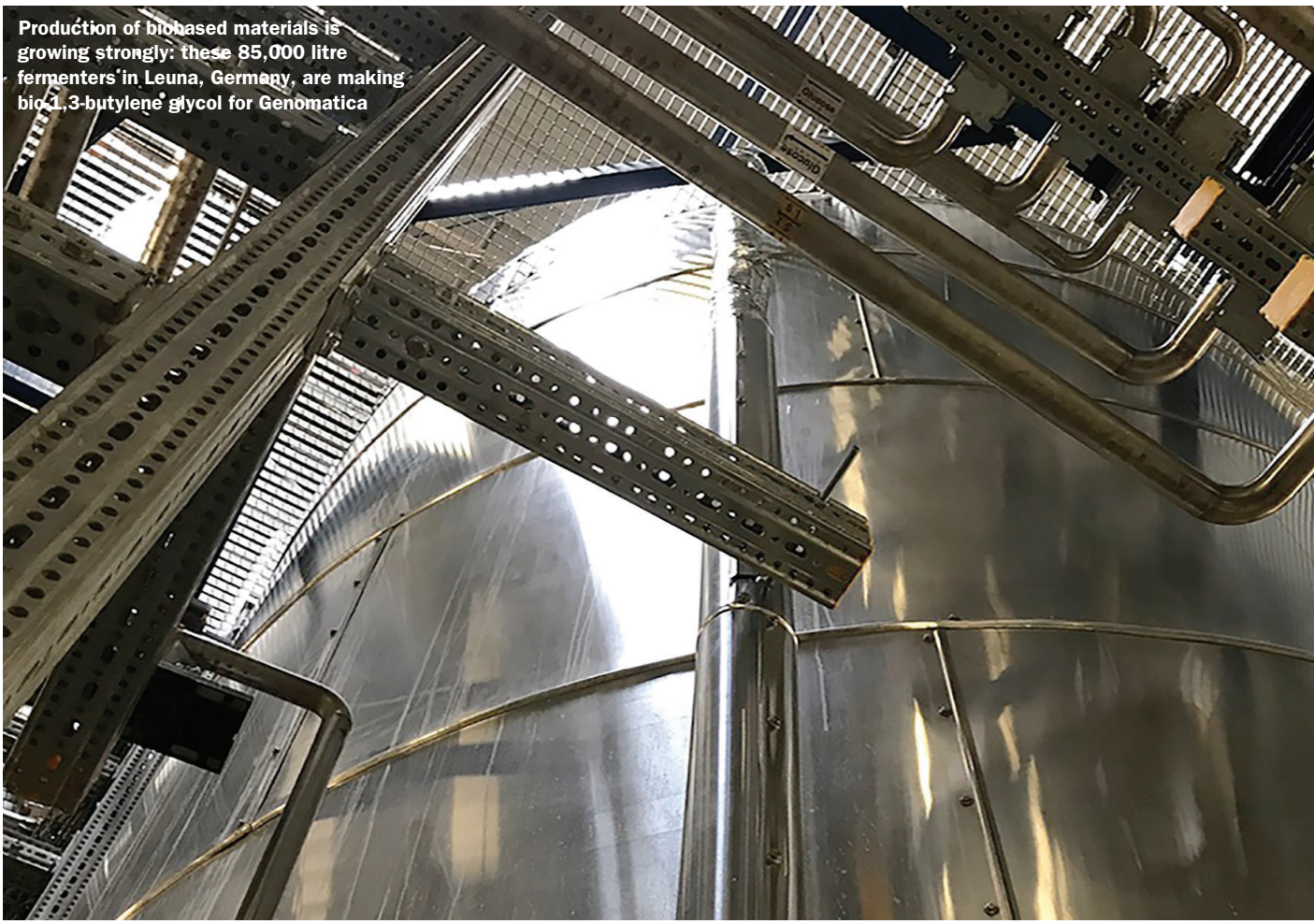


Production of biobased materials is growing strongly: these 85,000 litre fermenters in Leuna, Germany, are making bio-1,3-butylene glycol for Genomatica

Renewables push into the mainstream

Producers, users and distributors of chemicals are all taking an increasingly active interest and role in the introduction of biobased materials made from renewable feedstocks, driven by consumer demands. Primary issues relate to setting up new supply chains and customer adoption, reveals the latest ICIS/Genomatica survey

JOHN BAKER LONDON

Seven out of 10 chemical industry executives believe that biobased materials, produced from renewable feedstocks, will be in common use within the next five years.

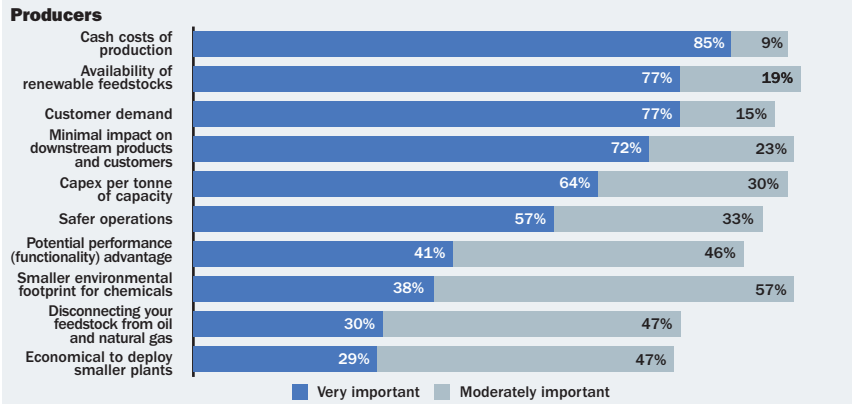
This extraordinary leading indicator of confidence is backed up by current actions. Indeed, over a third of chemical producers are already offering more sustainable versions of the chemicals they sell, and a similar proportion of their end-user customers and chemical distributors say they are already using or offering them.

These findings, from the latest ICIS Chemical Business industry survey, carried out in association with Genomatica, a US-based company that develops biobased process technologies, show that renewables have continued to penetrate mainstream thinking and practices since we started surveying the industry on this topic together in 2009, with subsequent surveys in 2012 and 2014, despite challenges from periods of low oil prices.

Much has changed over these eight years.

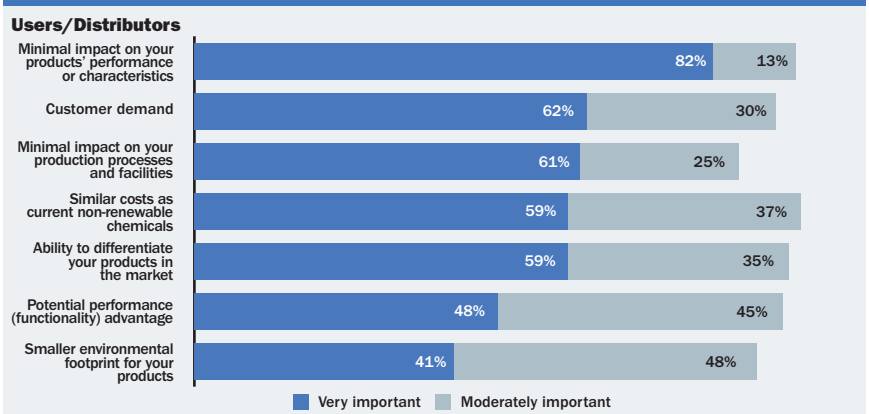

Genomatica

HOW IMPORTANT ARE EACH OF THE FOLLOWING FACTORS WHEN CONSIDERING RENEWABLE-BASED PRODUCTION?



SOURCE: ICIS/Genomatica survey

HOW IMPORTANT ARE EACH OF THE FOLLOWING FACTORS WHEN CONSIDERING USING RENEWABLE-BASED CHEMICALS IN YOUR PRODUCTS?



SOURCE: ICIS/Genomatica survey

On the technology push side, development of biobased chemicals, materials and technologies have advanced, with many biotech firms and major chemical producers moving projects from development to commercialisation deployment.

On the demand side, industry customers, brand owners and end use consumers have all increased their demands for more sustainable ingredients and products.

The availability of such products has clearly increased and uptake is becoming easier, even if there are still questions about costs, reliability of raw materials supply and customer qualification and acceptance.

This is clearly shown in the survey results, provided by various actors along the value chain, with a particular focus on producers (28% of respondents), users of chemicals (22%) and distributors (15%). After many years of assessing and assimilating the concept of biobased materials, one-third of producers who responded to the survey, carried out online in late October/early November, said they have fully adopted and implemented sustainable chemistry practices across their businesses. A further 22% said they were close to this state of affairs, with only a tiny minority stating they had done nothing in this respect. This broad indication of what companies regard themselves as doing to enhance sustainability clearly shows the direction companies are travelling.

Amongst users and distributors, the figures for full and significant adoption were »

BRAND PERCEPTIONS REVEAL THE LEADERS

THE 2017 ICIS/Genomatica survey repeated a series of questions to see which companies respondents identify as technology leaders in the renewable/sustainable chemicals field – seeking both unprompted replies and a rating for each of several specified companies.

Unprompted, respondents mentioned BASF, Dow Chemical, ExxonMobil Chemical, Genomatica and Braskem as the top five companies with respect to sustainability technology. The result very closely mirrors the 2014 survey ranking.

Other companies mentioned were Croda, DuPont, BioAmber, Covestro, Cargill, NatureWorks, Neste and Shell.

Asked to name the leading producers of sustainable chemicals, respondents put forward BASF, Braskem, Dow Chemical, BioAmber and Cargill as the top five.

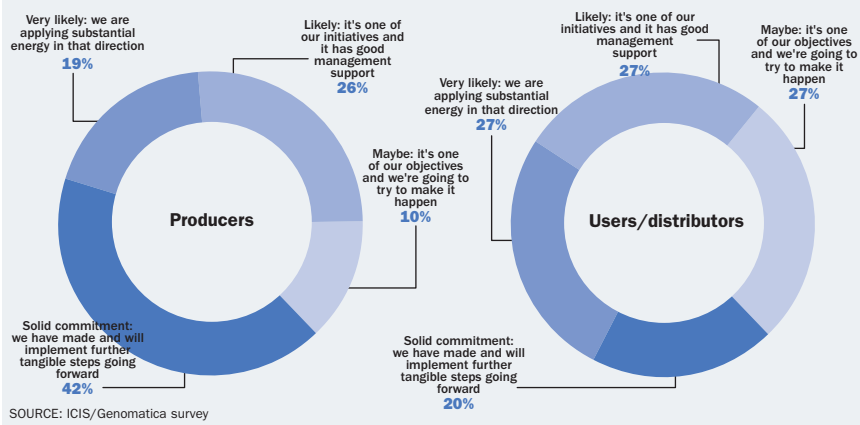
We then asked respondents for their overall impression of several specific companies with regard to sustainability technology, rating them one at a time. Genomatica had the highest rating, followed by Novozymes, Covestro, Novamont and BASF; Genomatica was third in 2014.

We suggest this is the result of Genomatica's persistence in working with mainstream chemical firms, commercialization track record and long-time recognition (including ICIS' Top 40 Power Players listing and Innovation Awards success in 2017). ■

lower, at 23% and 11%, indicating that producers, as might be expected, are setting the pace in sustainable practices. This may partially be a reflection of the relative sizes of the major producers vis-a-vis distributors and the resources they can bring to bear.

But the picture has to be seen in the context of the value chain and the inter-relations between the players. Users and distributors (60%) said they are already asking suppliers for information on their sustainability practices, and 44% require information on the environmental footprint of the chemicals they buy from them.

HOW WOULD YOU DESCRIBE THE DEGREE OF COMMITMENT TO OFFER/USE MORE SUSTAINABLE VERSIONS OF CHEMICALS?



SOURCE: ICIS/Genomatica survey

DRIVING FORCES

This, over and above self-motivation, is driving producers to embrace the sustainability agenda and look at biobased materials. Close to a third are currently engaged in research and development in this area, with a further 28% now considering becoming active, while 23% are currently offering renewable content in commercial offerings.

Only 16% of respondents said they had no intentions in renewables at this time.

On the users and distributors portion of the survey, executives reported that they are already using (41%) or actively investigating and/or considering using (59%) chemicals based on renewable feedstocks. Those expressing little or no interest in this group was only 11% of respondents.

The mood in the industry is thus very positive towards biobased uptake. Over 40% of producers responded by saying their commitment to offering more sustainable versions of their chemicals was "solid", that is, they have made moves and will implement further tangible steps going forward.

A further 20% indicated they are very likely to take steps in the near future and "are applying substantial energy in this direction."

Amongst users and distributors, again, the absolute numbers were lower, with only 20% indicating solid commitment, but 27% indicating they are very likely to take steps. However, the general direction of the trend is clearly a positive one.

We also asked producers, users and distributors what the most important factors were when considering renewables-based production or use of such materials.

In line with previous surveys, costs of production, the availability and security of renewable feedstocks and customer demands were key issues for producers, with the impact of changes on downstream products and customers a close fourth.

In terms of investing in in-house production, the issue of consistent supply of feedstock again came out as the major concern, albeit jointly with customer qualification and acceptance. We suspect that this is because biomass of various types represents a new supply chain for many in the industry, hence there is a need to learn something

OPTIMISTIC PRODUCERS TURN UP THE HEAT ON RENEWABLES

FOR THE fourth time in an ICIS/Genomatica survey on the topic of biobased material, hundreds of people shared their insights on renewables. Users and distributors show increased interest and action.

But producers stood out:

- Increasingly strategic: 46% say it's "very important" to be a leader in sustainable chemicals (Slide 22 – download the set by visiting http://tinyurl.com/ybzxqr2j). That's big – and the opposite of a "nice to have". More than half see long-term economic advantage in using renewable feedstocks (S20).
- Taking action: 61% are showing a strong commitment to offer more sustainable chemicals (S14). And 34% are setting specific targets and benchmarking versus competition (S25), suggesting they're applying action-oriented management disciplines, rather than just considering an alternative.

Genomatica's CEO Christophe Schilling: "more traction in product value chains" for renewables

- Planning to deliver: 79% of producers offer or plan to offer more sustainable chemicals within a few years (S13); that is up from 72% last time for a similar question. That is likely due to hearing stronger buying signals: producers say 91% of their customers express the same or greater interest in sustainable chemicals than a few years ago (S24) – up from 80%.

Some 17% show much greater interest, up from 10%. And users and distributors are bullish, with 89% (S13) planning to offer more sustainable products, which suggests they feel confident they can get the necessary sustainable ingredients.

Producers and users predict a big future for renewables: For the first time we asked for views about the future – a sort of "Renewables Confidence Index". A remarkable 71% (S9) believe renewables-based chemicals will be in common use in five years.

Why now? Our view is that producers, especially, are seeing first-hand that renewable technologies are increasingly deployable and advantageous. The last few years have seen more commercial process technologies, real commercial plants, costs coming down and traction in product value chains.

Almost two-thirds of their customers are showing greater or much greater interest (S24), and they're telling producers they want it.

The drive toward renewables is consistent with an increased C-suite focus on corporate responsibility. A recent KPMG study of 4,900 companies showed 67% of the world's 250 largest firms disclose carbon reduction targets, and 43% tie corporate responsibility to the UN's recently-launched Sustainable Development Goals. Deploying renewable technologies will only help.

Christophe Schilling is CEO of Genomatica (www.genomatica.com), which develops biobased process technologies to make widely used chemicals, such as butanediol, butylene glycol, caprolactam and butadiene, from alternative feedstocks. He has been named on the ICIS Top 40 Power Players list five years in a row.

Christophe can be reached at *cschilling@genomatica.com*.

new. Actually building the plant and customer attitudes to biobased materials were lesser concerns.

For users and distributors, the most important considerations when thinking about renewable-based chemicals in their products were not surprisingly minimal impact on products' performance or characteristics – cited by an overwhelming 82% of respondents.

Other leading factors were customer demand, impact on production processes and facilities and, again, costs – but this issue was nowhere near as highly ranked by them as by the producers (59% vs 86%).

The position and direction of travel thus looks quite clear, towards a greater adoption of renewables, but with a close eye on costs and feedstock security. The benefits are now more widely expected to materialise.

Well over half of the producers who responded (54%) said they believe there will be a long-term economic advantage for them in switching even partially to renewable feedstocks. This compares to 43% in the 2014 survey. Only 17%, down from 28%, said there would be no economic benefits.

BROADENING BASE

Just over half of producers also believe their company should reduce its dependence and exposure to the petroleum-based commodity market, and just under a half said it was important for them to be seen as a leader in terms of sustainable chemicals.

Two-thirds have had customers express an interest in sustainably produced chemicals, slightly up from the level three years ago. In fact, 63% of respondents reported rising interest over the last three years, with only 28% saying interest had remained the same.

Over a third of producers (39%) and users/distributors (37%) said they are now actively having discussions with brand owners, as one of the main ways that they were developing and implementing its strategy with respect to renewables-based products. Many are setting targets for their efforts on renewables, although this is twice as common for the producers than for users and distributors.

There is one more major concern amongst the respondents to the survey, and that is legislation. Although we did not specifically ask about this issue, it was raised by many respondents in verbatim remarks.

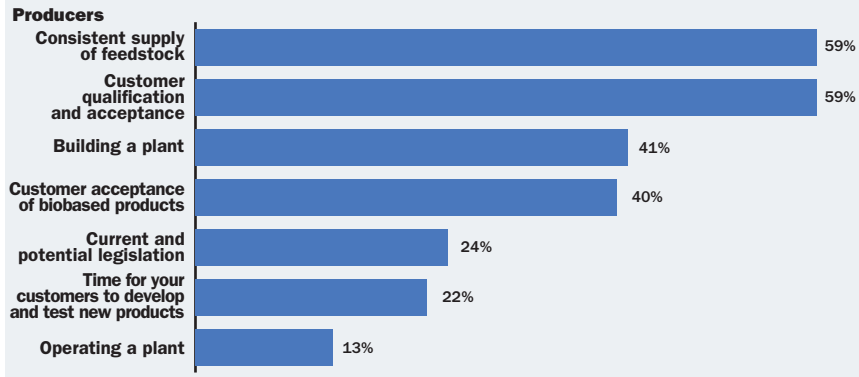
"Transition needs to be driven also from the legislative point of view", commented one user based in Europe, while one manager at a producer in North America added: "The key driver for sustainable chemicals will be legislation, as customers are generally not willing to pay for it." Another European C-suite executive commented: "Hopefully [biobased materials] will find sufficient traction (with the needed politics and society drive) to make it happen."

But caveats aside, the thrust of the survey results are tremendously positive. So positive in fact that when asked, "what percentage of the chemicals made by your company will be made using renewable feedstocks in three years' time?", executives working for chemical producers gave a mean figure of just over 20%.

That would represent a real stretch target, but one the survey results suggest cannot be dismissed out of hand. ■

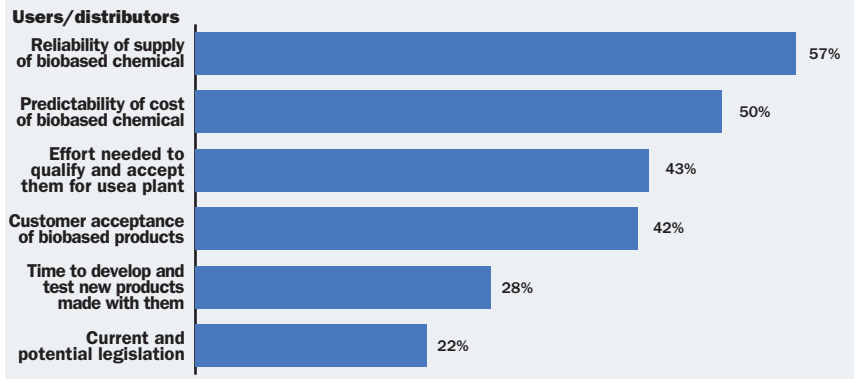
To see a complete set of slides from the ICIS/Genomatica 2017 survey, go to:
http://tinyurl.com/ybzxqr2j

WHAT DO YOU SEE AS THE MAIN ISSUES REGARDING PRODUCTION OF BIOBASED CHEMICALS?



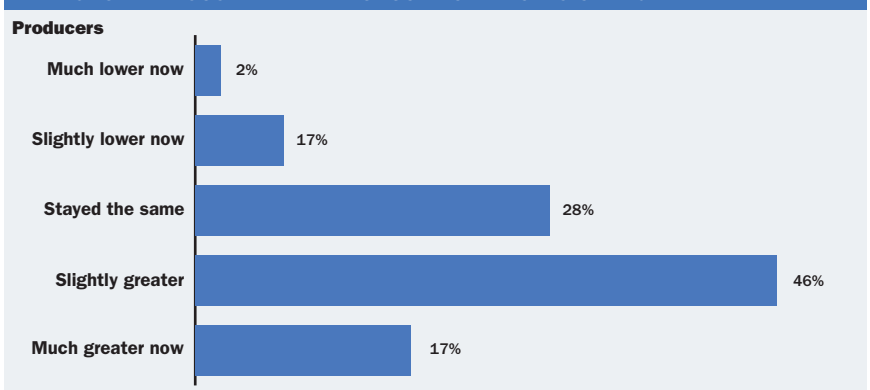
SOURCE: ICIS/Genomatica survey

WHAT DO YOU SEE AS THE MAIN ISSUES AROUND THE USE OF BIOBASED CHEMICALS?



SOURCE: ICIS/Genomatica survey

IN THE LAST THREE YEARS, HOW HAS THE LEVEL OF INTEREST YOUR CUSTOMERS HAVE SHOWN IN SUSTAINABLY PRODUCED CHEMICALS CHANGED?



SOURCE: ICIS/Genomatica survey