Improvements of wet chemical etch equipment (SAT) to support Infineon Zero Defect Strategy

Dr. Ursula Meyer; Infineon Austria AG

AGENDA:

• Equipment Improvement  - Motivation
• Levers & Modifications
• Targets & Results
Our Team

- **Gerhard Wahl**; equipment engineer & system expert
- **Willi Schwarz**; process engineering
- **Ursula Meyer**; process engineering & project management
- **Michi Holzinger**; APC expert
- **Gernot Auer**; IT and system integration
- **Dieter Frank & Team**; IT
SAT equipment improvement - motivation

High throughput tool

**Critical process application**

Processes:
- Etching: Al, Si, Cu, W, TiW
- Resist removal
- Rinsing & Drying

**Poor performance**

Challenges:
- **Process stability**: cpk 30% below target
- **Equipment stability**: Unscheduled down > 10%
- **Wafer scrap**: 300% above target

**SAT: Spray Acid Tool**
SAT equipment improvement - motivation

EP computer
EP system

tank 3

tank 1
flowmeter
pump

temperature sensor

ozone generator

heating system

tank 2
Levers, Modifications & Targets

Levers & Modifications

- Bearingless pumps adapted and installed
- New sensors integrated for temperature, chemistry, flow
- Double quartz ozone-generator installed
- Multiband endpoint system adapted
- Logic Controller integrated and programmed in-house

TARGETS & RESULTS

- Process stability
  Improve cpk
  +20%

- Equipment stability
  Reduce Equipment Down -50%

- Wafer scrap
  Reduce Scrap ratio -50%
Complex and In-Depth Hardware Modification at SAT1D

EP computer

EP system

tank 3

tank 1

flowmeter

bearingless pump

ozone generator

temperature sensor

heating system

tank 2
Levers, Modifications & Targets

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**TARGETS & RESULTS**

- **Process stability**
  Improve cpk
  \[+20\%\]

- **Equipment stability**
  Reduce Equipment Down
  \[-50\%\]

- **Wafer scrap**
  Reduce Scrap ratio
  \[-50\%\]
Complex and In-Depth Hardware Modification at SAT1D

EP computer
EP system

Temperature Sensor
Flowmeter

tank 1
Chemistry Sensor
flowmeter

tank 3

ozone generator
tank 2

temperature sensor
heating system

bearingless pumps
Levers, Modifications & Targets

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TARGETS & RESULTS

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  **-50%**

- **Wafer scrap**
  Reduce Scrap ratio
  **-50%**
Complex and In-Depth Hardware Modification at SAT1D

- EP computer
- EP system
- tank 1
- tank 2
- tank 3
- flowmeter
- temperature sensor
- Chemistry sensor
- bearingless pumps
- temperature sensor
- heating system
- double quartz
- Mulitband
Levers, Modifications & Targets

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Complex and In-Depth Hardware Modification at SAT1D

- EP computer
- EP system
- multiband
- tank 1
- tank 2
- tank 3
- temperature sensor
- flowmeter
- chemistry sensor
- bearingless pumps
- double quartz
- heating system
- Controller
Levers, Modifications & Targets

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  Improve cpk  
  +20%

- **Equipment stability**
  
  Reduce Equipment Down  
  -50%

- **Wafer scrap**
  
  Reduce Scrap ratio  
  -50%
Results
process uniformity - cpk

Target +20%

old system:

Result: +70%

CD Measurement

samples by date
Levers, Modifications & Targets

Levers & Modifications

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TARGETS & RESULTS

- **Process stability**
  Improve cpk
  (+20%)

- **Equipment stability**
  Reduce Equipment Down
  (-50%)

- **Wafer scrap**
  Reduce Scrap ratio
  (-50%)
Results
Equipment Performance

Target: - 50%

Unscheduled Downtime

Year

Result: -70%
Results
Equipment Performance

![Graph showing Unscheduled Downtime by Quater (Q1/2010, Q2/2010, Q3/2010, Q4/2010). The graph indicates a decrease in Unscheduled Downtime over time with a description of "Equipment Downtime reduced." The loading increases over the same period with a description of "loading increases."](image-url)
Levers, Modifications & Targets

**Levers & Modifications**

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**TARGETS & RESULTS**

- **Process stability**
  - Improve cpk
  - Increase by +20%

- **Equipment stability**
  - Reduce Equipment Down
  - Decrease by -50%

- **Wafer scrap**
  - Reduce Scrap ratio
  - Decrease by -50%
Results
Wafer Scrap

Target – 50%

Result: -80%

Year

2009

2010
Thank you for your attention!
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