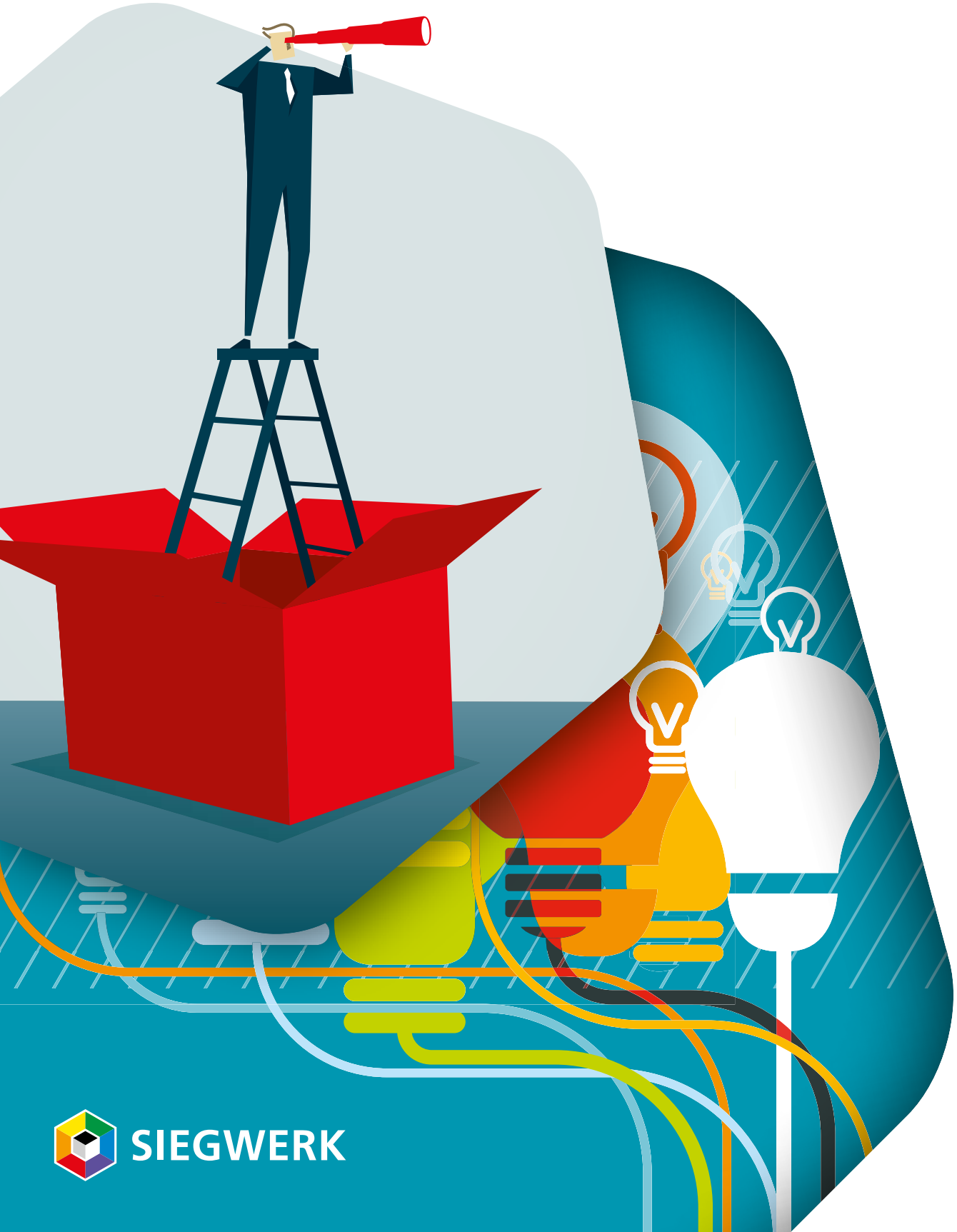
INK, HEART & SOUL

PACKAGING
FOR THE FUTURE



SIEGWERK

How to reconcile the implementation of new market trends while meeting newest safety and technology standards with resource efficiency & overall profitability?

Packaging gained increasing public attention over the years entailing new consumer-driven demands and trends that are continuously changing the packaging market. Today's biggest challenge is to design innovative & sustainable packaging while reaching optimal process efficiency and capacity utilization to further remain competitive and agile for the future.

Foreword

The Circular Economy is now centre stage and here to stay, it always was, but now it's impossible to avoid dealing with. Packaging is at a fundamental crossroads and has a significant opportunity to be integrated into a better eco-system. For this to happen, companies need to get even more deliberate about dealing with the Circular Economy. Depending upon your portfolio of products and business complexity this will be an easier or difficult challenge. Siegwerk is a key enabler to driving packaging success and is prepared to share the benefits and expertise of working with big brands to enable gains for others. We know that many companies are struggling to work out how to shift their packaging strategies (if they have one) towards conformity for the Circular Economy.
We want to bring our significant know-how at the coal-face with regards to packaging operations to the fore and help companies create formats that conform to the Circular Economy. All this in an increasingly tighter world of capital expenditure where companies need to squeeze more efficiency and innovation out of existing assets. We can definitely help here, especially in one complex area – flexible films where we can help drive performance gains, cost savings and innovation through redesign of material structures in combination of inks and finishes. We have a particular focus on tailoring solutions to your specific needs.

Based on the combination of our broad ink expertise, extensive packaging competence and incomparable product safety know-how, we are one of the global leading providers of packaging inks, varnishes and know the relations, processes and technologies like no other. The fact that we are packaging 'agnostic' ensures we propose the best possible packaging solutions for client requirements. Our dedicated experts have diverse experiences and have already helped many customers to improve performance and efficiency while saving money, waste and unnecessary process steps on their way to improved and forward-looking packaging solutions.

For more information or in case of questions please feel free to **contact us** at **BOC@siegwerk.com**. Kind regards,

Belal Habib
Head of Global Brand Owner Collaboration at Siegwerk

Let's investigate the details to unlock your full potential as well!

1. Differentiation
by functionality & efficiency

Sustainable and recyclable packaging is more in demand than ever before. Simple handling, convenience and functional features protecting the product and extending its shelf life are already considered to be standard properties by consumers today. To stay competitive nowadays it is not only about further invest in new packaging features and technologies, it is also important to work efficiently, economically and flexibly to be able to quickly respond to changing market trends. So, why not identify the potential for savings & improvements first and maximize the use of current equipment and resources? In other words, getting the best packaging out of existing equipment at optimized costs.

Finding saving potentials

Siegwerk has vast experience in saving costs across the value chain. In several customer projects the company has already generated cost savings up to 700k € per year combined with additional impacts on customers' efficiency and performance.

"We bring you competitive advantage even beyond inks"

In collaboration with customers, Siegwerk's experts analyse the equipment and processes used to identify improvement potential and point out concrete realization possibilities. For example, if the experts find out that it would be possible to run machines faster to increase the output and generate more revenues, they would directly offer suitable ink solutions to realize the same high-quality output at higher speed without increasing the complexity.

Siegwerk offers solutions to differentiate with functionality & efficiency while supporting converters and Brand Owners in mastering their specific complexity in regard to:

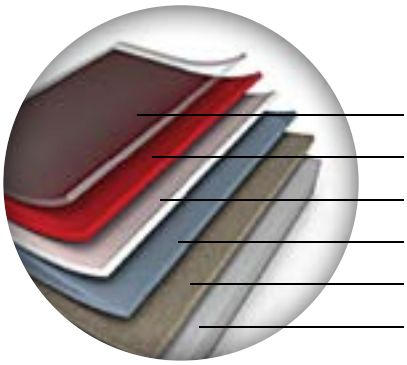
- Packaging type (Bags, pouches, liddings, etc.)
- Pre-press & print process (Workflows, print processes, lamination, etc.)
- Consumers (Microwaveable, chemical resistance, lamination bond strengths, etc.)
- POS (Brand recognition, abrasion resistance, optical and tactile effects, etc.)
- Ink technology (e.g. Binder system, color strength, adhesion, etc.)
- Packaging process (Slip properties, filling, sealing, etc.)
- Product safety (Regulation, brand requirements, low migration, etc.)
- End-use segments (Meat and cheese, snacks, pharma, etc.)

Siegwerk always improves ink performance in printing and packaging considering all requirements of each customer while optimizing costs.

Solution example #1:

Mini pouch for ketchup, mustard, lemon juice and similar fillings

Key functionality: Reduce the packaging structure complexity without compromising the high chemical resistance and superior optical effects.



Packaging Structure

- Overprint varnish
- Color ink
- White ink
- Metallized PET
- Adhesive
- PE

Printing process & type: Gravure & surface print

Solution Benefits:

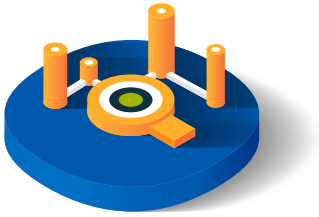
Printing & Packaging Functionality

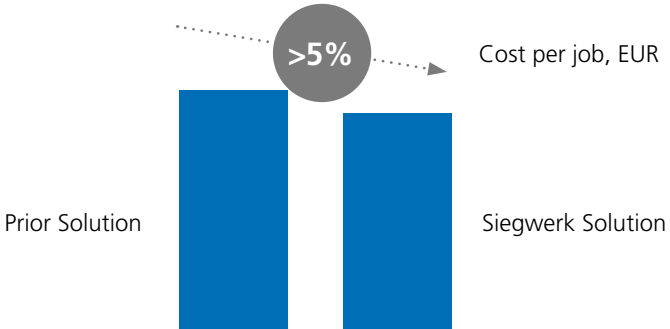
- High quality print solution comparable with lamination in gloss and abrasion resistance
- Great optics, e.g., matt-gloss and opacity
- Excellent chemical resistance
- Very good heat sealing stability at high temperatures

Printing & Packaging Efficiency

- Process simplification by take-out of lamination step
- Less cost via saving of aluminum foil & adhesive

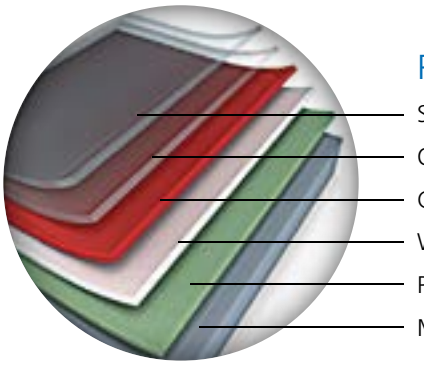
Customer Project Example





Solution example #2:
Candy wrapper

Key functionality: Reduce the packaging structure complexity without compromising the high chemical resistance and superior optical effects.



Packaging Structure

- Special varnish
- Overprint varnish
- Color ink
- White ink
- Primer
- Metallized OPP

Printing process & type: Gravure & surface print

Solution Benefits:

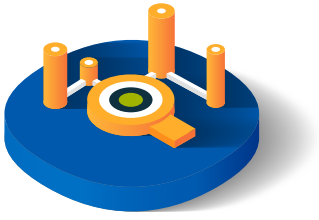
Printing & Packaging Functionality

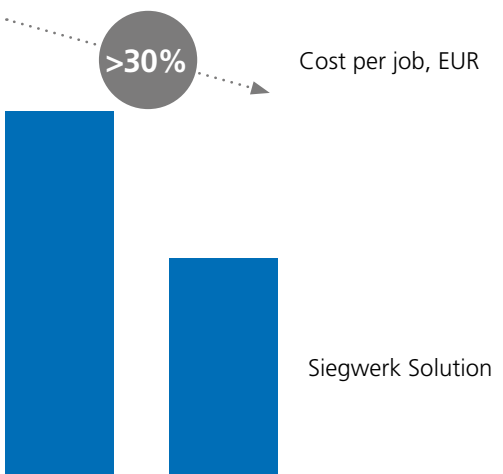
- Highly durable twist effect with standard films

Printing & Packaging Efficiency

- Cost reduction via substitution of expensive, twistable films
- Excellent adjustable coefficient of friction for optimized packaging speed

Customer Project Example

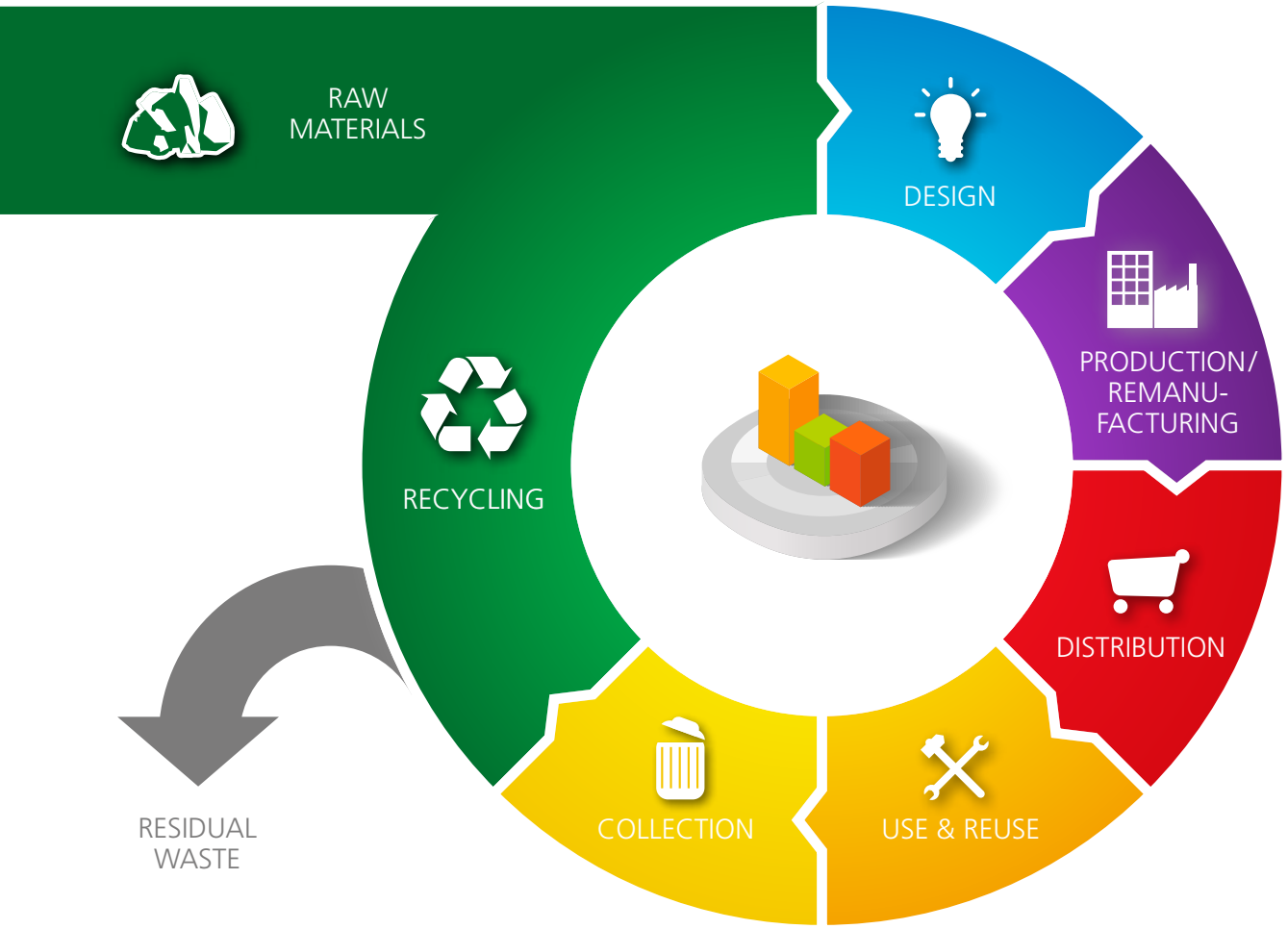




2. Increasing demand
for sustainable solutions

Sustainability and eco-friendliness are two of the most significant buzzwords nowadays. The public awareness especially for plastic waste is further increasing driving the demand for sustainable solutions and recycling approaches. The Circular Economy is one example for a concept that could help to drive more sustainable consumption and reduce waste pollution. Concretely, a Circular Economy means building up recycling chains in which the waste of one value chain becomes raw material for another value chain. In order to do so, packaging needs to be recyclable. Therefore, current packaging concepts need to be redesigned and new packaging structures need to be developed. For enhancing plastic packaging solutions, the main challenge is to manufacture recyclates to a sufficient level of quality allowing them to be re-used for the production of high-quality packaging.

Therefore, printing inks and adhesives in non-separable laminates based on mixed materials, and organic residues from post-consumer waste represent a general challenge when it comes to manufacturing a reusable clean recyclate that is as versatile as possible. The majority of today's recyclates are not suitable for use in packaging yet and thus are removed from the packaging cycle. In this context, surface printing on polyolefinic substrates for example gain importance compared to the commonly used reverse printing for laminated structures. It can improve the ink removal and therefore the recyclability of packaging and help to realize novel packaging ideas while delivering functional features and good visual design opportunities at surprisingly attractive costs.



“We support you to optimize your packaging for a Circular Economy”

Sustainability means progress

Printing inks and varnishes play a key role in the manufacture of packaging. They are not only crucial for the appearance and functionality of a packaging, but also for its recyclability. As a leading ink provider Siegwerk has a wealth of experience with inks for paper & board applications and the corresponding need for ultimate deinkability of inks to support paper recycling as well as deinkability solutions for plastic film. In 2019, the company launched a new UV/LED UV offset ink system with impressive deinking properties on various paper grades even comparable to the deinkability of conventional oil-based sheetfed offset inks. Siegwerk also offers ink series that are compostable according to DIN EN 13432. In addition to its water-based ink range UniBio, Siegwerk is continuously working on the development of further bio-based inks with an increased share of raw materials based on renewable resources. Another aspect is the development of innovative ink solutions to facilitate sustainable printing technologies like LED curing UV-Flexo printing and digital Inkjet printing for the reduction of energy consumption and the avoidance of waste in the converting process.

~80 m. tons of plastic waste
accumulate worldwide per year

10% of the resources used in the production of plastics are **recovered through recycling**

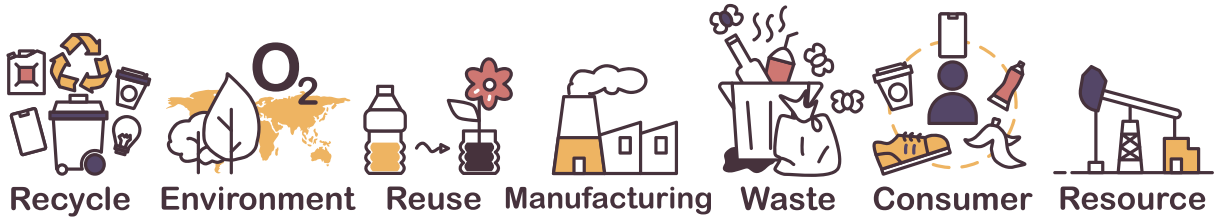
90% of the annual plastic waste is incinerated, dumped or **enters the environment in an uncontrolled manner**

41.9% of plastic packaging is **recycled in Europe** (2017)

Recycling rate of 50%
is the **European goal until 2025**

With its ink series Sicura Litho NutriEco Siegwerk also markets the world's first low migration UV ink range for cosmetics and food applications that has been awarded Gold status of the "**Cradle to Cradle® Material Health Certification**" by the Environmental Protection Encouragement Agency (EPEA). This means, that these inks are safe for recycling processes and therefore fit well into the Circular Economy approach.

Recycling is a complex topic, it cannot be solved by one industry player or sector alone, cross-industry exchange is inevitable. That's why Siegwerk is partnering with different associations and industry networks to join forces and develop advanced packaging solutions with improved performance and recyclability to help realize the full potential for a sustainable future. The company makes every effort to shape the future of packaging not only through innovative and sustainable ink solutions but also through sharing its packaging ink know-how with customers and industry partners.



CIRCULAR ECONOMY

3. Product Safety
the highest command for packaging

Producing food packaging as well as printing on food contact materials inevitably involves exposure to specific consumer safety concerns. It is a continuous challenge to produce safe and compliant packaging dealing with food contamination risks and compliance requirements.

Even though several scientific publications had already revealed the migration potential of low molecular substances from printed layers the risk remained largely unnoticed. The public only became aware after the first big migration scandal in 2005 when findings of ITX (isopropyl thioxanthone), a low molecular photoinitiator used in UV inks, in baby milk and other liquid foodstuffs were reported all over Europe, causing several product recalls.

By this scandal stakeholders within the packaging chain realized that substance transfer from printed or varnished layers, even if not intentionally brought into direct food contact, can happen. As a consequence of the ITX case, the first legal regulations and alert platforms were put in place by the European Commission. Regulation (EC) 2023/2006 on Good Manufacturing Practice has been issued to address processes involving the application of printing inks while the Rapid Alert System for Food and Feed (RASFF) was put in place to serve as platform for control authorities to exchange measures taken responding to serious risks detected in relation to food or feed.

In early 2009, new findings of the two UV curing photoinitiators „4-MBP“ and „benzophenone“ above the acceptable thresholds in breakfast cereals packed in polyethylene pouches included in cardboard boxes gained huge media coverage all over Europe. Food and packaging were recalled on a broad scale, bringing considerable financial losses to the affected companies and a negative image to the food production industry as a whole. Today, consumer safety is one of the top priorities for food and packaging constantly driving the demand for new migration optimized solutions.

"We are committed to support you with maximum product safety."

On the safe side with Siegwerk

Siegwerk has been aware of the need for safe printing inks for packaging applications from the early beginning making ink safety to one of its key commitments. Today, the company is a global leader in providing product safety guidance. As Siegwerk places great value on the highest safety standards and environmental protection the company has a global expert team exclusively dedicated to product safety & regulatory issues. Siegwerk's product safety guidance includes global legal compliance, brand owner requirements, self and industry-specific commitments as well as safety and risk assessments targeting raw materials to end-use applications.

Amongst others, Siegwerk is committed to full compliance with the EuPIA (European Printing Ink Association) Exclusion Policy and adheres to the Good Manufacturing Practice (GMP) recommendations. Although these guidelines have an Europe-wide applicability, Siegwerk goes a step further by applying them on a global level. Besides, the company has implemented a comprehensive global raw material introduction process that is based on a centrally coordinated approval process to achieve complete knowledge of the chemical composition of each raw material intended for sensitive applications including food, pharma and hygiene packaging. Further processes, including the company's global formulations guidelines, ensure that its packaging inks worldwide only include raw materials that have been thoroughly checked beforehand. Thereby, Non-Intentionally Added Substances (NIAS) are carefully assessed by Siegwerk as well. From consumer safety perspective the migrating substances need to be evaluated, independently whether they are used intentionally or non-intentionally. The company's standards go far beyond legal requirements and are success factors for highest possible product safety.

Do you want to benefit of Siegwerk's knowledge on crucial food safety related topics?

Then register to the company's **Ink Safety Portal** or contact **evert.delbanco@siegwerk.com**.

Raw Material Introduction Process

Sample request → **Lab tests** → **Trial preparation** → **Global PSR approval** → **Business approval** → **New raw material**

Checklist for approval

- *Compliance with exclusion criteria (e.g. carcinogenics, mutagenics, repro-toxics, toxics)*
- *Compliance with our stringent purity standards (e.g. heavy metals, dioxins, primary aromatic amines)*
- *Compliance with chemical registration in each applicable region*
- *Composition data for NPH applications*

Our material introduction process excludes unwanted substances

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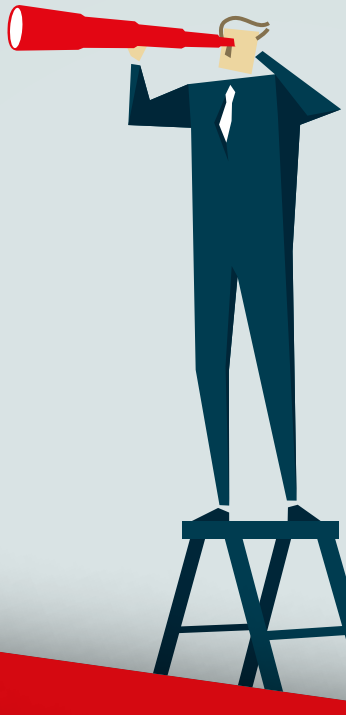

SIEGWERK – your partner to exploit your full performance & profit potential

No matter whether you are looking for performance optimization, higher safety standards or more sustainability for your packaging solutions, Siegwerk can support you to unlock your full potential for sustained value creation. Benefit from Siegwerk's packaging competence and analytical capability always considering all requirements of packaging structures, printing and processes. Compare your performance with the industry and gain competitive advantage by differentiating your packaging from the market.

"We guide you to safe & efficient performance"

With more than 185 years of experience, Siegwerk is a globally leading provider of printing inks for packaging applications and labels today. The company's expertise ranges from flexible and liquid food packaging through tobacco as well as paper & board applications to narrow web, sheetfed and digital printing. With a combination of best ink performance, highest product safety and comprehensive guidance & support, Siegwerk offers a full-range portfolio for best packaging solutions always considering the individual requirements – including both printing processes as well as end-application purpose of the packaging. Based on its wide printing expertise and packaging competence Siegwerk offers comprehensive technical support, diverse consulting services and trainings and can help to optimize the Total Cost of Ownership.

Siegwerk is an expert in analysing the relations of printing and packaging production to identify potential areas for improvement and unlock the full potential for sustained value creation. Saying so, Siegwerk supports customers and brand owners e.g. in the development of novel packaging designs including the formulation of innovative ink solutions exactly meeting the new performance and functionality requirements. With its broad expertise in paper & board packaging the company offers deep know-how for the re-design of packaging by using paper & board materials as substitute for current substrates. And with its wide range of sustainable solutions, Siegwerk can also support customers towards packaging that is compatible with Circular Economy needs. In several customer projects Siegwerk's experienced experts have already helped to improve customers' efficiency and capacity utilization adding significant value and freeing up latent potential.

Whatever your goals are, we are happy to support you to further drive the future of your packaging. Benefit from our experience and let us support you to exploit your full performance & profit potential.

Just contact us without obligation at **BOC@siegwerk.com**.

SIEGWERK

A collaboration with

ADDED VALUE

AT A GLANCE:

Siegwerk's offering:

- Expert network accumulating global knowledge on packaging applications, printing technology and end-use segments
- Proactive knowledge transfer across regions
- Experts providing on-demand and just in time customer support delivered by your dedicated Siegwerk technician

Your Benefits:

+ Access comprehensive know-how and global application experience
+ Receive optimized technology timely on site
+ Gain functionality and efficiency in printing and packaging