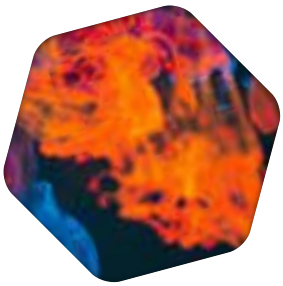
INK, HEART & SOUL

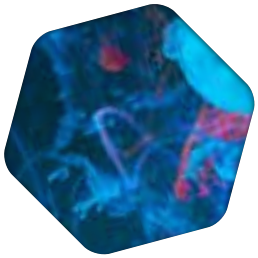
Keys to successful

INKJET PRINTING

for labels & packaging

SIEGWERK





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Foreword

The building blocks for successful inkjet printing

The packaging and printing industries continue to evolve: Less working capital, decreasing job lengths and an increasing demand for individualization of packaging, flexibility and sustainability of processes are constantly leading to new challenges further driving the need for innovations. Preserving momentum and agility to address changing market and regulatory requirements in a quick and especially complete manner while remaining economically successful is today's constant challenge.

In this context, digital printing and especially inkjet printing has gained traction and credibility over the last few years as a variable and viable printing method for a wide range of industrial and commercial printing applications. With speed, flexibility and quality, inkjet printing enables businesses to respond faster and more successfully to customer requirements.

Inkjet has the potential to master the balancing act between market trends and economically sensible implementation for specific applications, but behind the scenes it takes more than just putting ink on a machine and starting to print. Rather, it is a cross-disciplinary technology uniting different variables from mechanical engineering and electronics through printheads integration and driving software to ink chemistry and curing technology. Every inkjet application needs a complete solution with all components harmonized and targeted to the individual application needs.

This essential compatibility between inks, substrates, software, printheads and machinery is key for the successful development and adoption of an inkjet printing solution for a specific application, making cross-disciplinary collaboration the most essential success factor.

"As inkjet is a complex interaction of components, the priority should be to join forces across disciplines building an application-driven process to trust."

Matthieu Carni, Director Inkjet Business at Siegwerk

Whether you are an Original Equipment Manufacturer (OEM), or someone who wants to integrate inkjet into an existing production line, you might want to check for a suitable partner adding value to your expertise and supporting you to create the best possible solution to meet the quality, reliability and lifespan requirements of the competitive industry.

In this paper, you will find more insights on how building a community might help you to unlock the full potential of inkjet printing for existing applications as well as new markets.

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

WHY INKJET AT ALL

- Packaging Printing Trends
- Digital Printing for Packaging
- Inkjet Printing – Status & Outlook
- Benefits
- Stumbling Blocks

Packaging Printing **Trends**

The increasing demand for short runs, digitalization and embellishment of packaging while addressing sustainability aspects and cost challenges will keep the packaging printing industry on its toes going forward.

With constantly shorter product cycles and ever broader product portfolios, mastering diversification is becoming an even more essential success factor for converters and brands. Addressing specific customer groups with individualized products leads to an incredible variety of packaging structures and layouts, resulting in decreased job lengths per print.

With the variety of packaging designs competing for attention, maintaining consumers' brand loyalty has never been more challenging. Therefore, more and more brand owners pursue not only versioning and individualization but also on the intersection between printed packaging and digital content. By extending the length of time a potential buyer is engaged with a product, the brand awareness can be significantly strengthened. As a result, the demand for smart packaging solutions is further growing.

Different studies, amongst others from the Foil and Specialty Effects Association (FSEA), show that refined products can be identified faster than non-finished ones, and therefore drive brand owners to increasingly ask for special packaging processing and finishing. Whether it is about visual or haptic effects, solutions for the embellishment of packaging are thriving. This also includes a growing demand for optically invisible marking solutions for product and brand protection. New regulatory demands for track & trace or serialization, like e.g. the new Russian dairy regulation for mandatory labeling of dairy products, also do their part for driving the need for new and cost-effective solutions to print variable data.

Moreover, decreased working capital asks for lean production processes, less inventory and obsoletes as well as higher flexibility. These are all aspects that further drive the need for print on demand solutions. An increasing sustainability awareness from consumers brings further evolving aspects into play that need to be addressed by converters and brand owners. In this context circular economy aspects further grow in importance.

Generally, digital printing can help to master the balancing act between these market trends and an economically viable implementation. In addition, it not only offers technical and economic benefits but also supports the ongoing sustainability trend in the packaging industry.

Packaging Trends & Challenges 2021:

SUSTAINABILITY
CO_2 reduction targets, realization of a Circular Economy, recyclability, reusability, anti-plastic initiatives…

REGULATORY
Food safety, track & trace, serialization…

TECHNOLOGY
Smart packaging, personalization, consumer engagement…

RETAIL CHALLENGES
Shorter product cycles, broader product portfolios, higher diversification needs…

CONSUMER FOCUS
Fast responsiveness, speed to market…

COST CHALLENGES
Decreased working capital, lean production needs, print on demand solutions…

Figure 1: Packaging Trends & Challenges 2021[1]

Digital Printing **for Packaging**

Digital printing has made printing on demand (POD) possible in the first place, enabling a very short time to market with a cost-effectiveness even for only one printing copy. Less stock and less resource consumption are the results – important economic and ecologic advantages over conventional printing technologies. As one of the most widely used digital printing processes for packaging, inkjet printing has already taken its place in the label and packaging market, e.g. for primary or secondary packaging, and is further expanding.

On the one hand, the growing demand for short runs in label printing lets especially UV inkjet gain ground against UV flexo printing. An increasing use of direct-to-object printing for label-less decoration of tubes, bottles and cans further favors the use of UV inkjet creating solid competition to in-mould labeling (IML), shrink sleeves and conventional label applications. On the other hand, a continued development of pigmented and food compliant water-based inkjet inks further expands digital printing into corrugated, folding carton, tissue printing and flexible packaging. A noticeable share of the market is already using digital printing with increasing tendency. Flexible packaging can become one of the largest volume applications for water-based inkjet printing going forward.

Especially the ability for inline digital printing, where the printing step is integrated in a filling line, enables the desired late-stage customization and finishing of packaging and thereby pays into the decentralization and market orientation trend in packaging printing: Printing when needed, where needed and with highest flexibility in terms of print design.

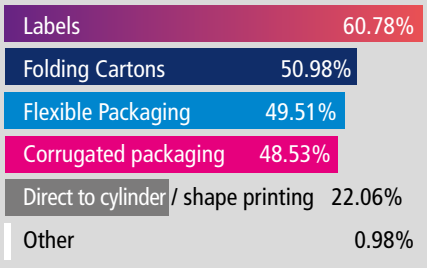
Principal drivers for further adoption of digital printing technologies include Big Data, the Internet of Things and the digitalization of both printing process and packaging. A growing interconnectedness of machinery and materials respektive packaging and devices will drive the collection and sharing of data and thereby can significantly help to improve production efficiency and gain valuable insights into consumer behavior. Here, it is the speed, flexibility and cost control opportunity of digital printing that enable businesses to respond faster to customer requirements and changing market trends. Moreover, hybrid concepts, where inkjet is integrated in printing, filling or sealing steps, allow for a smooth entry into the market while the expansion of digital printing solutions for further applications will bring packaging printers to the highest level of flexibility needed to stay competitive and sustainably successful.

For more information
about the survey and its insights visit
https://futureprint.tech/surveys-reports

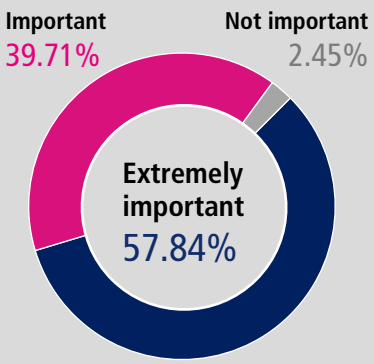
FUTUREPRINT & PACK SURVEY

FuturePrint, a platform dedicated to the development of new printing technology, conducted a global survey within its community providing answers amongst others to how digital inkjet can play a larger role going forward. The survey's insights include amongst others:

Growth is expected across the packaging gamut with labels being considered as the single biggest growth sector by any notable distance:



Digitalization of production is key for the future of packaging print:



The flexibility of the inkjet technology enables tailoring its use to diverse production needs:

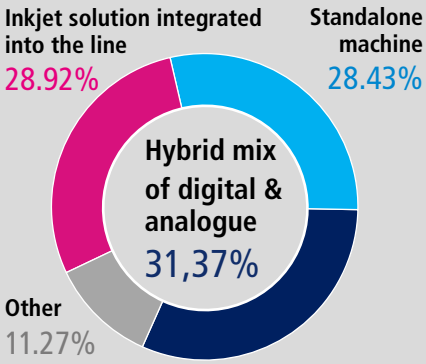


Figure 2:
FuturePrint & Pack Survey[2]

Inkjet Printing – **Status & Outlook**

According to Smither's report "The Future of Inkjet Printing to 2025" the inkjet print market is expected to reach $118.2 billion in 2025. Solely for graphics and packaging applications nearly 124,000 tons of inkjet inks are to be used – more than twice the volume of 2015. And as inkjet press performance is further improving, the economic crossover moves to longer runs, making inkjet more and more feasible for print service providers and packaging converters.[3]

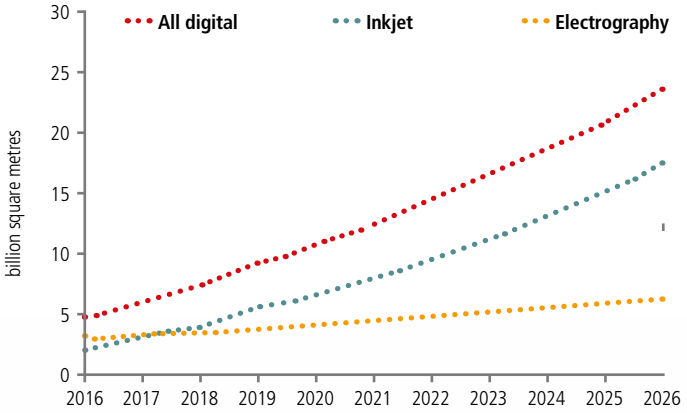


Figure 3: Inkjet overtook electrophotography in 2018 as applications, particularly corrugated, have developed beyond labels.[4]

Even though the break-even point between analog and inkjet in terms of print costs per sqm cannot be easily stated as this depends on a variety of influencing factors, efficiencies in inkjet are going up as the technology is evolving and at the same time costs in inkjet are going down as the market is growing. Advanced inkjet technologies (press and ink) and economies of scale and scope will move the break-even point slowly but steadily to a higher press output. Going forward, higher-performance inkjet machines will offer even higher quality and reliability. Thereby, the integration of manufacturing methods linking prepress with printing and finishing in a single-pass operation will further change the economics of inkjet printing.

Over the last years, inkjet has already proven its capacity to adapt to many markets and cope with very diverse challenges. Here, labels and packaging can indisputably become the largest volume application for inkjet printing in the future. Saying so, inkjet has not only proven to reveal new approaches for brand differentiation but also to enable packaging producers to achieve overall leaner processes and more sustainable products.

Today, UV curable inkjet is already well established in label printing. It is a perfect fit for thick substrates and direct-to-object printing, while water-based inkjet is ideally suited for porous substrates and thin films in applications with high demands on product safety and regulations. Therefore, water-based inkjet is a promising technology for single pass large width printing on paper packaging and corrugated applications and has just started to make inroads on mainstream flexible packaging printing.

However, it is not expected that inkjet will replace other technologies 1:1 but rather extend the current production capacities. Here, hybrid concepts will be part of the big picture, as adding inkjet printing stations e.g. into traditional webfed or sheetfed systems will further leverage the advantages of both systems.

Benefits

As outlined before, inkjet offers several benefits compared to conventional printing methods to address current challenges and key trends in packaging printing. The technology's primary strength is the fact that it is a non-repetitive and non-impact printing method providing excellent flexibility in print systems. Furthermore, inkjet inks can be printed on almost any surface including delicate materials and irregular objects.[5] Inkjet printing allows for high printing speeds and sharp, high-quality print results while offering highest flexibility and a favorable total cost of ownership.

From a sustainability perspective, inkjet printing especially offers environmental benefits as it uses a contactless printing method suited to print variable data on demand without the need of repetitive elements. Therefore, fewer set-up and production materials are needed – no cylinders, no plates, no adhesives – and subsequently less waste is created compared to conventional printing. With its ability of direct-to-object printing (D2O) it also supports the reduction of labels, energy-intensive shrink sleeves or in mould labelling (IML) processes. Furthermore, the fact that irregular shapes can also be printed using D2O inkjet, allows the decoration of new and sustainable packaging materials as e.g. cups, bottles and secondary packaging produced from moulded pulp.

By enabling a decentralized and customer-oriented production, inkjet focusses on printing of what is required at any time. As a result, it does not only help to eliminate redundancies throughout the supply chain, but concretely supports the reduction of stock, obsoletes and resources providing printers and brand owners with additional ecological advantages.

AT A GLANCE

THE BENEFITS OF INKJET PRINTING

1. ANSWER TO THE CHALLENGE OF DECREASING PRINT JOB LENGTH
   (cost effective versioning/individualization of packaging)
2. MORE FLEXIBILITY AND SHORTER TIME TO MARKET
   (print on demand)
3. LEAN PRODUCTION
   (no excess production, optimized working capital, low inventory costs, less waste, etc.)
4. PRINTING OF VARIABLE DATA
   (serialization, anti-counterfeiting, track & trace, etc.)
5. NON-IMPACT PRINTING
6. DIRECT-TO-OBJECT PRINTING
7. LATE-STAGE CUSTOMIZATION
8. INTEGRATION OF PRINTING INTO DOWNSTREAM PROCESSES
   (filling line, sealing, logistics, etc.)
9. GOOD POSITIONED TO ADDRESS THE REQUIREMENTS OF A CIRCULAR ECONOMY APPROACH
   (less waste, purposive packaging production, high resource efficiency, etc.)

Figure 4: The Benefits of Inkjet Printing

Stumbling Blocks

Inkjet printing is a growing segment with high potential for answering many of today's challenges and requirements, but it still has its limits slowing down a broad adoption. Examples for stumbling blocks in the market penetration of inkjet printing are:

- **Cultural barriers** for change in technology
- **Misperception**, that inkjet should replace existing printing technologies 1:1
- **Limited awareness** where inkjet can solve existing problems, add value and offer a competitive edge
- **Limited understanding** of packaging requirements of companies without experience in the packaging industry (ink film fastness, product safety & regulatory requirements, colorimetry, etc.)
- **OEM-based business model is a concern** of many printers and converters today
- Integration of inkjet in existing systems to build hybrid solutions can be **technical challenging**

The list of stumbling blocks seems extraordinarily long; and indeed the overall challenge is significant. Still inkjet has already proven its capacity to adapt to many markets and cope with very diverse challenges.

Inkjet is an evolving but rather still unstructured market with few sales channels. Customers might have decided to invest in inkjet, but they do not know how and with whom they should collaborate to build up a reliable process for their applications and specific needs.

Although engineering might drive innovation for new applications, it cannot unlock its full potential without compatible and reliable inks. The availability of inkjet inks has improved in recent years, but the choice of the right ink for a given printing system or application is not as broad as in conventional printing. That's why collaboration across the entire supply chain including inks, substrates, software, printheads and machinery needs to be at the center of all inkjet innovation.

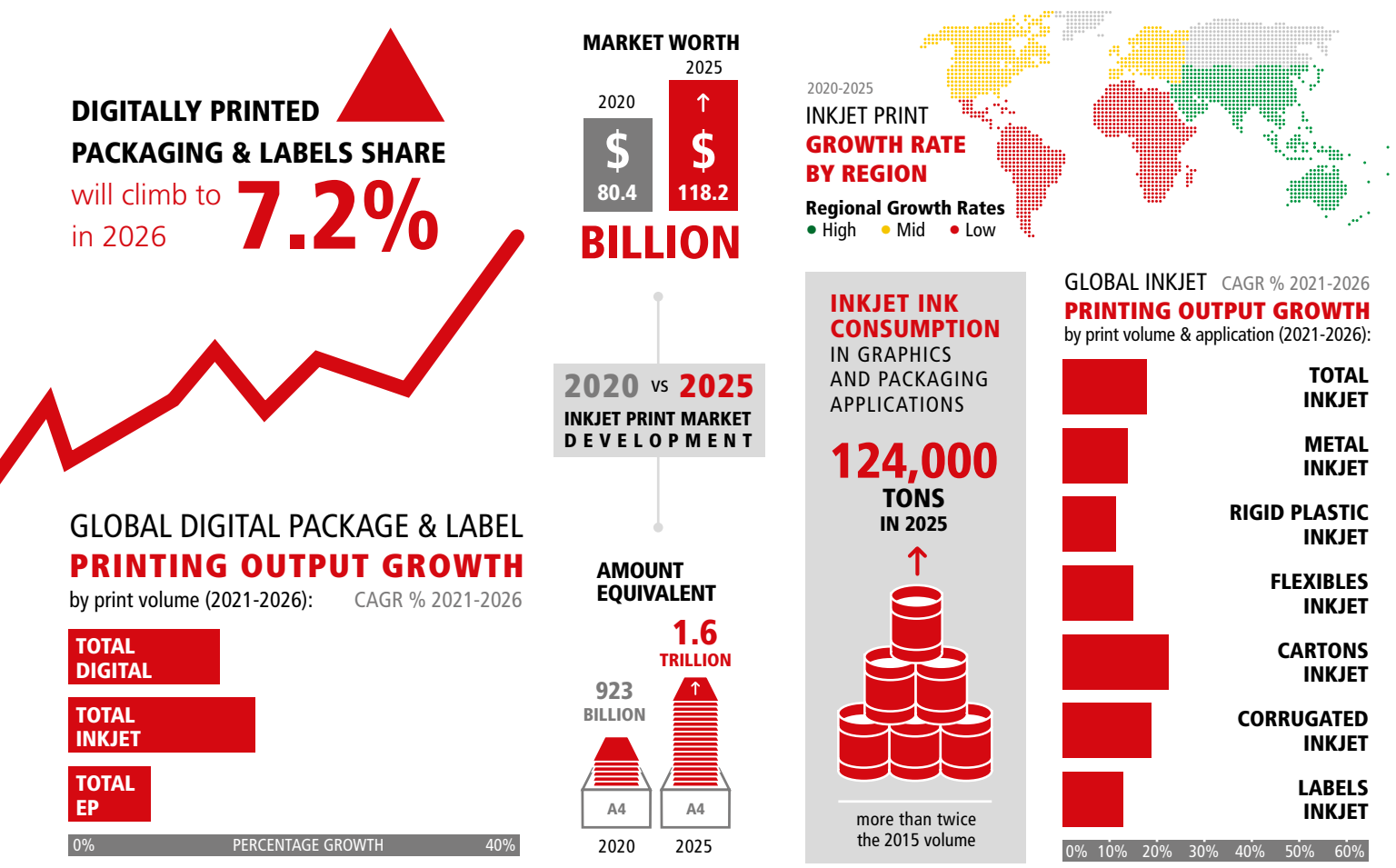


Figure 5: Inkjet Printing: Facts & Figures[6]

DIGITAL PRINT IMPACTS
on packaging trends and challenges in 2021

TREND		DIGITAL PRINT IMPACT
SUSTAINABILITY	CO_2 reduction targets, realization of a Circular Economy, recyclability, reusability, light-weighting, anti-plastic initiatives...	Digital eliminates the use of cylinders, plates and associated chemistry reducing set-up waste. It shows a lean production process with low inventory needs, less obsoletes and a good carbon footprint. The use of direct-to-object printing enables label-less decoration contributing to the recyclability of packaging.
REGULATORY	Food safety, track & trace, serialization...	Digital helps to remove VOCs from ink solutions. Lower potential for redundancy in supply chains. Inks and coating can be accredited for food use. Enables printing of variable data supporting anti-counterfeiting efforts.
TECHNOLOGY	Smart packaging, personalization, consumer engagement…	Digital enables many innovative campaigns, versioning and personalization to boost engagement.
RETAIL CHALLENGES	Shorter product cycles, broader product portfolios, higher diversification needs…	Digital print allows versioning and individualization of packaging, boosting packaging awarenesss.
CONSUMER FOCUS	Fast responsiveness, speed to market…	With its speed, flexibility and cost control opportunity digital enables to respond faster to changing customer requirements and market trends.
COST CHALLENGES	Decreased working capital, lean production needs, print on demand solutions…	Digital has made printing on demand possible in the first place, enabling a very short time to market. Better inventory management, less resource consumption and lower printing costs for shorter runs are the result. Digital also enables late-stage customization and the integration of printing into downstream processes to further speed up time.

Figure 6: Digital print impacts on packaging trends and challenges in 2021[7]

HOW TO ACHIEVE INKJET SUCCESS

- Building Blocks of Success
- Components to consider
- Success through Teamwork

HOW TO ACHIEVE INKJET SUCCESS

Inkjet has the potential to master the balancing act between market trends and economically sensible implementation for specific applications, but behind the scenes it takes more than just buying a machine and starting to print. Hereby, every application needs a complete solution with all components harmonized and targeted to the individual application needs. It is about the right interplay of inks, substrates, software, printheads and machinery, making cross-disciplinary collaboration to the most essential factor for the successful development and adoption of an inkjet printing solution for a specific application.

Building Blocks of Success

According to FuturePrint there are five critical steps that will enable the success of the development of an inkjet printing solution for any sector:

1. STRATEGY & COMMUNICATION

This contains a reality check right at the beginning to understand if inkjet is the right technology to achieve the objective of a project followed by defining the strategy for adoption.

2. PROBLEM SOLVING & APPLICATIONS

What is the exact problem that the new technology should solve and what are the applications it should address? Here, it is about clarifying for what kind of markets, print materials and end use purposes the technology will be designed while defining the machine specifications needed to achieve all this.

3. COLLABORATION

Exchanging with people with the right technical expertise, commercial acumen, and technologies to serve the needs of the required machine design helps to limit the risk of failure on the way to a machine with quality print output.

4. TECHNOLOGY SELECTION & INTEGRATION

After setting a sound strategy to address the desired problem and based on the exchange with other experts across the supply chain the development roadmap can now be defined including technology selection and integration.

5. COMMUNICATING THE ECONOMIC CASE FOR INKJET

The technical homework is done, now it is time to prove the economic value of the designed technology compared to analogue printing to drive adoption. Here, it is not about comparing inkjet ink price versus flexo, screen or gravure, it is rather about factoring in the entire cost of operating and lifecycle production contribution.

Figure 7: Critical steps for the successful development of an inkjet printing solution[8]

The entire process sets on spending more time at the beginning of the development to save time later on through good preparation and weighing of potential pitfalls. Thereby, early teaming up with the right experts can help to bridge knowledge and skill gaps to develop a profitable and reliable inkjet solution which exactly meets customer demands.

Components to consider

Successful inkjet printing needs more than just a well-engineered machine with adequate printheads and inks. There are several components to consider, and they all must be harmonized with each other to work well as one inkjet system for one specific application. These variables include but are not limited to the following:

DRYING/CURING SYSTEM

The drying time of the chosen inks is an essential factor for the printing speed. Water-based inks for example need purposive heat application after printing to drive a fast evaporation of the water within the ink while UV inks are cured by being exposed to UV light leading to the polymerization reaction forming a uniquely strong ink layer.

DRIVE ELECTRONICS

To be able to print at all, the digital image file needs to be translated into electronic signals that the chosen printhead can understand to be able to control where to apply the ink exactly. The drive electronics are essential for the communication between computer and printhead.

INK SELECTION

The selection of ink is considered the most critical decision in the correlation of all variables. The composition of the ink not only needs to be well-suited for the application and its end purpose but also needs to match the printheads ensuring a reliable jetting without clogging the fine nozzles. Ink properties like viscosity, pigment size, density, surface tension, adhesion or similar must fit the printing process as well as the substrate. While the compatibility of ink and substrate is essential to guarantee the desired print results, the ink formulation also must meet all regulatory requirements to be safe for the end use application.

INK SUPPLY SYSTEM

To achieve the print quality desired, each printhead needs to be supplied with sufficient but not too much ink. Here, the ink supply system not only needs to be designed to maintain the right negative pressure to avoid ink flooding the nozzle-plate, but also to heat the ink to the right operating temperature, to filter out particles that could clog the nozzles, and to avoid any cause of foaming. It needs to be robust and made of materials that cannot be attacked by the inks used.

MAINTENANCE & CLEANING

The nozzles of printheads can occasionally be blocked by air bubbles, particles or dried ink residues making regular maintenance and cleaning – automatic or manual – essential to avoid printing issues caused by those blockages. Although some types of printheads already include self-maintaining features, jetting, wiping, or vacuum purging are still occasionally required maintenance activities.

PRINTHEADS

The decision of the type of printing (single pass, scanning etc.), the ink supply (nozzleplate recirculation) and the number of colors desired has an impact on the type and the number of printheads needed just as the ink selection itself. In addition, things like resolution, minimum and maximum application weight, as well as productivity and reliability needs play an essential role for the choice of printheads to best suit the specific application.

RASTER IMAGE PROCESSING SOFTWARE

Without the right Raster Image Processing (RIP) software to translate a digital image file (BMP, PDF, JPEG, TIFF, EPS) into concrete instructions, inkjet printing is just not possible. It is the key element for creating the raw data determining where drops of ink need to be placed on the substrate and in which size reflecting the defined image resolution, sharpness, scaling, and colors achieving the print output desired. Printing results are only as good as the data input, that's why RIP and printer driver software must match with the drive electronics of the printheads.

SUBSTRATE SUPPORT

For a successful print output ink and substrate need to get close enough to each other. While experiences show that in most cases a distance of around 1mm leads to the best print quality, it is essential to avoid contact through the moving substrate and printheads in any case as any vibration or change in tension can lead to visible variations in density and color. To avoid this and achieve a regular print pattern, there are different transport mechanisms needed – depending on the type of printer system used – to feed the material into the print section and keep it stable during printing.

All in all, there are lots of variables to consider when aiming for a reliable inkjet printing solution for a specific application. Various technical expertise needs to be combined to best harmonize all different components in order to bring a fit-for-success solution to the market.

Success through **Teamwork**

Continuously increasing demands for shorter run times and faster turnaround times put pressure on equipment manufacturers and OEMs to come up with new innovative solutions while ink manufacturers work on the development and enhancement of inkjet-suited formulations. Through these individual development efforts, we will not reach an evolution of the market as we could.

Speculative development of single variables does not enable unlocking the potential of inkjet for several applications as a collaborative development approach could. Inkjet is a cross-disciplinary technology uniting different expertise from ink chemistry and curing technology through engineering and software to electronics and printheads. Thus, striking up strategic partnerships along the supply chain could help to develop innovative solutions for new applications.

Collaboration and an open exchange with other disciplines have the potential to essentially drive inkjet success and adoption going forward.

WHY SIEGWERK IS THE RIGHT PARTNER

- A Look behind the Scenes
- Siegwerk's Inkjet Solutions
  - · UV inkjet inks for labels and direct-to-pack
  - · Water-based inkjet inks for packaging
  - · Primer & OVP for inkjet printing
- Benefits of Partnering with Siegwerk

WHY SIEGWERK IS THE RIGHT PARTNER

A Look **behind the Scenes**

TRADITION MEETS INNOVATION

Siegwerk is one of the leading global providers of printing inks and coatings for packaging applications and labels. With more than 180 years of experience, the company has not only comprehensive expertise in ink formulation and product safety but also a holistic packaging know-how. Today, the company offers customized ink solutions for almost all printing technologies including industrial inkjet. For Siegwerk, ink customization always targets the final application and not only a given printing equipment.

> "OUR INKJET OFFERING GOES BEYOND INK AS WE KNOW WHAT IT TAKES TO GET IT ON THE PRODUCT."

In other words, it goes beyond classical color matching, also involving optimization of adhesion, mechanical and chemical resistance properties as well as assessment of migration risks to ensure that solutions always meet the user's individual needs.

EXPERTISE GROWN FROM CENTURIES OF EXPERIENCE

For the development of state-of-the-art inkjet ink solutions, the company runs two dedicated analytic labs – one in Siegburg, Germany, and one in Annemasse, France – as well as an in-house innovation center enabling simulation and test printing on almost all kind of flat substrates using different printhead technologies. Besides, Siegwerk has a team exclusively dedicated to product safety regarding both regulatory compliance and brand owner requirements to always ensure that all products are safe for the end-use application. Thereby, company experts not only run diligent raw material approval processes, but also model, measure and evaluate ingredients by themselves. With its online ink safety portal Siegwerk concretely provides customers and partners with an expert platform that offers condensed knowledge on crucial product safety and regulatory topics with regard to printing ink ingredients incl. inkjet, regulatory affairs, exposure assessments and safety evaluations.

THE FIRST DROP OF INK IS THE LAST STEP OF THE PROCESS

Siegwerk defines working for its customers by working with its customers. Close collaboration and open exchange are key for the ink manufacturer to stay at the forefront of technological progress and design solutions concretely answering the market's growing demand for all-around flexibility. Providing the first drop of a customized ink is usually the last step in a partnership with Siegwerk. The company sees its responsibility in supporting customers in whatever is needed to achieve their goals. Whether this means to enable sustainable packaging design through innovative ink solutions, to comply with regulatory and product safety requirements or develop reliable application-driven solutions and processes, with its long-standing packaging and ink expertise Siegwerk accompanies its customers as trustworthy partner through all stages.

> "OUR INNOVATIONS ARE BASED ON LISTENING TO THE INSIGHTS OF PLAYERS ALONG THE SUPPLY CHAIN."

Siegwerk's **Inkjet Solutions**

For industrial inkjet printing, the ink manufacturer sets on pigment-based ink systems for piezo drop-on-demand inkjet as the most promising technology currently available on the market. The company's portfolio of inkjet solutions consists of various UV and water-based inkjet inks as well as different primers and overprint varnishes (OPVs). These products are suitable for a wide spectrum of substrates and applications concretely designed to support current market requirements for flexibility and short lead times. Based on its long-time expertise in ink technology, Siegwerk not only offers the development of perfectly tuned solutions of inks and complementary primers and OPVs, but also develops any CMYK, CI or other desired spot color solution on demand.

Here, all inkjet solutions always enable a customization of ink and film properties to meet the end application without compromising on product quality and safety. Whether water-based or UV inkjet is the best technology depends on the application.

UV INKJET	vs	WATER-BASED INKJET
...thicker substrates with high requirements on brilliance, scratch, and abrasion resistance	SUITABLE FOR	**...thin or porous substrates and applications with high demands on product safety and conformity**
Self-adhesive labels •	APPLICATION EXAMPLES	• Flexible Packaging
Wet-glue labels for food / beverages •		• Corrugated board and boxes
Direct printing on 3D-packaging objects •		• Folding Carton
Blister Packaging •		• Tissue and Napkins
Aluminum lids •		• Paper cups
etc. •		• etc.

Figure 8:
Comparison UV vs. water-based inkjet technology.

UV inkjet inks for **labels and direct-to-pack**

Siegwerk's UV inkjet inks are designed for single pass piezo drop-on-demand printers. The portfolio contains different ink families for both low viscosity as well as regular viscosity inkjet printheads (incl. Epson, Fuji Samba, Konica Minolta, Kyocera, Ricoh, Seiko or Xaar). The company offers special low odor inks for labels, industrial and household packaging as well as special migration optimized UV inkjet inks for sensitive applications like food or pharma packaging.

INK FAMILIES FOR LOW-VISCOSITY INKJET PRINT HEADS including Kyocera, Fuji Samba, Epson or Ricoh (MH5220)

Ink series	Colors	White	Hexa-chromie	Spot Colors	Viscosity at 45°C	Description
SICURA Jet G2	C M Y K R Y	○[1] ○[2]	V G O R	upon request	5,8-7,2	General purpose process set for Labels & Packaging applications on non-absorbent substrates ([1] Regular opacity, [2] High opacity)
SICURA Jet G4	C M Y K	○[1] ○[2]	V G O	upon request	6,5-8,5	Highly flexible ink series especially designed for laminate tube printing and other flexible application ([1] Pre-print white ink, [2] Post-print white ink)
SICURA NutriJet GLM	C M Y K R	○	–	upon request	5,5-7,5	Low-migration ink set for low-viscosity print heads
SICURA Jet D2K	K	–	–	–	6,0-7,0	Deep black ink for coding applications

INK FAMILIES FOR REGULAR-VISCOSITY INKJET PRINT HEADS including Konica Minolta, Xaar, Seiko or Ricoh

Ink series	Colors	White	Hexa-chromie	Spot Colors	Viscosity at 45°C	Description
SICURA Jet Design DP2	C M K Y Y	–	R G O	upon request	9,0-13,0	General purpose ink set for Labels & Direct-to-Packaging printing
SICURA Jet Pack SUV2	C M K Y	–	–	upon request	9,0-13,0	Designed for printing on paper-based substrates
SICURA NutriJet LMX	C M K Y	○	G O	upon request	9,0-13,0	Low-Migration ink set for regular viscosity print heads

Figure 9:
Overview of Siegwerk's UV inkjet inks

Water-based inkjet inks **for packaging**

Siegwerk's water-based inkjet inks are designed for any kind of absorbing and non-absorbing substrates suitable for a wide range of packaging applications from paper and tissue through corrugated board and folding cartons to flexible film packaging. The portfolio contains solutions for both low viscosity as well as high viscosity printheads (incl. Epson, Fuji Dimatix Samba, Fuji Starfire, Konica Minolta, Kyocera, Ricoh, Seiko or Xaar). All water-based inkjet ink series have a content of bio-renewable raw materials of >50%, generally making them an ideal candidate for circular economy projects to produce sustainable packaging.

All products comply with the Regulation (EC) No 1935/2004, the Swiss Ordinance 817.023.21, and the Turkish Food Codex Regulation (No. 30381) and are produced according to GMP standards. More information about Siegwerk's digital printing offering can be found ***here***.

(https://www.siegwerk.com/en/products-solutions/digital-printing.html)

WATER BASED INKJET INKS FOR LOW-MEDIUM VISCOSITY PRINTING HEADS*

Ink series	Colors	Viscosity (30°C, mPa*s)	pH	Description
Unijet FP	●●●●●●●	4,0 - 5,0	7,5 - 9,0	General purpose inkjet ink set for non-absorbing substrates, as e.g. PA, PET, PE, PP, BOPP or PVC
Unijet COR	●●●●	5,0 - 6,5	8,5 - 9,5	General purpose inkjet ink set designed for diverse types of paper & board
Unijet TN	●●●●	5,0 - 6,5	8,5 - 9,5	Inkjet ink set designed for absorbing substrates, as e.g tissue, napkins or paper towels

Figure 10: Overview of Siegwerk's water-based inkjet inks

All Unijet inks are suitable for applications with high product safety and regulatory demands, such as indirect food, pharma, or hygiene packaging.

Primer & OVP **for inkjet printing**

In addition to reliable ink solutions, Siegwerk also provides complementary primers and overprint varnishes suitable for the specific print conditions and end-use application. Whether water-based primers for board, folding carton or tissue (UNICOAT), water-based OPV for board (UNILAC) or the different solutions for UV inkjet, in combination with Siegwerk's inkjet inks, they all offer high reliability and quality. Designed for gravure, flexographic or inkjet printing, they open new windows for inkjet printing.

Benefits of **Partnering with Siegwerk**

Siegwerk has a long-term strategic focus on inkjet continuously working on new developments and enhancements with its strategic partners. Based on the company's well-established network along the supply chain, it has a profound understanding of the different needs of printers, print equipment manufacturers, converters, and brand owners. Thereby, the company is able to connect all this to not only support with its packaging and ink know-how but also bring partners together to best leverage the core competencies of each one and jointly develop fit-for-success solutions.

SIEGWERK PARTNERS BENEFIT FROM:

- **Profound knowledge in printing** based on a longstanding successful analogue ink business
- **Well-established products** for **digital printing**
- **Global business presence** and **strong brand reputation**
- **Market access to brand owners & converters,** from small boutiques to large internationals
- Access to a **global network of equipment manufacturers**
- **Sufficient production capacities** to meet the growing demand for digital printing
- Holistic **packaging know-how** and **broad application expertise**
- **State-of-the art testing capabilities** to analyze inks & substrates, including migration risk analysis
- **In-house innovation center** for simulation and test printing on almost all kind of flat substrates using most common printhead technologies
- Expertise in **product safety and regulatory requirements**
- Ability to offer **direct supply to end-users** based on OEM royalty agreements
- Broad range of **complementary analogue inks and coatings** matching with developed inkjet solutions
- Strong focus on the **development of sustainable solutions** in line with a Circular Economy
- Family-owned company structure building on **independence, objectivity, and financial stability**

Thus, Siegwerk is well-positioned to support and guide partners in their move towards digital printing creating the building blocks for a successful journey.

"We are always looking for partnerships to develop ink solutions tailored to a specific equipment and application evolving the benefits of inkjet printing to an increasing number of applications."

Matthieu Carni, Director Inkjet Business at Siegwerk

GET IN **CONTACT**

Are you interested in learning more about Siegwerk's digital printing solutions?

Do you want to start your journey towards inkjet printing, or would you like to discuss a specific application or individual requirement with one of our experts? Then please do not hesitate to contact us via:

contact.inkjet@siegwerk.com

LIST OF FIGURES & IMAGES

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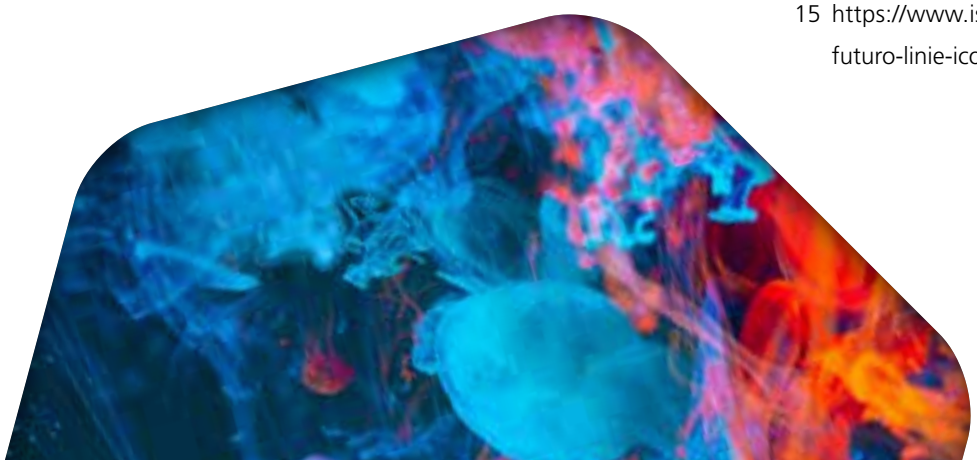

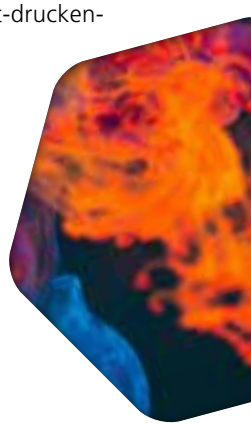

ENDNOTES

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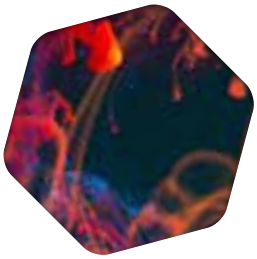

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