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Hitting a sustainable note

Producers are increasingly prioritizing a switch to sustainable chemistry, but many perceive significant hurdles, as a recent ICIS/Genomatica survey discovered

JOHN BAKER/LONDON

SUSTAINABLE CHEMISTRY and green chemicals are receiving plenty of industry and media attention. Producers and their customers are looking to reduce dependence on petrochemical feedstocks and are seeking instead to utilize renewable feedstocks. At the same time, they would like to switch to processes with lower energy intensity and reduced environmental impact.

Of the 800-plus respondents to the ICIS/Genomatica survey, over half (57%) said their company was already engaged in sustainable chemistry practices and that this engagement would continue during the current downturn. A similar percentage agreed that their customers had expressed an interest in sustainably produced chemicals.

Besides this customer-driven interest, there are also cost and strategic drivers. Nearly half (46%) believe there is an economic advantage to switching manufacturing process inputs to renewable feedstocks, such as sugars, starches and biomass; and 57% agreed that their company should seek to reduce exposure to the petroleum-based commodity markets.

Christophe Schilling, CEO of California, US-based technology start-up Genomatica, has observed this trend first hand. "From all of our discussions with chemical producers, hydrocarbon pricing volatility is proving to be an increasing burden on today's chemical industry," he notes.

"With well over 90% of all chemicals coming from hydrocarbons, there is a need to diversify the feedstock portfolio. That is making chemical executives increasingly open to petro-alternatives that improve returns and help stabilize feedstock costs."

> "Jumping in with both feet is not a requirement"
>
> Christophe Schilling, CEO, Genomatica

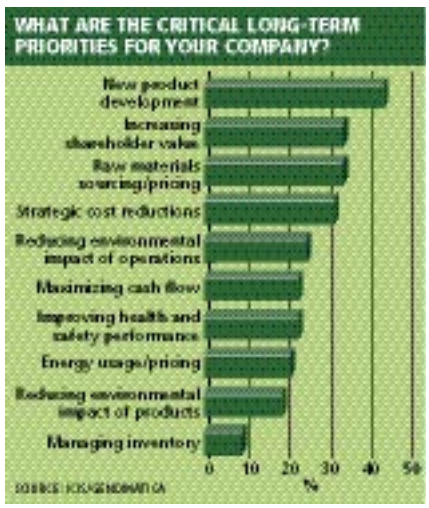
Nearly half (47%) of all those surveyed said they were already using renewable feedstocks or agents in their manufacturing process. Of this 47%, half were using sugars and/or other carbohydrates, and half were using some form of plant-derived material. Just over one-third of those who are already active in renewables said they were using bacteria and yeasts in their production processes.

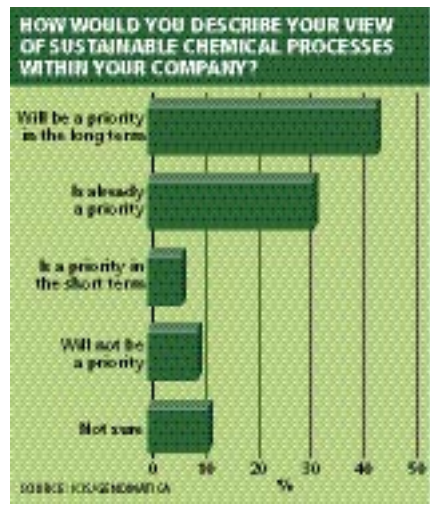
For some respondents (31%), exploitation of sustainable chemistry processes is already a priority, while even more (43%) commented that it would be a priority in the future.

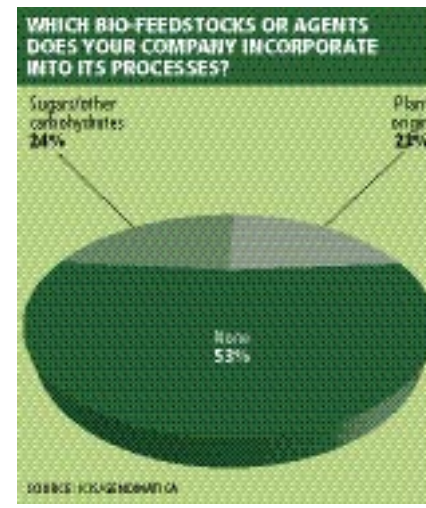
Some 71% of those replying to the online questionnaire noted that it was important or very important for their company to be perceived as a front-runner is terms of sustainable chemicals. This point was further emphasized by the fact that most firms claim to be addressing sustainability on a company-wide or at least a management-level basis.

However, 10% admitted to approaching it only at the business unit level and a sizeable minority – some 20% – revealed that the issue was not yet a high priority or was only seen as a press relations opportunity.

When asked who the main front-runners were at present, the major producers evidently sprang first to mind. Leading the list were chemical majors BASF of Germany and Dow Chemical and DuPont, of the US, followed a little lower down by the likes of the UK's BP and the Anglo-Dutch Shell, Germany's Bayer and specialty chemical producer Clariant, of Switzerland. Also







among the top 10 choice were US agriculture products giants Cargill and Archer Daniels Midland and specialty polymer producer NatureWorks, a joint venture between Cargill and Japanese chemical company Teijin.

"Chemical professionals want their companies to embrace sustainable chemical production," adds Schilling. "Perhaps more importantly, their customers are beginning to expect the same thing."

DIFFICULTIES

Although the survey in theory indicates a fairly positive message on sustainable chemistry, in practice, respondents cited several challenges. The cost and time to develop a sustainable chemical program were high on many minds.

Estimates of the time needed to go from conception to commercial production were lengthy. Periods varied from five to 10 years (47%) and over 10 years (14%). Only 39% thought such programs could be implemented in less than five years.

Says Schilling: "Undoubtedly, there is a history of somewhat lengthy development timelines around commercializing renewable bioprocesses and creating markets for renewable polymers. Creating markets is always a time-consuming endeavor, but there is a lot we can do to bring new technologies forward more rapidly that will produce chemicals with existing markets.

"It is up to companies like Genomatica and our colleagues developing this next generation of sustainable manufacturing processes to demonstrate how the wealth of technological advances witnessed in the past decade will allow for reduced development time lines and costs."

Other factors making sustainable chemistry uptake difficult were technical capabilities (44%), adapting existing plant and infrastructure (36%) and the attitude and awareness of internal management (26%). Such hesitation is not unreasonable given the current steep recession.

"Jumping in with both feet is not a requirement," adds Schilling. "Sustainable plants have lower capital costs, so they can be economical at lower chemical production volumes than traditional petrochemical facilities. This allows companies concerned about cost during the current economic downturn to try smaller plants and match capacity expansion with demand more precisely when the upward cycle begins."

When asked what their reservations about sustainable chemistry were, respondents cited the future pricing of renewable feedstocks (53%) and the availability of feedstock (52%) as their two main worries. But they were also worried about the fact that the chemicals would not be the same as the petrochemical-derived products they were substituting (26%) and that they might not have predictable, repeatable properties (23%).

As the respondents recognize, some sustainable chemical alternatives are chemically different from the products they replace.

COMPANY PERCEPTIONS OF SUSTAINABILITY

We asked readers how they defined sustainability in terms of their business. The majority said to look at two main areas almost equally: the environmental qualities of the end-products and the carbon footprint of internal processes – largely determined by energy usage.

Fewer companies are looking at external energy consumption and impacts, that is: those associated with supply chain operations – only 45% of respondents identified this as very important, compared with 67% and 65% saying end-products and internal carbon footprint were a very important consideration in terms of sustainability.

But when asked to rank current and future business priorities overall, the environmental impact of products and processes slipped well down. Top priorities are inevitably raw material sourcing and pricing, cost reductions and maximizing cash flow.

Only the fourth priority brings up new product development. Seventh was reducing environmental impact operations.

When asked to rank the same critical priorities for the longer term, new product development surged to first place, and increasing shareholder value rose from ninth to second.

But, even longer term, product and operational environmental concerns are not, it seems, of prime importance. This sits somewhat at odds with the survey results suggesting that many companies have a high focus on sustainable chemistry. But perhaps this can be rationalized in terms of "good to do" and "critical to do" priorities.

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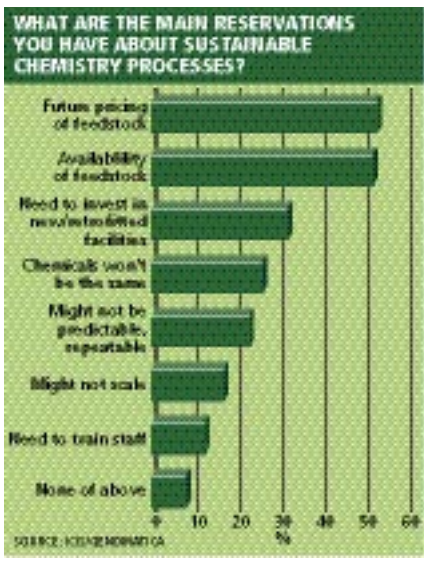

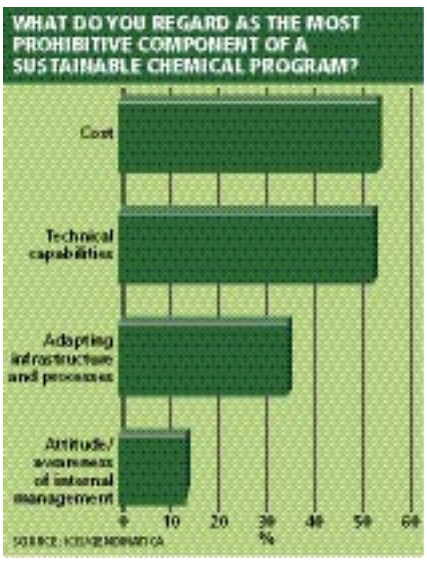

Fewer seem to realize, however, that many bio-manufactured chemicals are identical to existing petro-based products. Feedstock anxiety shouldn't be a surprise, since most chemical executives haven't had a reason to track renewable commodity markets.

Other issues included the investment required in new or retrofitted plant (32%) and the need to train and retrain staff (12%).

CONCLUSION

The survey indicates broadly that there is certainly much interest in sustainable chemistry and that many companies are embarking on this pathway to sustainability. But there are significant concerns about the cost, the feedstocks and time and investment required to move to commercial production based on bio-derived raw materials.

In many ways, it is up to the large chemical majors and the smaller, specialist start-ups to show the way forward in this area. The big producers because they have the funds and longer term perspective; the start-ups as they have the innovation and drive to demonstrate successful projects and products.

"The research corroborates what Genomatica has learned from engaging chemical executives," explains Schilling. "The industry believes in a sustainable future. It is seeking technologies that will work at commercial scale and provide improved cost positions using less energy with lower carbon emissions. Now it is time for us all to deliver on this opportunity."

RESPONDENT DEMOGRAPHICS

The ICIS/Genomatica online survey was undertaken on May 11 and attracted over 800 replies from senior industry executives. An introductory article appeared in that week's issue of ICIS Chemical Business, on page 17.

Nearly one-third of respondents were either CEO, chairman or president, or a vice president of their company, while a further 25% were general managers. Most came from either specialty (37%), petrochemical (34%) or polymer companies (34%), with the balance working mainly in agrochemicals and fertilizers, fine chemicals and pharmaceuticals, and commodity inorganics.

Some 35% of respondents worked for companies with turnover greater than $1bn/year (€711m/year), while 40% worked for smaller businesses, of under $500m in annual sales.

The geographic split of respondents was as follows: Europe (32%), North America (31%), Asia (21%), and Middle East (5%), with the balance in South America, Australasia and Africa.

A full presentation of the findings can be downloaded at www.icis.com/sustainabilitysurvey2009

ICIS genomatica sustainable chemicals