



BUSINESS SWEDEN

INSIGHT SERIES 2019

MATERIALS OF THE FUTURE

TRUTH 1: DRIVEN BY CUSTOMERS
FROM HEAVEN AND HELL

Materials engineers are always on the lookout for the next big thing. But customers are increasingly playing an instrumental role in shaping the innovation paths and materials that transform everyday life. In collaboration with Swerea, Sweden's world-class research group, and trend analyst firm Kairos Future, Business Sweden presents a special report in nine parts about the race for stronger, lighter, more sustainable, absorbable - and fully connected materials.

INTRODUCTION: TRENDS AND TRUTHS IN THE MATERIALS RACE

IN THIS
INSIGHT

TRUTH 1: DRIVEN BY CUSTOMERS FROM HEAVEN AND HELL

Demanding customers who want more and pay less are a strong incentive for rapidly developing, new and better materials. This will lead to a future with higher degrees of collaboration with customers in order to understand their needs, ideally before they are aware of them themselves.

TRUTH 2: ENVIRONMENTALLY FRIENDLY - SUBJECT TO RESERVATIONS?

The materials of the future are obviously designed in environmentally friendly ways with lightweight, energy saving and low-carbon emissions at top of mind, but how simple will it be to recycle them? Complex, tailor-made materials place high demands on future recycling facilities.

TRUTH 3: IN THE SHADE OF THE FOREST

The forest is a natural source of raw materials for much of what is made using oil today. Nations rich on forests have great potential for developing new, advanced materials industries based on raw materials.

TRUTH 4: HYPER-DESIGNED

There is no reason to believe that the trend towards more intensively designed and customised products will slow down, quite the opposite. In future, materials may even be designed all the way down to atomic level in order to meet increasingly high demands.

TRUTH 5: CONNECTED

Sensors can already be found on many products today, but in the future they will be embedded in materials to a far greater extent as woven fibres, smart coatings, conductive nanotubes or in other forms. The materials will be able to report fractures, overheating and other issues via the Internet of Things.

TRUTH 6: BORN AT THE CROSSROADS

It is increasingly difficult for a single party to develop sophisticated and advanced materials. The materials of the future are therefore rarely born from a single company but in the interaction between several different parties, each with their own expertise, requirements and areas of strength.

TRUTH 7: CREATED BY NEW PIONEERS

New players from the IT and space industry, among others, are beginning to drive material developments to a larger extent. They can often afford to manage major collaborations or, if necessary, develop what they need themselves. Pioneers from other areas are entering the materials industry, both as partners and as competitors.

MATERIALS OUTLOOK 2020: WHERE ARE WE HEADING?

Join us as we explore the seven truths about the materials race in depth. Go to business-sweden.com/materials

DRIVEN BY CUSTOMERS FROM HEAVEN AND HELL

Are demanding customers who want more and pay less an insurmountable challenge or a gift from above? Either way, customer co-development is the name of the game.

Materials can be found all around us, in everything we use in everyday life. Is it then strange that we want them to be as good and reliable as possible? After all, who wants their phone to break down or their computer to be too heavy?

In the past, material development was mainly driven by safety and efficiency – today it is practically a given that materials must also be long-lasting and lightweight. But customers of the future will look for other aspects of quality, from materials being easy to use, to being attractive, comfortable, customised for their particular purpose environmentally friendly, natural and with several other more specialised properties. They are the customers from hell – who have given material developers a kick up the backside.

MATERIALS FOR COMFORT

The materials of the future will be manufactured and developed in new ways to meet radically changing needs. Where the paradigm once was that you would buy the best materials available, it is now increasingly common to request materials that are even better and do not exist – not yet, anyway. Materials that once stood out from the crowd

are fast becoming part of the mainstream. Customers who choose organic cotton push all suppliers towards offering organic cotton, anything less would be unimaginable as the material is already available.

Materials are being shaped by customer expectations and demand, but also through new forms of collaboration. It is becoming more and more common to work together with customers to develop materials for specific purposes, which can greatly benefit new materials development. Besides setting higher requirements, customers contribute with expertise and insight into the standards that will be set for products. This results in better products and hopefully also better materials.

As the findings of Swerea's materials survey reveal, four out of ten respondents consider the driving force of new materials to be price pressure and environmental requirements from customers and end consumers. In addition,

56%

...of respondents to our survey specified that "demanding customers" are a crucial strength for the Swedish materials industry.



four out of ten respondents also consider these to be the most important driving forces. Environmental legislation does not appear to be as important as environmental requirements – in other words, change is driven more by customers than legislation.

As for how materials are developed, the influence of customers is also visible here. The greatest change over the past decade is that materials have become customised and intensively designed to meet specific needs. This was confirmed by eight out of ten respondents in the survey and the trend overshadows all other developments as well as traditional incremental changes such as improved strength and lighter weight.

Customer needs increasingly dictate how materials are designed and this trajectory is expected to continue. Almost nine out of ten respondents believe that the materials of the future will be more customised and uniquely designed than today. At the same time, the expectation is that they will be more diversified with broader functionality – perhaps to better meet customers' evolving needs, although these attributes (diversification and broad functionality) are not expected to grow quite as fast.

WONDER MATERIALS AND WHERE THEY ARE FOUND

What is the outcome of this massive customer-driven pressure? More often than not, amazing results. Customers have become key allies in materials development today as they strive for continuous innovation in order to remain competitive. They are talented partners and invaluable assets as they provide insight into applications and processes.

Today, many new materials are developed simply because customers initiate manufacturing and want to increase innovation speed and remain competitive. This is a strong incentive for further collaboration between manufacturers and users, which not only creates driving forces for more innovation but also generates a sort of

41%

...of respondents in the Materials-survey stated that environmental requirements from customers and end consumers was the most important driving force of material developments in the past decade. An equal percentage stated that demand for cheaper products was the largest factor.

natural environment in which people with different expertise can come together.

DISCERNING CUSTOMERS – A GODSEND FROM HEAVEN?

The idea that creative and discerning customers are assets in today's industry value chains was supported by more than half of the respondents in the materials survey. Discerning Swedish customers were cited as particularly influential in helping to strengthen companies' competitive edge.

4 STRATEGIC RECOMMENDATIONS

- Recognise that customers are more demanding than ever and embrace the opportunities for innovation
- Invite customers to participate in the innovation process and learn from their insights
- Be aware that customers expect continuous improvements. If there is no progress – you will fall behind.
- Review your business model: is it based on passive customer relationships with limited scope for change, or on open communication channels and regular feedback?

"Industrial use of materials is much more user-driven today. In the past, steel was made "better". Now customers say: We need to have it this way, either you provide us with the steel or we change our supplier."

Eva Lindh Ullgren, Head of Research, Swerea KIMAB



The fact that customers are demanding in terms of the environment, price and quality is a stick that drives materials development forward. But it is also a carrot as there is a lot to gain in terms of monetary rewards and innovation when customers get smarter and want to be involved in materials development. Good collaboration between material manufacturers and material customers was listed as a major strength by around half of the respondents, suggesting that discerning customers are perhaps not from hell at all but, by contrast, a godsend from heaven. They provide the opportunity to understand customers' needs, which should not be underestimated in a world of increasingly tough competition to retain customers and consumers.

Focusing on customised materials tailored for specific applications was considered an attractive strategy for the future by nearly half of the respondents. More industrial research may be even better as it provides a way to benefit from the most demanding of customers. The latter strategy

CO-CREATION IS ON THE RISE

Sandvik manufactures 16,000 metres of high-precision pipes in different specialised alloys each day, often on a customised basis to meet unique customer demands.

Lesonal which manufactures car paint has a scheme in which they cover the cost for workshops needed to repaint cars that have been damaged.

Patagonia needed a material for an environmentally friendly wetsuit. So they entered into collaboration with Yulex, a company that manufactures latex-free rubber.

3 BREAKTHROUGH MATERIALS:

- **Metallic glass:** Typically used in smartphones and medical implants. Superior to ordinary glass in terms of durability, reduced weight and energy absorption.
- **Nanocellulose:** Made from wood-fibres with exceptional strength matching that of Kevlar. Used in applications such as paper production and packaging.
- **Lead-free brass:** Ideal for water taps to eliminate the toxic presence of lead in standard alloy taps. Unlocks both health and environmental benefits.

came in at fifth place among the twelve proposals, with 54% strongly backing the proposal.

2030 OUTLOOK: FROM HELLISH CUSTOMERS TO HEAVENLY DESIGNERS

If you thought materials were created by material manufacturers or designers, think again. They are designed by customers – in theory at least. In today's complex industrial landscape, different players compete to be able to offer the best solution using a wish list that in principle constitutes the final design. It specifies what the material will be used for, its required weight and structure, as well as the conditions under which it will be used. The practical development steps will usually be decided in a collaborative setting. It is then up to the materials supplier to solve the problem of manufacturing the material in accordance with the specification. While materials are still commodities, the development and improvement of materials has almost become a consulting service.

“Ultimately, it is customer value that drives change, such as materials that are more durable in different environments and provide a new advantage. Demonstrate the benefits in the actual environment is key in order to convince customers. It may take 5-10 years to build trust.”

Anders Holmberg, Head of R&D, ABB Composites

81%

...of respondents in the Materials-survey stated that material designs in their industry have become more customised and complex in the past decade.



SWEDEN – A NATION RICH IN FORESTS AND MINERAL RESOURCES

Sweden is Europe's leading mining nation and a global forest industry giant. These natural resources formed the bedrock for Sweden's industrialisation. And they remain important today. But times are changing. Digitalisation is eroding demand for newsprint and new technology is driving innovative applications for traditional metals and high-tech metals. Sweden hosts mineral deposits like graphite, lithium, rare earth metals.

The shift towards sustainable development and renewable materials is transforming the forest industry to a stronger orientation towards higher value products. Innovative companies are using Swedish wood to develop new bio-based materials such as barrier films, chemicals, carbon fibre, textile fibers and other applications with industry-changing potential.



Photo: Melker Dahlstrand

ABOUT THE AUTHORS

Swerea: Swerea is the Swedish research group for industrial renewal and sustainable growth. Our mission is to create, refine, and convey scientific results in the areas of materials development, production and product development. We work in applied science, with extensive industrial knowledge and experience of how research results are translated into practical use. Our five research institutes exist at roughly a dozen towns in Sweden and France, and we have a network of over 700 member companies and 3,000 corporate clients. We create greater competitive power for Swedish industry.

From October 1st 2018 two thirds of Swerea is acquired by RISE Research Institutes of Sweden, and one third will form a new research institute, Swerim.

Kairos Future: Kairos Future is an international consulting and analysis firm that helps companies take leaps towards the future. Through trend and scenario analysis and support in innovation and strategy, we help customers with the big picture and the direction for the future. Kairos Future was formed in 1993, our head office is situated in Stockholm and we have partners worldwide.

Business Sweden: Business Sweden helps Swedish companies grow global sales and international companies invest and expand in Sweden. We ensure that international companies can rely on our knowledge, experience and extensive network to identify new business opportunities and achieve an accelerated return on investment. Business Sweden is present in 50 of the world's most promising markets and owned by the Swedish Government and the industry, a partnership that provides access to contacts and networks at all levels.



We help Swedish companies grow global sales and
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