



# *Integrated Automation Solution Driving Zero Yield Loss under Reticle Management*

MES, USC  
RAPID/MACH, KLA Corporation

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*Presentation*  
*KLA/RAPID*  
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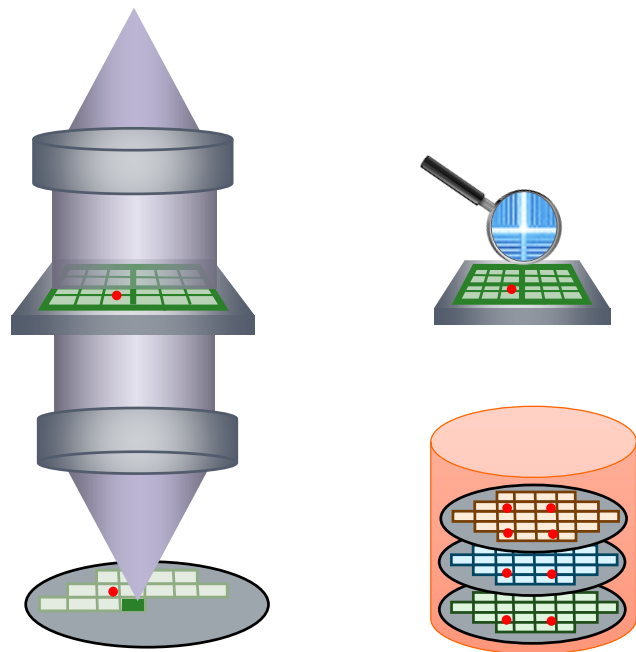
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- 02** Integrated Intelligent Automation Solution  
(SARC/Smart Task assignment & FA /RA)
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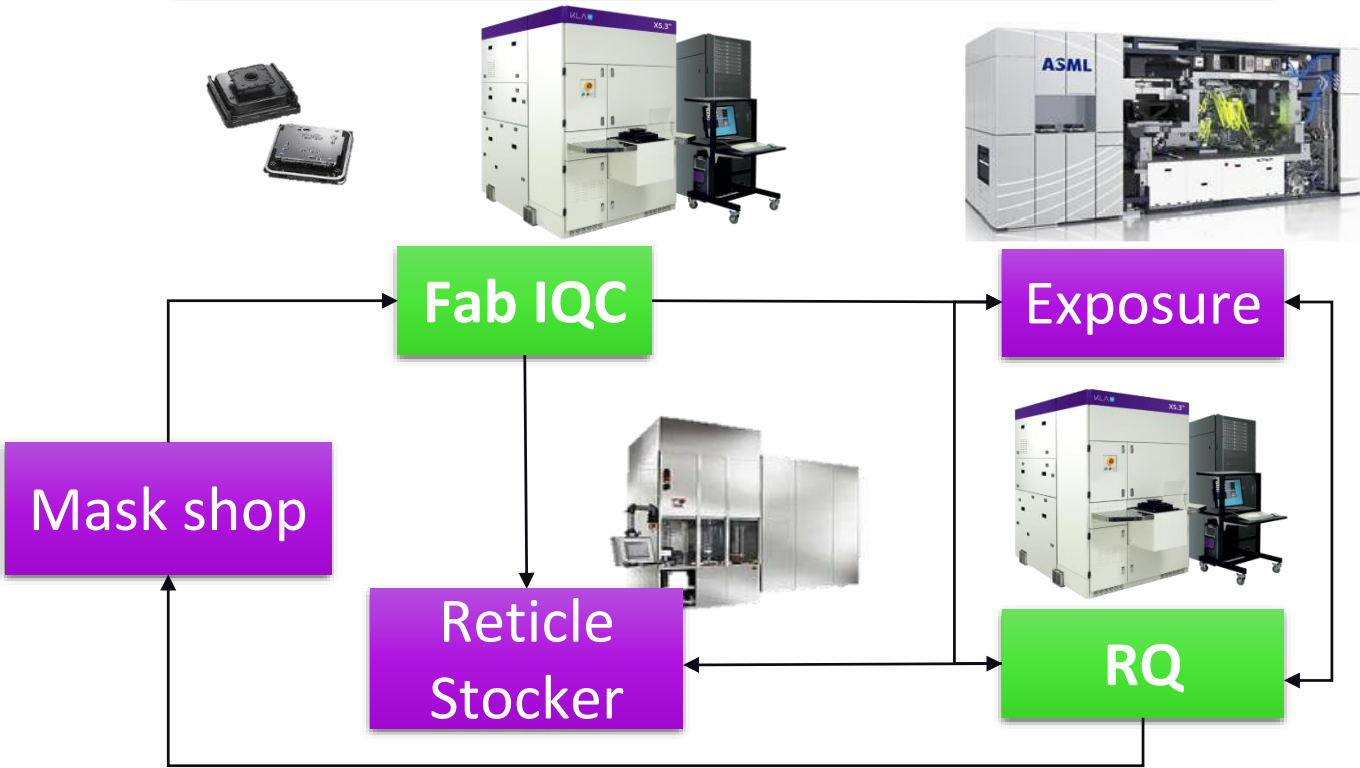
# Reticle Quality Control in IC FAB

## Lithography Flow



One defect on reticle impact **all** chips on the wafer and may **kill** hundreds of wafers!

## Mask Quality Control Process



Income Quality Control (IQC) and Re-qual (RQ) are essential steps to control mask quality

# Common Production Issue in the Controlling Process

## Quality

Can we avoid defect missing in IQC and RQ process

## Throughput

Can we improve throughput and reduce cycle time

## Risk Control

Can we avoid mis-operation in transport, setup, review and disposition steps

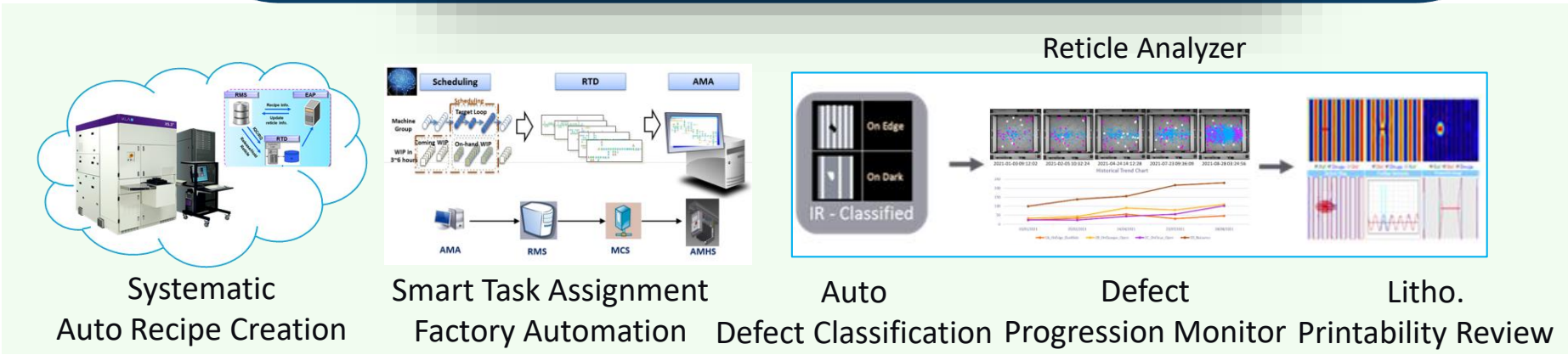
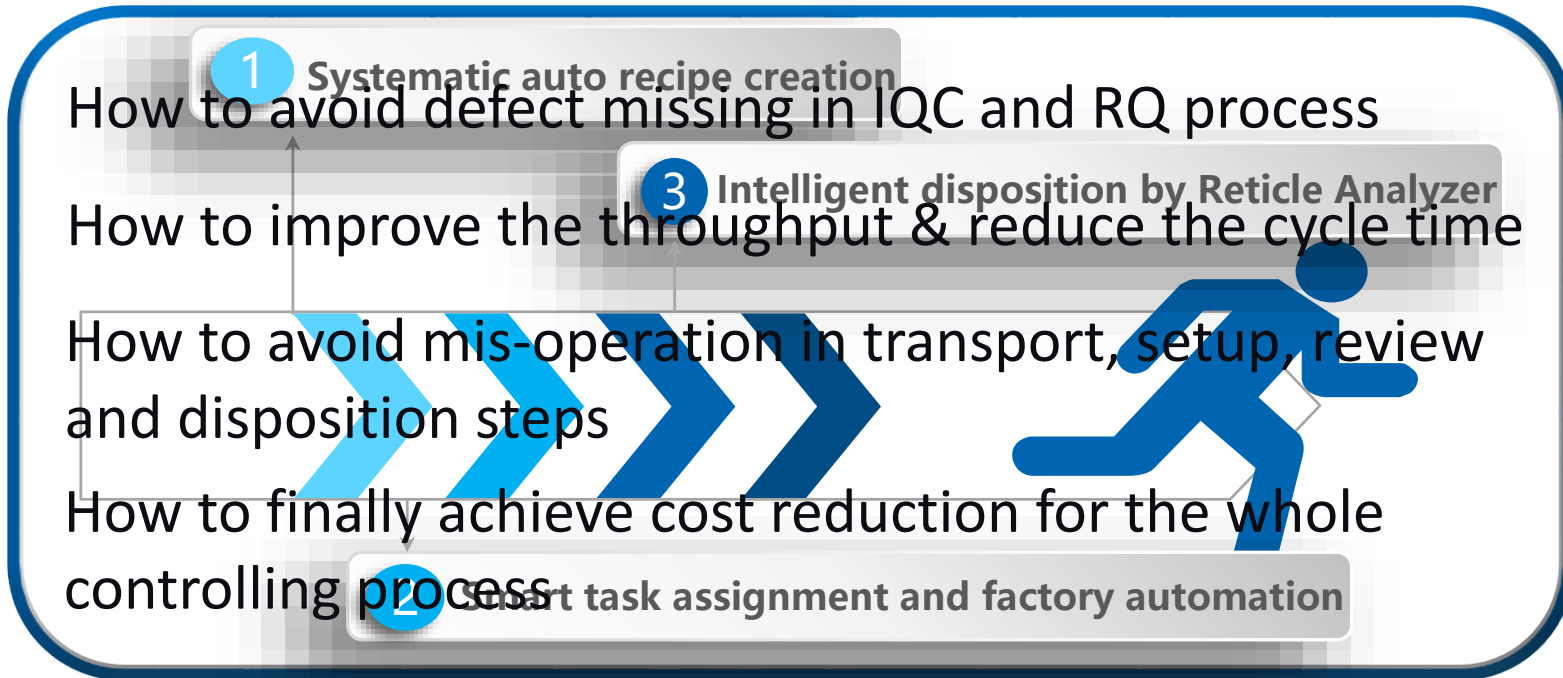
## Cost Reduction

Can we achieve cost reduction for the whole controlling process



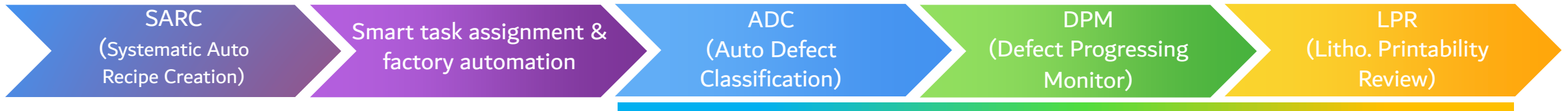
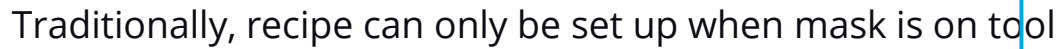


# Integrated Intelligent Automation Solution



## Integrated Intelligent Automation Solution

## MO prevention on setup and cycle time reduction

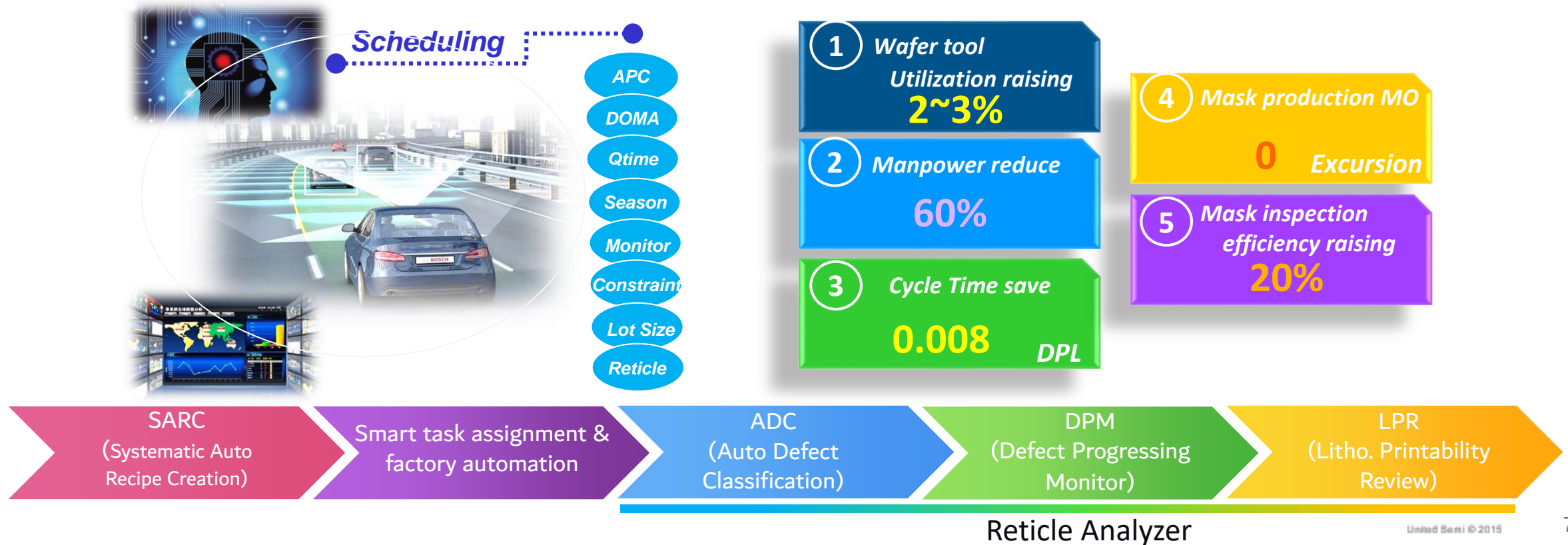


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# Smart Task Assignment and Factory Automation

Throughput improvement and MO prevention in transportation

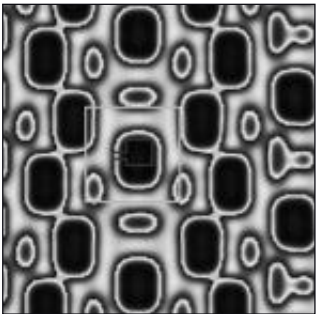
- Smart task assignment is like Autopilot
- Multiple production mode – throughput first mode, cycle time first mode, etc.
- Integrate all tools to optimize production flow and improve production/management efficiency



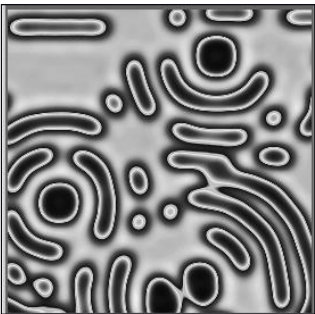
# Intelligent Disposition by Reticle Analyzer

Ensure mask quality, control risk and reduce cycle time

Complex Design for Better Process Window vs Challenge on Defect Classification and Mask Disposition

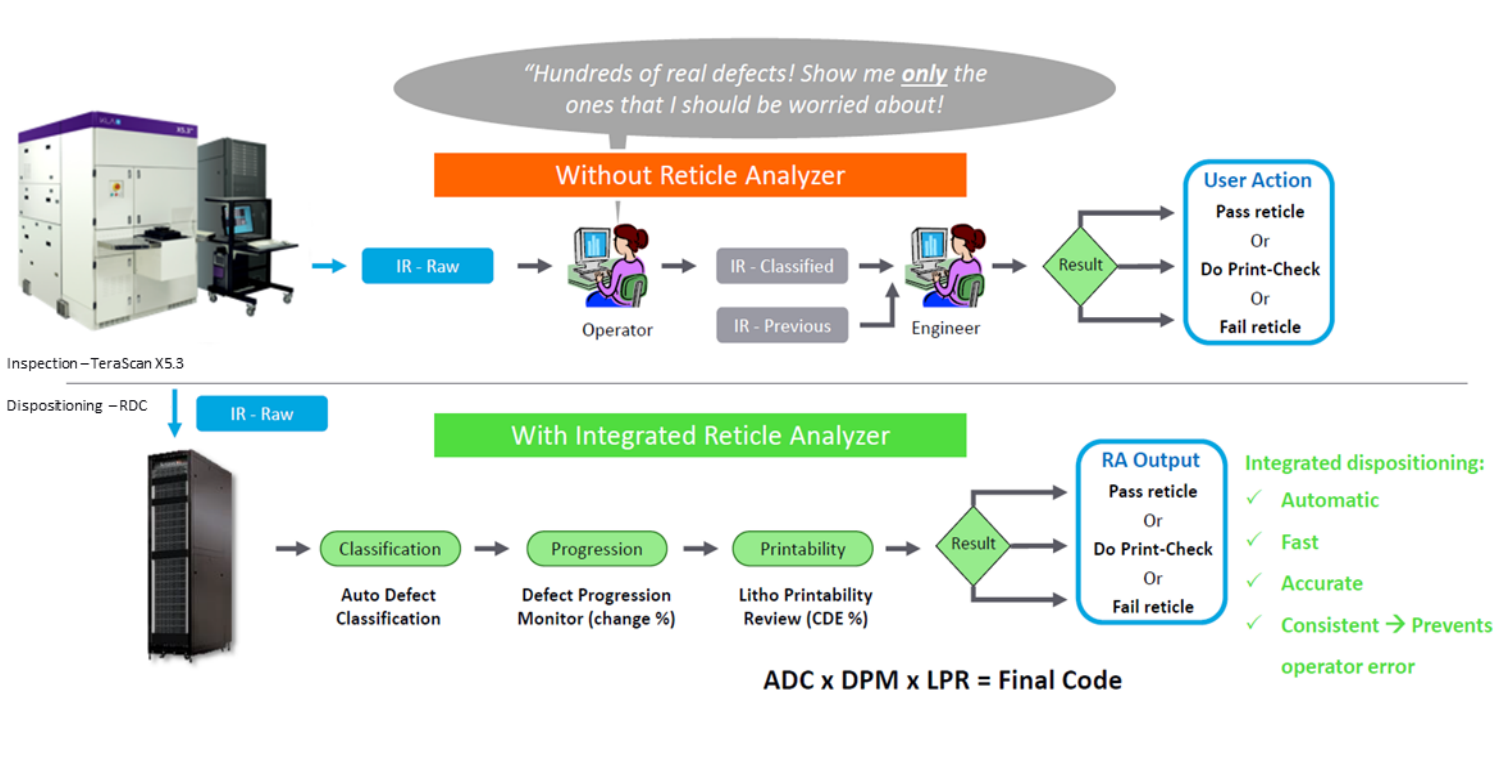


Model Based OPC



ILT

“Yield Management in Sub-10nm Chip Manufacturing”  
SEMICON Japan 2015, Manufacturing Innovation Forum



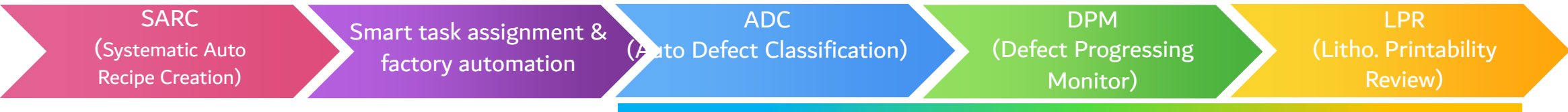
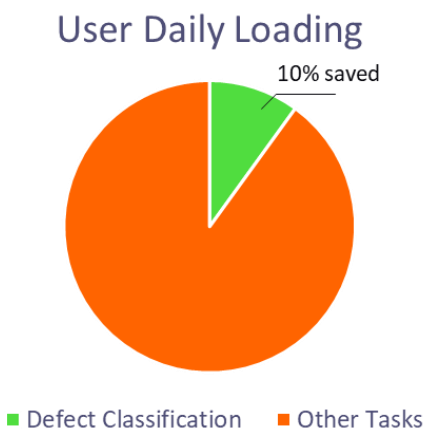
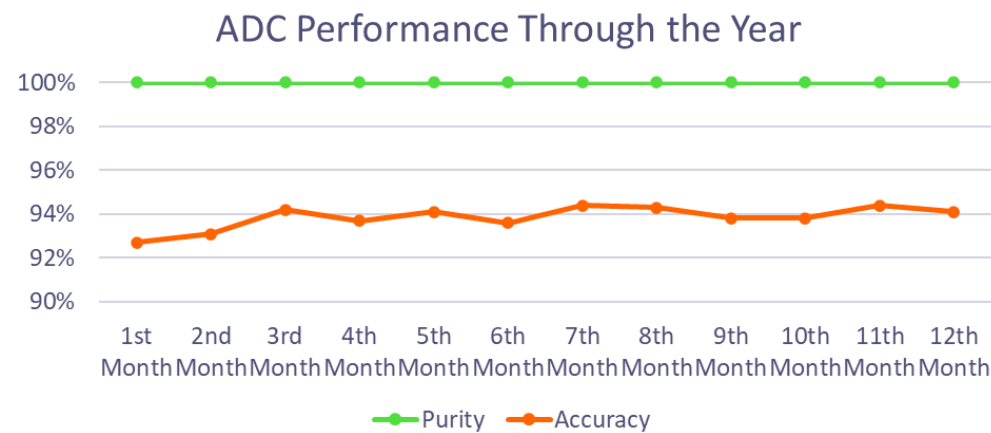
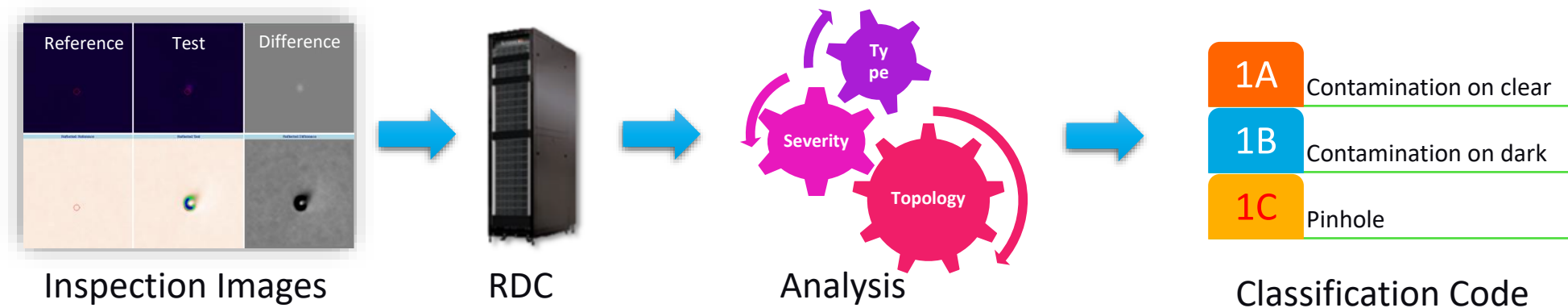
Reticle Analyzer

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# Intelligent Disposition by Reticle Analyzer - ADC

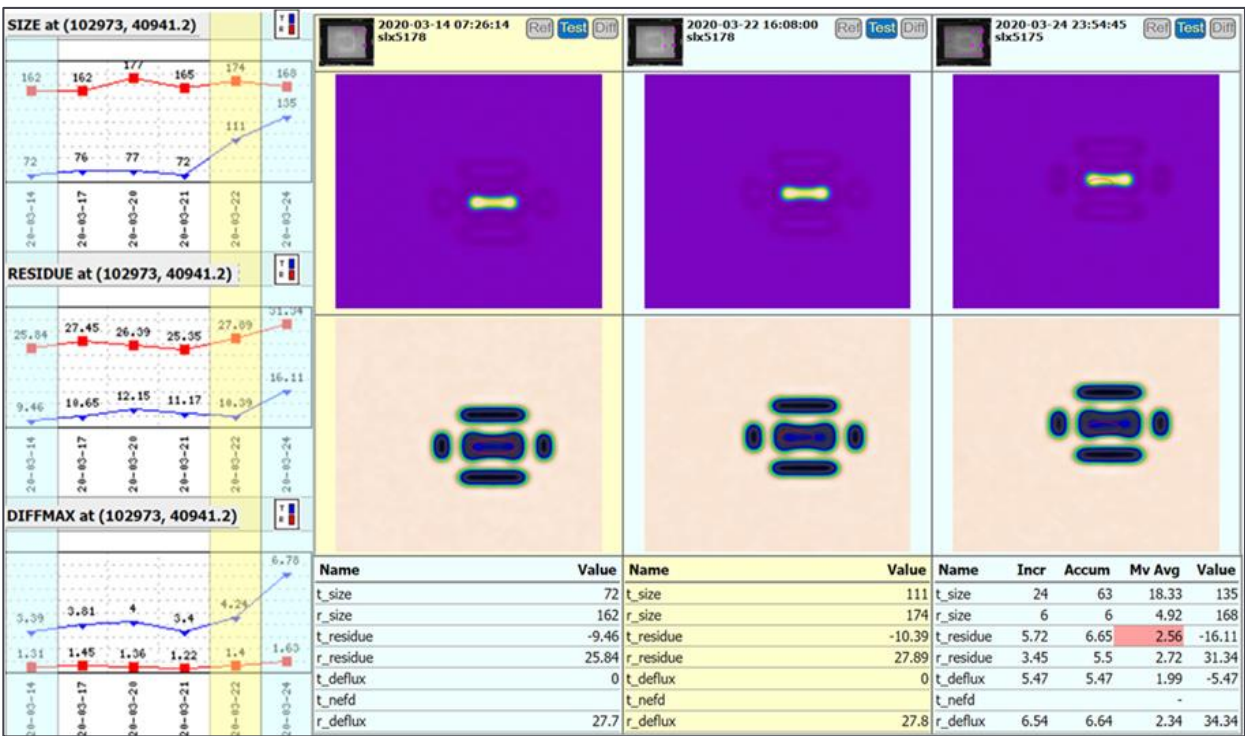
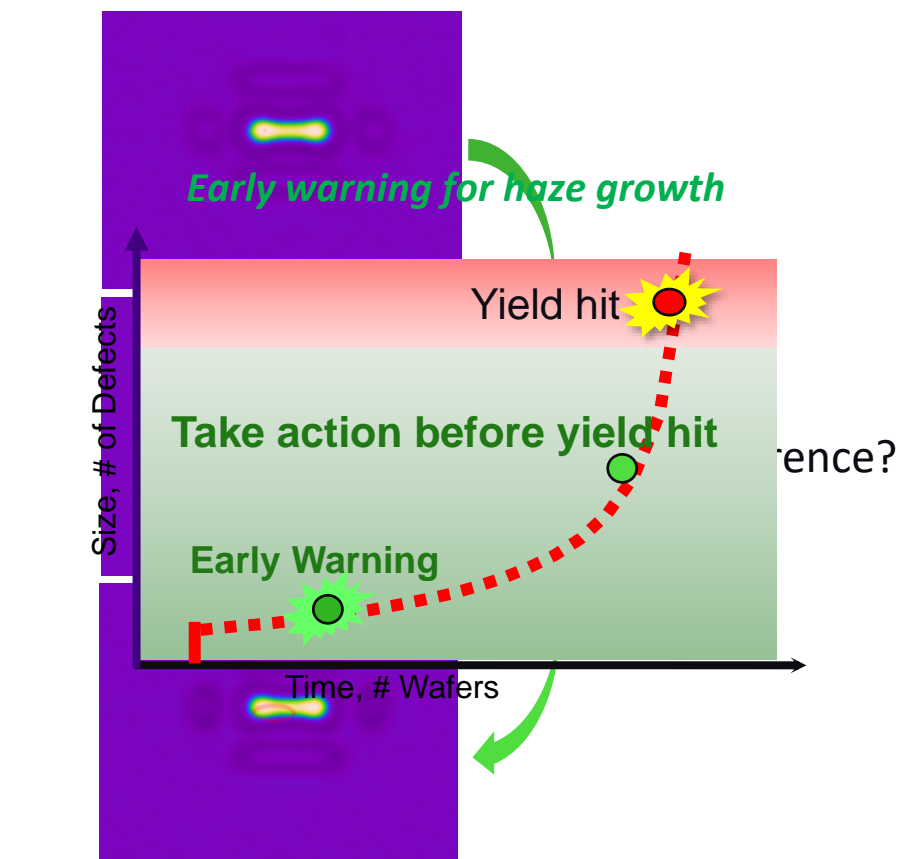
MO prevention on review



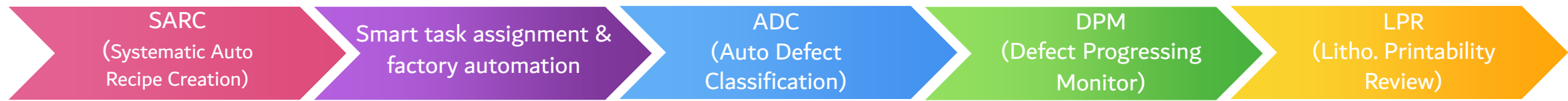
Reticle Analyzer United Semi © 2015

# Intelligent disposition by Reticle Analyzer – DPM

Risk control and efficiency improvement



Defect will be highlighted once it changes bigger

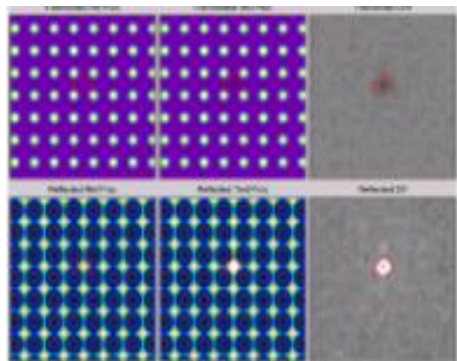


Reticle Analyzer

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# Intelligent disposition by Reticle Analyzer – LPR

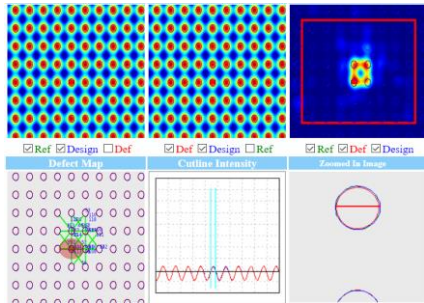
Risk control and cycle time reduction



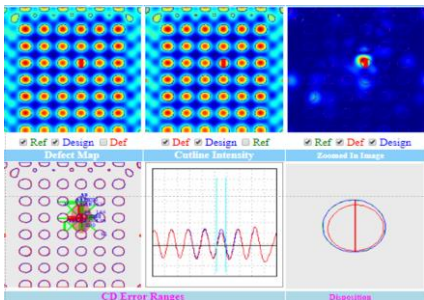
Which Defect is severe?



Get the answer in minutes



LPR Aerial Image

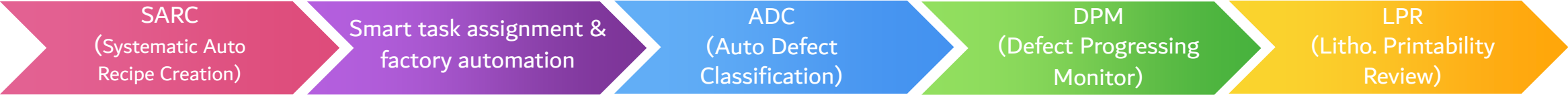


Def#	Type	rCD	dCD	%	Gauge	Status	Disp	Comment
- 11 (-12049166.96, -3082377.19): 37 pass, 0 margin, 0 fail, 0 error								
42	CNT	48.70	46.26	-5.01	CD_relearr	PASS		
41	CNT	48.63	46.20	-4.99	CD_relearr	PASS		
62	CNT	48.78	46.46	-4.77	CD_relearr	PASS		
43	CNT	48.74	46.42	-4.76	CD_relearr	PASS		
55	E2E	68.21	71.18	4.35	CD_relearr	PASS		
105	E2E	68.30	71.27	4.35	CD_relearr	PASS		



CD Error Report

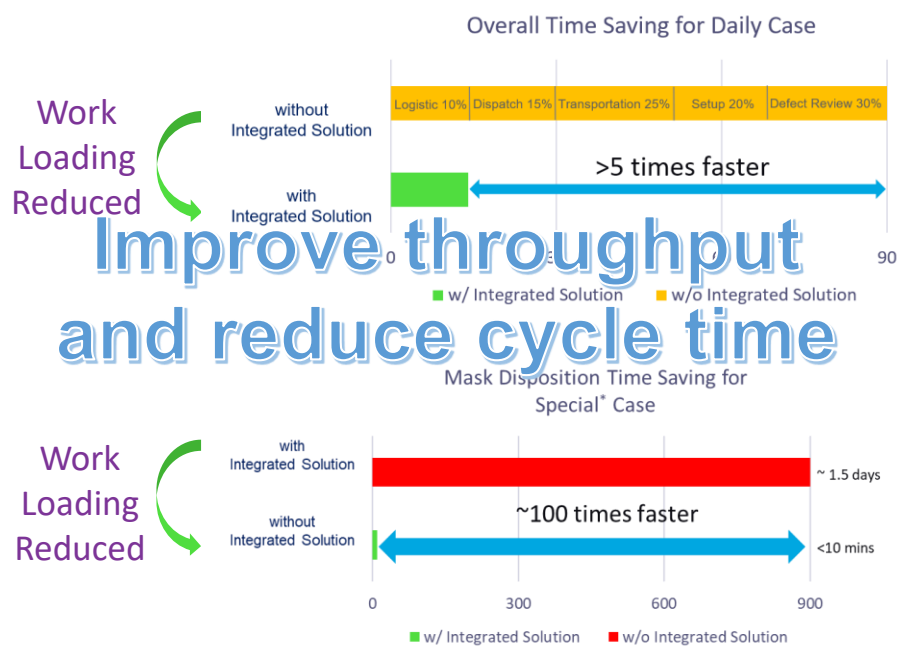
Def#	Type	rCD	dCD	%	Status	Disp	Comment
- 9 (7500.00, 7500.00): 30 pass, 0 margin, 10 fail, 0 error							
54	CNT	77.90	68.28	-12.34	FAIL		
55	CNT	84.95	75.16	-11.53	FAIL		
58	CNT	76.59	78.26	2.19	PASS		
38	CNT	83.08	81.27	-2.18	PASS		
46	E2E	59.35	67.74	14.14	FAIL		
101	E2E	66.39	72.25	8.82	PASS		



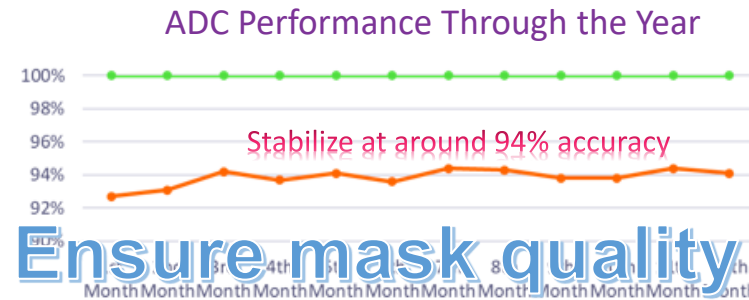
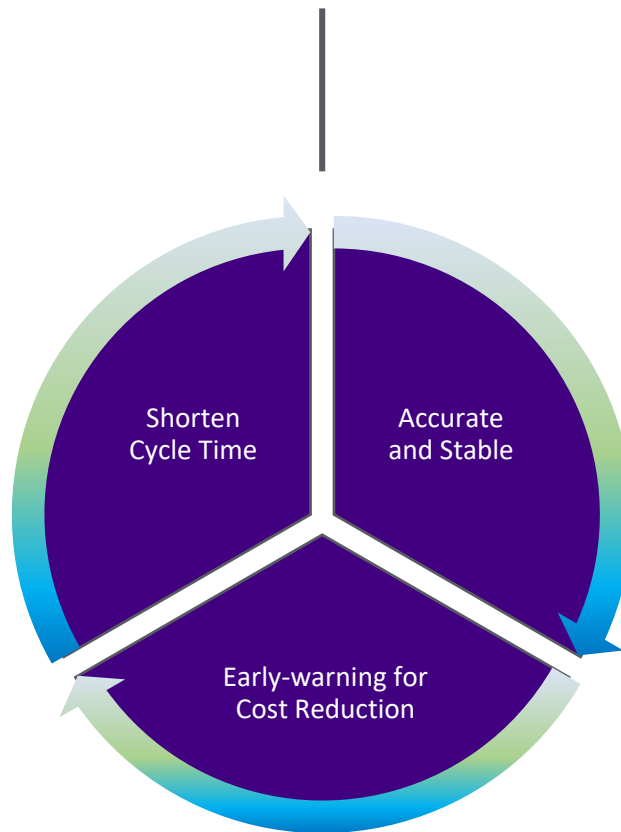
Reticle Analyzer

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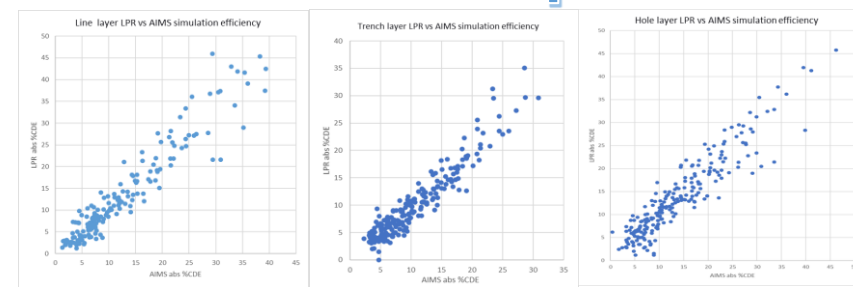
# Driving Zero Yield Loss with the Integrated Solution



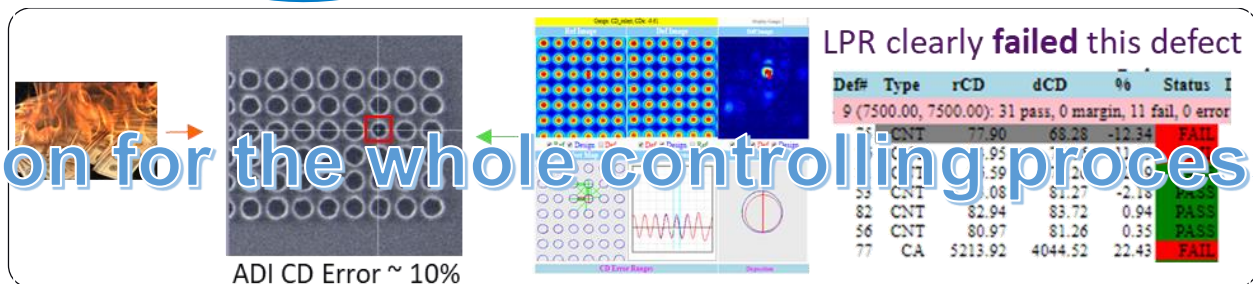
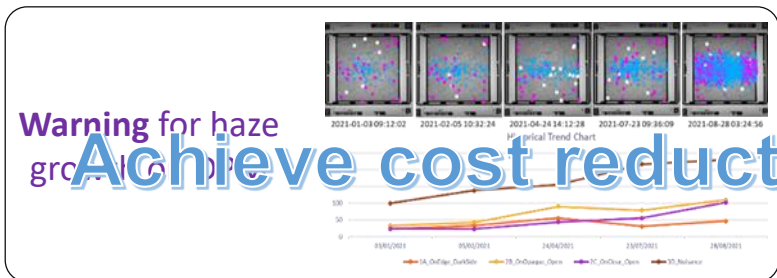
\*In which need additional Wafer Printing Check



# Ensure mask quality and avoid mis-operation



LPR Simulation Efficiency  $\geq 90\%$  on PDMs





***Thanks for Your Attention***