WHO WE ARE

OLED technology has re-defined the digital screen. Vivid color and remarkable image quality came first. Now, it's flexible OLEDs. Ultra-thin and feather-light displays that give extraordinary reach to consumer product design innovation.

Kateeva re-imagined inkjet as the ideal OLED mass-production equipment solution. We developed the world's first inkjet printer specifically to manufacture OLEDs in high volume. Our equipment innovation helped speed the adoption of OLED technology.

Service Offerings

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OUR SERVICE OFFERINGS

FIELD SUPPORT

It starts with world-class expertise. That's how we help customers mass produce display technologies quickly and with high yields. It's also how we work with our partners. Anticipating manufacturing challenges calls for a deep understanding of how equipment, inks and process integration interact, and how the interactions influence production performance. That's why at our technology development centers in Silicon Valley and XX (China) and at mass-production sites, our team of experts in advanced print technology, process engineering, and print software collaborate closely with customers and partners to solve difficult problems fast and efficiently.

The same world-class expertise extends to our regional support centers where local service and applications engineers are trained to respond fast to field issues. Kateeva's industry-leading system uptime record is thanks to superior printer design and the novel algorithms that optimize print-head and ink performance, as well as a comprehensive preventive maintenance program.

SERVICES

Kateeva printers are comprised of 1000s of precision parts sourced from a vast network of global suppliers. To help our flat panel display customers meet their productivity, performance, and cost goals, we offer comprehensive service plans.

When you have a comprehensive service plan with Kateeva, our commitment extends way beyond installation and field support; it's a deep engagement that merges best-in-class expertise and extends throughout the lifecycle of your Kateeva printer.

Kateeva technology experts are routinely found at our customer sites providing technical guidance on integration issues, assessing the rigorous manufacturing imperatives of emerging applications, or exchanging ideas on inkjet's capability to enable a new display technology.

World Class Support – Service Contract Offering

Options		Billable	Engineer On Site	Labor Only	Full Service
Response	Phone Response	Based on availability	On Site	2 hour	2 hour
	Onsite Response	Based on availability	On Site	4 hour	4 hour
	Escalation Report	No	Yes	Yes	Yes
Coverage	Duration	5d x 8h	7d x 24hr	7d x 24hr	7d x 24hr
	Preventive Maintenance	No	Yes	Optional	Optional
	Backfill	No	Optional	Yes	Yes
	Travel Expenses	No	Local Only	Yes	Yes
Parts	Diagnostic	No	No	Optional	Yes
	Repair	No	No	No	Yes
	Consumables	No	No	No	Optional
	Consigned Inventory	Optional	Optional	Optional	No
Field Change Orders	Safety Updates	No	Optional	Optional	Yes
	Software Updates	No	Optional	Optional	Yes
Other	Performance Contract	No	No	No	Optional
	Ink	Optional	Optional	Optional	Optional
	Applications Support	Optional	Optional	Optional	Optional
	Upgrades	No	No	No	No

Software Upgrades Offerings

FLEX PLUS I Software Package		
Feature	**Description**	**Benefits**
6pL Printhead	• Process window 1: 2-10 µm • Process window 2: 10-16 µm	• Enable narrow bezel • Enable thinner and flexible panel • Uniformity improvement • Enable more linear panel edge line • Wide film thickness process window
Printpack Auto Theta-Z	• Theta-Z adjustment happens automatically with one button	• Improve uptime (improve efficiency of calibration procedures) • Reduce risk of misprocessing • Ensure procedures are performed regularly at the right time • Reduce labor costs (through automation)
Auto Waveform Tuning	• Auto-tuning	
Edge Compensation	• User friendly UI to define Edge profile • Customer to control and implement the Edge profile • Up to 3 custom Gradients	• Allows precision control of panel edges
Arbitrary Shape	• Customer can input any shape contour in DWG or PDF format	• Enable next generation display shapes and process

AUTO BIDI Software		
Feature	**Description**	**Overall Benefits**
Auto BIDI	• Automatically determine bidirectional print offset	• Reduce risk of misprocessing • Improve user operation efficiency and reduce labor costs

MTAP		
Feature	**Description**	**Benefit**
MTAP 5 Layer	• Multi-Thickness Area Printing (MTAP) feature enables the printing of 5 thicknesses and edge compensations within a single TFE film	• Customize multiple “layers” of processes within the same Sub-panel • Enables multiple edge compensations on a single subpanel • Enables multiple thicknesses a single subpanel
MTAP 3 Layer	• Multi-Thickness Area Printing (MTAP) feature enables the printing of 3 thicknesses and edge compensations within a single TFE film	

FLEX PLUS II		
Feature	**Description**	**Overall Benefits**
Auto RDI Scheduling	• Automatic maintenance operations • Time based • Substrate based	• Improve uptime (improve efficiency of calibration procedures) • Reduce risk of misprocessing (ensure procedures are performed regularly at the right time) • Improve user operation efficiency and reduce labor costs (through automation)
Auto DMU Scheduling		
Auto Prime & Blot or Blot Scheduling		
Printpack Auto Theta-Z Period Maintenance		

Software Feature Description

1. Flex Plus I

Introducing FLEXPLUS

- Enabling the next generation OLED display in TFE InkJet Printing – Thinner, Sharper, and Smoother with highly productive IJP process

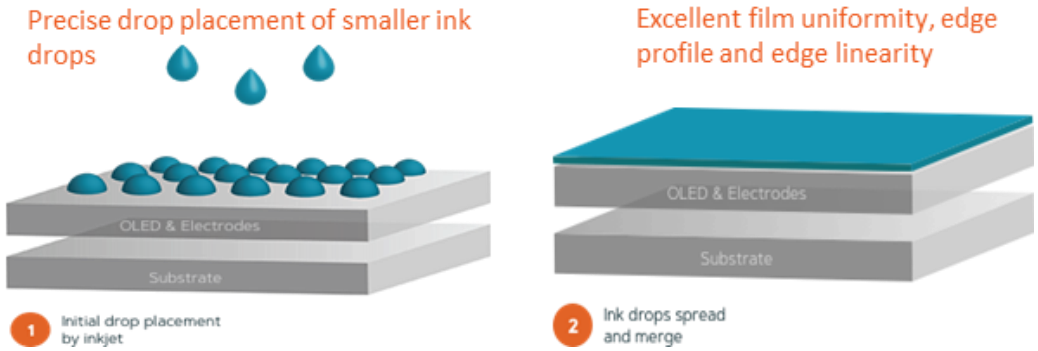
New hardware/software upgrade for existing TFE tools to enable the printing of sharper edge definition, enhanced tool automation/productivity and thinner coating support

- Increase reliability and repeatability with advanced SW features
- Thin film printing capability down to 2um
- Thickness uniformity and edge width

improvement for thin films

- Improve edge linearity
- Easier and more accurate printer setup
- Improve key setup time as much as 98%

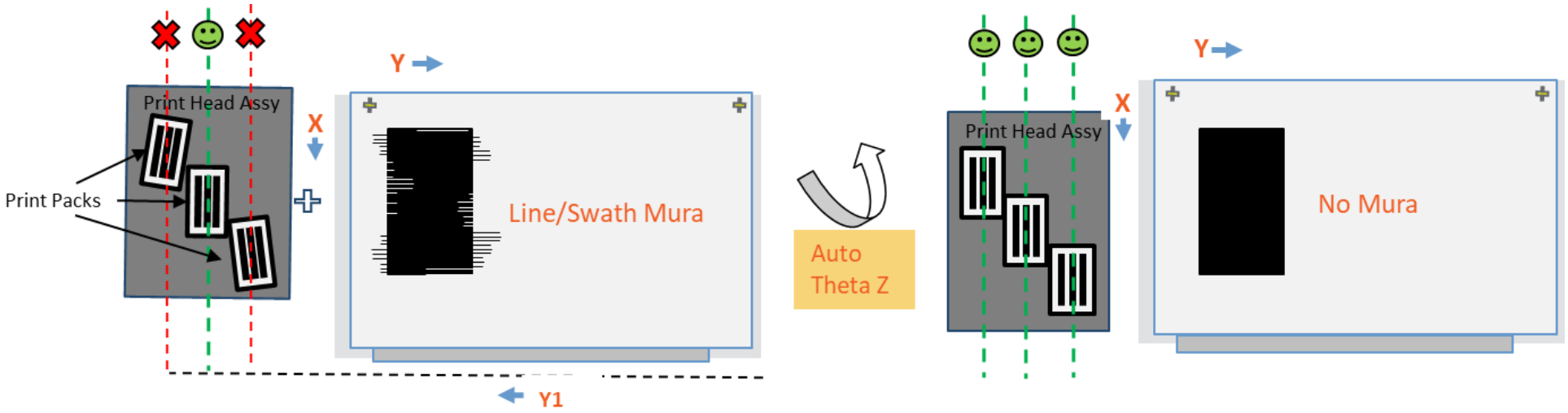
(e.g. Auto Waveform Tuning)



A. Print Pack Auto Theta-Z (Lassen Only)

SW Upgrade	Past	New Capability
Printpack Auto Theta-Z (For YIELDjet FLEX 1500 only)	•Manual or purchase option	•Applicable for both 10pL and 6pL Printhead Printpacks •Theta-Z adjustment happens automatically with one button •Significantly reduce calibration time to 10 minutes •Elimination of operator error/inconsistency

- Printpacks may not be parallel with the X axis which may result in distorted printing (e.g.,. After blotting)
- Previously time-consuming manual adjusting process needs to be conducted to ensure accurate printing
- Auto Theta-Z automatically complete motorized adjustment on Printpacks for optimized printing result with one click

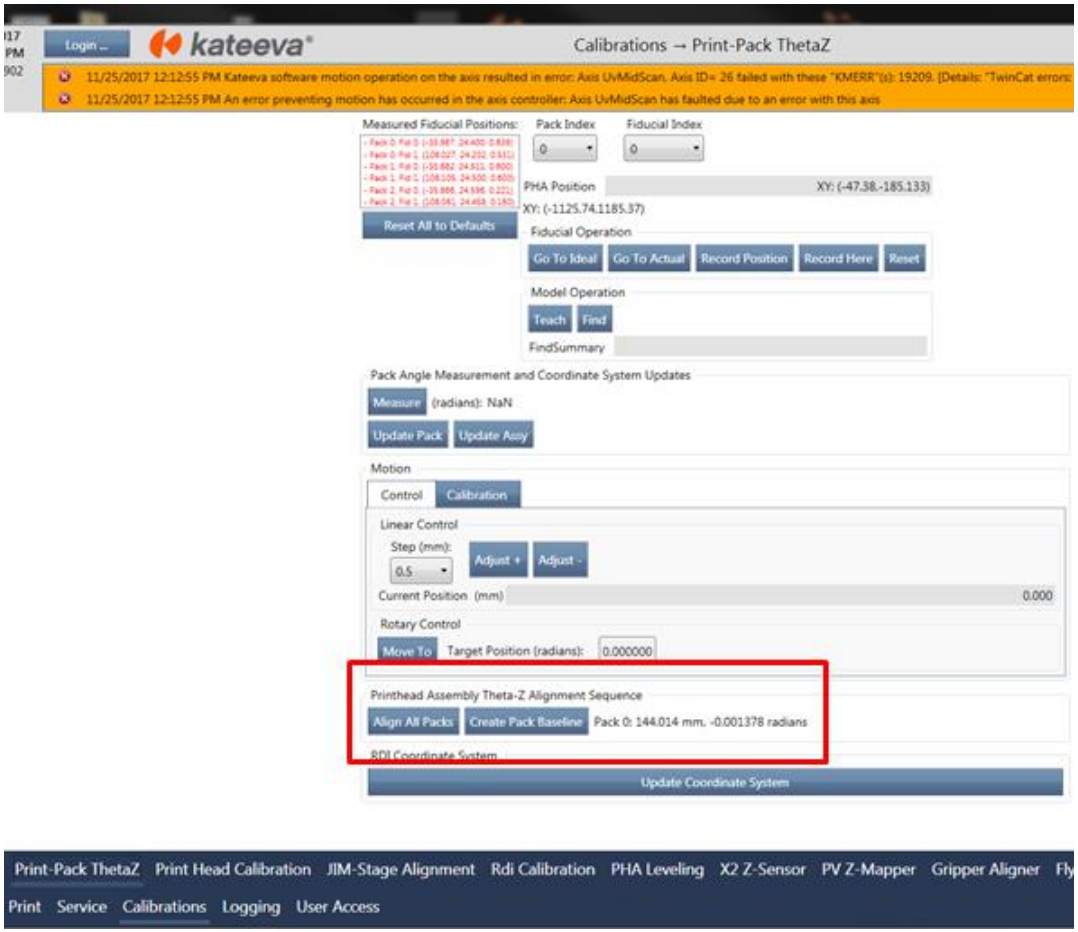


Automate process for theta-Z adjustment of Printpacks

- ✓ Recommended to be run once per day
- ✓ Significantly reduces calibration time by **300 hours*** per year
- ✓ Virtually eliminate operator errors
- ✓ Increase system up-time

Theta Z calibration recommends to be run once per day (during PM) and it takes an average of 1 hour.
Auto theta z's calibration time is 10 minutes.

Time saved: 365days*50mins ≈ 300 hours per year

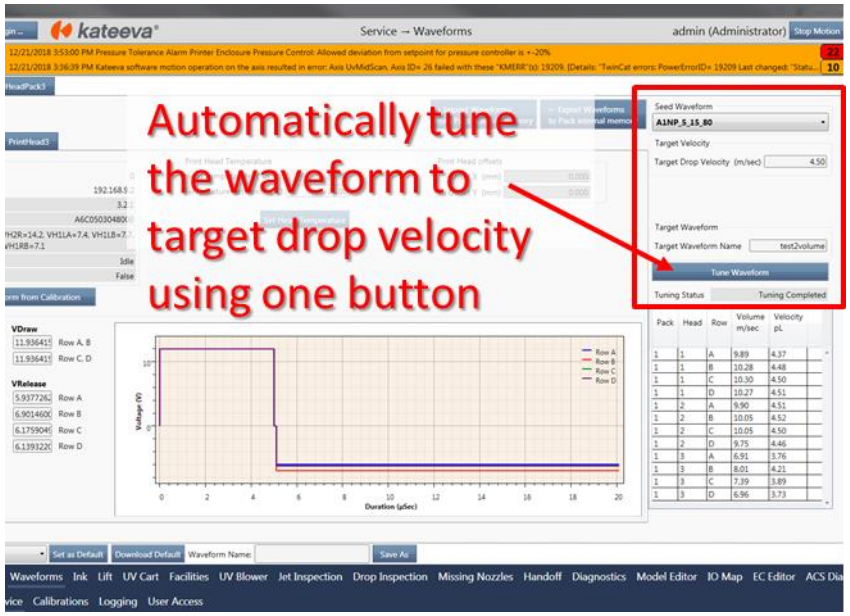


B. Auto Waveform Tuning

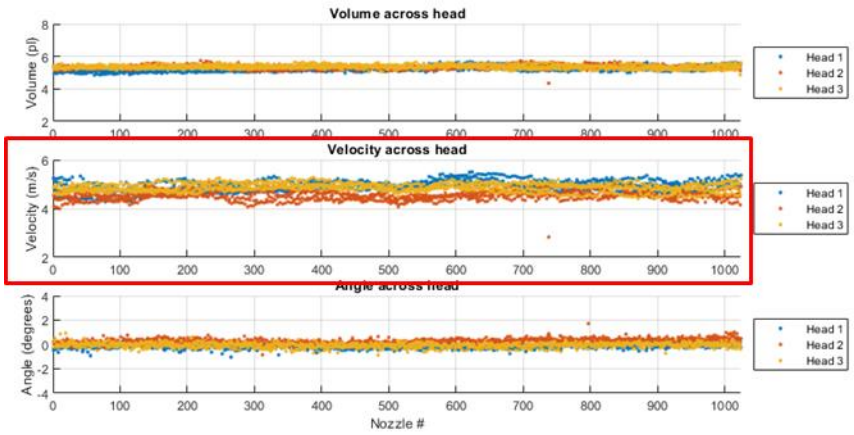
SW Upgrade	Current Capability	New Capability
Auto Waveform Tuning	•Default and Un-tuned Waveform	•Applicable for both 10pL and 6pL Printhead Printpacks •Automatic Waveform Tuning •Significantly reduce tuning time to 15 minutes

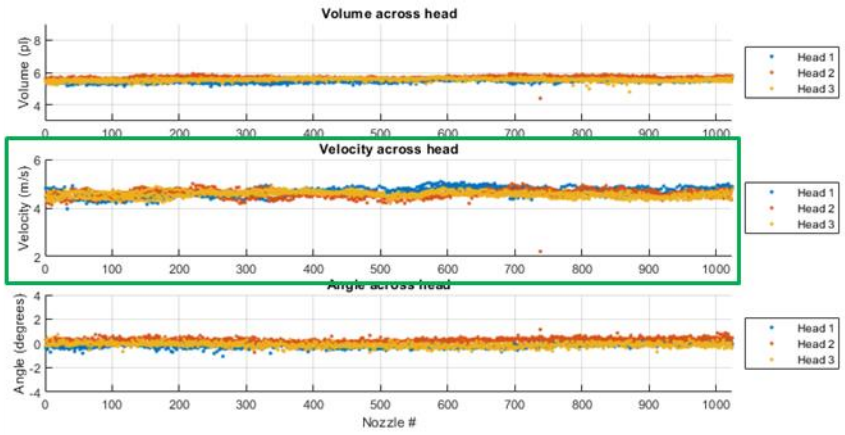
System will tune printhead waveforms automatically

- ✓ Significant time savings compared to manual tuning
- ✓ Reduction of operator error
- ✓ Increased tuning accuracy
- ✓ Improving the consistency



Auto Waveform Tuning Example



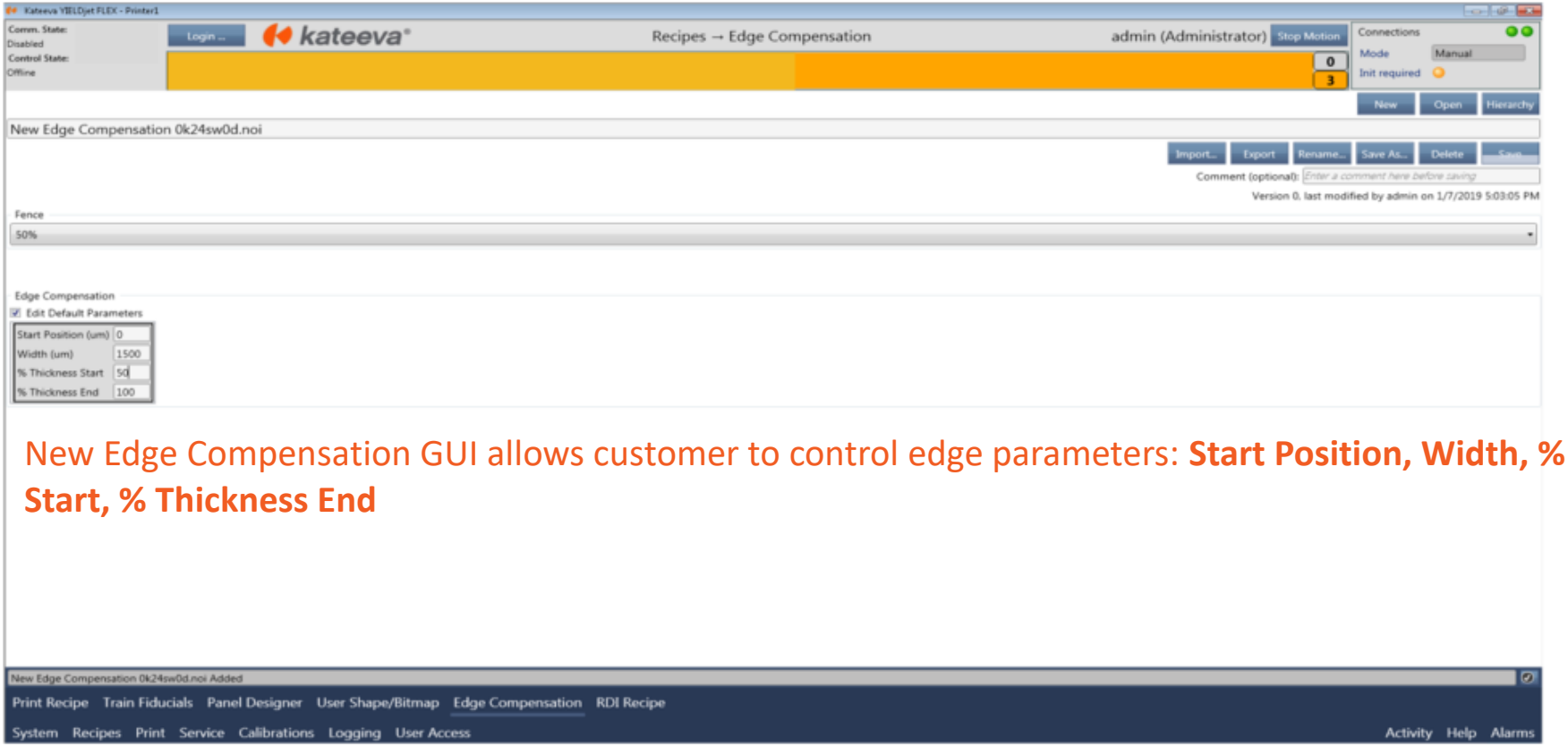


Condition	Head 1 Velocity Mean	Head 2 Velocity Mean	Head 3 Velocity Mean	Average Velocity Delta
Before WF tuning	4.93 m/s	4.54 m/s	4.87m/s	0.26m/s
After WF tuning	4.64 m/s	4.59 m/s	4.56m/s	0.05m/s

Auto Waveform Tuning will automatically tune velocity across head to achieve **best printing quality**

C. Edge Compensation and Fence GUI

SW Upgrade	Current Capability	New Capability
Edge Compensation and Fence GUI	•Only accessed by Kateeva or purchase item	•Applicable for both 10pL and 6pL Printhead Printpacks •User friendly UI to define Edge profile •Customer to control and implement the Edge profile



New Edge Compensation GUI allows customer to control edge parameters: **Start Position, Width, % Thickness Start, % Thickness End**

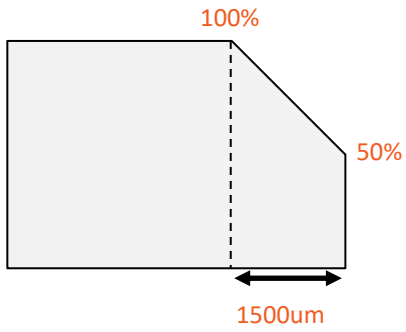
Edge Compensation Examples

Example #1

Edge Compensation

Edit Default Parameters

Start Position (um)	0
Width (um)	1500
% Thickness Start	50
% Thickness End	100

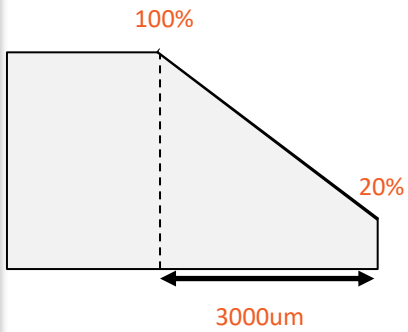


Example #2

Edge Compensation

Edit Default Parameters

Start Position (um)	0
Width (um)	3000
% Thickness Start	20
% Thickness End	100

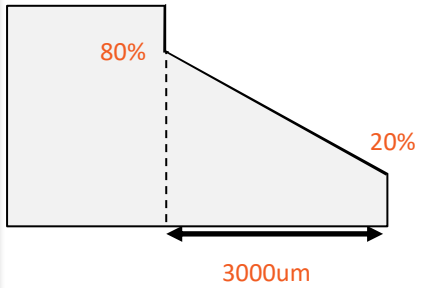


Example #3

Edge Compensation

Edit Default Parameters

Start Position (um)	0
Width (um)	3000
% Thickness Start	20
% Thickness End	80

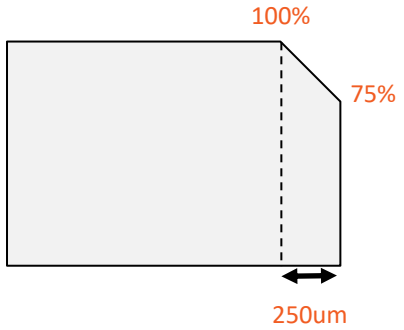


Example #4

Edge Compensation

Edit Default Parameters

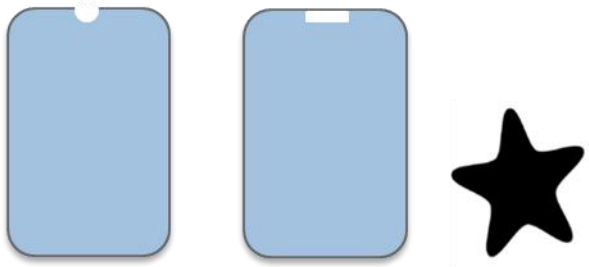
Start Position (um)	0
Width (um)	250
% Thickness Start	75
% Thickness End	100

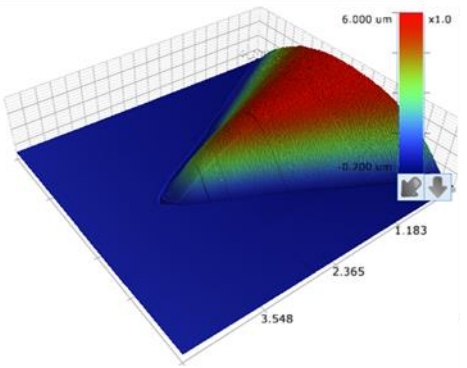


D. Arbitrary Shapes

SW Upgrade	Current Capability	New Capability
Arbitrary Shapes	• Print Rectangular or Rounded Rectangle shapes	• Print any arbitrary shape, allowing for unlimited tuning of display shapes and features

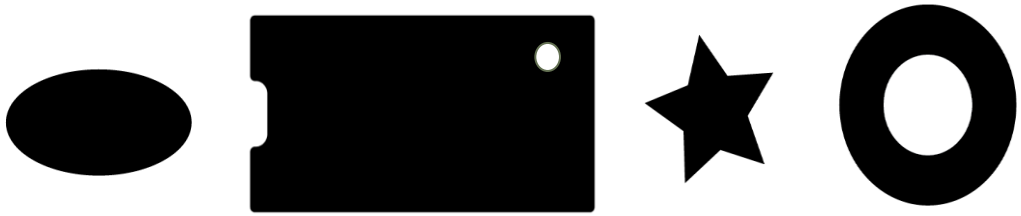
- YIELDjet software make it easy for the user to define variable patterns on the same glass with single and multiple sub-panel type layout
  - Auto layout of sub-panel matrix
  - Each sub-panel can be different
  - Can have different shaped panels on the same glass
- User shape can be imported as DWG or PDF
  - User shape edit functions allow iterative adjustments to optimize the shape:
  - Capability to print all importable shapes
- Unique SW architecture enables the flexibility to meet any customer requirement in mass production





Kateeva's system software makes it easy to define arbitrary print shapes

- The ability to define a non-rectangular area in which to place ink.
- The ability that within a non-rectangular or within a rectangular/rounded rectangular inked area to define areas that will not be inked within the inked area.
  i.e., You can print a doughnut or a display where you want not to ink an interior area.

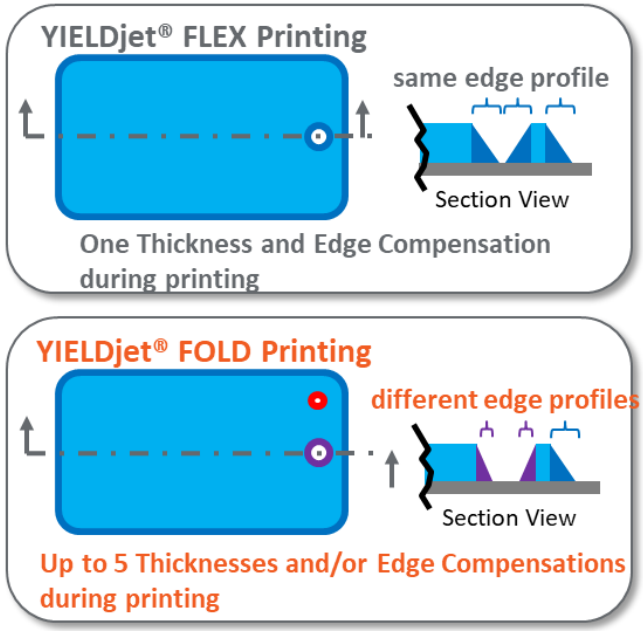


- The ability to select each shape and set process recipe. User can define:
  - ✓ Thickness & thickness calibration by shape position on the panel. One per shape/sub-panel.
  - ✓ The edge compensation to be applied to all the edges, external and internal, within a shape.
  - ✓ Grow and trim all edges of the shape.
    - No longer controlled by side as in rectangles since there is no “sides” to an arbitrary shape

2. MTAP (Multi-Thickness Area Printing)

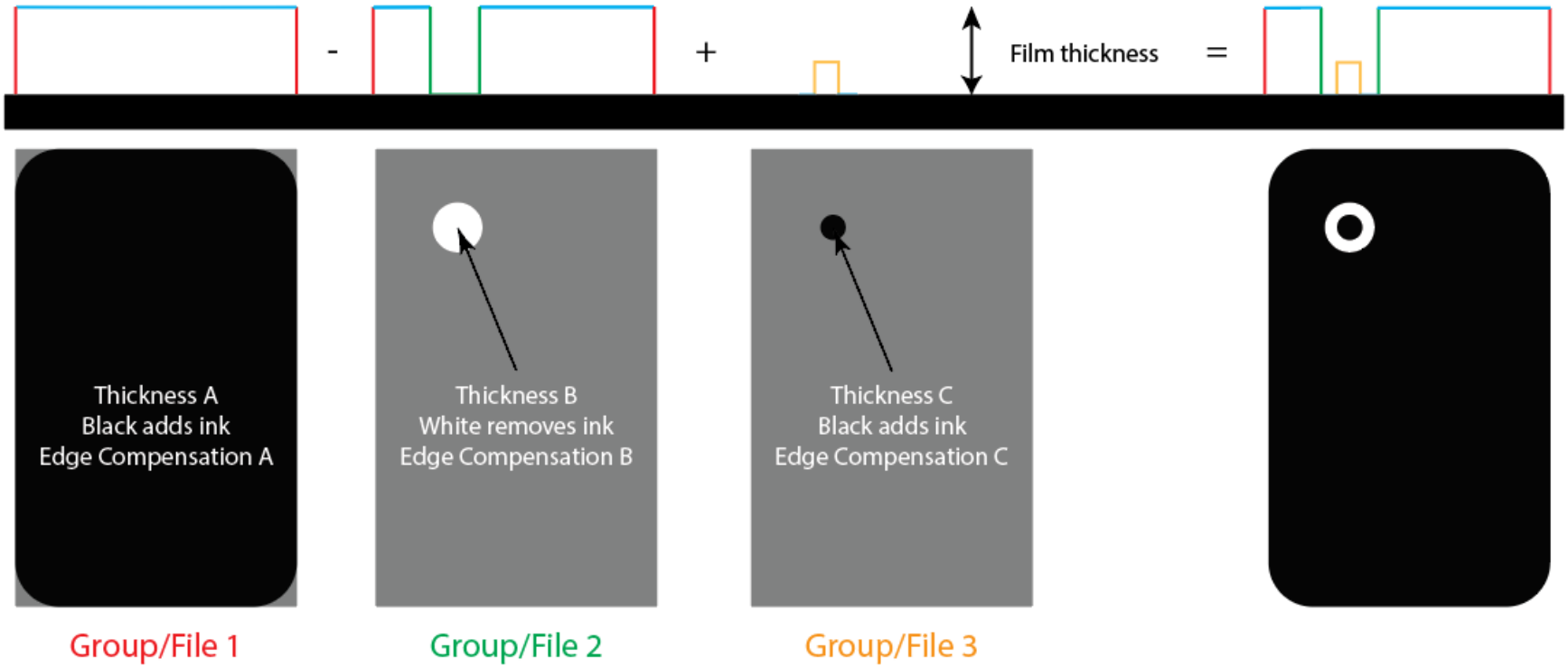
Feature	Past	Now	Benefit to Customer
MTAP 5 Layer	• DTAP	• Multi-Thickness Area Printing (MTAP) feature enables the printing of 5 thicknesses and edge compensations within a single TFE film	• Customize multiple "layers" of processes within the same Sub-panel • Enables multiple edge compensations on a single subpanel • Enables multiple thicknesses a single subpanel
MTAP 3 Layer	• DTAP	• Multi-Thickness Area Printing (MTAP) feature enables the printing of 3 thicknesses and edge compensations within a single TFE film	• Customize multiple "layers" of processes within the same Sub-panel • Enables multiple edge compensations on a single subpanel • Enables multiple thicknesses a single subpanel

- Multi-Thickness Area Printing (MTAP) feature enables the printing of multiple thicknesses and edge compensations within a single TFE film for a single sub-panel empowering more advanced panel designs.
- MTAP is based on Kateeva's proprietary arbitrary shape technology.
- Users generate their input directly from the CAD files of their displays.
    - MTAP allows for up to the use of five different input files per sub-panel to control the different thickness or edge compensation changes within the film.
- Supported within Kateeva's user friendly recipe generation process.



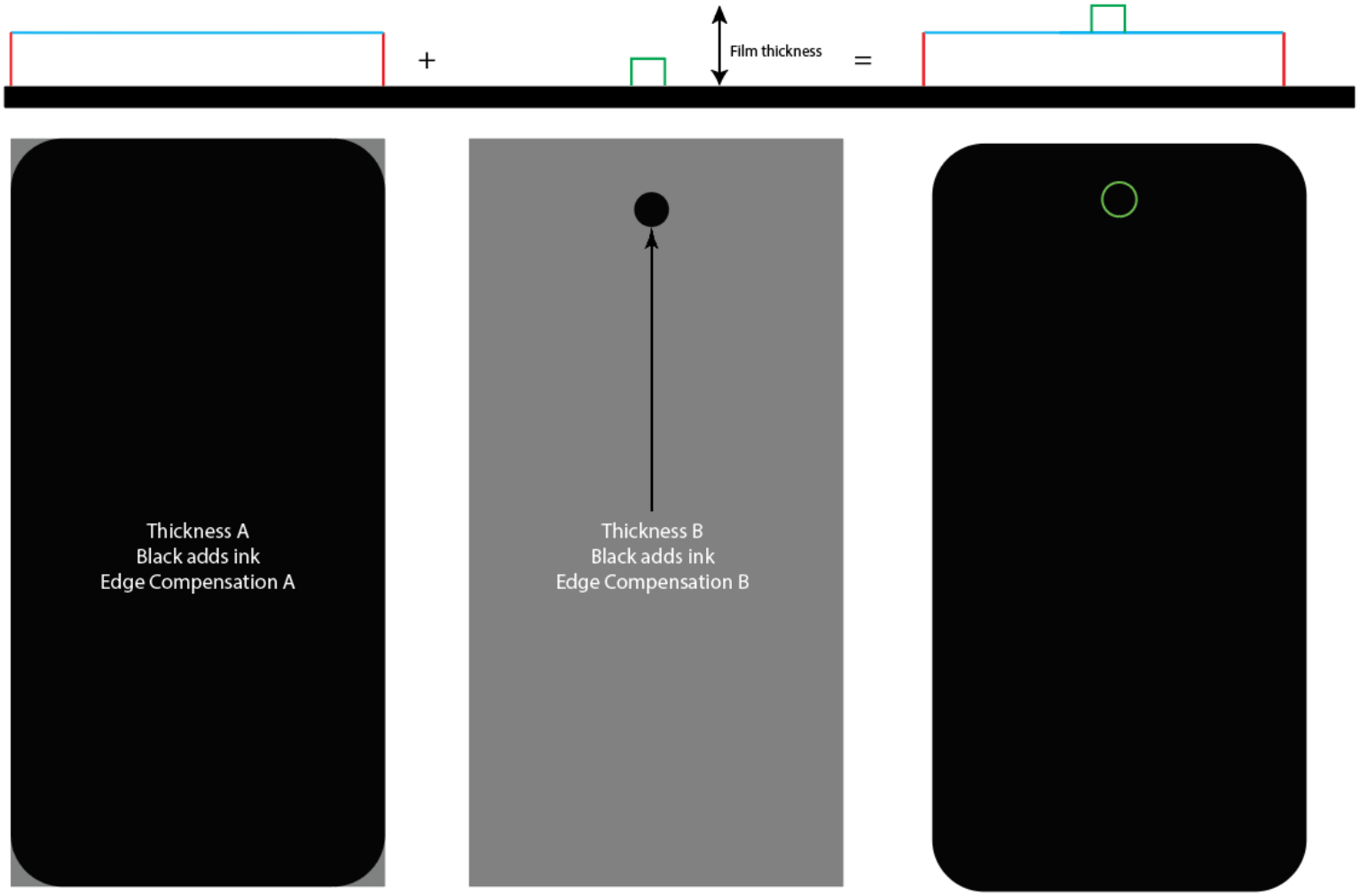
The MTAP proprietary algorithm features multi-edge compensation and multiple thicknesses in a single sub-panel which are combined at print time and all printed at one time with no loss of TAKT.

MTAP Example 1



Isolated features printing with different thicknesses.

MTAP Example 2



Features with added thickness to small region.

3. Flex Plus II (Productivity Feature)

Introducing FLEXPLUS II

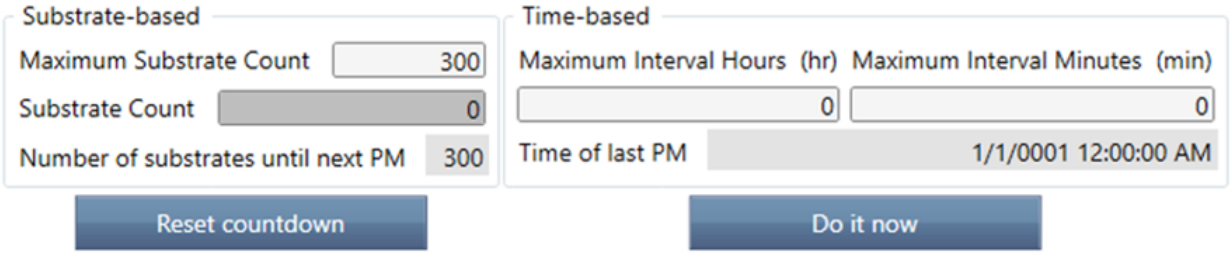
- Offers a full suite of automation features for maximum tool reliability with minimum labor

Feature	Now	Overall Benefits
• Auto RDI Scheduling • Auto DMU Scheduling • Auto Prime&Blot or Blot Scheduling • Printpack Auto Theta-Z Period Maintenance	• Automatic maintenance operations • Time based • Substrate based	• Improve uptime (improve efficiency of calibration procedures) • Reduce risk of misprocessing (ensure procedures are performed regularly at the right time) • Improve user operation efficiency and reduce labor costs (through automation)

A. Auto RDI and DMU Scheduling

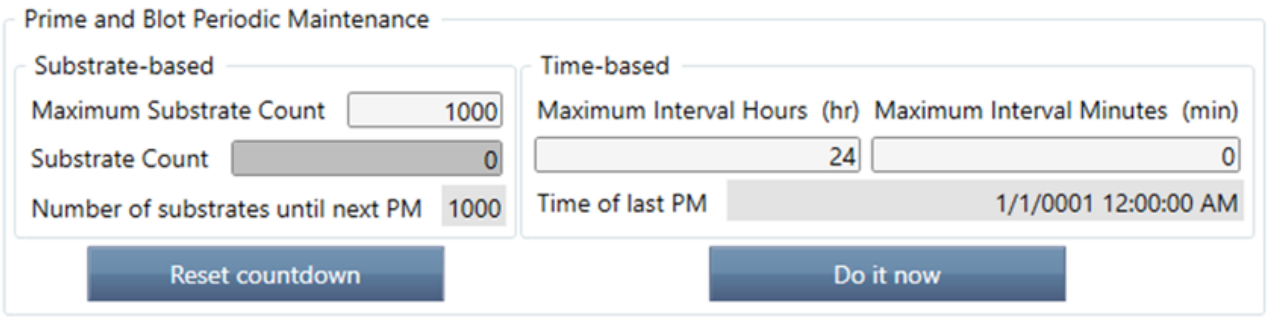
- Auto RDI and DMU PM is a software feature offered with the YIELDjet® Productivity Software package.
- Functions as part of a sequence when Tool is put in Auto Mode
- Rapid scan of each printhead

- Substrate-based
  - Allows user to set maximum substrate count between RDI and DMU scans
  - Actively monitors and presents number of substrates printed
  - Actively monitors and presents number of substrates until next PM
- Time-based
  - Allows user to set maximum interval hours (hr) and/or minutes (min)
  - Displays time of last PM by date and time
- Button Functions
  - Pressing the **[Reset countdown]** button will reset the Substrate Count
  - Pressing the **[Do it now]** button will initiate an RDI scan



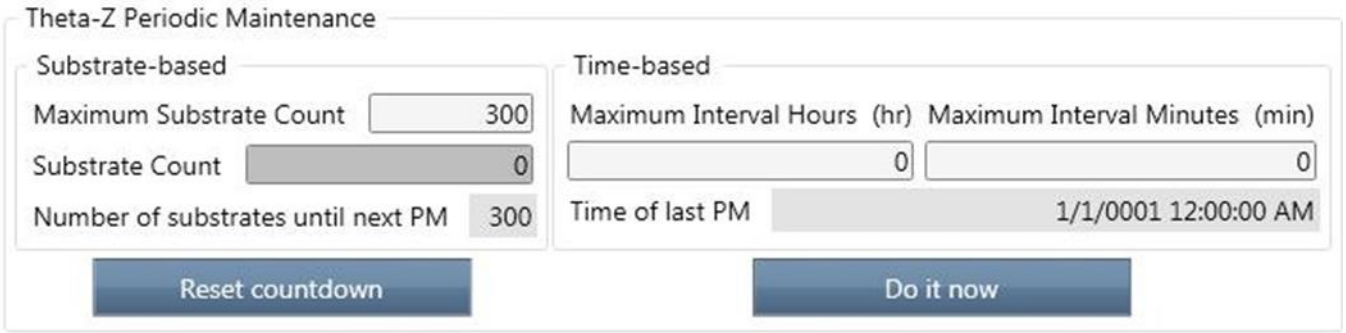
B. Auto Prime & Blot Scheduling UI

- Substrate-based
    - Allows user to set maximum substrate count between Prime & Blots
    - Actively monitors and presents number of substrates printed
    - Actively monitors and presents number of substrates until next PM
- Time-based
    - Allows user to set maximum interval hours (hr) and/or minutes (min)
    - Displays time of last PM by date and time
- Button Functions
    - Pressing the **[Reset countdown]** button will reset the Substrate Count
    - Pressing the **[Do it now]** button will initiate a Prime & Blot



C. Auto Theta Z Scheduling UI

- Periodic Process for Auto Theta Z by completing motorized adjustment on Printpacks for optimized printing result
  - Recommended to be run once per day
  - Significantly reduces calibration time by **300 hours*** per year
  - Virtually eliminate operator errors
  - Increase system up-time

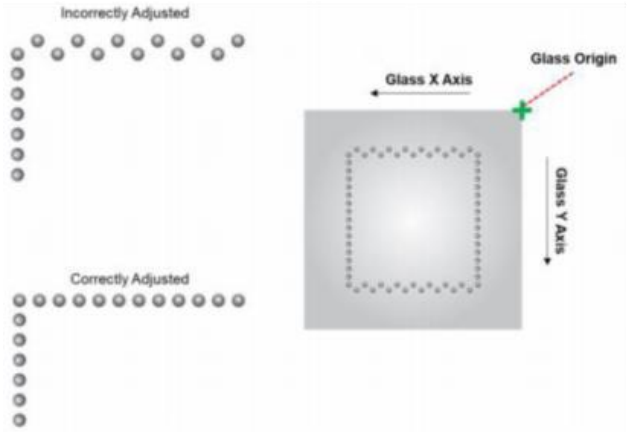


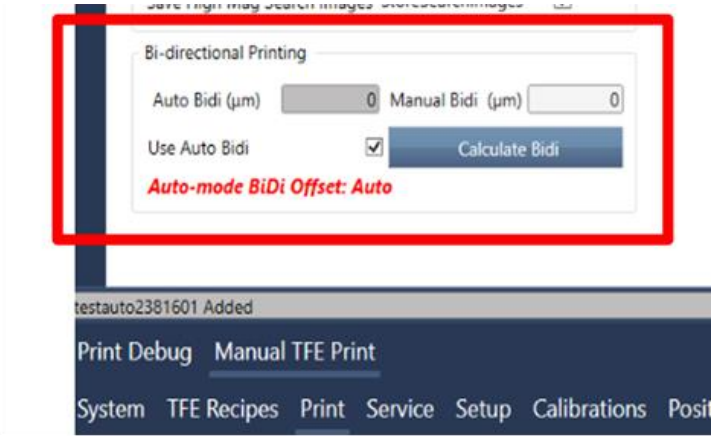
*Theta Z calibration recommends to be run once per day (during PM)and it takes an average of 1 hour. Auto theta z's calibration time is 10 minutes. Time saved: 365days*50mins ≈ 300 hours per year

4. Auto BiDi

Feature	Now	Overall Benefits
• AutoBIDI	• Automatically determine bidirectional print offset	• Reduce risk of misprocessing • Improve user operation efficiency and reduce labor costs

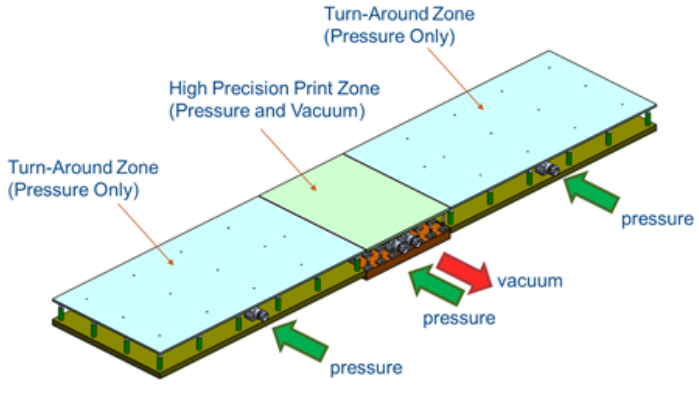
- Currently, offsets for bidirectional print offset are determined manually
  - User prints test pattern on portion of glass in both print directions
  - Offset is determined using visual pattern analysis, using high-mag and low-mag cameras
  - Offset value is recorded
- System will automatically determine bidirectional print offset using average RDI velocity data
- If print speed or print gap values are changed, calculated bidi offset will automatically update
- From UI, user will have option to choose newly calculated value, or revert to value stored in system EC



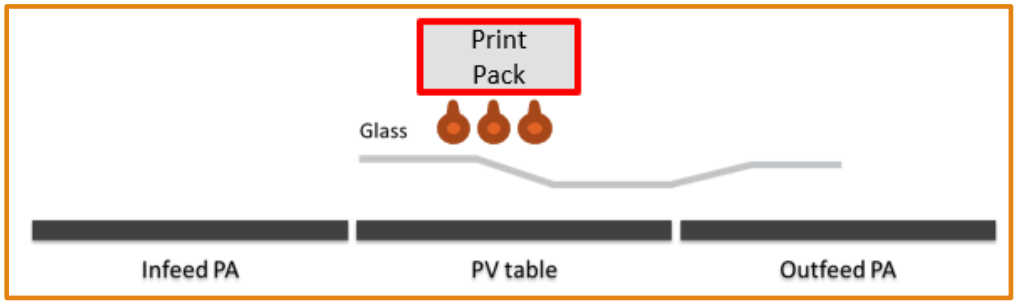


PV Table Refurbishment

Overtime ink spills or misting over the Pressure and Vacuum table (Print Zone) can cause a reduction in the vacuum flow due to the ink deposits in the vacuum holes. The consequence is a degradation of the print performance (non-uniformity of glass fly height and Bi-Directional offset) and potential glass backside scratches.



The picture below shows a non-uniform glass flight height due to uneven vacuum across the table. As you can visually see, printing could be affected both for drop placement accuracy and edge linearity



Print Table Refurbishment Program

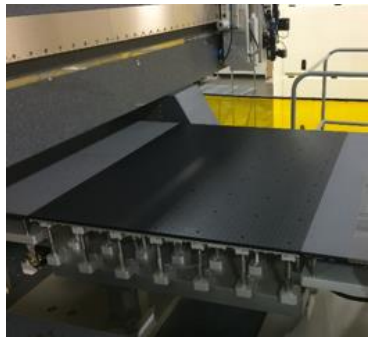
As the YIELDjet® FLEX tool is used in mass production or in an R&D environment, overtime ink residuals from prints or ink misting will likely deposit in the vacuum holes of the print table. The vacuum holes obstructions could lead to a decrease in the print performances.

Kateeva offers a refurbishment program to extend the life of the print table (PV table, pressure-vacuum table) and bring them back to the original specifications. In the refurbishment process, Kateeva will inspect the PV table on arrival and determine if the PV table can be refurbished. the PV table that are evaluated not to be repairable will be sent back to the respective customer. During the PV table refurbishment, the table will be disassembled and cleaned to remove cured ink from the vacuum holes. This process will take several cleaning cycles at high pressure with specific chemicals compatible with standard TFE inks. In the refurbishment process, any PV table damaged components will be replaced.

Currently there are two different refurbishment programs:

Advanced Module Exchange (AME)

- Kateeva provides a refurbished PV table to the customer with a reduced lead time.
    - The availability of each configuration is dependent on forecast and returned cores.
- Customer returns the original used PV table to Kateeva



Normal Module Exchange (NME)

- Customer provides the used PV table to Kateeva
- Kateeva refurbishes the PV table to new standards
- Kateeva provides the same PV table to the customer after refurbishment

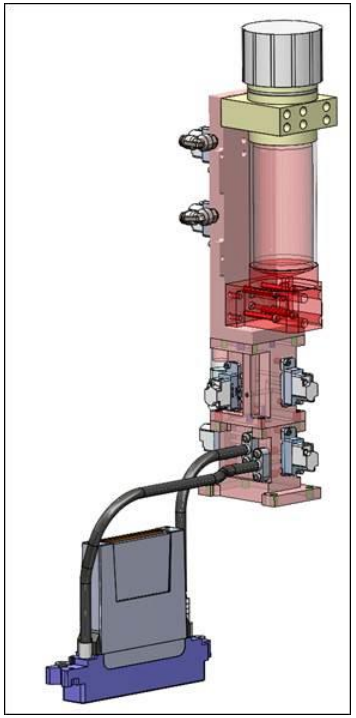
Parts Information

Item#	Part Description	KPN	Tool
1	AIR PLATE, PV WITH PRINTING ZONE, 1500 X 925, LASSEN 3	1007-00316-00	YIELDjet FLEX

Inksticks Refurbishment

As customers experiment with different inks that may not be compatible, they find it difficult to reuse inksticks on new inks without possible cross contamination. Additionally, through use or ink formulation, inkstick performance over time may not meet the original specifications.

Kateeva offers a refurbishment program to extend the life of the inkstick. All the wetted components within the inkstick, including the print head, manifolds, tubes, and reservoirs will be replaced with new components. The refurbished inkstick will be tested using the same processes as a new inkstick, with physical inspection, testing alignment and actuation. The refurbished inkstick will meet all specifications of a new purchased inkstick.



Advanced Module Exchange (AME)

- Kateeva provides a refurbished inkstick to the customer with a reduced lead time.
  - The availability of each configuration is dependent on forecast and returned cores.
- Customer returns the original used inkstick to Kateeva

Normal Module Exchange (NME)

- Customer provides the used inkstick to Kateeva
- Kateeva refurbishes the inkstick to new standards
- Kateeva provides the same inkstick to the customer after refurbishment

Program Availability

The refurbishment program for inksticks is available now with parts available to ship from our US Headquarters depending on core availability and forecast. In the future, we will be able to ship parts directly from our regional logistics locations. The following parts are currently included in the refurbishment program (please see detailed list below):

KPN	Description	Program Name
9800-01717-0X*	ASSY, INK STICK, 1-HEAD, 7PL, RGB	New
9800-01717-0X-R*	ASSY, INK STICK, 1-HEAD, 7PL, RGB, R	AME
9800-01717-0X-CR*	ASSY, INK STICK, 1-HEAD, 7PL, RGB, C	NME
9800-01716-0X*	ASSY, INK STICK, 3-HEADS, 7PL, RGB	New
9800-01716-0X-R*	ASSY, INK STICK, 3-HEADS, 7PL, RGB, R	AME
9800-01716-0X-CR*	ASSY, INK STICK, 3-HEADS, 7PL, RGB, C	NME
9800-01845-0X*	ASSY, INK STICK, 1-HEAD, 4PL, RGB	New
9800-01845-0X-R*	ASSY, INK STICK, 1-HEAD, 4PL, RGB, R	AME
9800-01845-0X-CR*	ASSY, INK STICK, 1-HEAD, 4PL, RGB, C	NME
9800-01844-0X*	ASSY, INK STICK, 3-HEADS, 4PL, RGB	New
9800-01844-0X-R*	ASSY, INK STICK, 3-HEADS, 4PL, RGB, R	AME
9800-01844-0X-CR*	ASSY, INK STICK, 3-HEADS, 4PL, RGB, C	NME
9800-01900-00	ASSY, INK STICK, 1 HEAD, 10PL, TFE	New
9800-01900-00-R	ASSY, INK STICK, 1 HEAD, 10PL, TFE, R	AME
9800-01900-00-CR	ASSY, INK STICK, 1 HEAD, 10PL, TFE, C	NME
9400-04343-00	ASSY, INK STICK, 1 HEAD, 6PL, TFE	New
9400-04343-00-R	ASSY, INK STICK, 1 HEAD, 6PL, TFE, R	AME
9400-04343-00-CR	ASSY, INK STICK, 1 HEAD, 6PL, TFE, C	NME

* Use -01 for IP wet test, -02 for Toluene wet test


ABOUT
Displays. Re-imagined