chemsec
INTERNATIONAL CHEMICAL SECRETARIAT

The bigger picture

Assessing economic aspects of chemicals substitution

Summary

What are the true costs and benefits of substitution? Simply comparing per kilo prices of a hazardous chemical and an alternative is rarely relevant. Instead a number of complex factors interplay. To see them all, you need to take a step back and look at the bigger picture.

Assessing the economic aspects of substitution is a complex task. Even in cases where substitution is a relatively straightforward process of replacing one chemical with another, basing an economic assessment on a comparison of the price per kilo is often irrelevant. Progressive companies, as featured in this report, know that one must include several other factors when assessing the true costs of hazardous chemicals and the benefits of replacing them.

Assessing the socioeconomic aspects when regulating hazardous substances can be even more challenging. Nevertheless, such assessments need to be based on the very same big picture outlook. The use of hazardous chemicals is often accompanied by additional costs, including employee health measures and handling of hazardous waste, to name a few. And while there may be a negative economic impact for a company that has to substitute a substance it is dependent on, there are also opportunities and potential financial benefits for other companies, for example producers of alternatives and progressive competitors that have already made the substitution.

To summarise, a proper assessment should include and analyse all extra charges surrounding hazardous chemicals and the costs and benefits for all involved parties, including society as a whole. Failing to include these aspects in the assessment may lead to the wrong conclusion and in the end regulation that counteracts its purpose of driving innovation.

The cases in this report outline four main aspects of the economic benefits of substitution, which must not be forgotten if we are to see the bigger picture and make the most accurate assessments:

1. PRICES ARE NOT STATIC

New alternatives are often expensive initially, while prices tend to decline as supply increases.

2. USING HAZARDOUS CHEMICALS IS COSTLY

Typically, the use of hazardous chemicals is accompanied by additional costs. These can include setting up protective measures/equipment for workers, including healthcare, handling of hazardous waste, etc. At the same time, new innovations may bring additional benefits, such as reduced energy or water consumption.

3. REGULATION SETS THE STAGE FOR INNOVATION

New and better products are being developed quickly and continuously. Anticipation of regulation efficiently drives the process further. What seems to be impossible or too expensive today may very well be possible tomorrow.

4. THE MARKET FOR SAFER ALTERNATIVES IS GROWING

Sustainability is here to stay. Safer products not only have the advantage of remaining safe from potential future regulations, but are also increasingly requested by consumers and other stakeholders, including investors.

SUBSTITUTION MEANS the replacement or removal of chemicals in processes or products. In many cases, chemicals that may be hazardous are added to a product to achieve a certain function. The aim of substitution is to achieve the same functionality without the specific chemical, which can be done in many different ways. The most straightforward substitution is to replace one substance with another that is less hazardous, but most often it is more complex than this. Replacement of hazardous chemicals can be achieved by changing materials, changes in processes or by using new technology. Substitution is a true driver for innovation, and can bring additional benefits.

Introduction

When a company feels its business is under threat from an upcoming chemical regulation, it is naturally very vocal about this, and eager to provide evidence of impact. This publication aims to give voice to the silent players, the companies that would actually benefit from more stringent regulation.

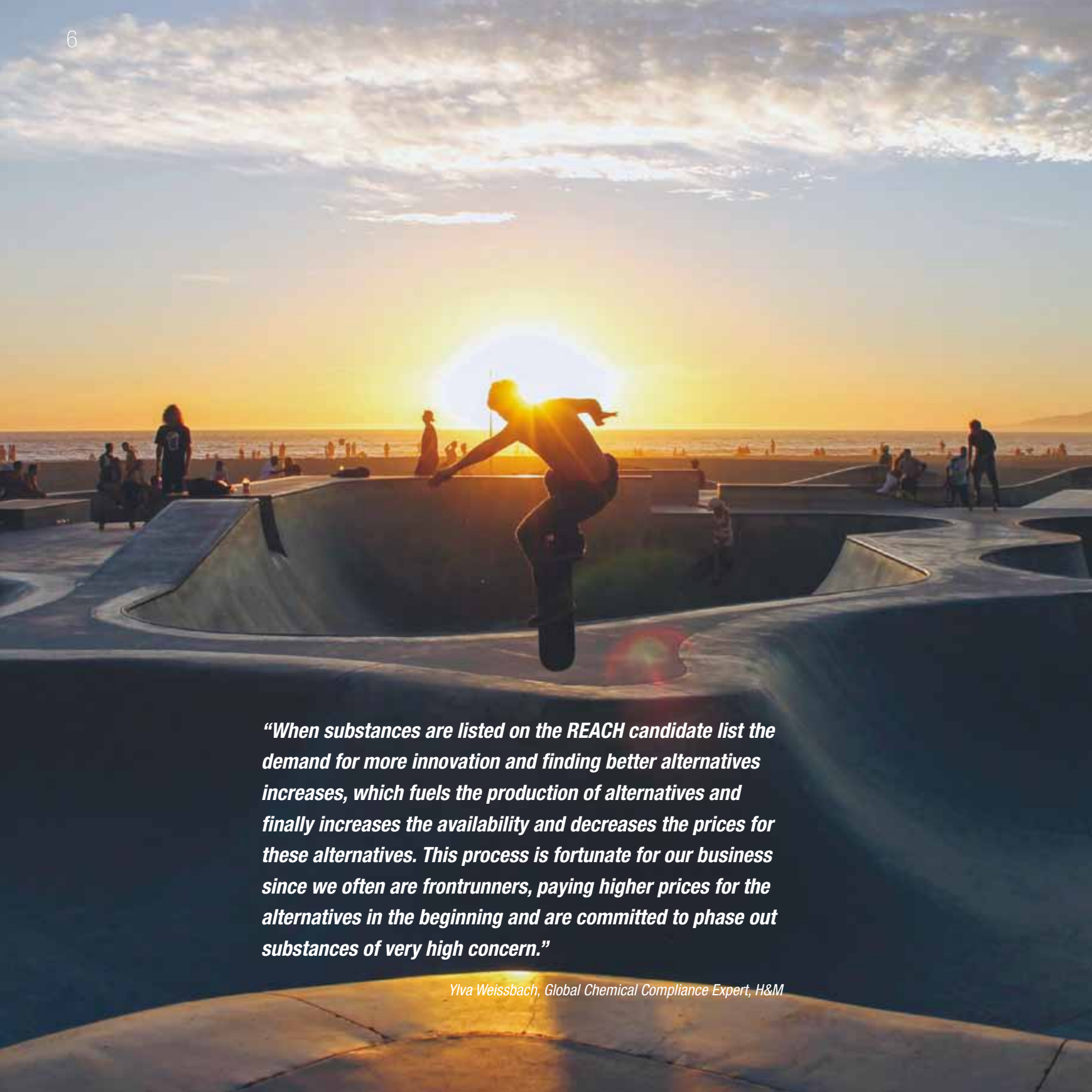
While chemical regulation may seem to be a burden and a hurdle to some companies, others see business potential. Looking at examples from a variety of companies, including Apple, H&M, Skanska, Adidas Group and DSM, this publication illustrates a number of economic benefits of substitution. What these companies have in common is that they have realized it is rarely relevant to simply compare per kilo prices of a hazardous chemical and an alternative, since there are a number of factors that make the decision more complex.

Policy-makers also need to take a similarly wide perspective when they assess the potential impacts of chemical legislation, including the potential costs and benefits to society as a whole. A number of recent reports point out the huge costs that arise from hazardous chemicals in the form of impaired human health. This report, however, focuses on the actual economic benefits for individual companies related to the substitution of hazardous chemicals.

The companies featured in this publication are in most cases already well ahead of chemical legislation. In many cases they have been taking action on safer chemical substitution because it is part of their value system, not just because of potential economic benefits or regulatory efficiency.

Since they are well ahead, they are not visible in discussions regarding chemical restrictions and regulations. This does not mean, however, that legislation does not affect them or any other progressive companies. The really big companies can push whole supply chains to stop using unwanted substances with a little help from progressive regulation. Innovative companies and producers of safe alternatives can gain market shares. Stalled regulation will instead have the opposite effect.

The main concern of policy-makers should therefore not be to reduce the "burden" of environmental regulation on laggard companies, because this also disfavours the frontrunners. Time and time again we see how anticipation of regulation is an extremely effective driver for innovation, which in turn is the foundation of economic development.



"When substances are listed on the REACH candidate list the demand for more innovation and finding better alternatives increases, which fuels the production of alternatives and finally increases the availability and decreases the prices for these alternatives. This process is fortunate for our business since we often are frontrunners, paying higher prices for the alternatives in the beginning and are committed to phase out substances of very high concern."

Ylva Weissbach, Global Chemical Compliance Expert, H&M

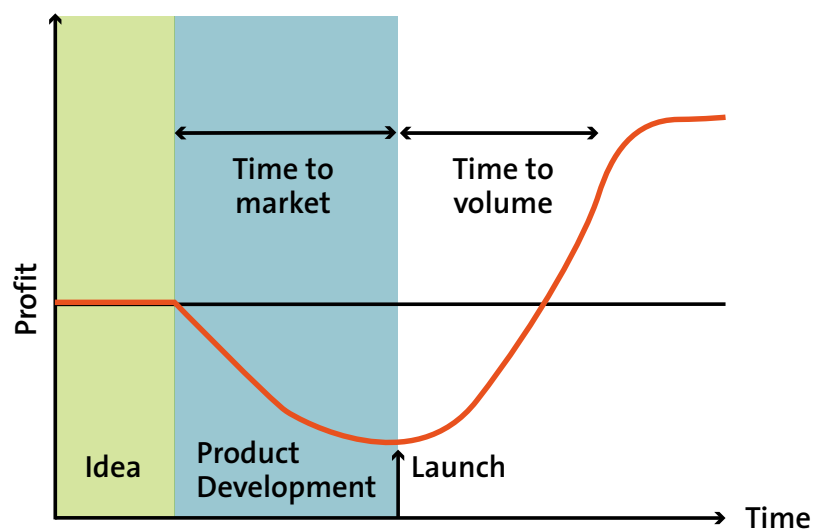
Prices are not static

New alternatives are often expensive initially, while prices tend to decline as supply increases.

Prices depend on supply and demand; as demand and supply increases prices tend to decline. Comparing prices of a hazardous substance and an alternative that has just reached the market, or doing so before the hazardous substance has been banned, can therefore be very misleading.

This needs to be kept in mind by both policy makers and companies. Policy makers should be aware that even though the potential regulation of a substance will be economically burdensome for some companies, it will drive market shares towards others. Likewise, companies pondering substitution need to calculate what will bring the most benefits in the long run, not just for the moment.

Lessons learned from initial mistakes and fine-tuning of the process help increase production and reduce the cost. This is called the learning curve.



The learning curve, figure adapted from: Innovationmanagement.se: "Measurement is critical to increase return of innovation".

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Apple

Give it two years

The consumer electronics company Apple started to phase out PVC in 1995 and had phased out brominated flame-retardants (BFRs) by 2008. The alternative substances were initially more expensive. Two years after starting to produce PVC-free and BFR-free products, the cost had fallen to the same level as before the transition.[1]

– Our investment in green chemistry is driven by both our passion for innovation and our commitment to safety," says Art Fong, Environmental Toxicologist, Apple.[2]

Public procurement

Price dropped three times in five years

In Sweden, Stockholm County phased out the majority of PVC gloves used in medical care in 2004 and started to use nitrile gloves instead. The main reason for this was the presence of hazardous chemicals, especially phthalates, which could represent up to 50% of the weight of the glove. At this time the nitrile gloves cost 8 euro cents each. Just 5 years later the price of nitrile gloves was 2.5 cents each. In parallel, the price of the PVC gloves went up, and by 2009 the price of both gloves was more or less the same. In 2004 alone, more than 100 tonnes of phthalates were phased out in Sweden due to the shift of gloves used in medical care".[3]

1. *Source: ChemSec RoHS Conference European Parliament 2009 http://www.chemsec.org/images/stories/publications/Downloads/Summary_Greening_Consumer_Electronics_Conference_2.pdf*

2. *http://www.apple.com/environment/toxins/*

3. *This example can be found in the SUBSPORT case story database: http://www.subsport.eu/case-stories/153-en?lang=en.*

Paxymer

Market demand for innovation bring prices down

Flame retardants are a group of chemicals used in many products, including textiles, furniture, plastics and electronics, with the purpose of delaying or preventing the spread of fire. Flame retardants are also increasingly under scrutiny from an environmental and health standpoint, due to their often very hazardous properties. Because of this they have become the subject of legislation in the last couple of years, driving more and more businesses towards producers of alternatives.

Not only is this market segment a prime target for innovative chemical producers, but it is also a great area to study the effects legislation has on chemical innovation as well as how tightly interlinked price and production volume are.

Chemical producer Paxymer produces flame retardants that are free from halogens, one of the most common hazardous ingredients.

– Legislation is crucial to drive substitution in our industry, says Amit Paul, Managing Director at Paxymer. The businesses that use flame retardants use them as a consequence of standards or legislation, but the incentives for substitution of hazardous substances are limited. Without this they will keep using conventional, persistent and toxic solutions. They need triggers. Legislation and OEM demands are by far the most efficient triggers.

Amit Paul also argues that calculations of the financial effects of substitution are normally approached inaccurately. Even though per kilo comparisons fail to give the full picture they still dominate product calculations, missing out on important factors such as waste management, worker safety and other investments in workplace safety.

– Halogenated substances incur these costs every time they are used. Of course these investments have often already been made by the companies and are therefore not included in cost assessments. If they were, however, halogen-free substances would be considered cheaper than halogenated ones by roughly 10%. Include societal costs and the savings would be even greater, probably in the range of 25–30%, says Amit Paul.

Nevertheless, Paxymer anticipates that it will still come out ahead with per kilo comparisons of halogenated substances and its halogen-free alternative in future. As customer demand grows, Paxymer expects the price of its alternative to drop.

– If halogen-free alternatives had the volume that halogenated substances have today, the cost would be reduced by a third. At that point they would be cheaper than halogenated solutions, says Amit Paul.

Information shared by Paxymer 2016

"At the adidas Group we are committed to continuously improve our environmental and chemical footprint as well as to meet our increasing consumers and stakeholder's expectations and regulatory requirements. Already many years ago we phased out PVC in our products. More recently we decided to phase out PFCs up till 99% of our products. This is a very ambitious goal for a high performance sport brand, but we have invested significantly in innovation resources in order to find environmental, performance and economical viable solutions. Like most innovations more sustainable chemistry might be more expensive initially, but costs can be further reduced over time once applications are scaled up."

Philipp Meister, Director Strategy Social and Environmental Affairs, adidas group

Use of hazardous chemicals is costly

Comparing the price of a hazardous chemical and an alternative may seem relatively straightforward. However it's often the opposite since the use of hazardous chemicals is followed by additional costs.

Typically, the use of hazardous chemicals is accompanied by additional costs for the company using the substance. Examples of this are:

- Special routines for transport and storage
- Protective equipment for workers
- Extra health examinations and education for workers handling the substance
- Waste and wastewater treatment
- Environmental remediation

Substituting a hazardous chemical can be an opportunity to get rid of these additional costs. Also, when substituting to a modern alternative, alternative material or alternative process there may be other benefits, including reductions in water, energy or carbon emissions. To give one example, the electronics company Dell replaced LCD technology with LED technology in displays and notebooks. One reason for this was to get rid of the mercury used in LCD displays, but additional advantages were energy savings and increased life span.[4]

The chemical company DSM and cookware manufacturer Greenpan both produce products with additional benefits compared to counterparts that use hazardous chemicals. Greenpan produces non-stick cookware without fluorinated compounds, using a ceramic coating. This alternative coating has the advantage of being more scratch-resistant than the coatings it replaces.[5] DSM produces a breathable membrane for textiles as an alternative to similar products, which are often based on halogenated compounds, or contain plasticizers. According to DSM the carbon footprint of this product is also lower than for traditional membranes.[6] When done right, substitution helps companies carve out their own market niche and places them ahead of their competitors.

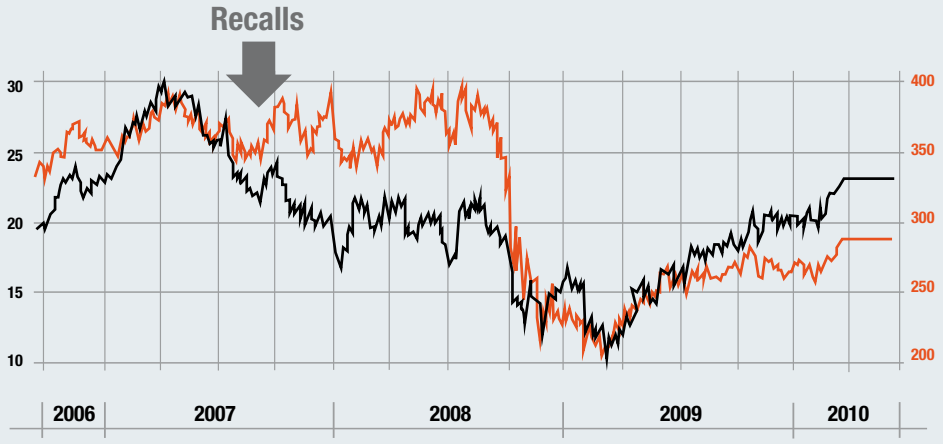
Another aspect of hazardous chemicals is company scandals. Having to withdraw products from stores, due to non-compliance with regulations, media campaigns or worries among consumers, is a nightmare for many companies, and potentially very expensive. To quote Warren Buffet: "It takes 20 years to build a reputation and five minutes to ruin it. If you think about that, you'll do things differently".

4. *This example can be found in the SUBSPORT case story database: http://www.subsport.eu/case-stories/115-en*
5. *This example can be found in the SUBSPORT case story database: http://www.subsport.eu/case-stories/234-en*
6. *This example can be found in the SUBSPORT case story database: http://www.subsport.eu/case-stories/189-en*

Mattel

Recall caused stock price to plummet

In 2007 Mattel, a worldwide leader in toys and family products, had to recall approximately 1.8 million toys due to that lead was detected in their products. It had been used in the paint for the toys. If you look at the stock market during this period you can see how Mattel's stock was seriously underperforming for almost a year compared to the toy industry index. In the end, Mattel had to invest a lot to build up the trust among consumers after this scandal.



Source: Bloomberg

New Balance

Managing the supply chain

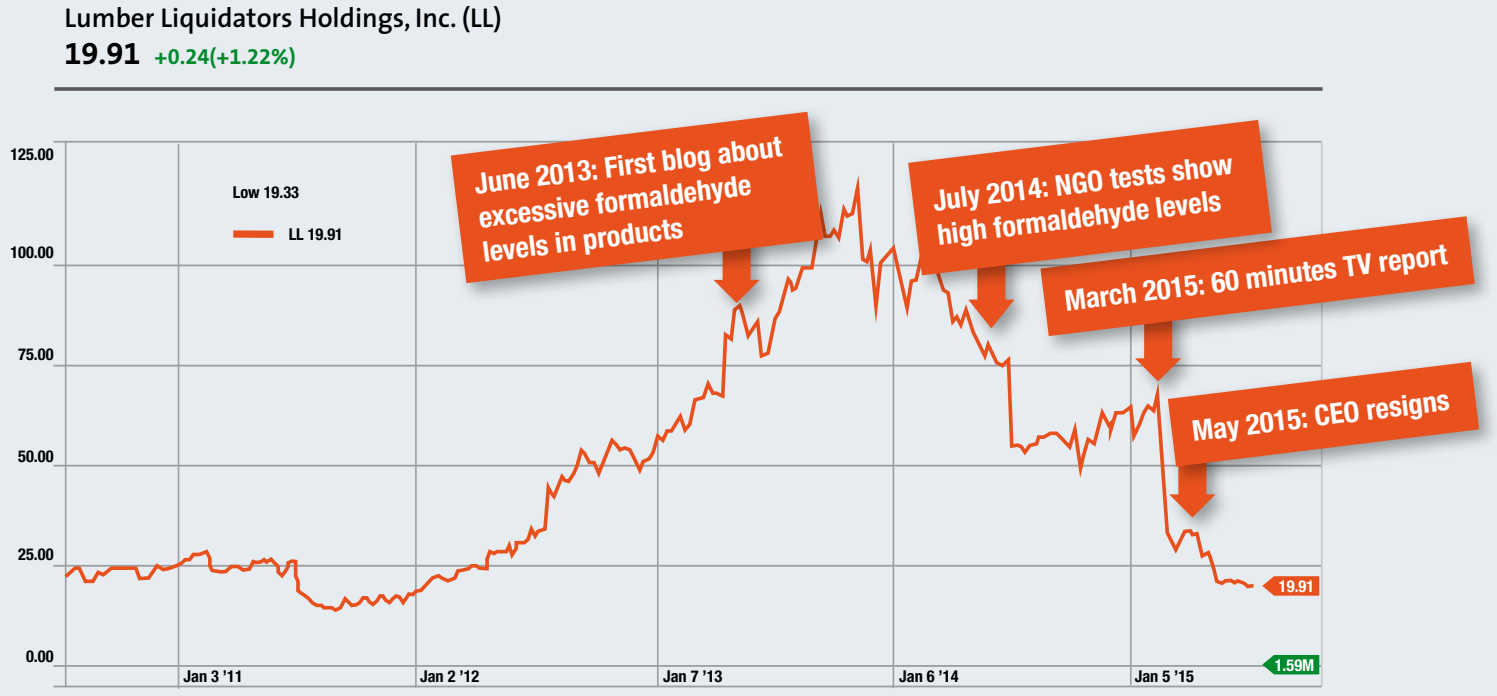
Primers are designed to improve the effectiveness of an adhesive, and are used to pre-treat polyurethane (PU)/Thermoplastic polyurethane (TPU), PU foam and synthetic leather when bonding athletic footwear. Some of these primers are known to contain Tetrahydrofuran (THF), which has been classified as suspected of causing cancer. Even though there is no regulation to ban THF in consumer products, US athletic brand, New Balance, decided to replace these primers with THF-free formulations in an effort to protect the manufacturing associates producing New Balance footwear in 2014. The price of the THF-free primer is nominally higher, however, the real economic benefit results from the fact that the THF-free formulation has shown a higher bonding strength which improved quality and production efficiency.

Information shared by New Balance 2016

Lumber Liquidators

NGO expose formaldehyde in flooring

Lumber Liquidators, a US laminate flooring company, were exposed by an NGO for having high levels of formaldehyde in their floors, a known cancer-causing chemical. The stock price took a serious hit, and plummeted even further after a CBS News report on the matter in March 2015.



Source: Yahoo finance, http://finance.yahoo.com/

Skanska

Long-term chemical strategy cuts additional costs

Injectable mortar containing isocyanate has been a recurrent troublesome product in recent years for construction company Skanska. Isocyanates are potentially dangerous irritants to the eyes and respiratory tract, and until recently there were no known alternatives.

– Besides not being environmentally friendly, it was especially problematic for workers handling the material. Not only did they need certified training, they also had to use special protective equipment and areas had to be sealed when the injectable mortar was used, says Carl Enqvist, Sustainability Development Leader at Skanska.

By the late 2000s, Skanska and producer Hilti initiated a dialogue in order to create a non-hazardous alternative but with the same technical properties. A couple of years later they were able to introduce the injectable HIT-CT1 mortar on the market, which is free from isocyanates. The alternative is slightly more expensive but overall the shift has been economically beneficial.

– There are no occupational hazard problems related to the use of HIT-CT1 and it does not require any training. At the same time we know that we can use the new product in any upcoming projects as it fulfils our environmental criteria – that's a huge benefit, says Carl Enqvist.

Skanska started to implement a long-term strategy for chemicals in early 2000, in the wake of the Hallandsås Tunnel scandal, where the hazardous sealing compound Rhoca Gil was used during construction. The substance affected local animal life and halted the gigantic tunnel project for almost ten years.

Much has happened since then, and today Skanska apply a set of chemical criteria to their building projects that go beyond REACH. Internally, Skanska are always trying to take precautionary action and move away from the use of hazardous substances, but the push from the customer is just as important.

– The demands of our customers have meant a lot for progress in terms of chemicals. They set the bar through demands in their contracts and decide exactly how strict the criteria are that apply to each project, says Carl Enqvist and continues:

– Over the last five years we have experienced stronger demand from our customers. They want a better picture of what kinds of substances are built into their facilities.

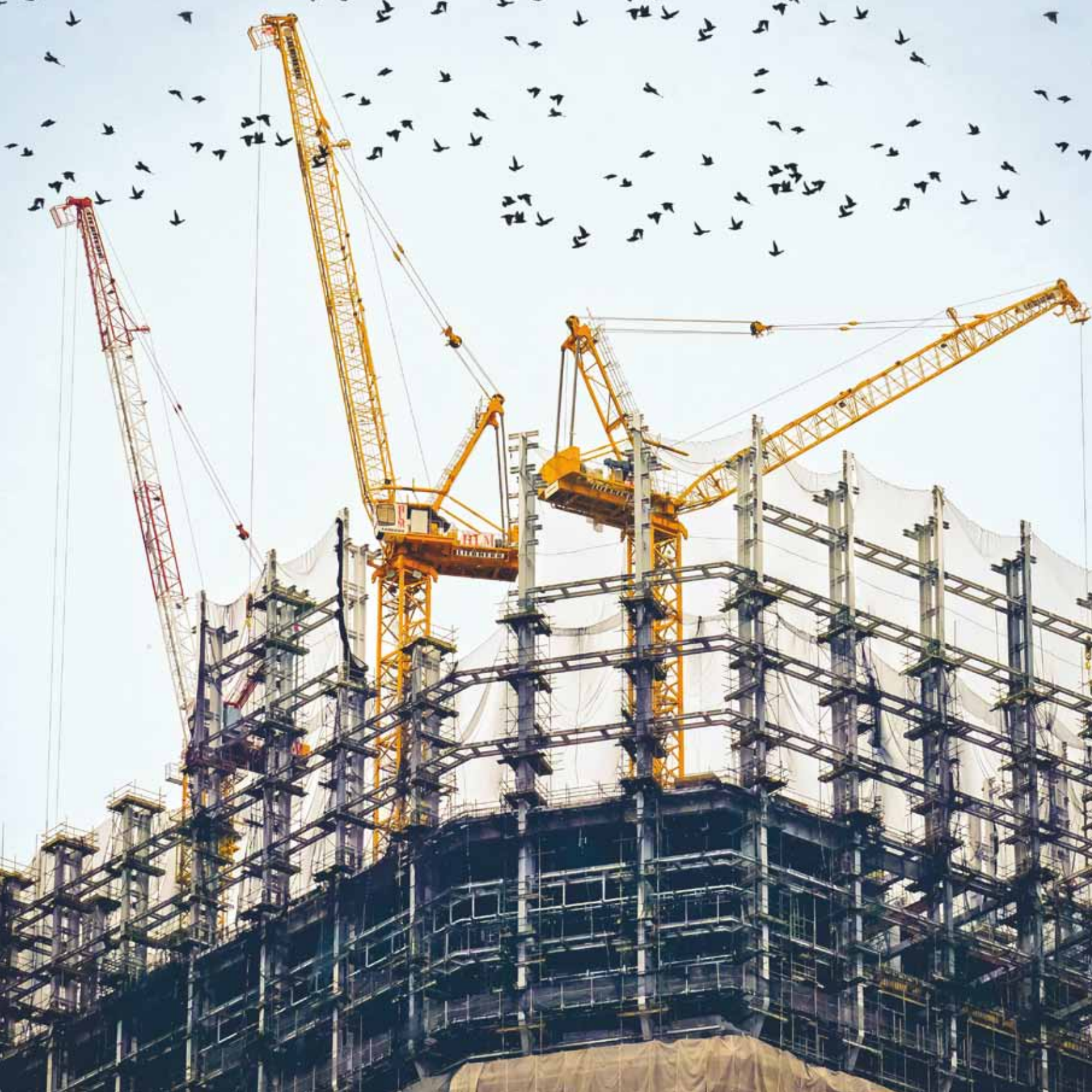
Information shared by Skanska 2016

OrganoClick

Saving money by using biobinders

OrganoClick is developing and producing green chemical solutions for fiber based materials such as wood, textiles and paper. An example is biobinders for nonwoven materials. Traditionally, binders in nonwoven are made by petroleum based acrylic polymers. OrganoClick has developed a series of bio-based binders that can replace the traditional binders. The biobinders have approximately the same price as the traditional binders but save costs in the recycling as a 100% renewable and biodegradable nonwoven material can be produced which can be recycled completely in one piece instead of burning it as waste.

Information shared by OrganoClick 2016



"The authorisation procedure is designed to drive innovation and it has played a key role for the development of our products. The work that the REACH authorities are undertaking is in our view essential to ensuring that we will have all of the information necessary to assess and manage the risks associated with all of the materials we work with and where necessary to substitute hazardous chemicals with safer alternatives."

Gemini Adhesives Ltd

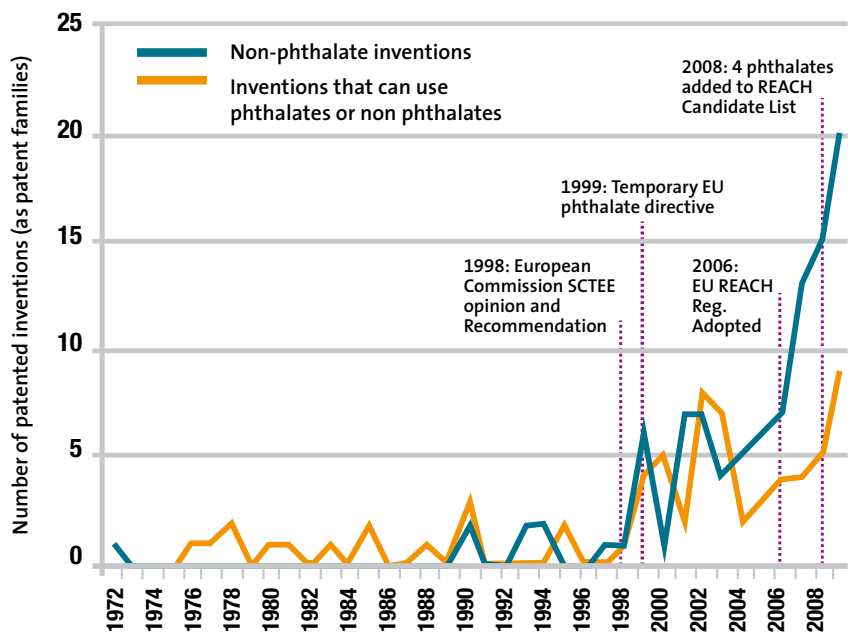
Regulation sets the stage for innovation

New and better products are being developed rapidly and continuously. What seems to be impossible or too expensive today may very well be possible tomorrow.

The strongest driver for substitution of hazardous chemicals is obviously regulation, or rather anticipation of regulation. Regulatory processes often take time, but when initiated they provide signals to the market, showing what is to come for companies that are watching developments. Under REACH, the authorisation process is a step-wise approach starting with Candidate Listing. We already know that Candidate Listing (along with SIN Listing) is a driver for innovation in the chemical manufacturing industry in the EU.[7] This driving force is dependent on the continuing process leading to restrictions or bans. If authorisations are given in all cases, the incentive to innovate will obviously be reduced.

The Centre for International Environmental Law (CIEL) examined the question of whether stronger laws bring safer chemicals to market through innovation. They investigated the case of phthalates, which are becoming increasingly regulated. They found exponential growth in patents for phthalate alternatives since stricter regulation of phthalates was first introduced.[8] They also concluded that stricter laws for hazardous chemicals help to bring inventions to the market, turning an invention into innovation.

Spike in Patented Inventions Free of Hazardous Phthalates



Exponential growth in the number of patented inventions for phthalate alternatives beginning in 1999, coincliding with the adoption of stricter rules (as captured by the number of patent families for "non-phthalate" and "phthalate free" inventions). Source: CIEL report "Driving Innovation, How stronger laws help bring safer chemicals to market", Feb 2013.

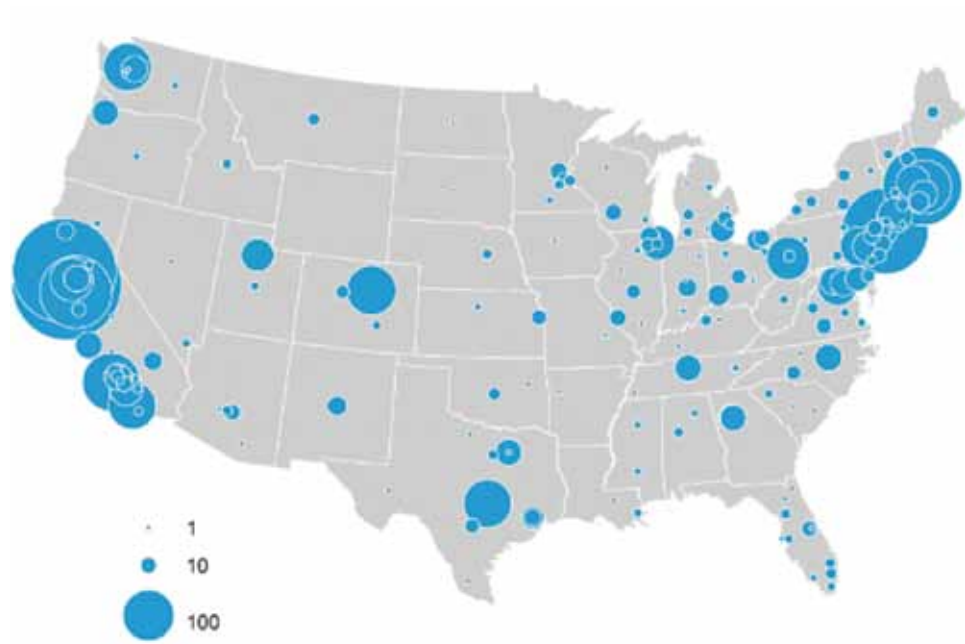
7. *EU Commission report on REACH and impacts on chemical industry, 2012*
8. *How stronger laws help bring safer chemicals to market, CIEL, 2013*

In some cases only a final ban will give the push to substitute. This can be the case when one of the most profitable or long-established products made by a company contains a hazardous chemical and the company is hesitant about alerting its customers to this fact. In these cases there may be an alternative product that has been developed in parallel, but which will not be placed on the market until the original product is truly "dead".

Looking at the EU market, the countries that have had the strictest chemical regulations at national level are also leading the way in eco-innovation. These countries include Finland, Denmark, Germany and Sweden.[9] A government-commissioned study[10] on the overall effect of REACH on the Austrian economy over the next 30 years shows it will be "overwhelmingly positive",[11] leading to considerable economic resource gain (e.g. benefits of private households, public budgets and companies; present value of net benefits).

Similarly, in the US the strictest environmental regulations are found in states like California, New York and Massachusetts. Some people argue that these regulations make companies move away from these states to others with less regulation. But when you look at venture capital, this is not the case. In fact, areas with strict environmental regulation have the highest venture capital.[12]

Venture Capital Deals by Area Code



Venture capital deals by area code show that areas with strict environmental regulation have the highest venture capital. Source: Richard Florida: America's Leading Venture Capital Area Codes, citylab.com July 18, 2013

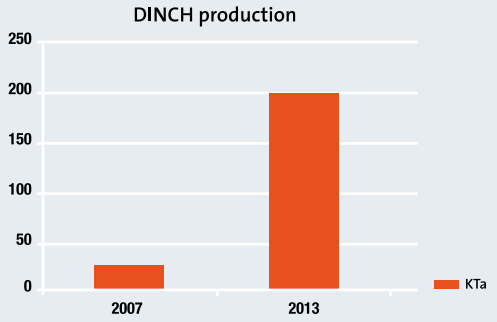
9. *Eco-innovation index.. From http://database.eco-innovation.eu*
10. *'REACH – Evaluation of the impact on the affected industry and the whole economy in Austria' was commissioned by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water (BMLFUW) March 2015*
11. *https://chemicalwatch.com/37207/reachs-impact-overwhelmingly-positive-says-austria*
12. *http://www.citylab.com/work/2013/07/americas-leading-venture-capital-area-codes/5091/*

BASF

Producers of alternatives gain market shares as regulation moves forward

DEHP is a phthalate plasticiser that has been up for regulatory discussions for years and is since 2015 subject to authorisation within REACH. This means DEHP cannot be placed on the market or used, unless an authorisation is granted for a specific use. The chemical company BASF produces an alternative to DEHP, called DINCH. To ensure worldwide supply in the face of increasing demand, the company decided in 2011 to build a second production plant for DINCH in Ludwigshafen, Germany. The new facility meant that production increased 700% in 6 years, from 25 KTa in 2007 to 200 KTa in 2013.

In parallel with this development, the company Arkema closed its DEHP plant in Chany, France, in 2013, in response to a market shift to non-phthalate plasticisers, which was expected to accelerate. [13]



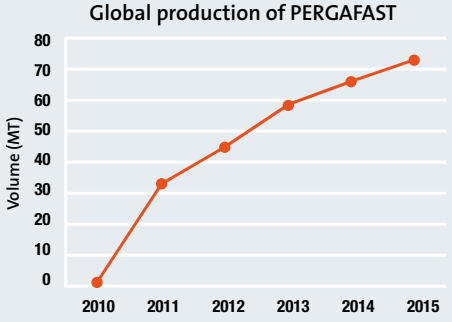
BASF plasticizer Hexamoll DINCH grows from strength to strength, Market Report Company, 2013

Chemical production

Volume of alternative increases when regulation moves forward

Volume of alternative increases when regulation moves forward. Prices of alternatives tend to decrease as they become more sought after and when the chemicals they replace are due for regulation.

Pergafast has been developed as an alternative to bisphenol A in thermal paper. Restriction of bisphenol A in thermal paper is currently being discussed in the EU.



Source: QYR Basic Lead Chromate Research Center, Nov 2015

13. *Transition to non-phthalate plasticizers speeds up in Europe. Plastics Today November 13:th 2013*

Mauviel 1830

Early adopter with increased competitiveness

Mauviel 1830 is a French company that manufactures cookware. They have managed to replace chromic acid, a carcinogen identified as a Substance of Very High Concern, SVHC, with a new process using diluted oxygenated water. As a result the company has gained a considerable boost to its reputation, as well as increased competitiveness and productivity. [14]

HP

Future-proofing computer parts pays off in the long run

Recently HP won a public tender for several thousand computer products to be delivered to six universities in the western region of Sweden. According to HP's Nordic Sustainability Manager, Hans Wendschlag, HP won the tender partly because they could offer computers and monitors with circuit boards with non-halogenated flame retardants.

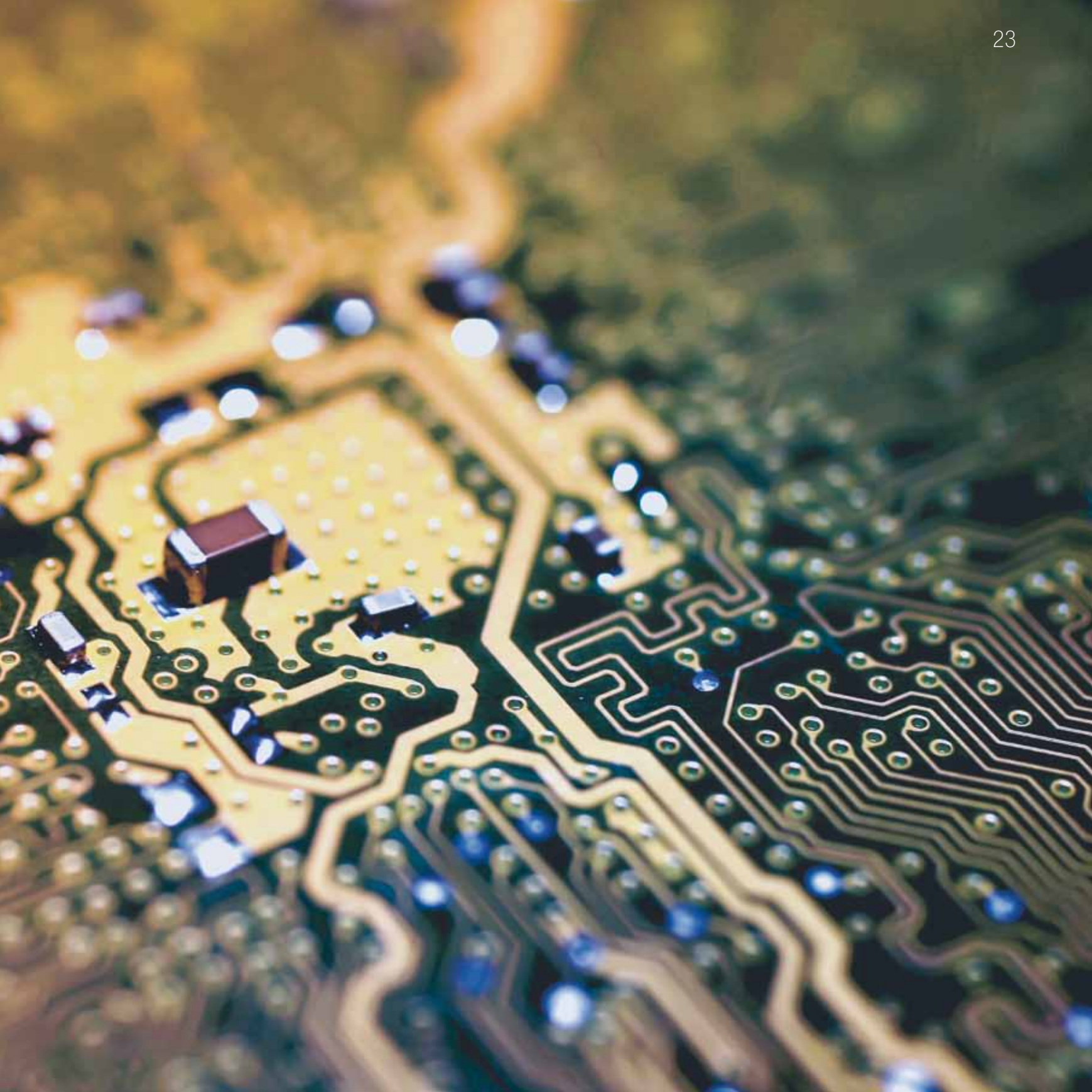
– There was a real advantage for us to be able to offer a product with these properties. We know the customer rated this highly, as well as our PVC free power cable, in their evaluation of the tender, says Hans Wendschlag.

According to HP's calculations it costs € 4-8 million to substitute one chemical, and the new, non-halogenated substance is no exception – it's also more expensive compared to the substance it replaces. HP are confident, however, that their new product will pay off in the long run, especially since the chances that the substance will be regulated under REACH or RoHS are minimal due to its favorable environmental and health properties.

– Though, it is a challenge to convince a product manager when you tell them a circuit board, for example, with a different flame retardant, will cost 5-10% more, says Mr. Wendschlag.

Information shared by HP 2016

14. *(ECHA) Publication of the French Ministry of Environment, Sustainable Development, Transport and Housing on REACH, further information on Mauviel 1830 case (in FR): http://www.developpement-durable.gouv.fr/IMG/pdf/REACH-2.pdf*



Are you looking for safer alternatives to hazardous chemicals? ChemSec's Marketplace is an online B2B platform created to facilitate substitution. Go to marketplace.chemsec.org

The market for safer alternatives is growing

Safer products not only have the advantage of remaining safe from potential future regulations, but are also increasingly requested by consumers and other stakeholders, including investors.

Sustainability is no longer solely a question for sustainability professionals in sustainability departments, in fact most corporations place it high on the agenda at management level. While carbon emissions and energy consumption have been high on the agenda for many years now, the reduction of hazardous chemicals is increasingly being adopted as an important cornerstone of sustainability.

Socially responsible investors (SRI) look at aspects of sustainability – including chemicals – and mainstream investors are also following this trend.

European Sustainable and Responsible Investment (SRI) strategies grew between 2011 and 2013 at a faster rate than the broad European asset management market. During the period, the overall European asset management industry has grown by an estimated 22.1% while SRI strategies had growth rates of 65%. [15]

In a market survey among investment experts in Sweden, 88% of the respondents thought that sustainable investments would become more important in the future. Three years ago only 39% of the respondents thought so. More than 60% said that their companies work actively on developments within sustainable investments.[16]

Requirements set up for public procurement are also an increasingly important market driver towards more sustainable products. For example, for the IT company HP, public tenders represent 30% of the company's business, and in Europe 90% of public IT tenders use criteria from four common eco-labels.[17]

A US study conducted by the Lowell Center research institute investigated the economic benefits of safer chemicals. The study makes interesting observations regarding market trends. It estimates the market for safer chemicals to have 24 times the growth potential of the conventional chemicals market worldwide, from 2011 to 2020.[19] In the study, large corporations were shown to have higher sales growth for their broadly defined "green chemistry" product portfolios than for their conventional products. Smaller companies basing their business on greener alternatives also had steadily growing economies.

15. *Source: Eurosif, 6th Sustainable and Responsible Investment Study 2014.*
16. *"Hållbara investeringar" Laika consulting – svenskt fondexpertindex 2015. Report (in Swedish) can be found at investeringar http:// www.sfei.se/2015/hallbara-investeringar.html*
17. *Information shared by Hewlett Packard 2015*
19. *Safer Chemicals report commissioned by ASBC, the Green Chemistry & Commerce Council and developed by Trucost (05/2015)*

Shaw Industries

Gaining market attention and market shares

In the 1990s the carpet manufacturer Shaw Industries launched an initiative to identify all the chemicals and materials used in their products, and to phase out the more hazardous chemicals. Shaw's innovations were driven by a growing demand for PVC free flooring products which led to the development of a new carpet backing material which had the potential to replace the PVC industry standard. EcoWorx offered an alternative to the industry-standard PVC backing at comparable cost, 40% less weight, and equal or improved effectiveness across all performance categories. Their new innovation, which eliminated PVC and phthalate plasticizers from their carpets, quickly captured market attention. Shaw tripled its production capacity in 2000 and within 4 years of the initial EcoWorx launch, Shaw had phased out all PVC backed products. Today, EcoWorx is the largest selling carpet tile in North America. [20]

COOP

The potential of improved branding

Danish retailer Coop decided to take microwave popcorn off the shelf because of the PFC (polyfluorinated) lining in the packaging, which is suspected to be damaging to health and the environment. The move would mean that Coop could lose more than 2 million euro in yearly turnover. The losses, however, were immediately offset by the great press coverage that the move generated, estimated to be worth even more from a communications perspective. Half a year later the very same supplier came back with an improved product without any PFCs. The popcorn has now returned to the shelves, with overwhelming reactions.[21]

Incusa

Reaching new markets

The Spanish leather company Incusa has introduced an alternative procedure for tanning leather that does not involve chromium 6. Although the alternative, a titanium-based product, is more expensive, the reduction in chemicals consumption, water consumption and energy leads to a productivity gain. Changing the production process was not easy and took nearly two years, but Incusa realised at an early stage that this was a fantastic opportunity for the company. Since the transition, Incusa has increased its total sales, and the new technology now represents around 25% of the total production of the company. It also helped Incusa to reach a wider range of customers and compete with other tanneries across the world.[22]

20. This example can be found in the SUBSPORT case story database and in references therein: http://www.subsport.eu/case-stories/155-en

21. Information shared by COOP Denmark 2015

22. ECHA newsletter: http://newsletter.echa.europa.eu/home/-/newsletter/entry/2_14_chromium-free-leather-is-good-for-business-consumers-and-the-environment

"87% of industry chemists predicted that sustainable chemistry offerings will increase during the next 10-20 years; 42% predicted a significant increase" [23]

OECD report on chemistry innovations

"55% of members believe the ROI (return of investments) of green chemistry R&D is greater than for standard investments." [24]

Lynn Leger, Director of Commercial Development for GreenCentre Canada

"The results of the report indicate that in the short term, economic growth under a green scenario may be less than under business-as-usual. However, in the longer term – 2020 and beyond – moving towards a green economy would outperform business-as-usual by both traditional measures (GDP growth) as well as more holistic measures (per capita growth)" [25]

UNEP report on Green Economy

"It's only when there's a business opportunity that things start to happen. We are sure that the environment and sustainability issue will be the single biggest issue to affect business over the next 5-10 years – it's not a nice to have, it makes a lot of sense. "

Chemical watch special report "Safer chemicals in the supply chain – case studies, 2015"

23. *OECD. "The Role of Government Policy in Supporting the Adoption of Green/Sustainable Chemistry Innovations." http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono%282012%293&doclanguage=en*
24. *Lynn Leger. "Perceptions and Experiences of Green Chemistry Practitioners" webinar for GC3 http://greenchemistryandcommerce.org/about-gc3/what-is-the-gc3*
25. *Report can be found here: http://www.unep.org/greeneconomy/GreenEconomyReport/tabid/29846/Default.aspx*

H&M

PFC-free clothes are a growing success

PFCs are a large group of chemicals known to be persistent and to accumulate in the environment, and only a few of them have yet been regulated. In clothing they are mainly used to provide water and stain repellence. In 2009, the fashion brand H&M started working to find safer alternatives to PFCs that could still provide the desired function. In 2010 the first PFC-free winter overalls were available in H&M stores and three years later all products are PFC-free.

– We have noticed that there can be a marketing advantage to using alternative processes and better chemicals. We have a specific hangtag for our fluorocarbon-free outerwear and we have recently developed a hangtag specifically for those processes that can be defined as "environmentally preferable", says Ylva Weissbach, Global Chemical Compliance Expert at H&M.

– Sportswear and functional wear is becoming a bigger part of H&M's assortment and in general we have noticed growing interest in sustainability among our customers.

While a common approach in the textile sector is to switch from regulated to non-regulated PFCs, H&M chose to go PFC-free.

At present, the difference in price between the PFC and the PFC-free technology is not significant, but productivity has increased thanks to the extended use of the alternative, as less cleaning is needed in production compared to when the PFC-free finishes first came into use. H&M's past experiences with phasing out chemicals have taught them that a straightforward price comparison between a preferred and an unwanted substance does not always tell the whole story.

– Sometimes it is just a matter of thinking a bit differently and designing products based on the qualities of the alternative material, instead of comparing it to the old product and its function and cost. However, in the long run it makes clear business sense to invest in sustainable options. We know from previous cases, for example when we phased out PVC, that the cost is likely to decrease when the volume of alternatives increases and becomes more commercial, says Ylva Weissbach.

Information shared by H&M 2016

Clariant

Sales of paraben free alternative tripled in 2015

Chemicals producer Clariant has developed a naturally based product for the personal care sector that boosts the efficacy of preservatives while it also offers the valuable properties of a co-emulsifier. One challenge of preservatives is that they can cause allergic reactions and sometimes irritate the eyes and the mucous membranes. Clariant's product is based on a new technology that enables customers to develop non-irritating, paraben-free solutions. The efficacy of the product also helps to reduce emulsifiers in cosmetics. This solution to substitute parabens in cosmetics is also commercially successful: after its launch in 2014, global sales of the product have been tripled in 2015 with very positive outlook for 2016.

Information shared by Clariant 2016

"Sustainability is a key value and it has become a strong business driver at DSM. To promote sustainability, DSM proactively seeks to develop safer alternatives to existing solutions. Within our ECO+ program we develop sustainable, innovative products and solutions with ecological benefits. Today, our ECO+ sales are growing faster than non-ECO+ sales and with higher margins, demonstrating the good growth opportunities that sustainable innovations can offer our company."

DSM

Conclusion

This publication covers examples of the economic benefits of substitution from a number of companies. The examples and experiences vary widely, as do the reasons for substituting a hazardous chemical in the first place. What these companies have in common is that they have assessed the benefits of substitution by looking at the bigger picture.

We want to highlight the need for policy makers to take an equally broad approach in their assessments of whether to regulate a chemical or not. Since the ultimate aim of chemical regulation is to protect human health and environment, while at the same time avoiding harm to the economy, one must include the costs and benefits for all involved parties. Failing to do so will not only cause regulation to misfire and favour laggards instead of frontrunners, but it will also create barriers to innovation and lead to weakened protection for the environment.

Our conclusion is that four aspects need to be included in the assessments, each adding to the complexity of the picture, as well as representing opportunities worth considering. First is the fact that prices are not static, but rather market-dependent. Secondly, substitution is a way to cut costs related to the handling of hazardous chemicals. Thirdly, regulation is a strong driver for innovation and finally, the global market is on the move towards sustainability.

As this publication aims to widen the scope of economic assessments in the context of regulation, it also hopes to inspire and encourage companies to see the substitution of hazardous chemicals as an opportunity.

WHAT LESSONS CAN BE LEARNED FROM THIS PUBLICATION?

Policy-makers:

- Make sure you do not disfavour users and producers of safer alternatives, even when they are not vocal: these are the companies that are driving the transition to a sustainable economy
- Do not underestimate the power of regulation to spur innovation
- When assessing costs, also assess the benefits

Companies:

- Be inspired by others and follow the trend towards sustainability
- Avoid the risk of using problematic chemicals in your products – plan well ahead and gain market opportunities
- When estimating the costs of substitution, look further than a simple kilo-by-kilo price comparison
- Make sure you communicate your need for and the availability of alternatives in the supply chain

Substituting hazardous chemicals with safer alternatives is of course beneficial for health and the environment, but what is often overlooked is that it can also be economically beneficial for companies. Simply comparing per kilo prices of a hazardous chemical and an alternative is rarely relevant considering the complexity of substitution. Similarly, regulation of hazardous substances should not be assessed in a straightforward manner. While it's often true that legal measures on an important chemical might be financially burdensome for certain companies, there are also great opportunities and potential financial benefits for other companies, i.e. those that produce alternatives and the companies that have already phased out the chemical in question.

In this report ChemSec argues that the scope of substitution and regulation should be much wider and include several commercial and societal factors. Only by looking at the bigger picture can true economic assessments of regulation and substitution be made.

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