

The background of the slide features a row of laboratory glassware on a reflective surface. From left to right, there is a round-bottom flask with yellow liquid, a round-bottom flask with red liquid, an Erlenmeyer flask with blue liquid, a central Erlenmeyer flask with dark red liquid, a graduated cylinder with green liquid, a round-bottom flask with bright green liquid, and a beaker with orange liquid. The glassware is arranged in a slightly overlapping manner, and the liquids are vibrant and clear. The entire scene is set against a plain, light-colored background.

Nouryon

Perspectives on Nouryon

 Google Cloud

October 1, 2020

Agenda



1. **Why?** Trends in the market
2. **What?** Responses from Nouryon's peers
3. **How?** Google's technological solutions & cases
4. **Who?** Nouryon's decision makers



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Market trends



Market trends



The following trends can be found in essential chemicals:

1. **Sustainability** - The chemical industry plays an essential role in advancing applications that support sustainability in a way that allows humanity to meet current needs.
2. **Digitalisation** - Chemical companies have been relatively slow to tap into the digitalization trends that are transforming downstream customer industries.
3. **Changing customer demands** - Mass production is giving way to mass customization - easier and faster than ever before.
4. **Economic trends** - COVID-19, geopolitical changes and uncertainty concerning trade policy.

Sustainability



Climate change and the shortage of raw materials are one of the biggest trends affecting the chemical industry. Chemical companies are major contributors to global emissions. However, it is also the chemical industry that plays a major part of the solution to sustainability.

How can the chemical industry help to meet current environmental, economic and social needs?

1. **Flexible use of raw materials** - by developing alternatives to fossil raw materials that are sustainable, economically feasible, safe, cost-effective and easy to scale up.
2. **Smarter and more efficient product processes** - by developing technologies, methods and business models to make existing processes more sustainable and flexible.
3. **Qualitative improvement of the functionality of chemicals** - in order to respond to trends in the supply chain.

Digitalisation



Chemical companies have been relatively slow to join the digitalisation trends that are transforming industries.

According to [Deloitte](#), there are five dimensions in the digital journey:

1. **User experience** - using customer analytics and demands to gain insight into customer trends.
2. **Talent enablement** - AI, RPA (robotic process automation) and augmented reality could enhance workforce capabilities
3. **Asset reliability and performance** - strengthening asset dependability using advanced digital technologies like IoT (Internet of Things), remote monitoring, and AI.
4. **Material system innovation** - using digital transformations to improve R&D activities, such as process modeling software with a focus on optimizing materials and energy flow within a chemical plant.
5. **Ecosystems** - active participation in the value chain through collaboration to share demand forecasts, better manage the supply chain, and commercialize new products.

Changing customer demands



Mass production is giving way to mass customization - ever faster and delivered with omni-channel convenience, while taking the sustainability agenda into account. How can the chemical industry keep up?

1. **By being customer-driven** - Understand not only your customers, but also your customer's customers.
2. **By being collaborative** - Co-create smart products, drive open innovation, share knowledge and extend your ecosystem and network of partnerships.
3. **By being innovative** - Adopt new technologies to become smarter, using analytics to be cost efficient and maximize the value derived from data.
4. **By being circular** - Drive new value by controlling the molecule lifecycle and enabling downstream circularity.

Economic trends



COVID-19, financial downturns and geopolitical disruptions have created a lot of new realities for chemical companies for which there is no set strategic playbook yet.

1. **COVID-19** - According to [PwC](#), the top concerns are financial impact, potential global recession and reduction in productivity
2. **Geopolitical concerns** - Growing tensions US and China have encouraged a significant questioning of globalization across many industrial sectors.

Nouryon's peers



Nouryon's peers



How do Nouryon's peers respond to these trends?

BASF & Sustainability - ChemCycling is a project launched by BASF in 2018 with the aim of manufacturing products from chemically recycled plastic waste on an industrial scale. They focus on plastic waste for which no high-value recycling processes are established yet, for example plastic waste, plastic with residues or multi-layer food packaging. ChemCycling is key to a circular economy and requires the chemicals sector to look to the ecosystem of converting used materials to be used as raw materials for processing again.

Dow & Digitalisation & Changing Customer Demands - Dow Polyurethanes, a business unit of Dow, is accelerating its digital transformation through increased integration into Artificial Intelligence (AI) and predictive capabilities aimed at increasing digital IQ across all business activities. *"Customer-centricity is what drives us,"* said Marcel Moeller, global marketing director at Dow Polyurethanes. *"With our predictive intelligence capability, we are combining a digital channel with process digitization and AI to provide a modern and seamless customer experience across all digital touchpoints - from product search to product formulation, purchase decision to the final delivery process. Doing business with Dow will be made easier and even more efficient."*

Nouryon's peers



How do Nouryon's peers respond to these trends?

SABIC & Sustainability - SABIC's polycarbonate facility in Cartagena, Spain, is set to become the world's first large-scale chemical production site to be run entirely on renewable power, following the signing of a major agreement with Iberdrola, a world-scale electric utility company. The 25-year deal represents another milestone in SABIC's journey to transition all its global operations to cleaner energy.

AkzoNobel & Digitalisation - AkzoNobel created the first tool for the shipping industry using data analytics to predict savings from different coatings on cargo tankers. Using billions of data point and algorithms, the tool generates a cost-benefit analysis detailing the impact on estimated fuel consumption, fuel cost and CO2 emissions of different coating options. This brings a new level of transparency, enables ship owners to increase profitability, while improving sustainability.

A joint path



A joint path



Obviously, we share the dream of a sustainable planet. Looking at a path we can walk together, we see two major opportunities:

- **Work on operational efficiency.** Especially in these challenging times, cost optimization and reduction are of the utmost importance. We see huge opportunities in reducing costs through demand forecasting, reduction of cloud costs, development time and better use of data, to give a few examples. And, because of our sustainable mission, everything we do together in the IT realm, immediately contributes to the reduction of your footprint.
- **Work on innovation and sustainability.** In a market where for about everything changes in the coming years, it's vital to look at innovation. On the next page, we share five initial ideas where we can partner.

top 5 opportunities



Based on the trends we have observed, we defined a first top five opportunities:

1. **Sustainability** - getting the most out of technology, without using more resources. Sustainable business solutions are key for you, your customers, and the environment around you.
2. **Data driven innovation / Artificial Intelligence** - we see an increasing application of smart solutions to enhance data analytics. With the use of AI-principles, business can better predict outcomes and make more informed decisions. For example: demand forecasting / waste reduction
3. **Simulation of chemical reactions** - let's find Digital Twin solutions together: capture data, develop models, visualize behavior. And encouraging scientific findings along the way
4. **Insights** - we see potential for a safer industry by providing information to quickly find hazardous chemicals.
5. **Circular Economy** - restorative and regenerative by design. A perfect blend of good for planet and good for business. With the help of technology, the circular economy can get a real boost ahead.

**a few
case studies**



Case studies



To make technological solutions more tangible, we'd like to present the following cases:

- a. **Google x Sycamore** - technology beyond impossible
- b. **MRSL** - restricted substances to protect workers and hold suppliers accountable
- c. **E.ON** - powering businesses on their sustainable journeys supported by Google Cloud
- d. **Unilever** - Teaming up to Reimagine the Future of Sustainable Sourcing

Google x Sycamore



Simulation of a chemical reaction

Google researchers at a quantum computer lab in California successfully simulated a chemical reaction. With the help of Sycamore, a device which achieved quantum supremacy, researchers simulated a diazene molecule.

Ryan Babbush from Google said: *'we're doing quantum computations of chemistry at a fundamentally different scale now. The prior work consisted of calculations you could basically do with pencil, but for the current demonstrations, you'd certainly need a computer.'*

The next step is scaling this algorithm to simulate more complex reactions. Eventually, new chemicals may be developed with the use of quantum simulations.

Google MRSL



Manufacturing restricted substances list (MRSL)

Protecting the health and well-being of everyone who comes in contact with our products is a core Google value. As our work evolves, we're always looking for better ways to protect workers and hold suppliers more accountable.

The MRSL-program singles out manufacturing restricted substances from other chemicals through a systematic self-assessment process that Google hardware manufacturers complete. In these assessments, we're seeking to understand which chemicals on the MRSL (if any) our suppliers currently use, how the chemicals are being used, the type of exposure controls currently in place, and how many workers are affected by the process.

Once we know more about the landscape, we work with the suppliers to take corrective action and come up with plans to chase out the chemicals on the list.

Source: <https://sustainability.google/progress/projects/safer-chemistry/>

E.ON



Transforming an industry founded on burning fossil fuels and splitting atoms

E.ON, one of the world's largest electric utility companies, turned to Google Cloud to take an in-house asset management software to market. Using self-managed solutions to scale and deliver data insights to 10,000 businesses worldwide, 99.9% availability has been enabled. With the help of Google Cloud, E.ON customers can use software to gain energy insights themselves, or rely on the company to manage their sustainable path on their behalf.

Source: <https://cloud.google.com/customers/e-on>

Unilever



Teaming up to Reimagine the Future of Sustainable Sourcing

Google Cloud and Unilever will advance sustainable business practices together using technology to expand the use of data for eco-friendly decision making.

By combining the power of cloud computing with satellite imagery and AI, the two companies are building a more holistic view of the forests, water cycles, and biodiversity that intersect Unilever's supply chain—raising sustainable sourcing standards for suppliers and bringing Unilever closer to its goal of ending deforestation and regenerating nature.

Google Cloud and Unilever will build a centralized command center. This will provide a more complete picture of the ecosystems connected to Unilever's supply chain and create a better mechanism for detecting deforestation, whilst simultaneously prioritizing critical areas of forest and habitats in need of protection.

Source: <https://cloud.google.com/press-releases/2020/0922/unilever-to-reimagine-future-of-sustainable-sourcing>



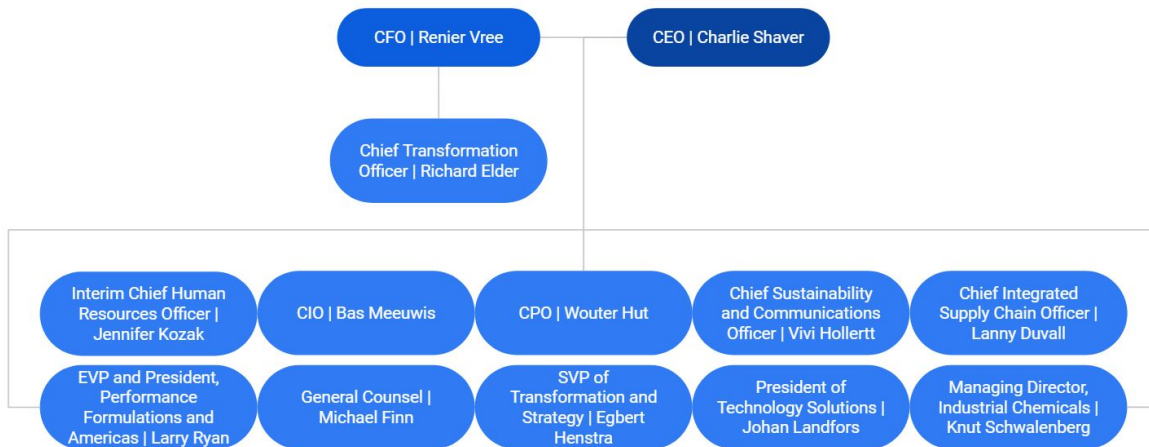
Nouryon
decision
makers



Nouryon's decision makers

Let's get together.

An overview of the most important decision makers and how they present themselves on social media and in interviews.





Nouryon's decision makers

| Role | Name & LinkedIn | Interview |
|--------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------|
| Chairman and CEO | Charlie Shaver | Link , Link (login required) |
| CFO | Renier Vree | Link , Link (Dutch) |
| CTO | Richard Elder | |
| CPO | Wouter Hut | |
| CIO | Bas Meeuwis | |
| Interim CHRO | Jennifer Kozak | |
| Chief Integrated Supply Chain Officer and Corporate Director RD&I and Sustainability | Lanny Duvall | |
| Chief Sustainability and Communications Officer | Vivi Hollertt | Link (Dutch) |
| Vice President/Director RD&I and Technology | Marco Waas | Link , Link (Dutch) |
| President Technology Solutions | Johan Landfors | Link , Link (access required) |
| Senior Vice President, Transformation and Strategy | Egbert Henstra | Link (Dutch), Link |



Quotes

[Charlie Shaver](#) - “This capacity expansion underlines the company’s strategy of investing in attractive growth markets and its commitment to sustainable growth platforms. [...] It will enable us to better support the future growth plans of our customers. They will benefit from our continued efforts to improve global supply chain performance and optimization, and the ability to produce more sustainable products.”

[Marco Waas](#) - “The automation area is where start-ups can be particularly useful. [...] Maintenance is an important area for us. As are technologies to link performance of a factory to trigger points like energy prices. We’ve got to have control of a factory so we can react quickly. We want it to be like turning down a fridge by 10–20%.”

[Johan Landfors](#) - “Nouryon is a responsible organization that takes its obligations seriously – to the planet, to our customers and to our own people. We believe the only way to grow is by developing sustainable, innovative solutions that benefit our customers and we’re constantly looking for ways to reduce our impact on the environment.”



Quotes

[Charlie Shaver](#) - "This capacity expansion underscores the company's strategy to invest in attractive growth markets and its commitment to sustainable growth platforms. [...] It will enable us to better support our customers' future growth plans. They will benefit from our continued efforts to improve global supply chain performance and optimization, and the ability to produce more sustainable products. "

[Marco Waas](#) - "In the field of automation, start-ups can be very useful. [...] Maintenance is vital to us. Just like technologies to link the performance of a factory to trigger points such as energy prices. We need to control a factory so that we can respond quickly. We want it to be like turning down a refrigerator 10-20%."

[Johan Landfors](#) -

"Nouryon is a responsible organization that takes its commitments seriously - to the planet, to our customers, and our own employees. We believe that developing sustainable, innovative solutions that benefit our customers is the only way to grow, and we are constantly looking for ways to reduce our impact on the environment."