REACH Update: Strategic Risks and Opportunities

A RiskMetrics Group Sustainability Solutions Report

December 2009

IN THIS REPORT…

- **We update our 2008 analysis of key aspects of REACH's authorization phase and the financial implications for the chemicals industry.** Uncertainty remains about how REACH applies to specific industry segments; we remain particularly concerned about agrochemicals. Given the host of new nickel-based compounds that recently were added to ChemSec's SIN List 1.1, we continue to monitor potential impacts to Electronic Products.
- **We present an updated analysis of the financial impacts of REACH on several industry segments and scoping analysis for 64 global chemical producers.** We conclude that REACH could have significant impacts to 16 percent of the companies analyzed. For the others, the potential impact appears to be less than 2% of sales, often less than 1%.
- **We highlight key policy updates that have set the scene for an expedited candidate list.** While E.U. Member States have been slow to move on setting a candidate list for REACH authorization, our analysis indicates that the timeline is set to accelerate based on market and regulatory forces. Companies that have anticipated an extended authorization process may be at risk.

KEY TAKEAWAYS…

Inks & dyes, polymer manufacturers, and agchem to see higher costs

We anticipate that companies with operations in these sectors may face value deterioration due to higher costs.

Spotlight on Electronics Manufacturers

New additions to the SIN list 1.1 indicate greater exposure for the electronics industry. This situation becomes more complicated for manufacturers that rely on components that contain multiple substances of very high concern (SVHCs) that could be phased out of the global supply chains.

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REACH: Implications of the Comprehensive Chemicals Management Program

In June 2007, the European Union's comprehensive chemicals policy, the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH), entered into force. REACH is the first international regulatory system that places the burden of proving safety on the manufacturers and importers of industrial chemicals. The European Chemicals Agency (ECHA) has estimated that the high cost of compliance is likely to drive at least 2% of the more than 30,000 classified chemicals listed with ECHA off the market.

REACH is a complex law whose implementation will span a period of 10 years through the following phases:

- **Registration:** In the E.U., manufacturers and importers of over 30,000 covered substances in excess of 1 metric ton/annum must register the chemicals and provide a chemical safety report, which documents the chemical safety assessment of the substance. Additionally, responsible parties are required to report on substance risks and develop an adequate risk management strategy.
- **Pre-Registration:** Pre-registration allowed manufacturers and suppliers to take advantage of an extended "phase-in" period. Through the pre-registration process, chemicals that were manufactured or imported before REACH went into effect were subject to registration over different time periods instead of requiring immediate compliance. The deadline for pre-registration was Dec. 1, 2008.
- **Evaluation**: ECHA will develop criteria for prioritizing substances for evaluation and will identify initial substances suspected of constituting a risk to health or the environment.
- **Authorization:** Authorization provisions require chemical manufacturers and importers of certain Substances of Very High Concern (SVHCs) to obtain approval for specific uses, within deadlines set by the European Commission. Authorization is designed to ensure that risks from SVHCs are adequately controlled. REACH defines SVHCs according to specific health and environmental properties. ECHA or E.U. Member States nominate SVHCs to a candidate list; priority for authorization will be given to substances with PBT or vPvB properties with wide dispersive uses and high production volumes. Additionally, candidate SVHCs trigger consumer information provisions and mandatory notification for SVHCs present in finished products above 0.1%, potentially shifting demand for downstream manufacturers in advance of authorization.
- **Restriction:** A restriction of a substance is any condition upon, or prohibition of, the manufacture, use or placing of it on the market. Restrictions will be proposed by E.U. Member States on a case-by-case basis to address unacceptable risks to human health and the environment. The authorization and restriction phases will be drivers for substitution of more risky chemicals with safer alternatives. While some companies may be positioned to benefit from this transition, others may face increased costs associated with regulatory requirements, process modifications, and other changes.

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Exemptions and Gray Areas

Currently, exemptions/limitations to the legislation are as follows:

- Substances under customs supervision, radioactive material, substances for national defense interest, and non-isolated intermediates are fully exempted from the guidelines of REACH.
- Substances used in medicinal products for human or veterinary use or as a food additive in foodstuffs are also exempt.
- Substances used in research and development can be exempted from registration for five years with the option to negotiate an extension.
- On-site isolated intermediates and transported isolated intermediates will be subject to less stringent requirements.
- Polymers are currently exempt from registration; however, monomers that constitute more than 2% by weight of a material and are produced/imported over 1 metric ton/annum capacity require registration.
- Monomers used as on-site isolated intermediates or transported isolated intermediates have to be registered as any other substance.

NOTE ON AGROCHEMICAL COMPANIES

The European Commission has emphasized that agrochemicals, pharmaceuticals and food products already covered by other safety regulations would be excluded from REACH. However, it has become clear that other substances in agrochemicals are subject to the new regulation to a greater extent than previously had been expected. Consequently, crop protection companies are faced with pesticide safety regulations that are considered among the most stringent in the world as part of this legislation exerting tighter environmental and health controls over chemicals in general.

We anticipate **small-cap crop protection** companies to struggle the most with REACH compliance due to the heavy data requirements of registration. This is an especially difficult situation given the late start that these companies had relative to sector peers. Under REACH some agrochemicals will be required to register even though most agricultural uses are officially exempt from authorization.

Going forward, the burden of regulatory compliance faced by the agrochemicals sector will be compounded by proposed E.U. legislation that aims to replace the 1991 directive with new, tougher rules on pesticide approvals. The proposed directive, due to come into effect around 2010, aims to bring within its scope most of the inactive substances in crop protection products.

Within five years of the approval of the new legislation, positive or negative lists for safety enhancers, synergists, and coformulants will be drawn up by the Commission, even though they may already have been registered under REACH. Most of the chemicals in plant protection products could then effectively be removed from the jurisdiction of REACH. For agrochemical companies, then, the disproportionate regulatory burden arises from timing differences between the two sets of regulations.

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Authorization Phase – Potential for Financial Materiality

Chemicals manufacturers are especially concerned with the potential that REACH's authorization phase has for creating a de facto "blacklist" of chemicals that could have extensive economic effects across multiple segments of the chemical sector. An estimated 1,400 chemicals might meet REACH's criteria for "Substances of Very High Concern" (SVHC) and are potentially subject to a tough authorization process. The substances must be authorized if companies demonstrate "adequate control" of risks, or in the absence of a suitable substitute provided that the socio-economic benefits outweigh the health and environmental risks. In 2008, the European Chemicals Agency identified 15 SVHCs on the original Candidate List. An additional 15 chemicals were added in 2009. As a result, public and political pressure is increasing on Member States and the European Commission to accelerate the process for nominating SVHCs for the REACH Candidate List. Once chemicals are placed on the Candidate List, it is in the interest of chemical producers to push for an accelerated authorization process to determine whether the chemical can remain on the market and under what circumstances it can be used.

WILL INDUSTRY WAIT FOR AUTHORIZATION?

As chemicals are nominated for the Candidate List and subject to authorization, we anticipate that testing and compliance costs may lead several industry members to seek alternative feedstocks and products rather than pursue approval. Not only is the authorization phase costly, but industry players holding banned chemicals in their product portfolios risk stigmatizing the remainder of their offerings. Chemical companies whose products are placed on the Candidate List may opt to voluntarily reformulate or divest these product lines and skip the costly testing procedures that are required for authorization. Therefore, the risk of REACH to companies is not in the restriction of these chemicals, but rather in the scrutiny that the regulation provides. This places potential product phase-outs much closer in time than previously expected.

THE INTERNATIONAL CHEMICAL SECRETARIAT'S SIN LIST

Using the criteria stipulated by REACH, the International Chemical Secretariat (ChemSec) developed the so-called SIN list of 356 Substances of Very High Concern. The Technical University of Denmark has conducted an independent study on the SIN List. Each of the substances on the list has been evaluated against the European Water Framework Directive list and the World Health Organization's drinking water quality guidelines. The substances on the SIN List 1.0 have also been assessed for their carcinogenic, mutagenic and reprotoxic properties. Additionally, the Ranking and Identification of Chemical Hazards (RICH)-tool has been applied, which assesses the inherent properties including environmental fate and toxicity in order to identify substances with potential environmental hazards. The result shows that of the 267 substances listed on the SIN List 1.0, 214 substances have confirmed hazardous properties. For the remaining 54 substances there was not enough data - 33 could not be properly assessed due to lack of data and the remaining 21 could neither be exempted from having nor confirmed to have hazardous properties.

Given the current uncertainty around REACH, the SIN list provides insight into which chemicals may be targeted by the regulation. For the purposes of our analysis, we assumed that all chemicals on the SIN List 1.1 would be subject to REACH authorization. We then used those substances to extrapolate which product segments and companies are at risk.

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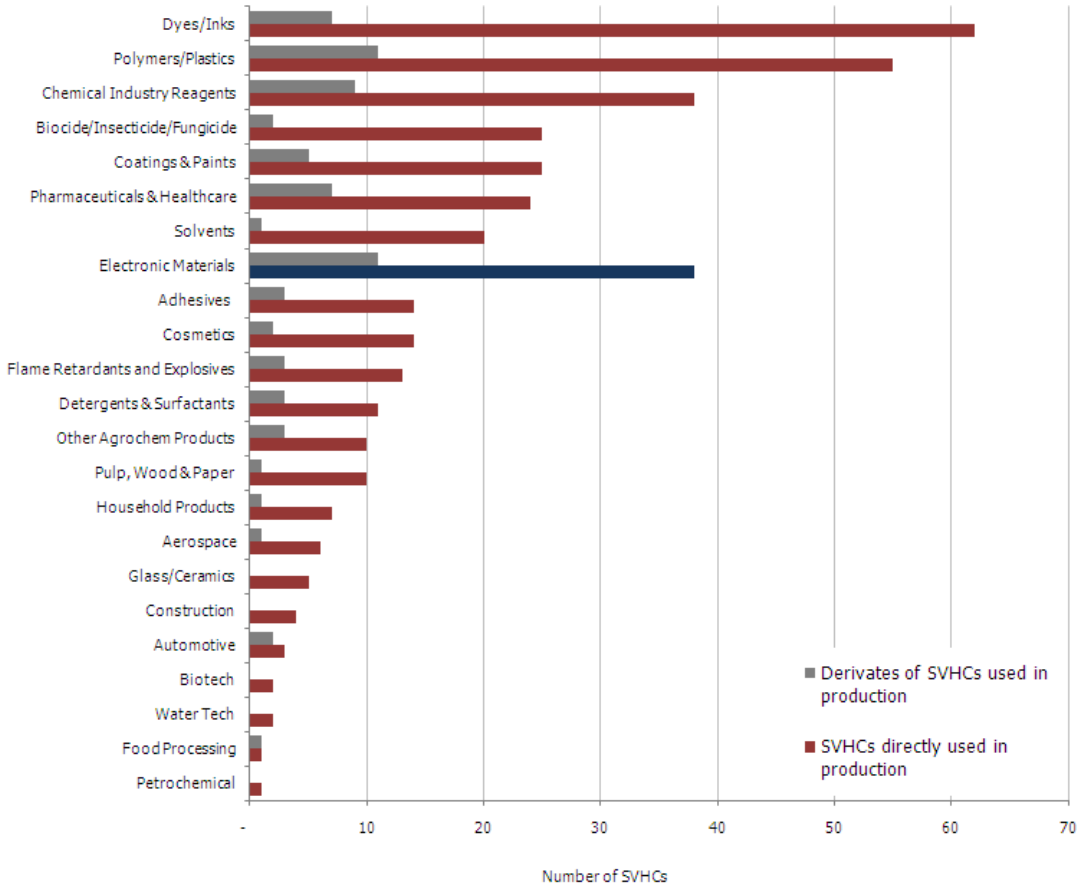
High-Risk Product Segments

Assuming chemicals on ChemSec's SIN 1.1 list are all subject to authorization under REACH, our analysis reveals that the following segments could face extensive phase-outs during REACH's authorization phase. Note that companies in these industry segments may mitigate these risks by successfully navigating the authorization process or adopting safer alternatives. Our analysis was conducted by mapping potential uses of the 356 potential SVHCs to products where they, or their derivates are applied. Dyes and inks and polymers are dependent on the largest number of potential SVHCs in their production process. We have updated our analysis to include the 89 new additions on ChemSec's SIN List 1.1. We also detect heightened risk for companies manufacturing electronic components and equipment (see page 7 for details).

FIGURE 1 **Industries Heavily Reliant on Substances of Very High Concern (SVHCs)**



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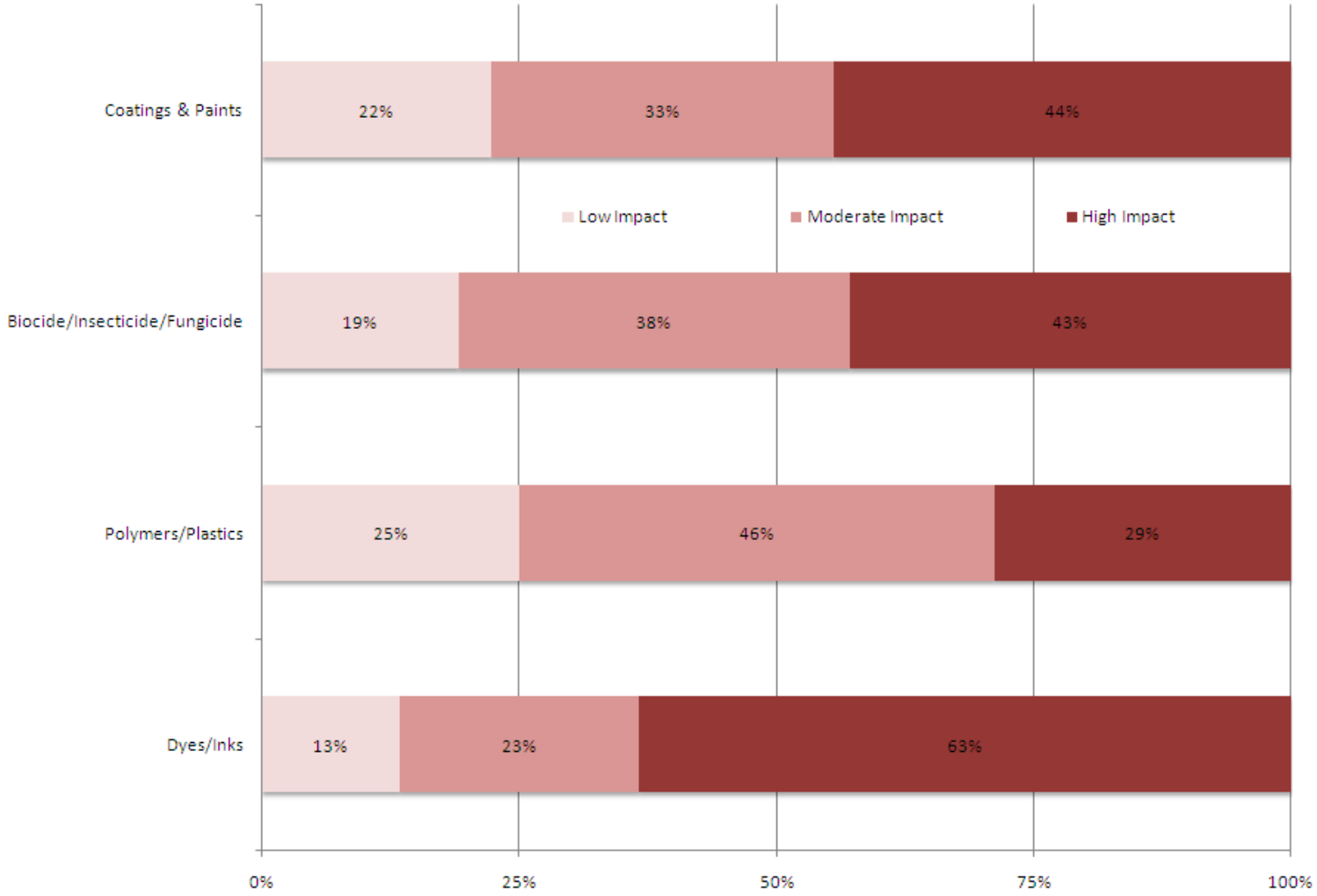
Our analysis of the financial effects of REACH's authorization phase evaluates risks on the basis of potential reformulation due to SVHCs in product lines, the importance of these SVHCs to their respective production processes, the current availability of viable alternatives, and the industry's ability to pass on costs to customers. To the extent that manufacturers of SVHCs succeed in securing authorization for existing uses, the risks to downstream users could be reduced. Accordingly, our analysis reveals significant exposure for manufacturers of inks and dyes, polymers, agricultural pest control products, and coatings and paints.

FIGURE 2 **Potential Impact of Substances of Very High Concern to the Production Process**



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Spotlight on High-Risk Industries

Dyes and inks, polymers, synthetic agricultural pest control products, and coatings and paints face significant reformulation risk (Figure 1). While food processing and petrochemicals also could see chemicals removed from their supply chains, the number of chemicals -- and thus the reformulation burden -- is significantly less. Taking into account the importance of potential SVHCs to their respective production processes, coating, paints, and polymers are highly vulnerable to changes in their current product formulations.

INKS AND DYES

Our analysis projects significant risks for inks and dyes under REACH's authorization process. Several companies we cover may be faced with reformulation, including **PPG, Solvay, Akzo Nobel,** and **Celanese**. On the upside, several viable alternatives are well-positioned for breakthrough profit. DuPont's Cerenol, used in ink jet inks, offers manufacturers a propanediol- (Bio-PDO) based alternative.

Anthracene serves as an early indicator of potential market risks. An important precursor to anthraquinone dyes, anthracene has been identified by Germany as an SVHC under REACH guidelines. Rohm & Haas (acquired by **Dow Chemicals**) currently offers anthraquinone-based dyes in its Automate™ series, making the company directly at risk to toxic lockout. We anticipate that this product line will be subject to reformulation and/or production halts as REACH implementation progresses. According to our impact assessment, 62% of the identified SVHCs involved in ink and dye manufacturing are currently very important to the production process and will require significant reformulation while an additional 24% will require moderate changes to the relevant production process. On the upside, a number of companies are set to capitalize on REACH through the development of alternative chemicals to replace candidates for restriction or phase-out. Over time, this type of activity could represent a potential source of breakthrough profit.

ELECTRONIC PRODUCTS

In October 2009, ChemSec released the SIN List 1.1, containing 89 additional substances newly classified within the E.U. as CMRs – Carcinogenic, Mutagenic, and Reproductive toxicants. The majority of these new chemicals are nickel-based compounds, many of which are essential to the electronics industry. Under REACH, manufacturers of electronic assemblies are responsible for determining if the electronic components used in their products contain any SVHCs. If the electronics industry's experience with the European RoHS directive is any indication, restriction under REACH could result in the discontinuation of many components and the performance requalification of others. We anticipate significant hurdles for battery manufacturers and downstream users, as these compounds potentially face the testing and potential reformulation costs. Because compliance with REACH will be an ongoing effort as chemicals are added to the roster, original equipment makers (OEMs) that take a proactive approach can expect to outperform competitors that adopt a haphazard approach.

POLYMERS AND PLASTICS

Over 30,000 polymers are estimated to be on the E.U. market. Despite the exemption of polymers from REACH, failure of an upstream supplier of monomers or other additives in a polymer could jeopardize access to the E.U. market. These could have devastating consequences for non-E.U. polymer manufacturers who export to the EU. Additionally, if the current exemption of polymers is reconsidered in the coming years, it could expand the scope of REACH to thousands of additional registrations and evaluations.

Given the number of monomers potentially on the SVHC list, we anticipate significant supply chain hurdles for plastics manufacturers. While only 29% of potential SVHC chemicals involved in the plastics industry have a high impact on production (see Figure 2), competition from low-cost markets coupled with rising feedstock costs may amplify the monomer issue for companies that fall under REACH's jurisdiction. Within our competitive set, **BASF, Bayer, Dow,** and

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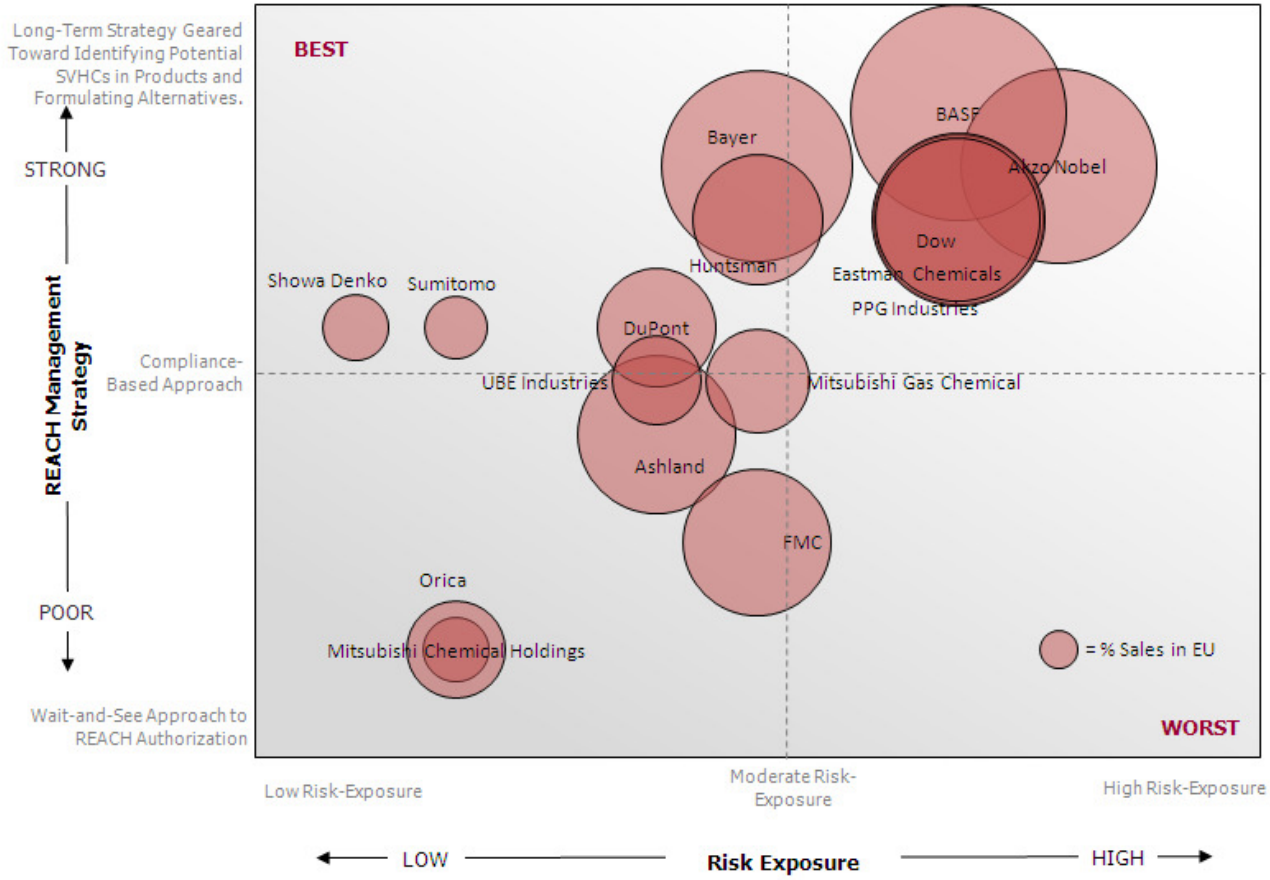
Lanxess are vulnerable to product reformulation/facility relocation risk in their plastics manufacturing divisions.

Company Analysis

While company exposure is largely a function of European sales and product mix, the range of management strategies adopted by companies in our coverage universe is disparate. Given REACH's extended timeline, companies may derive a significant advantage from proactive regulatory management strategies. Sector leaders are exploring divestment options for risky product lines, such as BASF with its styrenics unit. Additionally, companies are evaluating alternative feedstock options and expediting product reformulation. Our analysis maps current REACH risk exposure to management strategies for companies we cover. The convergence of poor management and high exposure, as outlined below, identifies companies for which increased costs would be relevant to a fundamental reassessment of investment value.

FIGURE 3 **Relative Risk Exposure and REACH Management Strategies for the Diversified Chemicals Sector**



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Our analysis reveals that **ICL Israel**, **Ashland**, and **BASF** currently offer several products that may be directly categorized as SVHCs. BASF seems likely to avoid negative results from this, however, given the company's diverse product portfolio and leading REACH management strategy. On the other hand, ICL Israel's significant portfolio exposure coupled with the company's weak management strategy (outlined in Figure 4) relative to sector peers raises concern over the company's ability to provide viable alternatives, preserve its customer base, and manage reformulation costs.

FIGURE 4 **Relative Risk Exposure and REACH Management Strategies for the Specialty Chemicals Sector**

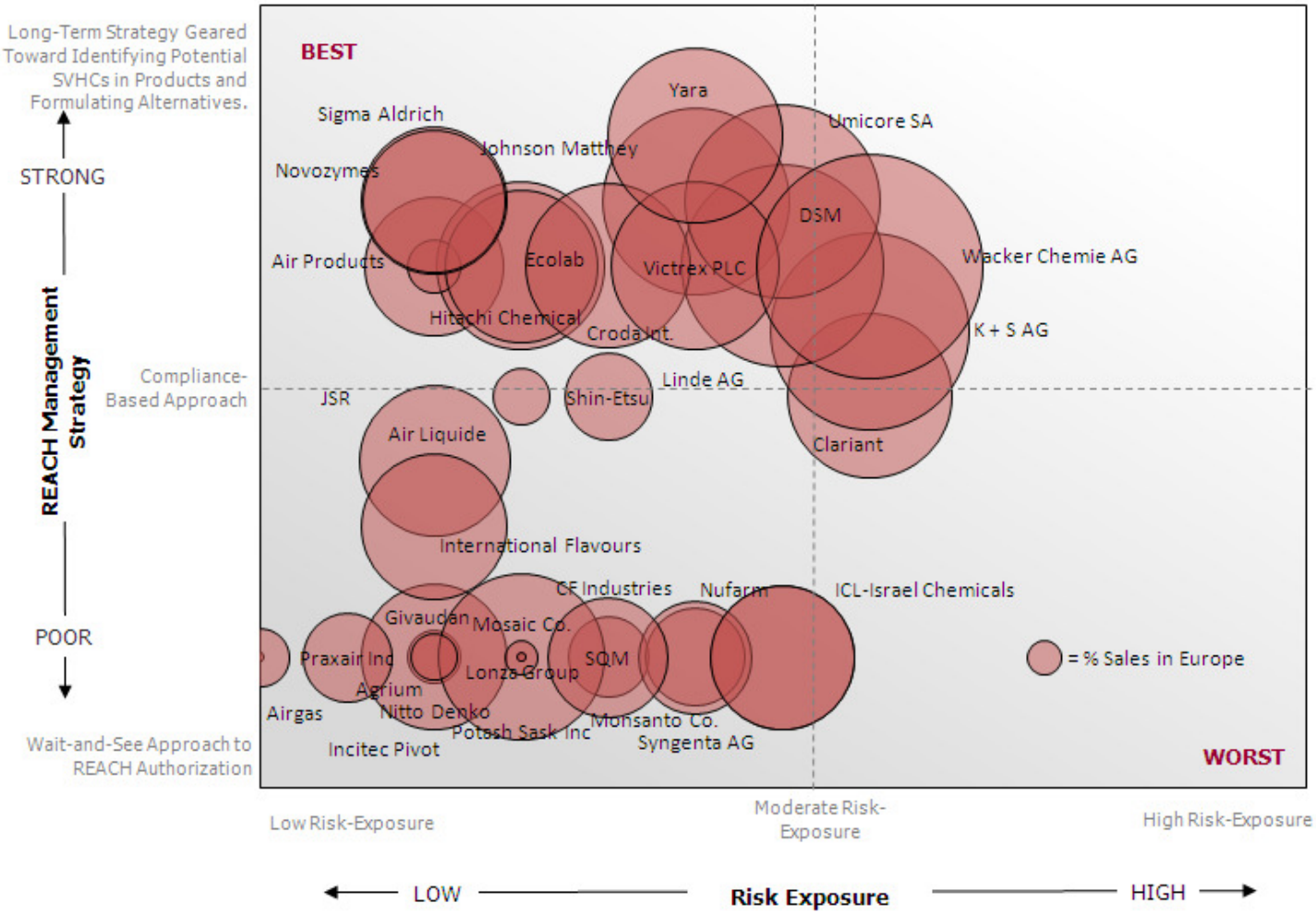

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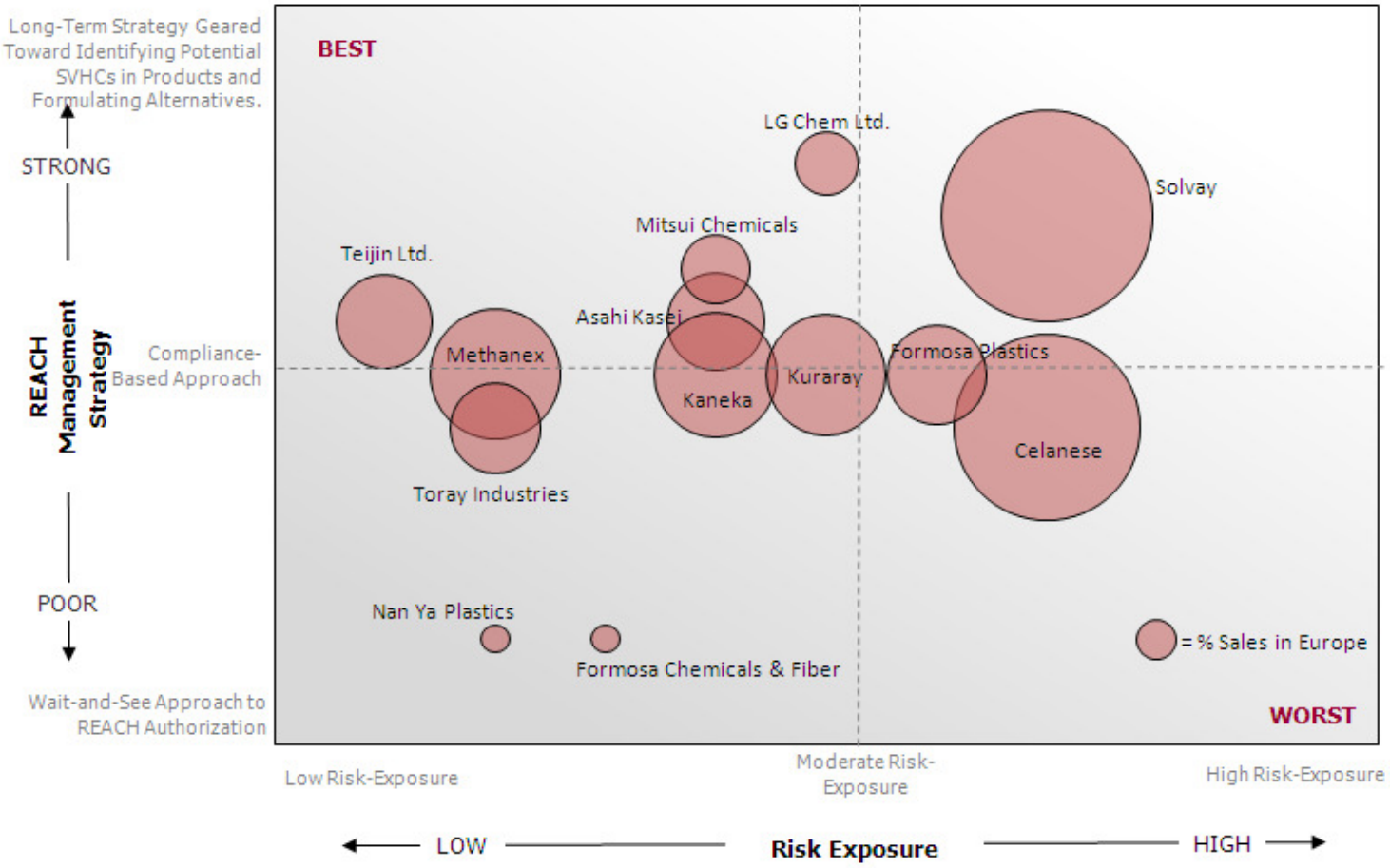
FIGURE 5 **Relative Risk Exposure and REACH Management Strategies for the Commodity Chemicals Sector**



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We have identified 12 companies in our analytical set on which REACH threatens a material financial impact. Our cutoff for indicative exposure was placed at more than 3% of sales per annum. The following subset of companies is significantly exposed to reformulation and/or facility relocation risk due to their product portfolios' current reliance on potential SVHCs. These sales estimates do not take into account current reformulation efforts that may be underway, and the analysis has been updated for companies with significant risk exposure, irrelevant of their current REACH management strategies. Several of these companies are prepared to offset and manage these costs through rigorous reformulation of risky product lines and strategic divestments. Figures 3, 4, and 5 outline the extent to which companies have addressed REACH management strategies vis à vis their current risk exposure.

FIGURE 6 **Estimated Impact of REACH Authorization on Annual Sales**

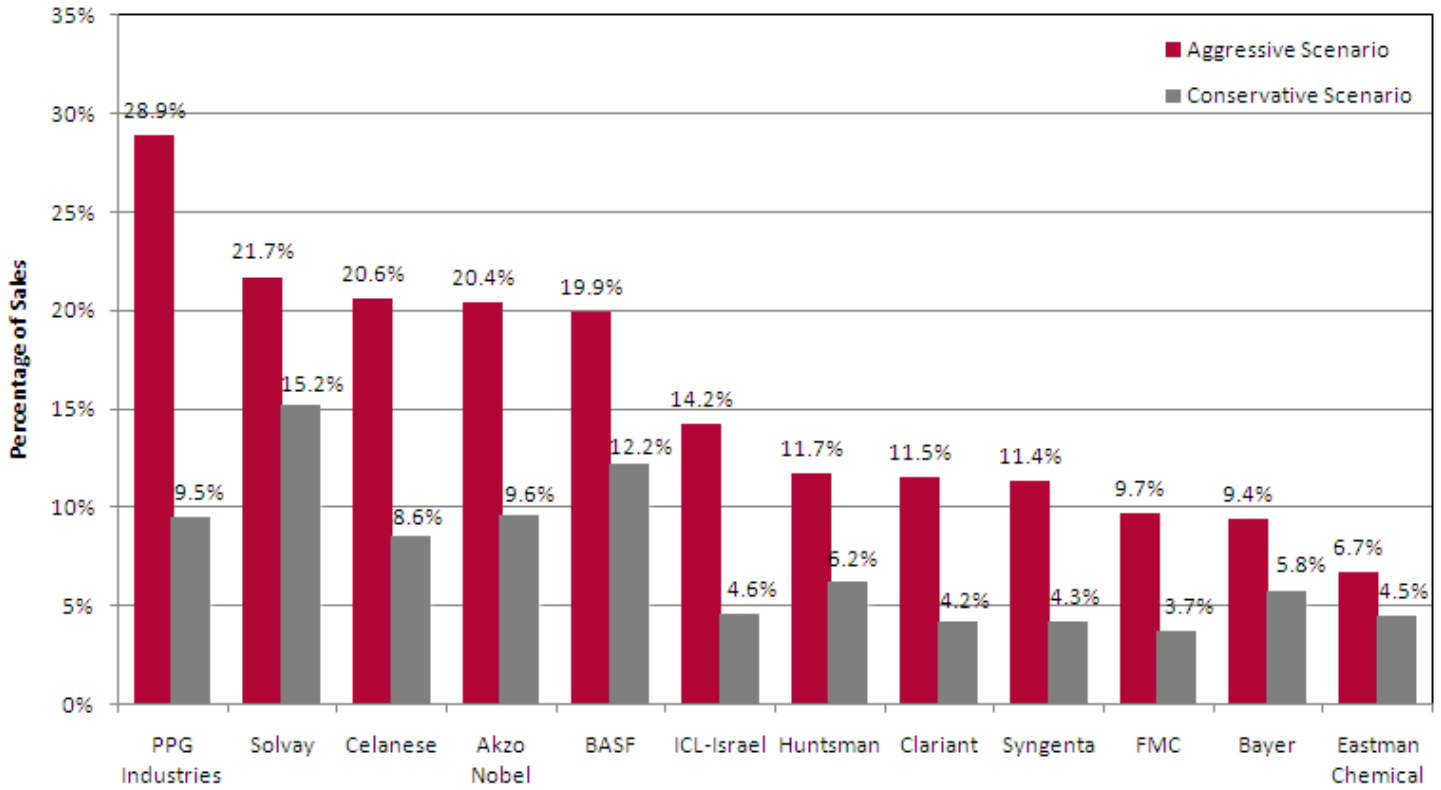

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FIGURE 7 **Summary of Product Risk, Exposure to E.U. Market, and Strategic Profit Opportunities Pertaining to REACH for the Diversified Chemicals Sector**

Company	Product Risk	EU Risk	SPO	Performance Improvement Vector
Akzo Nobel NV	■■■■	■■■	■■■■	Steady
Ashland Inc	■■	■■	■■■	Steady
BASF AG	■■■	■■■■	■■■■	Steady
Bayer AG	■■	■■■	■■	Steady
Dow Chemicals Company	■■■■	■■	■■■■	Steady
Du Pont El De Nemours	■■■	■	■■■	Steady
Eastman Chemicals Company	■■■■	■■■	■■	Steady
Huntsman Corp.	■■■	■■	■■■■	Up
FMC Corp	■■■	■■	■■	Initiating Coverage
Mitsubishi Chemical Holdings Corp.	■■	■	■■■■	Steady
Mitsubishi Gas Chemical Company Inc	■■■■	■	■■	Up
Orica Limited	■	■	■■	Steady
PPG Industries Inc	■■■■	■■	■■■■	Steady
Showa Denko KK	■	■	■■	Steady
Sumitomo Chemical Company Limited	■■	■	■■■	Up
UBE Industries	■■■■	■	■■	Steady

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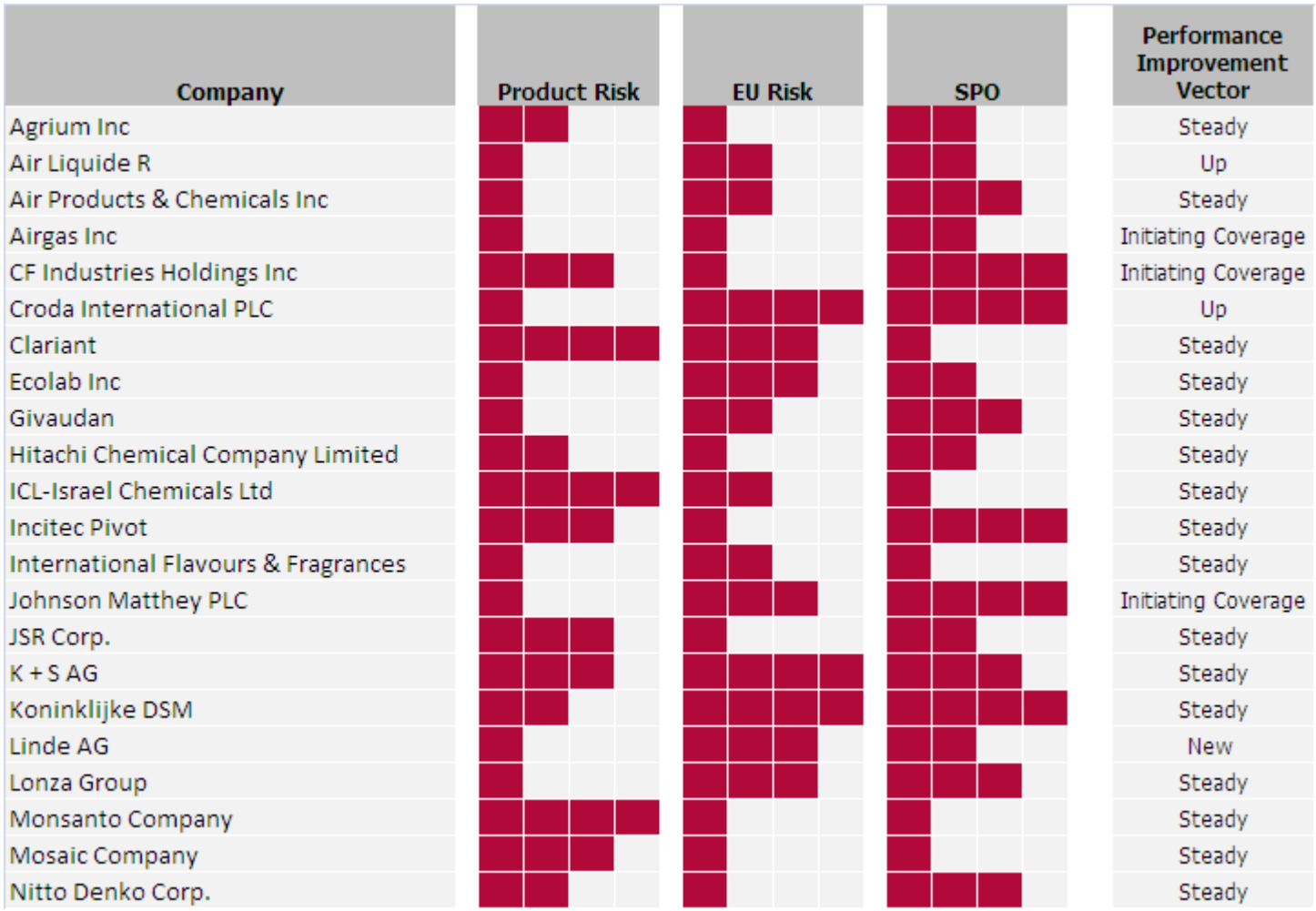
FIGURE 8 **Summary of Product Risk, Exposure to E.U. Market, and Strategic Profit Opportunities Pertaining to REACH for the Specialty Chemicals Sector**



Company	Product Risk	EU Risk	SPO	Performance Improvement Vector
Agrium Inc	2	1	2	Steady
Air Liquide R	1	2	2	Up
Air Products & Chemicals Inc	1	2	3	Steady
Airgas Inc	1	1	2	Initiating Coverage
CF Industries Holdings Inc	3	1	4	Initiating Coverage
Croda International PLC	1	4	4	Up
Clariant	4	3	1	Steady
Ecolab Inc	1	3	2	Steady
Givaudan	1	2	3	Steady
Hitachi Chemical Company Limited	2	1	2	Steady
ICL-Israel Chemicals Ltd	4	2	1	Steady
Incitec Pivot	3	1	4	Steady
International Flavours & Fragrances	1	2	1	Steady
Johnson Matthey PLC	1	3	4	Initiating Coverage
JSR Corp.	3	1	2	Steady
K + S AG	3	4	3	Steady
Koninklijke DSM	2	4	4	Steady
Linde AG	1	3	2	New
Lonza Group	1	3	3	Steady
Monsanto Company	4	1	1	Steady
Mosaic Company	3	1	1	Steady
Nitto Denko Corp.	2	1	3	Steady

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Summary of Product Risk, Exposure to E.U. Market, and Strategic Profit Opportunities Pertaining to REACH for the Specialty Chemicals Sector (continued)

Company	Product Risk	EU Risk	SPO	Performance Improvement Vector
Novozymes A/S	■	■■	■■■■	Steady
Nufarm	■■■	■■	■	Steady
Potash Sask Inc	■■■	■	■	Steady
Praxair Inc	■	■	■	Steady
Shin-Etsu Chemical Company Limited	■■■	■	■	Up
Sigma Aldrich Corp.	■	■■	■■	Up
Sociedad Quimica Y Minera Chile SA	■■	■■	■	Initiating Coverage
Syngenta AG	■■■■	■■	■■■	Steady
Taiyo Nippon Sanso Corp.	■	■	■	Steady
Umicore SA	■■	■■■■	■■■■	Initiating Coverage
Victrex PLC	■■	■■■	■	Up
Wacker Chemie AG	■■■	■■■■	■■■■	Initiating Coverage
Yara International ASA	■■	■■■	■	Up

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FIGURE 9 **Summary of Product Risk, Exposure to EU Market, and Strategic Profit Opportunities Pertaining to REACH for the Commodity Chemicals Sector**

Relative to our 2008 REACH analysis, we note an improvement in overarching regulatory management strategies among chemical companies, particularly among plastics manufacturers. On the downside, the introduction of viable REACH-friendly alternatives to the market has slowed significantly as chemical manufacturers have scaled back R&D expenditures to weather the economic downturn. Our top three picks of companies set to profit from REACH are DuPont, Ashland, and Dow Chemicals. DuPont's alternatively sourced plastics are well-positioned to benefit from compliance pressure on plastics manufacturers. Similarly, we anticipate greater demand for Ashland's renewable resin products and Dow's bio-based pesticides as E.U. Member States continue to nominate additional candidates for authorization. For more information regarding individual company performance in terms of REACH management and risk exposure, please contact the analysts.

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Our Approach to This Analysis

In order to quantify potential impacts on companies, we have used the approach outlined below, including several simplifying assumptions.

COLLABORATION WITH THE INTERNATIONAL CHEMICAL SECRETARIAT (CHEMSEC)

ChemSec, in collaboration with leading international NGOs, has developed the **SIN List**. The list identifies a set of chemicals through the combined efforts of public interest groups, scientists, and technical experts and is based on substance information from existing databases, scientific studies and new research. The aim of the project is to ensure that authorization is an effective tool to fast-track the most urgent SVHCs for substitution and to facilitate the reduction of use of toxins by businesses. The basis of RMG's REACH analysis is an extensive match-up of the ChemSec SIN list to company product portfolios and possible inputs.

NO CHANGE TO CURRENT SHAPE OF BUSINESS

We generally have assumed that current product portfolios are maintained. This means that our sensitivity studies do not take into account operational changes.

IMPLICITLY ASSUME NO PASS-THROUGH TO CUSTOMERS

We have estimated REACH compliance costs under the assumption that all these costs are borne by the company (not passed on to customers), which may be less the case if and when similar legislation emerges in more countries. By 2020, we anticipate that competitor countries will be imposing similar legislation, and prices may be able to rise in response.

A CAUTION

Given the high degree of uncertainty about the nature of final regulation and the exact calculation of risk for each operation, industry or company, these results should be considered scenarios rather than forecasts. Further clarity may emerge as companies continue dialogue with government and as the official Candidate List of SVHCs expands and the authorization process is put to the test. Even assuming that current proposals are enacted, some details will no doubt remain to be clarified within scheme regulations. Administrative application of the scheme may determine final outcomes for companies.

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