



## Applied SmartFactory® Rapid Response Inline Measurement

As an integral part of the Applied Materials knowledge management initiative, Rapid Response Inline Measurement establishes solid engineering practices, meets compliance expectations, and reduces human variability in manufacturing processes

### INDUSTRIES

- Front-end semiconductor wafer manufacturing
- Research and development

### FEATURES

- Single assessment of multiple violations
- Integrated electronic troubleshooting workflows
- Simplified audit control
- Active/passive commenting of statistical process control (SPC) samples
- Institute guided quality practices
- Task and action tracking
- Task duration and frequency KPIs

### BENEFITS

- Provides real-time response to production plan updates
- Reduces setup time
- Increases profitability
- Facilitates shift pass-down
- Enhances customer satisfaction by meeting “delivery-to-promise” dates
- Improves productivity by lowering cycle time and reducing variability
- Facilitates training of new hires & BKMs

### CHALLENGES

For manufacturers, a huge variability gap exists in human decision making capabilities. Time to detect issues is inconsistent, time to resolve issues takes too long, and simply detecting issues is not enough. An integrated electronic workflow management system is required to institute proper SPC practices and effective out-of-control action plans (OCAP) to recover from SPC violations.

### SOLUTION DESCRIPTION

Rapid Response Inline Measurement (RR ILM) is a set of advanced models built on Electronic Corrective Action Plans (eCAP) technology that fully integrates with Applied SmartFactory SPC. To provide guidance for root cause analysis, the solution standardizes the approach to resolve SPC violations. It offers integrated troubleshooting workflows to reduce human variability in a semiconductor manufacturing environment.

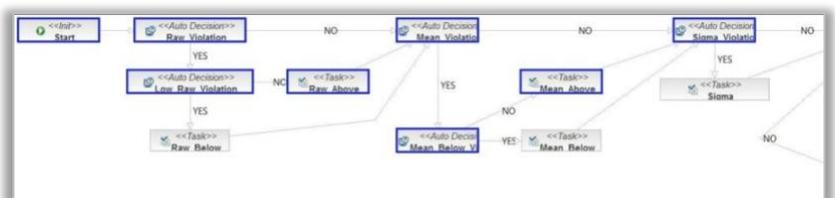
To increase tool availability, RR ILM reduces SPC inhibit durations. It provides the foundation of good engineering practices to help move OOS conditions to OOCs and keep signal-to-noise ratios at appropriate levels. The solution also integrates SPC for a standardized approach to problem solving; it allows manufacturers to recover from inline SPC violations to make appropriate decisions to reduce Cost of non-Conformance (ConC) events.

ACTIONS SUMMARY TABLE

Template ID	Instance ID	Name	Version	Integration Adapter	Started	Finished	eCAP Mode	Status	Division								
157.849	168.216	Observations_CustomerA	19	SPACE	01.09.16 19:24:56		test	In Progress	No Division								
STEP	START	LINK	ENGINE	TIME	WORKFLOW	STATUS	MEAN_ABOVE	SIGMA	RANGE	MEAN_BELOW	SIGMA	RANGE	STATUS	MEAN_ABOVE	SIGMA	RANGE	
1	Start		9/1/16 7:24:56 PM	Sep 1, 2016 7:24:57 PM	none												
2	Raw_Violation		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	YES												
3	Low_Raw_Violation		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	NO												
4	Raw_Above		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	none	1	true	true									
5	Mean_Violation		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	YES												
6	Mean_Below_Violation		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	NO												
7	Mean_Above		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	none	1			true								
8	Sigma_Violation		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	NO												
9	NO		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	YES												
10	Range_Below_Violation		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	NO												
11	Range_Above		9/1/16 7:24:57 PM	Sep 1, 2016 7:24:57 PM	none	1								true		true	
12	Metrology_Validation		9/1/16 7:24:57 PM		none												

This table highlights responses and task durations defined by the workflows.

TRACEABLE GRAPHICAL WORKFLOW



The RR ILM solution enables you to easily trace the actions of other operators.

## SMARTFACTORY SOLUTIONS WITH ENGINEEREDWORKS

EngineeredWorks is Applied's pre-built automation logic that executes on a proven Applied platform. EngineeredWorks increases speed-to-value for customers and provides quicker deployment times. When deploying SmartFactory Rapid Response Inline Measurement with EngineeredWorks, customers can cut deployment times by more than **50%** compared to custom deployments.

Rapid Response Inline Measurement Capabilities for Reducing Human Variabilities Across Modules		
✓	<b>Audit and Compliance Controls</b>	Provides the ability to guide the user to follow Good Engineering Practices (GEP) and align with corporate and industry quality audit standards. This includes proper flagging practices to ensure high quality control limits on SPC charts and meaningful and descriptive comments attached to all violated samples.
✓	<b>Faster Resolution to Holds and Inhibits</b>	Offers an integrated workflow system that launches from the SPC chart, allowing a higher degree of automation of information to assist users in troubleshooting potential causes of inline SPC violations. More comprehensive procedures provide faster time to resolution.
✓	<b>Human Variability Reduction</b>	In keeping with variability reduction initiatives, RR ILM guides users to answer the appropriate questions required to troubleshoot a process problem. Consequently, users better understand process and equipment variables that affect inline SPC results. Users can measure this guidance to show reduced variability for process and equipment types.

## Tackling Human Factors in Manufacturing

### CUSTOMER RESULTS

Measurable results from Rapid Response Inline Measurement implementations include:

- Audit conformance for commenting and flagging
- **4%** reduction in human variability across all modules over 3-month period—**20%** per year
- **15%** speed improvement for disposition

### PACKAGE CONTENTS

SmartFactory Rapid Response Inline Measurement with EngineeredWorks is built on the eCAP platform. It consists of models built for each front-end manufacturing module. The solution is fully integrated with the SmartFactory SPC product. The package includes an APF reporter dashboard with standardized reports for response time metrics. Customers receive product training to learn how to modify models, as well as specific use case training on EngineeredWorks models.

#### SOFTWARE

- Rapid Response Inline Measurement EngineeredWorks
- APF Reporter Dashboard

#### SERVICES, TRAINING AND SUPPORT

- Onsite deployment
- Quality standards alignment (including customer & industry standards)
- User workshops and training