to make a stronger commitment to improving industrial energy efficiency. For example, since 2008, the European Union has been phasing in the European Union Emission Trading System (EU ETS) as part of a wider climate change package, with the goal of cutting carbon dioxide emissions 20 percent by 2020, relative to 1990. In China, meanwhile, further regulation may also be on the way. "It's obvious that Chinese regulation is getting more and more strict," says Wan Xiaotao, sustainable development coordinator at Bayer China.

Climate change mitigation policies such as these will affect even those manufacturers whose production activity is less energy-intensive – especially in cases where their energy use represents a significant proportion of their environmental impact, for example through carbon dioxide emissions. The EU's cap-and-trade system is a case in point. "I think there's going to be pressure inside the European Union to meet the 2020 targets," says Terry McCallion, director of energy efficiency and climate change at the European Bank for Reconstruction and Development (EBRD) in London. "Investments are going to be very much linked to the evolution of the carbon markets and what sort of cap-and-trade systems will be in place that will affect the operations of the companies."

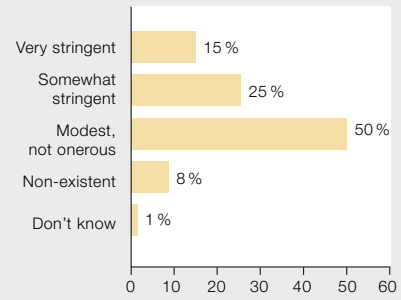
Besides legislation and regulation, pressure to act in accordance with sound sustainability principles will also continue to intensify within the business environment – and from within companies themselves. "A lot of customers are expecting their suppliers to be more conscious of the results of their actions and that has driven a lot of concern and, I think, activity in the area," says Steve Schultz, global manager of corporate energy at US industrial and consumer goods maker 3M. For its part, chemicals maker BASF has a group-wide initiative to improve the energy efficiency of its chemical production processes by 25 percent by 2020 relative to 2002. "As part of this, in 2009, we reduced the specific energy consumption per ton of product in Greater China by 17 percent," says Zheng Daqing, a board member of BASF Greater China.

Existing technologies will lead the way

As they seek a balance between maximizing economic output and minimizing environmental impact, it is likely that industrial companies will increasingly turn their focus to energy efficiency. To cut energy use in production processes in the short-term, points out McCallion of the EBRD, there is significant scope for further penetration of existing technologies-including, for example, variable-speed drives and more efficient motors. Furthermore, there appears to be room

As policy makers across the globe address climate change issues, voluntary industrial energy efficiency frameworks are increasingly being joined by mandatory regulations.

6 How would you describe legislation and regulation governing industrial energy efficiency?*



*In the country in which you are based

7 India's policy makers increase the pressure on industry

To add momentum to improvements in energy efficiency in India's heavy industry, the Government of India recently introduced a mandatory energy efficiency scheme for the country's largest industrial sites. The so-called Perform, Achieve and Trade (PAT) scheme, the country's first set of mandatory industrial energy regulations, came into force on April 1, 2011.

PAT is a market-based mechanism, similar to carbon dioxide emissions trading mechanisms seen elsewhere. Under the PAT scheme, over 600 individual industrial units in eight sectors across India, including plants that produce cement, power, chemicals, pulp and paper, iron and steel, and aluminum, are given targets to improve their energy efficiency. In all, these units account for around half of India's industrial energy demand.

The PAT scheme requires each plant to cut its specific energy consumption by a fixed percentage over a three-year timeframe, based on its current energy use. There is no industry-wide benchmark, nor is the required percentage reduction negotiable. Under the PAT scheme, plant owners are required to appoint an energy manager, provide authorities with an energy consumption report, comply with energy efficiency norms, and allow designated energy auditors to verify compliance. Failure to comply results in a hefty fine.

Each industrial site is allocated a quota of energy-saving certificates (ESCerts); sites that exceed their energy-savings targets are given extra certificates. The certificates can be traded at market-driven prices via the Indian Energy Exchange. Those failing to meet efficiency improvement targets can comply with the PAT scheme by buying extra ESCerts. Government officials say that the scheme is designed to accommodate the ongoing strong industrial growth in India, the wide bandwidth of specific energy consumption across individual sectors, and the need for transparent procedures that cannot be manipulated or negotiated. Over a 10-year period the government expects a 10 to 15 percent improvement in energy efficiency, largely driven by upgrades in technology.

L. Rajasekar, executive president of Indian cement manufacturer UltraTech Cement, points out how the new PAT scheme adds weight to the financial case for investment in improving energy efficiency. "If you take into consideration the penalties [for noncompliance], then your payback period comes down, practically by half," he says. "If you have a six-year payback, it becomes three years. In a way, it will help us."

Since 2008, the European Union has been phasing in the European Union Emission Trading System as part of a wider climate change package, with the goal of cutting carbon dioxide emissions 20 percent by 2020, relative to 1990.

for better management of energy use. In other words, significant improvements in industrial energy efficiency appear to be within relatively easy reach of many industry executives today.

For a few executives, however, this is not the case. Wan Xiaotao at Bayer China is one. "If we look at Bayer MaterialScience in China, the plants and equipment are pretty much new," he says. "They've all been built within the last five to six years, so there is little opportunity to upgrade the equipment to improve efficiency." In cases such as these, and many more besides, further advances in production processes will enable industry to improve efficiency → 8. Ajay Mathur, director general of the Bureau of Energy Efficiency (BEE), a Government of India body, predicts, "We will probably start seeing changes in manufacturing processes occurring towards the end of this decade."

For this to happen, of course, research and development, innovation, and collaboration have a central role to play, a point that is highlighted by L. Rajasekar, executive president of UltraTech Cement, an Indian cement producer. He says the company typically allocates 0.2 to 0.3 percent of annual revenues to its corporate research and development efforts, and in addition, funds common research programs run by the European Cement Research Academy based in Düsseldorf, Germany. "We need to have more and more collaborative work on research, because some of these things are not possible in individual companies," Rajasekar says. "Ultimately, the results have to be for [the benefit of] the whole industry."

Not surprisingly, as industry grapples with the compliance issues around energy efficiency and environmental legislation, the question emerges: Who will pay? Some industrial companies are calling on policy makers to improve tax incentives and subsidy schemes for energy efficiency improvement measures.

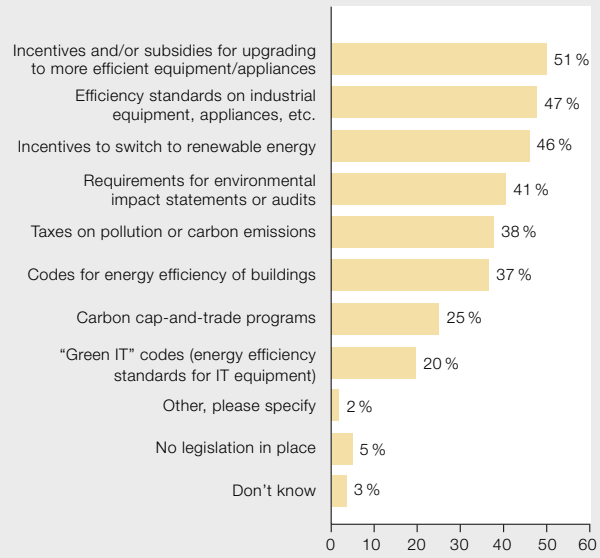
8 Process improvements that save energy

Production process improvements are set to assume a major role in tomorrow's industrial energy efficiency. Presented here are two examples from the chemicals sector.

The Thai joint venture SCG-Dow Group opened its new propylene oxide (PO) facility near Map Ta Phut, a coastal town in Thailand, in 2011, where production is based on the new hydrogen peroxide to propylene oxide (HPPO) process. Compared with prior PO production, the process, developed jointly by Dow and BASF, reduces waste water by 70 to 80 percent and cuts energy use by 35 percent. Furthermore, because plants based on HPPO technology are smaller and simpler than conventional PO plants, they require 25 percent less capital to build.

Germany's Bayer MaterialScience (BMS) is currently constructing a new production facility for toluene diisocyanate (TDI, a polyurethane raw material) in Caojing, near Shanghai in China. The facility went onstream in mid-2011, employing a new production process developed and trialled over seven years. The process uses 60 percent less energy, and 80 percent less solvent, than conventional TDI production. As TDI is increasingly becoming commodity-like, these production cost savings will contribute strongly to competitiveness.

9 In the country in which you are based, what types of laws and regulations does the government use to promote industrial energy efficiency?



Among the survey sample, 51 percent say that, in the country in which they are based, incentives or subsidies are on offer for companies to upgrade to more efficient equipment. In developed economies these appear more widespread (55 percent of respondents say they are available) than in developing regions (44 percent). Pradeep Monga, director of energy and climate change at the United Nations Industrial Development Organization (UNIDO), names Thailand as one example of a country successful in promoting energy efficiency. "The Energy Conservation Fund of Thailand provides loans through designated banks, at a lower rate of interest, to enterprises who are going to install energy efficient equipment or systems," he says ➔ 9.

Significant improvements in industrial energy efficiency appear to be within relatively easy reach of many industry executives today.

In developing countries, 38 percent of managers believe that taxpayers should bear more of the cost of companies' energy efficiency compliance. By contrast, this figure is 27 percent in developed economies. Pointing to the continued expansion of industrial production in developing countries and the great potential for absolute energy savings, some companies in these countries argue for further policies to promote energy efficiency in industry, including technical and financial assistance. Satish Agarwal, chief of corporate manufacturing at Apollo Tyres, based in Gurgaon in northern India, states the case: "Energy projects are sometimes very capital intensive. So the support of the government in terms of giving tax breaks or some other thing to these kinds of investments is always helpful."

Ultimately, though, executives say that most investments in improving energy efficiency pay their own way – with or without policy incentives. As regulation intensifies, it is becoming clearer that, to secure long-term financial performance, companies must strive for continuous energy efficiency improvement in their industrial processes. Those that do not do so face an uncertain future. McCallion concludes, "The companies where [energy] is not a key element of their cost, or they're not enlightened and they're behind the curve – they're the ones that will be hit hard by tightening regulatory pressure."

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10 Energy efficiency is important in all industries, including paper manufacturing

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Emerging regulations will increasingly require companies to improve their energy efficiency. The scope for savings using existing technologies is large; in the future, research will lead to further gains, for example through process innovations. To secure long-term financial performance, companies must strive for continuous energy efficiency improvement → 10. Those that do not will face significant pressure.

This article is the third of three parts of the report, "The frugal manufacturer: Using energy sparingly." The report was researched and written by the Economist Intelligence Unit and commissioned by ABB. The Economist Intelligence Unit bears sole responsibility for the content of the report.

The findings and views expressed in the report do not necessarily reflect the views of the sponsor. For further information on energy efficiency of industry, utilities, buildings and transportation please visit www.abb.com/energyefficiency

The Economist Intelligence Unit would like to thank all survey respondents, as well as executives cited in the report.

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