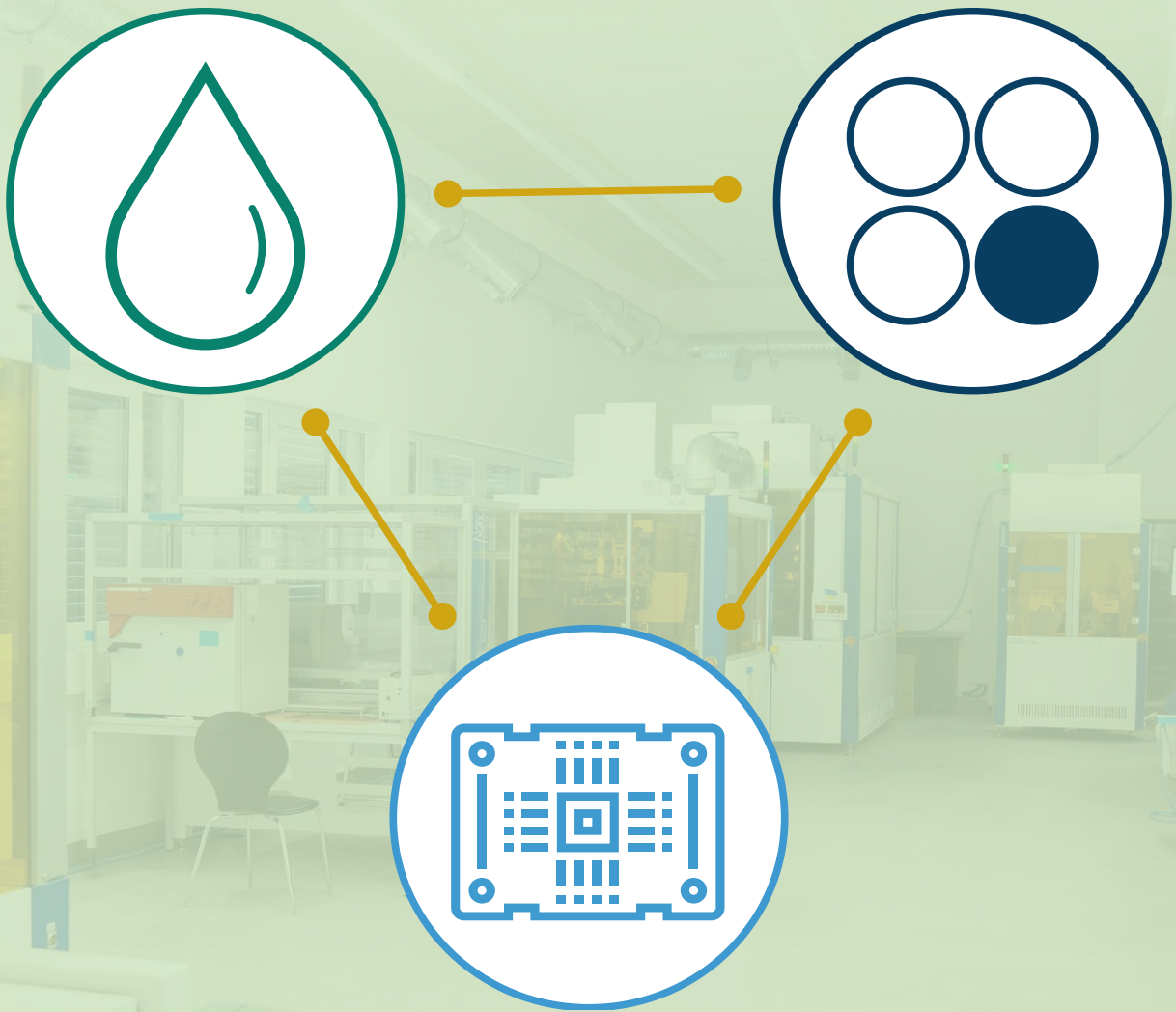


PROCESS  
DEVELOPMENT

*NOTION*  
S Y S T E M S



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WE SCALE INKJET PROCESSES FROM LAB TO FAB

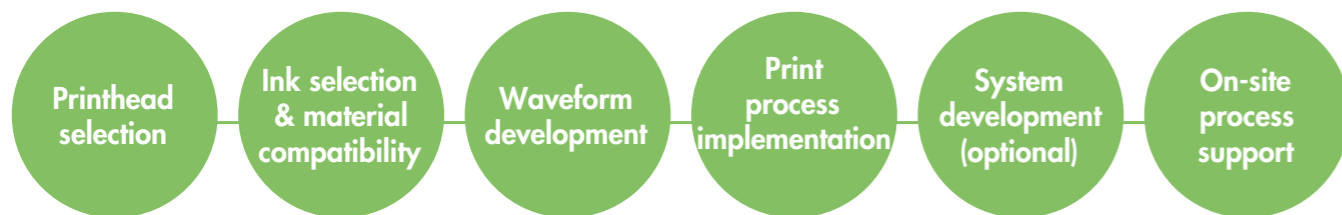
# IMPORTANCE OF PROCESS DEVELOPMENT

**Process development helps optimize various parameters such as:**

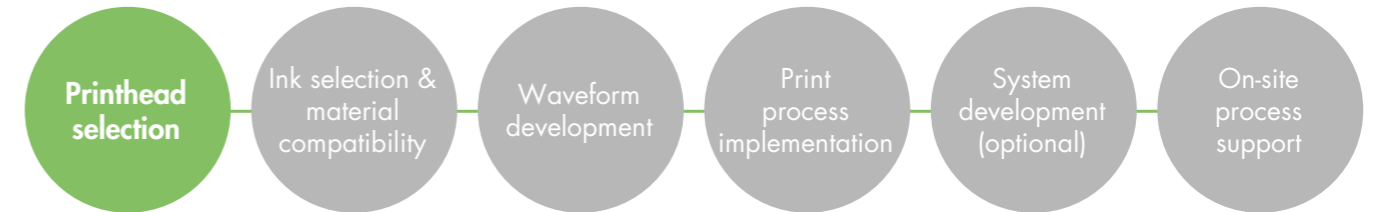
- Ink formulation
- Printhead selection
- Substrate choice
- Substrate preparation
- Printing speed
- Image resolution

By systematically adjusting these parameters, process development can enhance the **printing quality, efficiency, and reliability of inkjet printing.**

This is particularly important for industrial applications, where consistent and high quality printing is required for mass production. Additionally, process development can help **minimize the environmental impact of inkjet printing** by reducing ink and energy consumption and waste generation.



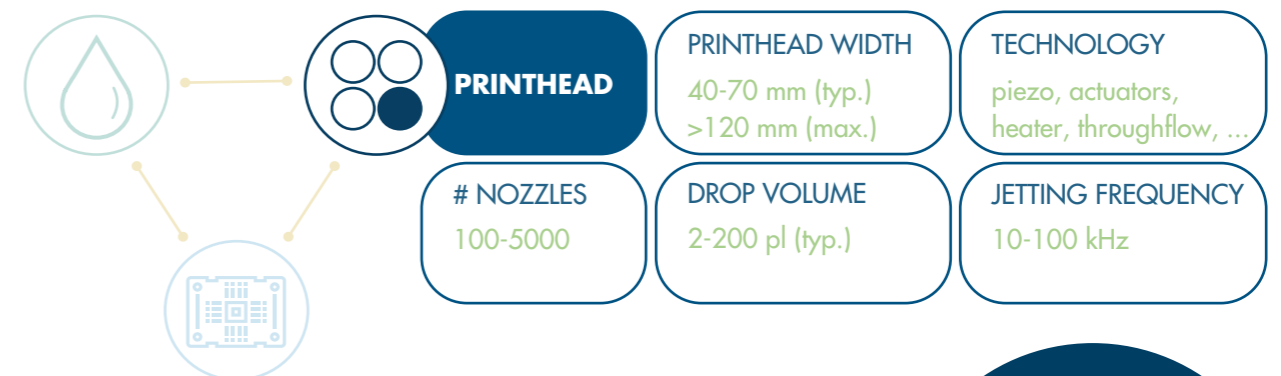
# SCALING PROCESS - PHASE 1



The inkjet print head selection directly affects the quality and speed of the printing process. The print head determines the

- Size of droplets
- Shape of droplets
- Print speed
- Number of nozzles and throughput
- Nozzle configuration

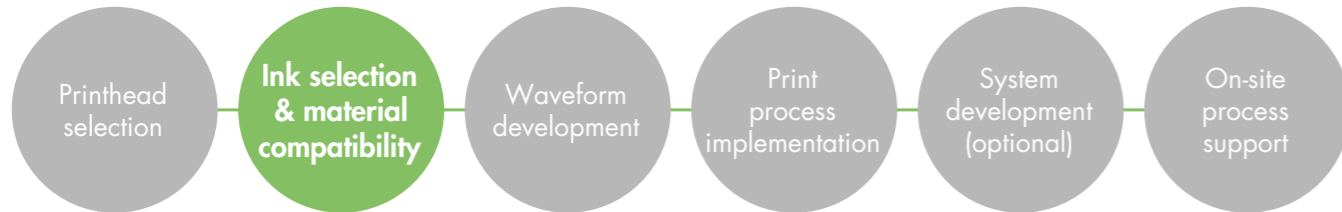
Choosing the right print head can improve **print resolution, accuracy, and overall print quality**, while also increasing printing speed and reducing ink consumption. Therefore, selecting the appropriate inkjet print head is crucial for achieving the desired printing results, as each ink type requires a different specific print head.



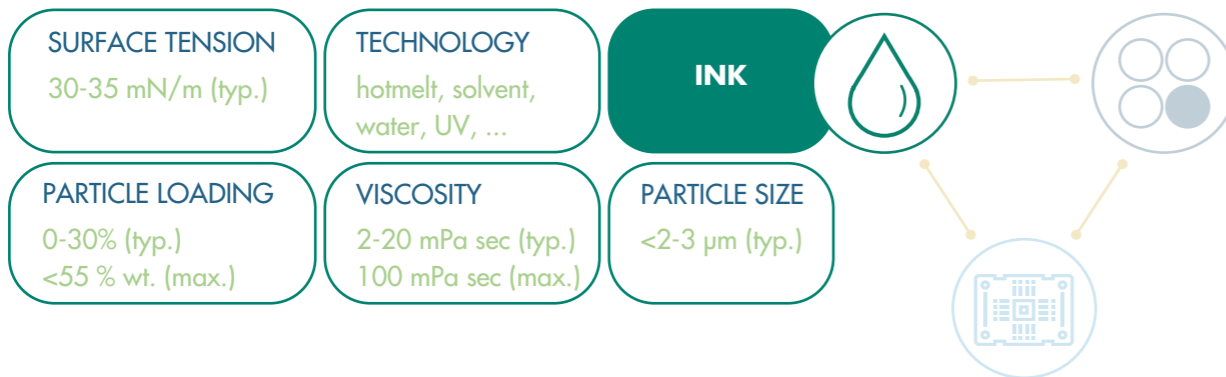
We work with all major printhead manufacturers and select them by application



# SCALING PROCESS - PHASE 2



The material selection and compatibility testing (MCK) helps to ensure that the whole inkjet system including the printhead and ink are compatible, meaning that the ink jets perfectly and produces the desired print results without damage to the individual components.

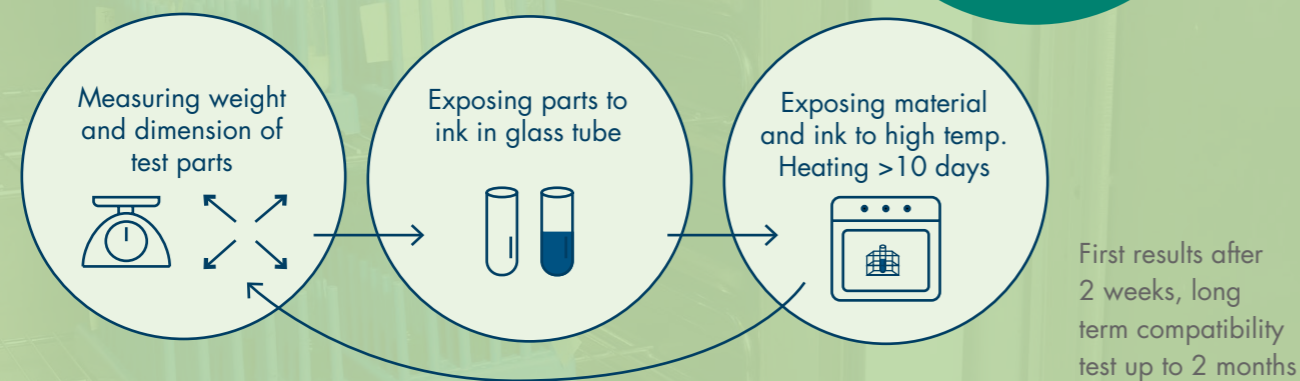


The compatibility of the ink, print head and substrate ensures:

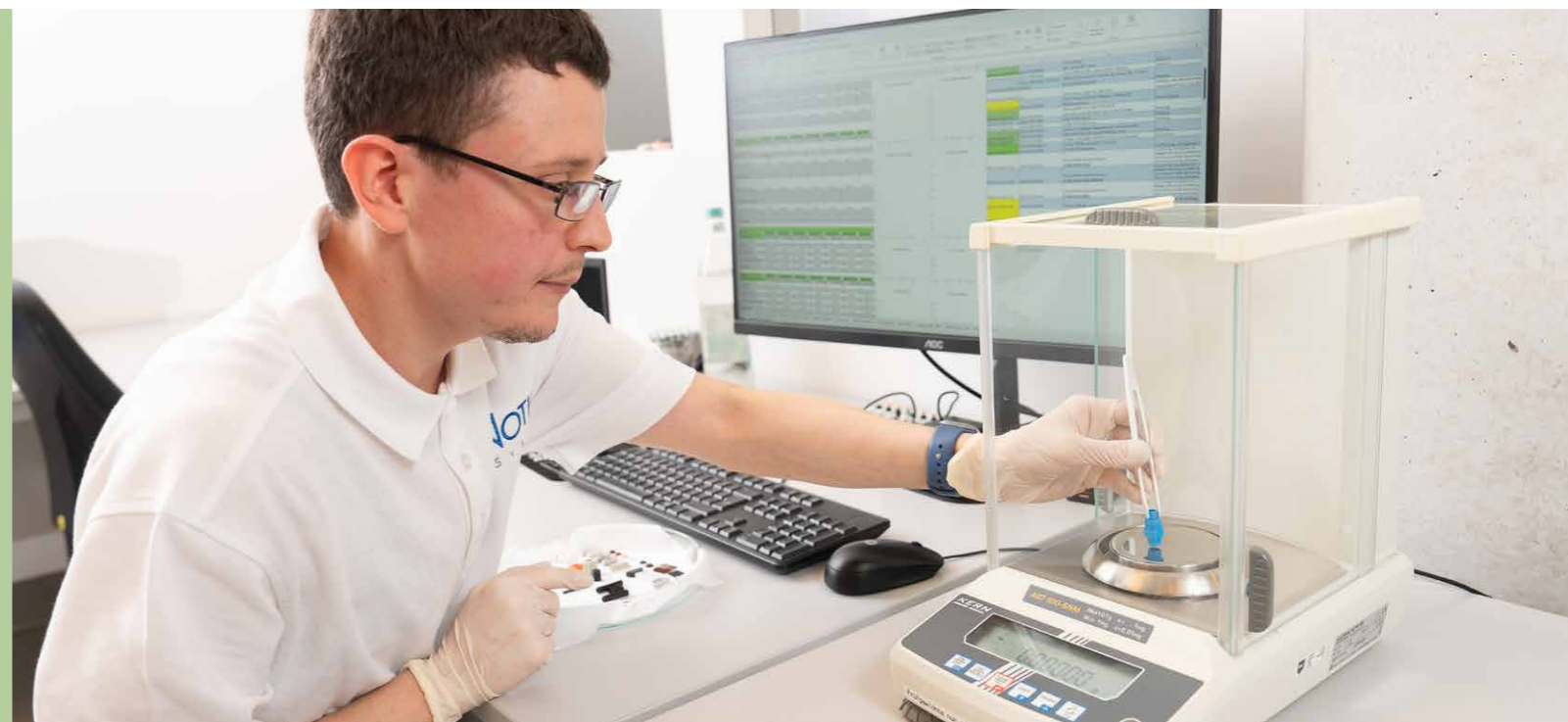
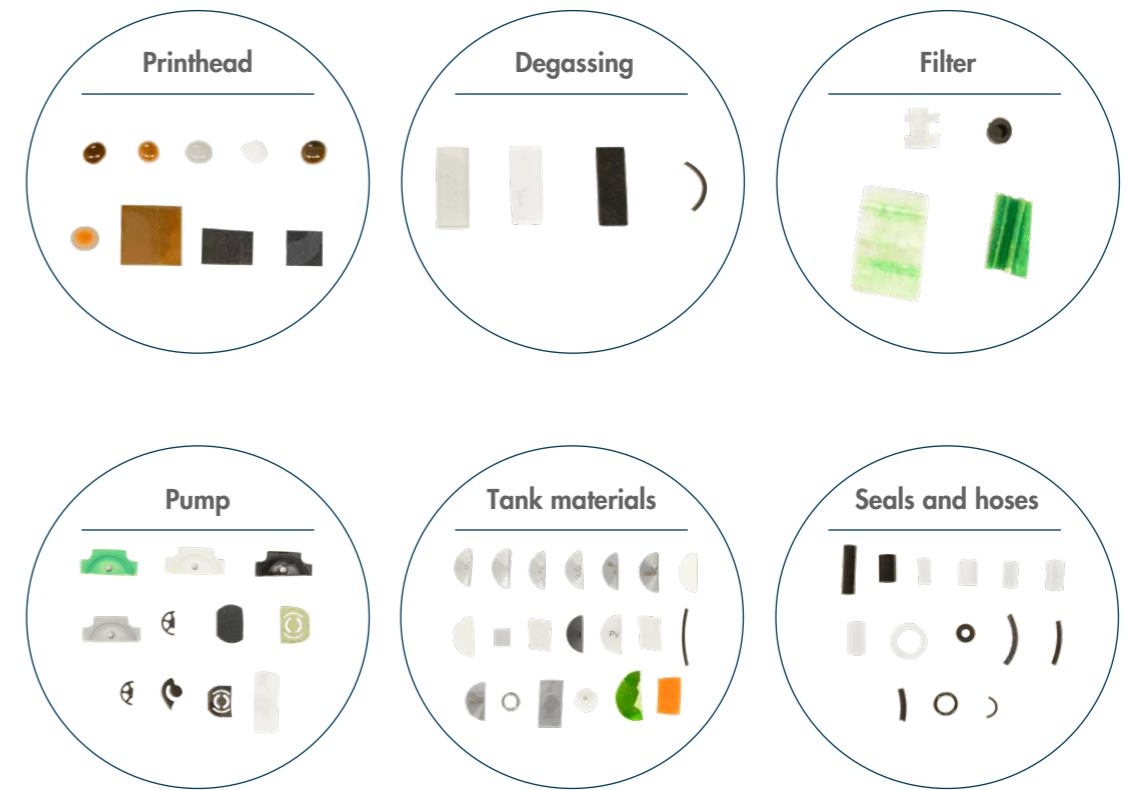
- Selection of compatible parts
- No clogging of nozzles
- Best possible print quality
- Increased durability
- Reduced costs
- Process stability

We test over 50 different kinds of materials for compatibility

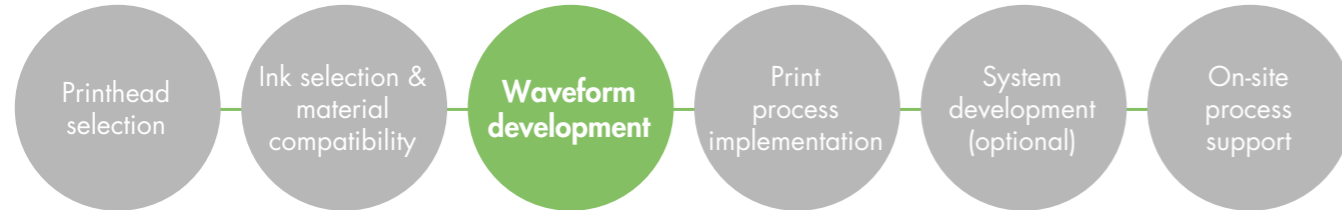
## MCK TEST PROCEDURE



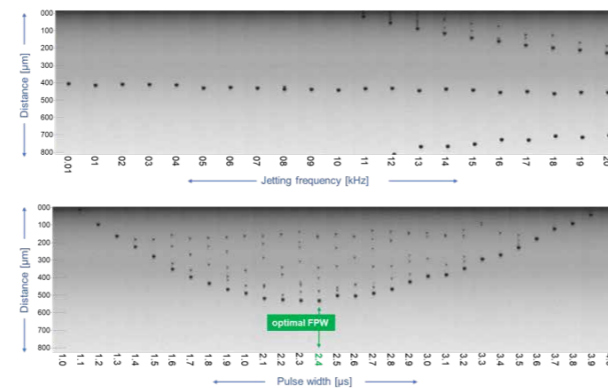
# MCK TEST MATERIALS



## SCALING PROCESS - PHASE 3



The waveform determines the quality of the printed image, the maximum jetting frequency and thus the maximum printing speed. By controlling the waveform, inkjet printers can optimize the drop ejection process to ensure **accurate drop placement, minimal ink spread, and consistent dot size**, which are essential for producing high-quality and precise prints at high production speed.



### Waveform development includes

- Max. jetting frequency & stability
- Production speed

### Fundamental quality parameters

- No satellites or misting
- No wetting of nozzle plate

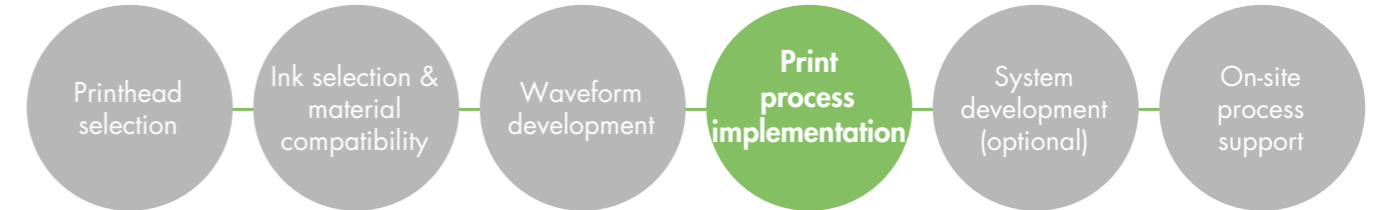
### Advanced quality parameters (fine tuning)

- Drop velocity
- Drop volume

Fully integrated Notion drop watch system **n.jet** dropwatch



## SCALING PROCESS - PHASE 4



Print process implementation is an essential step for transforming a proof-of-concept lab grade process to a stable process ready for high throughput mass production. Through the utilization of printed samples, we can fine tune the process in all key aspects of the inkjet process from the ink formulation to the ink deposition and the substrate preparation which guarantees optimal results for your process.

This is achieved through full control over both hardware and software which allows us to adjust every aspect of the print process and makes the full process implementation possible. Your custom process is implemented and transformed to fit any of our solutions which allow the step in your inkjet journey from lab machine to a fully automated and integrated platform.

### Proof of concept

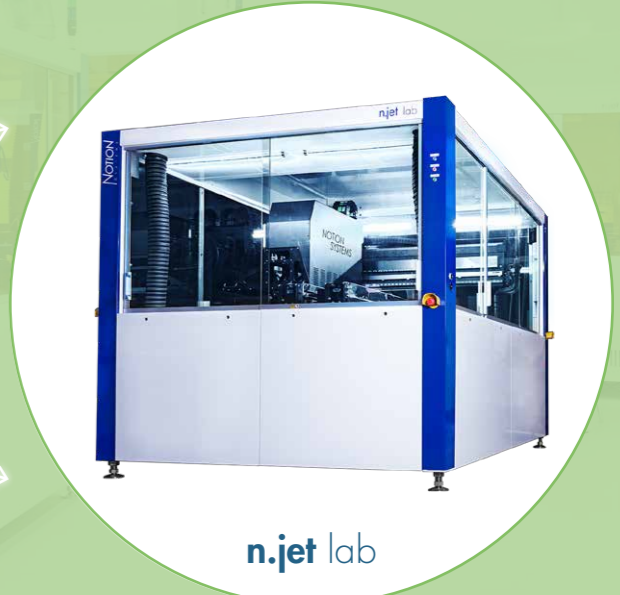
- Production of samples
- Adjustment of printing strategies

### Process tuning includes

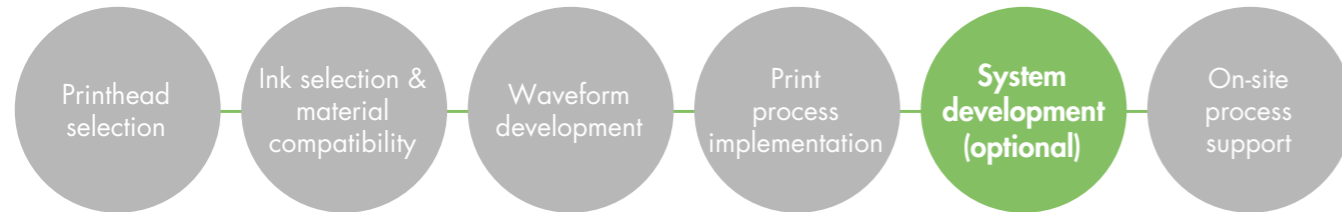
- Implementation of all parameters
- Nozzle calibration
- Jetting quality of all nozzles
- Dot position for all nozzles
- Dot size on substrate



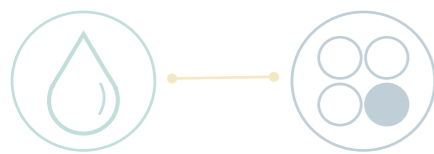
Scale-up



## SCALING PROCESS - PHASE 5

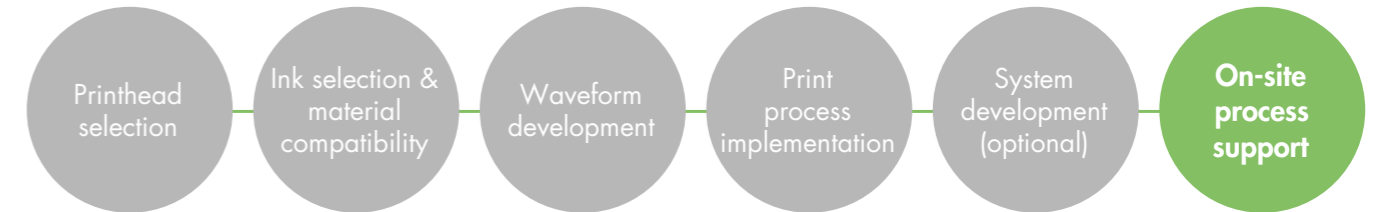


Process development is followed by system development. During system development, Notion Systems defines the system configuration based on the developed processes, e.g., selected printheads, ink, ink carrier materials and upstream and downstream processes. The modular system concept supports fast implementation and plays an important role by allowing easy scaling of the system for the optimal industrial production solution.



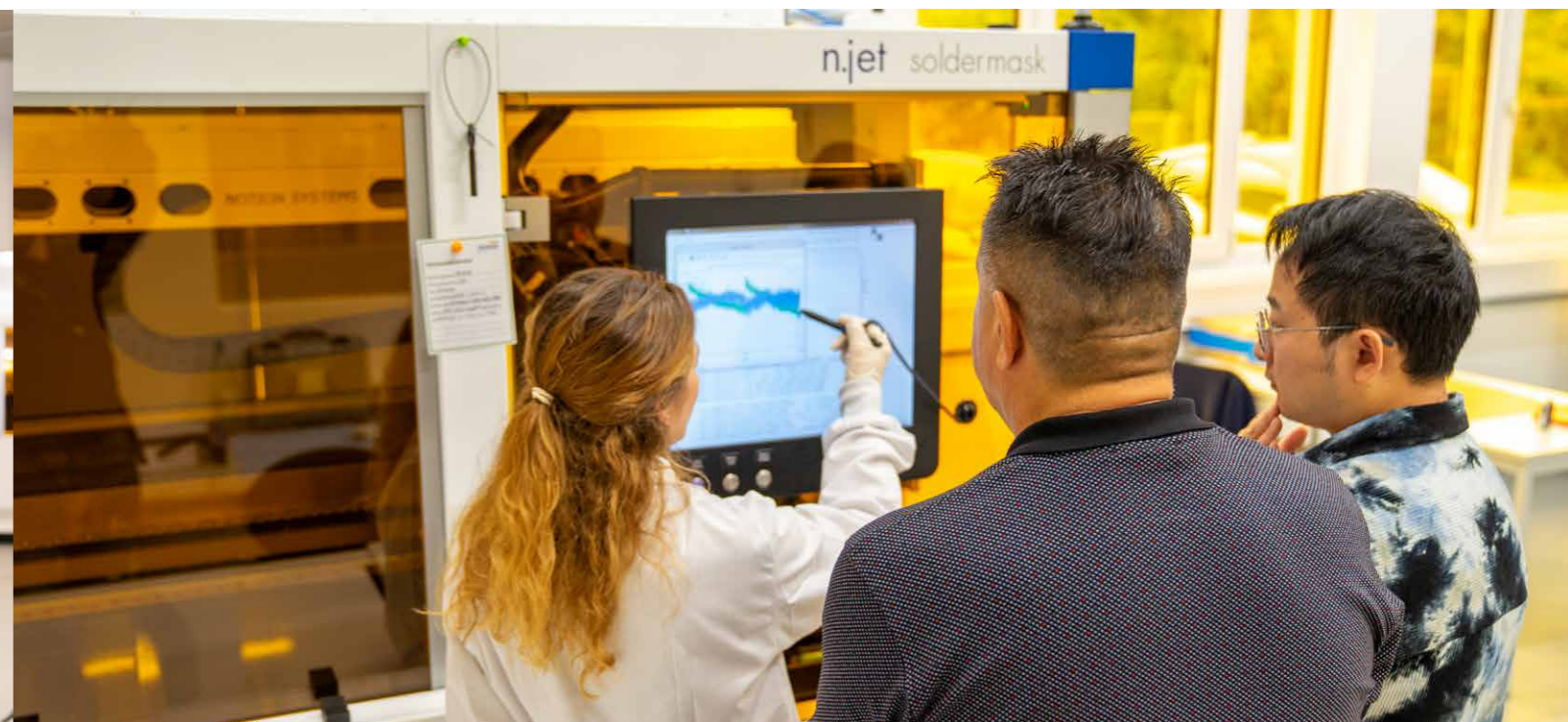
<b>SUBSTRATE &amp; INTEGRATION</b>	<b>SUBSTRATE SIZE</b> <600 mm (typ.) >2000 mm (on req.)	<b>RESOLUTION</b> 10-20 $\mu\text{m}$ (typ.) <1 $\mu\text{m}$ (max.)	<b>FEATURE SIZE</b> 30-300 $\mu\text{m}$ (typ.) ~20 $\mu\text{m}$ (min.)
	<b>PRINT VELOCITY</b> 300-600 mm/s (typ.) >2000 mm/s (on req.)	<b># PRINTHEADS</b> 4-9 (typ.) >25 (on req.)	<b>POSITIONING ACCURACY</b> <10 $\mu\text{m}$ (typ.) <5 $\mu\text{m}$ (min.)

## SCALING PROCESS - PHASE 6



### Notion Systems supports

- During process implementation
- On-site or remotely in ramping-up the production
- Stabilizing and improving the process and yield
- Process improvements
- Different kind of maintenance programs



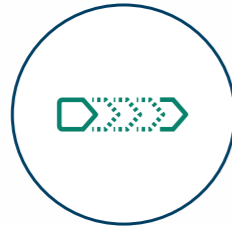
# KEY DRIVERS FOR OUR BUSINESS

Inkjet is a non-contact, digital printing technology which creates fine structures of down to 20 µm and processing without screens or mask. The fully digital non-contact printing enables wet-on-wet processing without the need for masks or screens.

Inkjet is used to replace established subtractive process sequences and reduces waste and energy consumption, which makes electronics production more economical and ecological.

## ECONOMICAL DRIVERS

REDUCED  
PROCESS STEPS



HIGHER  
YIELD



REDUCED ENERGY  
CONSUMPTION



FASTER  
TURNAROUND



REDUCED  
MATERIAL WASTE



## TECHNICAL DRIVERS

CONTACTLESS  
DIGITAL PRINT



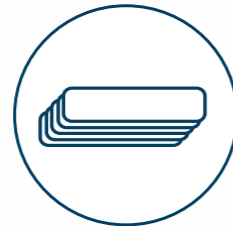
PRINT ONLY  
WHERE REQUIRED



PRINT MULTIPLE  
MATERIALS



PRINT MULTIPLE  
LAYERS



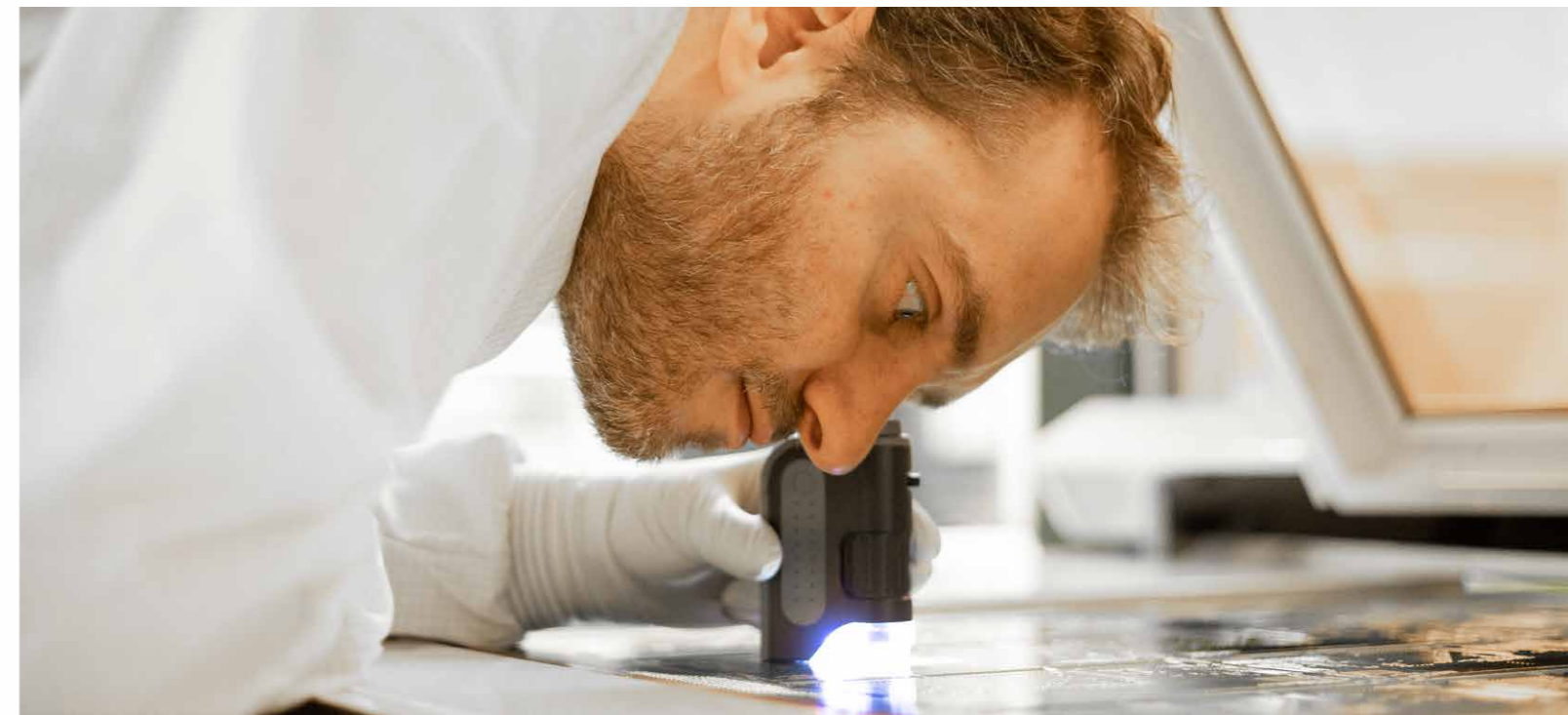
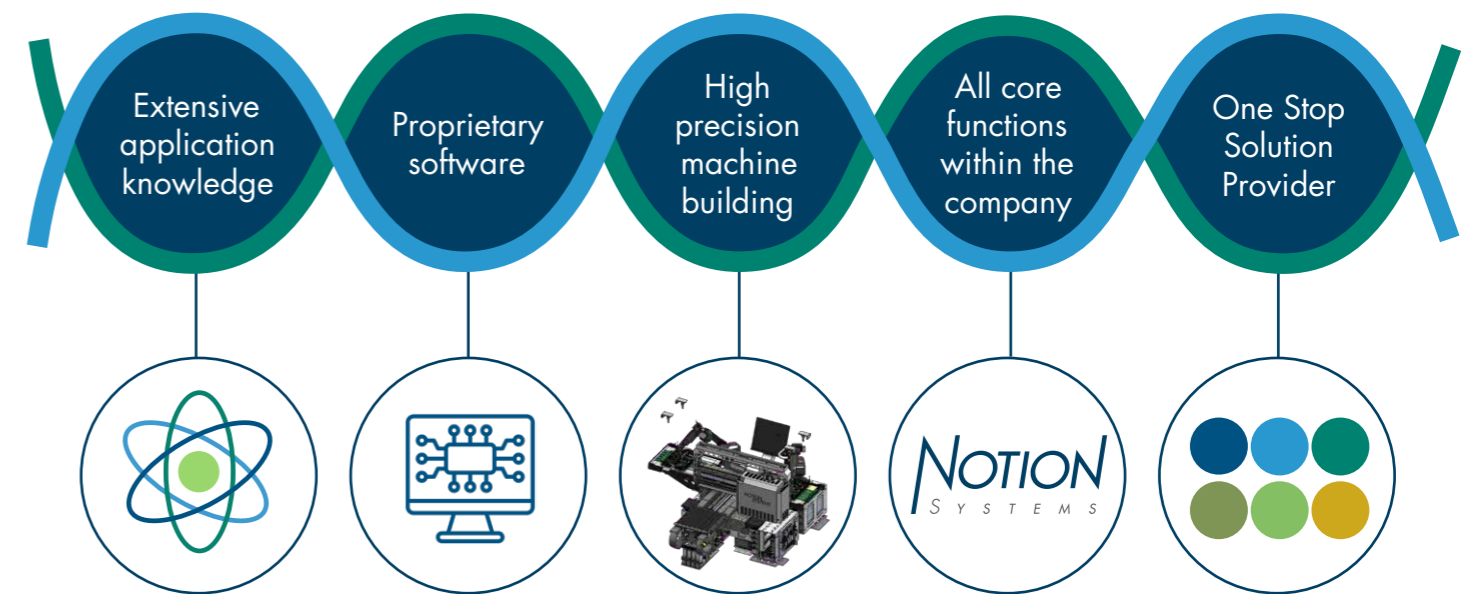
WET-ON-WET  
PROCESSING



# OUR DNA IS INKJET

Developing high-quality inkjet systems, custom software and stable inkjet processes is a complex assignment that requires advanced expertise in a range of technical areas.

Inkjet printing is our passion and we brought together a range of experts in the field of process development, software and engineering to develop tailor-made inkjet systems for functional materials with the highest standards.



# NOTION

S Y S T E M S



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