Blockchain in Chemical Value Chains

Tracking Complex Information and Enabling Real-time Eco Footprint Analysis

ReCarbonX, a smart tracking system for manufacturing developed by the eponymous Swiss start-up, creates a digital twin of production, collecting data from materials supplies, logistics and every step in production processes along complex value chains. It works alongside and integrates with existing company ERP systems (even multiple partners' systems), process control systems and sensors, enabling real-time proof of quality compliance, track-and-trace and life-cycle analysis (LCA). All data is stored on a distributed digital ledger with smart contracts, for proof of origin and authenticity of the data, and for security and transparency as needed. Michael Reubold spoke with Jens Schmidt, co-founder, CEO and CTO of ReCarbonX, and an early adopter of blockchain-based systems.

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Jens Schmidt, ReCarbonX

PERSONAL PROFILE

Jens Schmidt is an expert in chemical technologies, digitization, and sustainability, with deep international manufacturing experience. He studied Chemical Engineering at Hamburg University of Technology, Germany, where he received his PhD degree in 2002 and subsequently joined Dow Chemical as Lead Process Engineer. During his 19-plus-year tenure at Dow he held various positions and most recently was the highest-ranking Corporate Technology Fellow. A certified Six Sigma MAIC Black Belt and a seasoned entrepreneur, Schmidt is co-founder, CEO and CTO of ReCarbonX, founder and managing director at Trexcare, and currently also CTO at TES-H2, driving green energy transformation. He is a global industry advisor and IT/Tech architect with expertise in sensors, sensor control and process automation.

CHEManager: How did ReCarbonX get started and when was the idea born?

Jens Schmidt: Two years ago, I met my co-founder Oksana Pilatova who —at the time, like me—worked in the chemical industry. We went to Italy for a review of an innovative hydrogen start-up and during a lunch break talked about the upcoming need for sustainability and the associated complexity of tracking carbon footprints along value chains with multiple partners. That was when we developed the first high-level idea of ReCarbonX, using blockchain technology for value chain tracking.

How did you move from idea to starting a company?

J. Schmidt: At first, we defined and refined the concept and workflows, did a first minimum viable product—MVP—and a real blockchain implementation, and added back integration with IoT sensors and data gathering via mobile devices. Soon it became obvious that the solution could do much more than just eco footprint tracking in the chemical industry. Then, still in 2020, we brought our co-founders on board and established the company in Switzerland.

We found an innovative food processing company in Bulgaria—our very first customer—and the installed system delivers excellent results.

How does ReCarbonX create value for its customers?

J. Schmidt: Sharing data across value chains with multiple partners is a necessity of today's business world, to ensure compliance and to understand material flows and product properties. At the same time, it's a cumbersome and resource-intensive process. ReCarbonX solves exactly these challenges. Essentially, it's all about providing manufacturers with security and control over the transparency of their own data, while giving them access to a tool that can not only improve the productivity and processes of production and reporting, but also calculate and showcase any product's real-time life-cycle analysis and full eco footprint. It is value made visible!

How has ReCarbonX been impacted by the pandemic and the war in Ukraine?

J. Schmidt: It's a challenging time for start-ups. Oksana is Ukrainian, and

we therefore as a team feel the impact of the crisis first-hand. We are all actively focused on using our skills to start and help volunteer initiatives that support people in need and those on the ground in Ukraine.

At the same time, we are working with people in companies who continue production despite the crisis in the region, and we can see that they and many others are suffering in at least two major ways: Firstly, with personnel challenges, the difficulty finding people to work in production —this is something that was also evident during the pandemic—and, secondly, with serious supply chain disruption leading to a lack of availability of raw materials and ingredients, with no way to reliably prove quality and provenance.

While we can see that many are floundering, we can also see that having the ReCarbonX system installed with a digital twin of production can bring reliability to workflows and proof of high-quality production when stress and systems chaos might otherwise lead to human errors and more distress for those involved. Our customer in Bulgaria found real benefits during the height of the pandemic, when the system allowed them to automatically capture, monitor and record compliance and quality documents and checks with-

out the need for auditing personnel to be sent in person to the production plant. This continues to be a great time- and resource-saving benefit for them. Additionally, having the digital twin and defined workflows with hand-held tablets has meant that new personnel—even those previously untrained and under pressure to perform—are able to get up to speed with just one day of training, and carry out production steps like long-time employees.

What's next for ReCarbonX?

J. Schmidt: We've been doing pilots and showcasing various demos with our bespoke Sustainability Simulator for large chemical companies, oil & gas companies, and logistics majors. We have also been invited to present our unique solution to the EU commission on digital product passport in workshops of the German Chemical Industry Association and the Association of German Chemical Traders. We would like to use our links to organizations like DIN to continue to work on an open standard for data exchange between various systems along value chains, as we believe in open access and interoperability to reach the goal of truly transparent value chains.

BUSINESS IDEA

Safe, Smart, Sustainable

Tracking and proving the authenticity of production data and being able to calculate the true eco footprint of products are huge challenges for manufacturers and producers in today's increasingly complex value chains.

ReCarbonX is an affordable and easily scalable "umbrella" system that works alongside, and integrates with, existing company ERP systems—even up- and downstream partner companies' systems.

The kinds of data collected include documents and reports, the type and origin of raw materials and percentage of recycled materials, waste, water use, the type of energy used during processing and for cooling chains, types of fuel used for transport and logistics, and distances traveled for delivery.

Especially unique is the ReCarbonX algorithm and Sustainability Simulator, which can calculate per-product eco footprints, and show the effect of relevant sustainability improvements in real time. The system provides on-demand CSR capability and verifiable data presented in easy-to-understand vi-

sualizations, as well as per-product industry comparisons.

Key features of the technology

- **Easily scalable** from small operations to large multinationals, starting in-house to seamlessly integrate partners up- and downstream, step by step as needed and value-adding.
- **Platform independent,** through the use of decentralizied solutions; adaptable to cloud-based or on-premises solutions, depending on customer needs.
- **Adaptable**. Designed as an open platform, easily adaptable to different industries and workflows, offering nondiscriminatory free interfaces for integration with other solutions.
- **Customizable** to specific needs from data gathering, processing, visualization of an individual production item or in ESG report for a production line, factory, entire region or company.

- ReCarbonX AG, Zurich, Switzerland
  http://recarbonx.com/

A digital twin of production processes is created with IoT sensors, ERP and manual inputs.

ELEVATOR PITCH

Value Made Visible

ReCarbonX was founded in 2020 in response to key sustainability challenges faced by manufacturers who are under pressure to track, verify and report (or "make visible") their compliance, quality and sustainability improvements in increasingly complex and dynamic value chains.

ReCarbonX combines the benefit of distributed ledger technology (blockchain) and tailored interfaces with real-world IoT sensors, ERPs and manual entries in mobile devices to create a reliable and trustworthy digital twin of the entire value chain. The system is able to capture data for every logistics and production step, and each product and raw material along the chain.

The unique algorithm reliably calculates the true eco footprint of products in real time, and shows compliance, source and destination of goods and product streams, including the real percentages of recycled materials and waste. Up- and downstream partners can join at any stage, with full ownership and control of their own data and transparency.

Milestones

2018
- Idea

2019
- Founding team assembled

2020
- Develop minimum viable product (MVP)

- ReCarbonX AG founded in Switzerland

2021
- Implementation in food industry
- Presentation to multiple industry associations
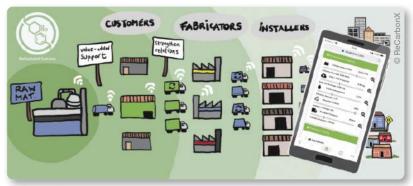
Roadmap

2022
- Demonstration of portability of deployed solutions for new sectors such as textiles and wood industry
- Addition of individual product-based recycling tracking
- Support of the "Lieferkettengesetz" (Supply Chain Law) compliance

2023
- Expansion of deployed systems along the value chain by integrating multiple layers, and define open standards to allow data exchange and interaction with other solutions
- Addition of automatic reward systems for footprint reductions along value chains, allowing brand owners to automatically reward eco improvements early in the chain in a fair and data-based manner

2024
- Helping establish open standards as an industry norm
- Support EU product passport initiatives
- Meet standardized ESG reporting needs and global standards on product footprint reporting

ReCarbonX shows the impact of product sustainability improvements along complex value chains.