Changing slurry formulations – Issues and Observations

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Outline

- Overview of SVTC
- Problem Statement
- Experimental plan
- Results
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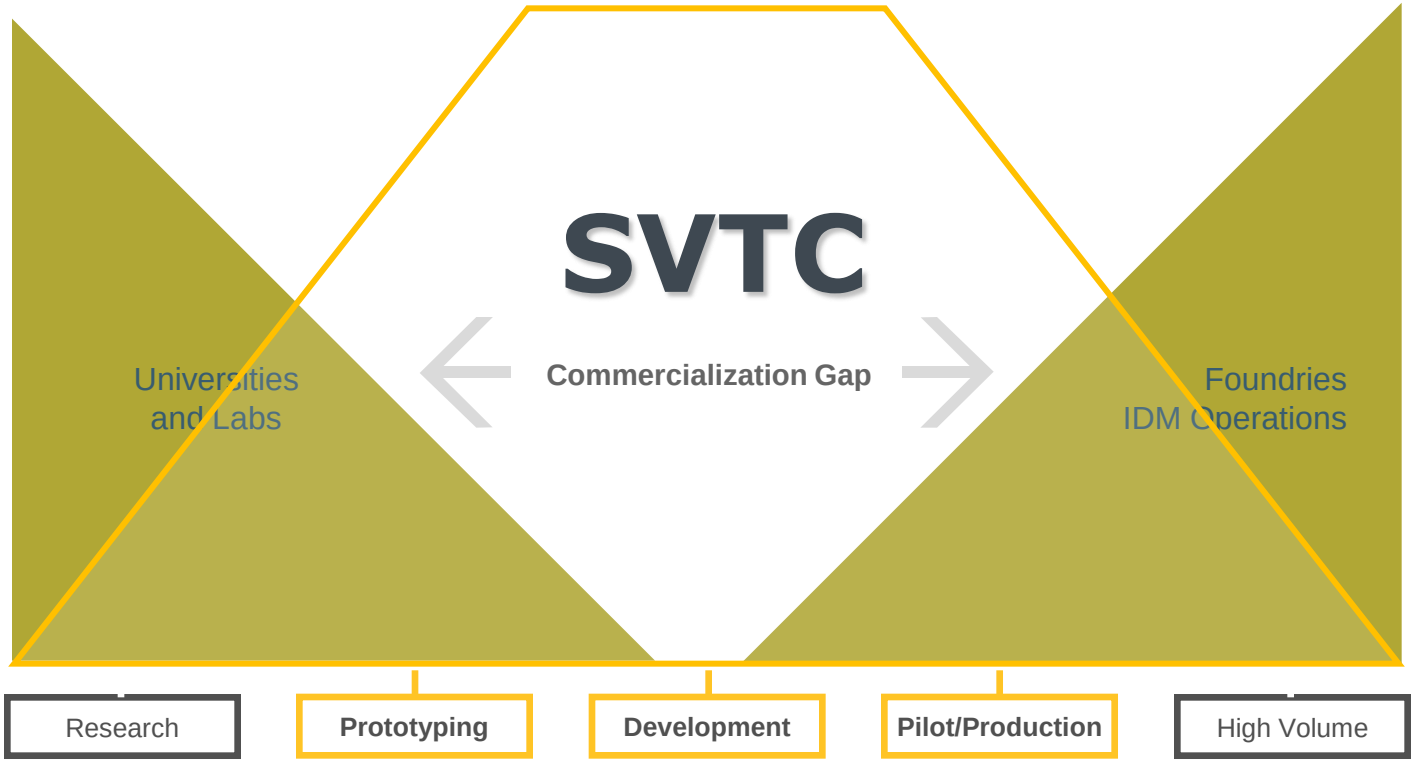
- Conclusions

Bridging the Gap



Innovation Phase

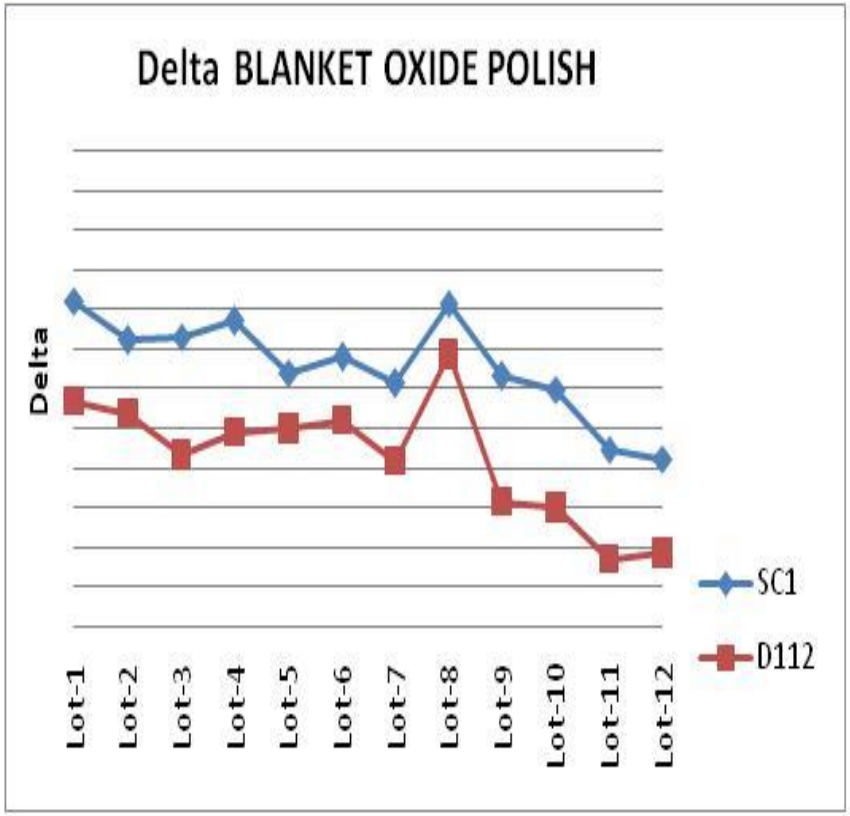
Problem Statement

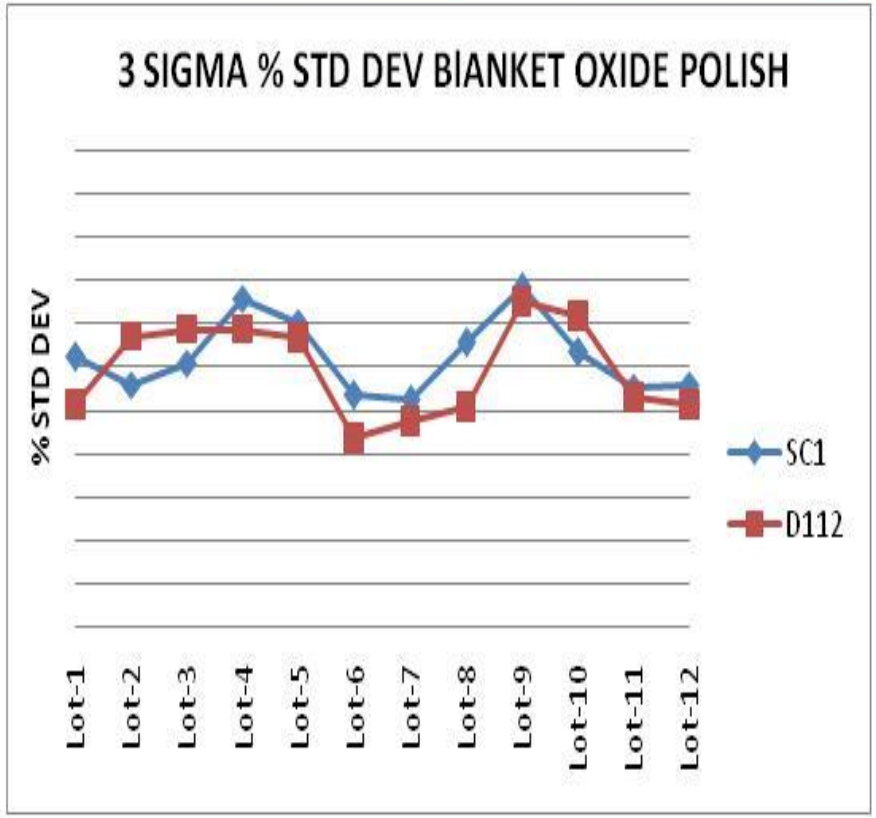
- Problem:
  - In SVTC we have a complex business model allowing customers to run their own processes as well as for SVTC to process wafers for them.
  - Why:
    - Cabot stopping manufacturing of SC1 slurry which impacts everyone.
  - Solution:
    - Collection of data and present to our customers and implement with little impact to customers learning curve and processes.

Experiment plan

- Plan:
  - Blanket Polish using OXIDE over SI wafers.
    - Polish Rate
    - Uniformity
  - Pattern wafer polish 30-45% pattern density.
    - NIT
    - OXIDE
  - Particle Test.
    - .16 Um
    - .25 um
  - Collection of statistical data within a quarter on different days.
    - 1. Blanket
    - 2. Patterned
    - 3. Particle

RESULTS: Blanket OXIDE Polish Data

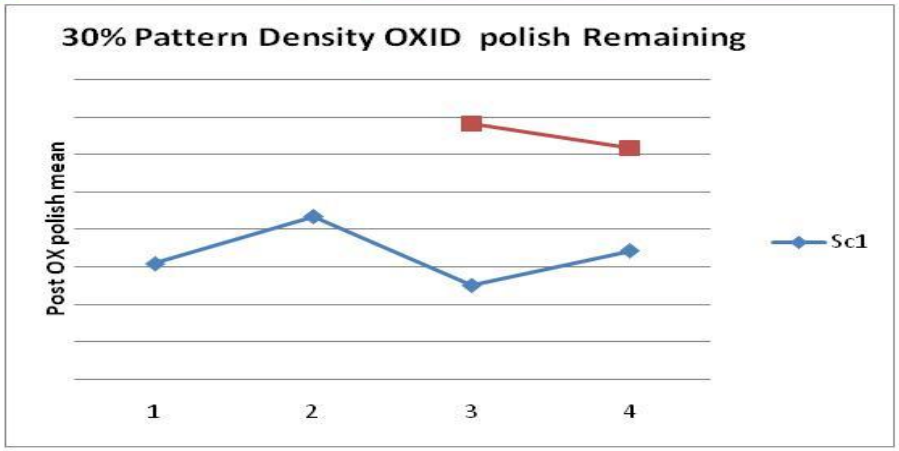


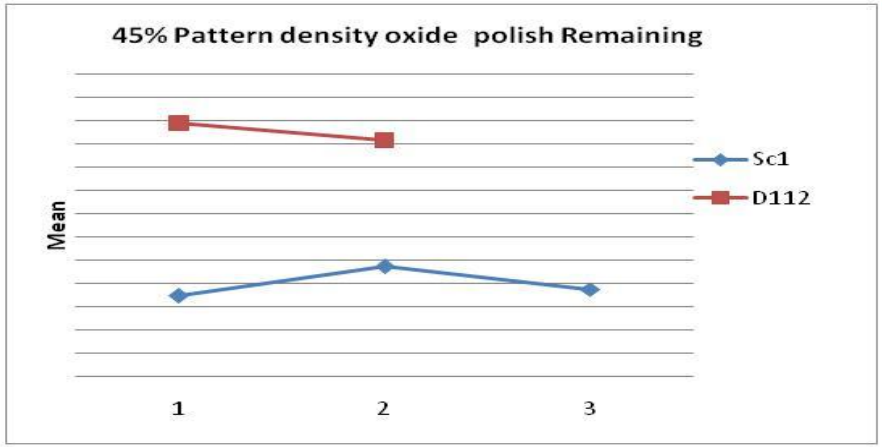


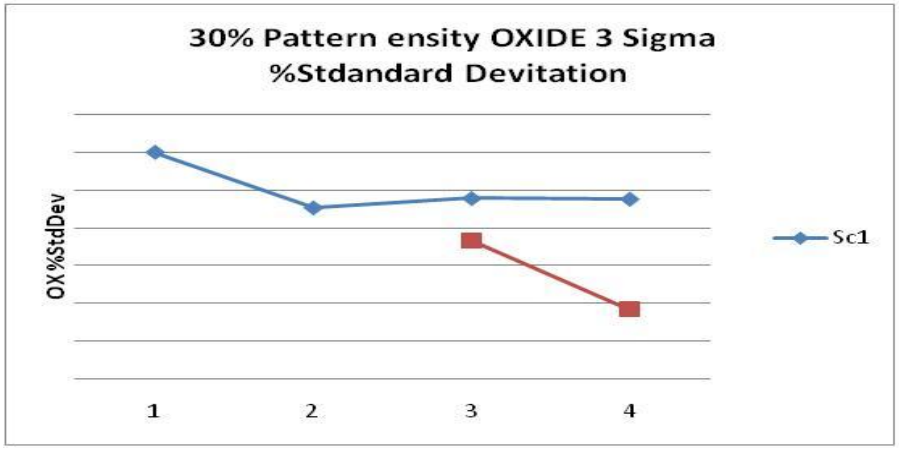
Summary:

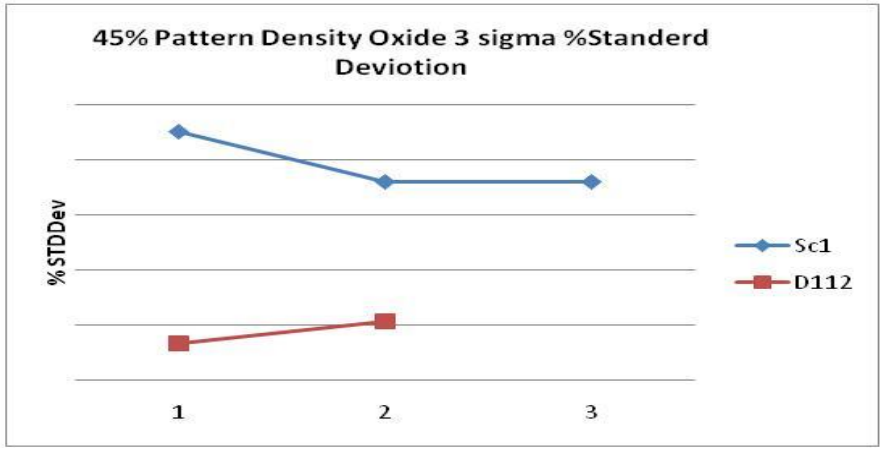
- **D112 slurry has constant delta with SC1 and slower Removal Rate then SC1.**
- **D112 3 Sigma % Standard Deviation is overlapping with SC1.**

RESULTS: OXIDE Pattern Wafer Polish Data





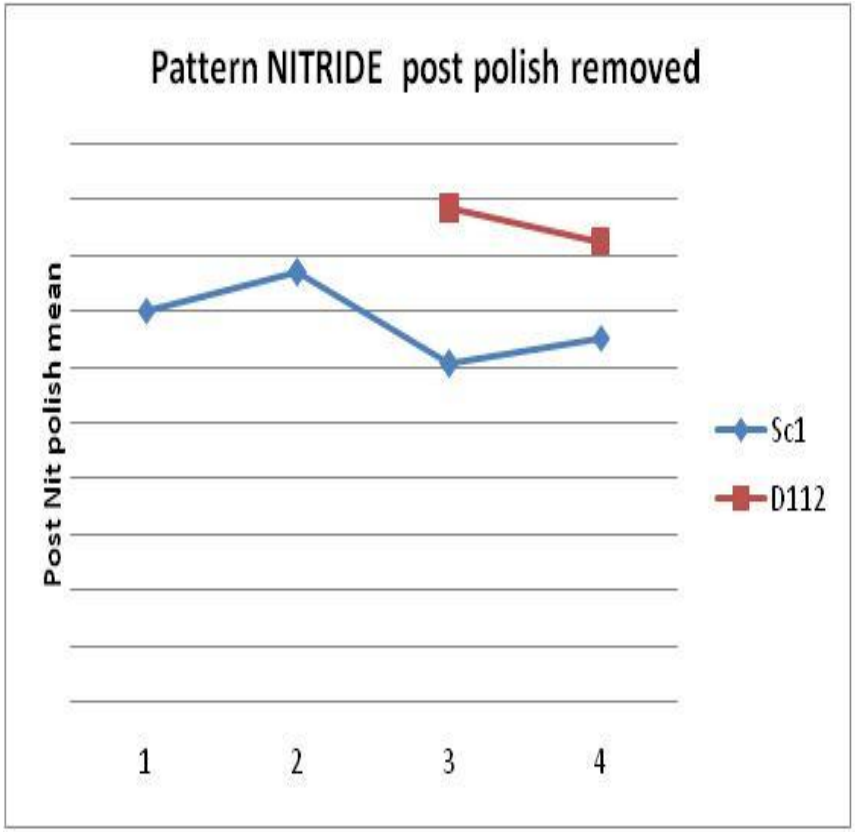


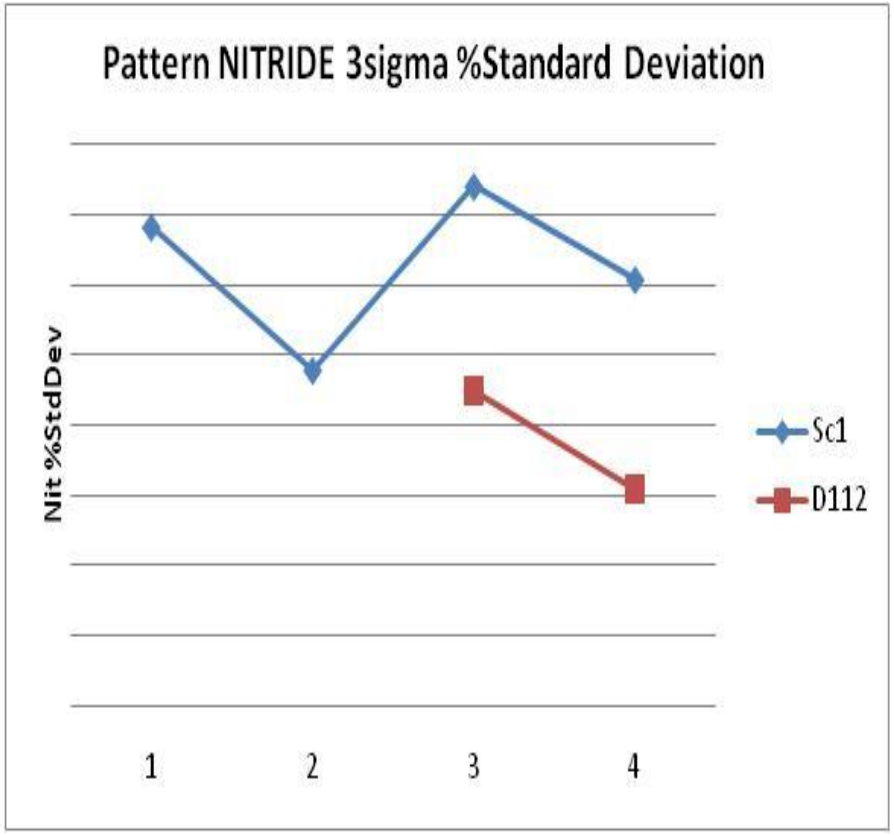


Summery:

- **D112 Pattern showing slower removal rate than SC1 with different pattern density wafers.**
- **D112 showing Lower uniformity across wafer than SC1 with different pattern density wafers.**

RESULTS: 30% Patterned density NITRIDE Data





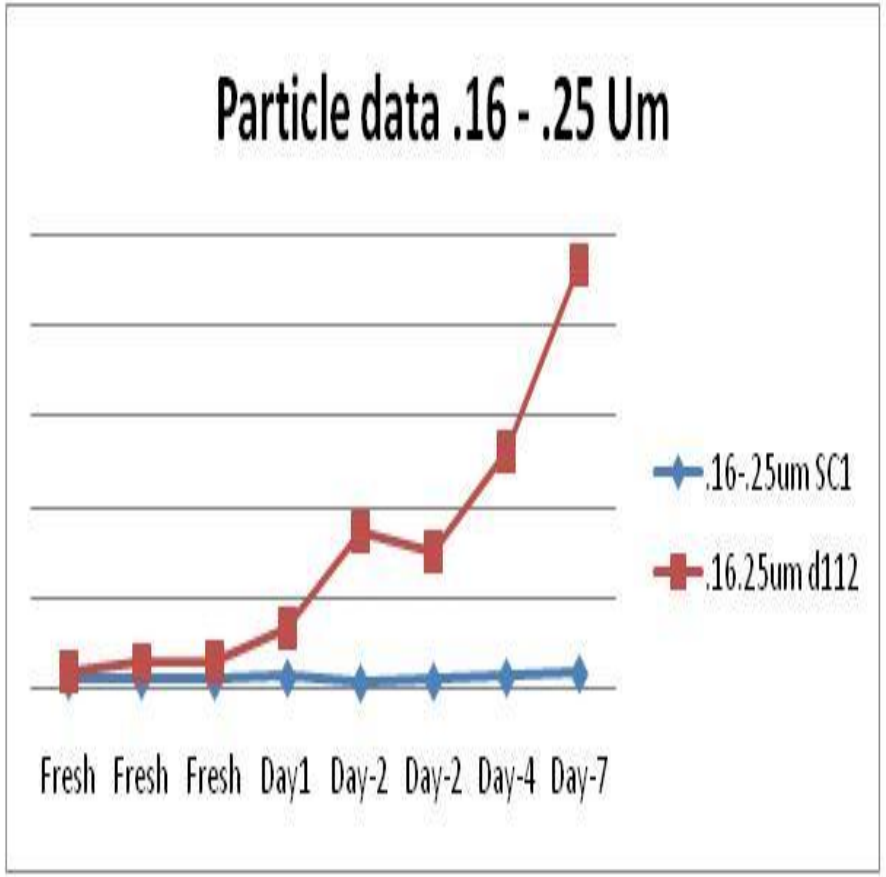
Summery:

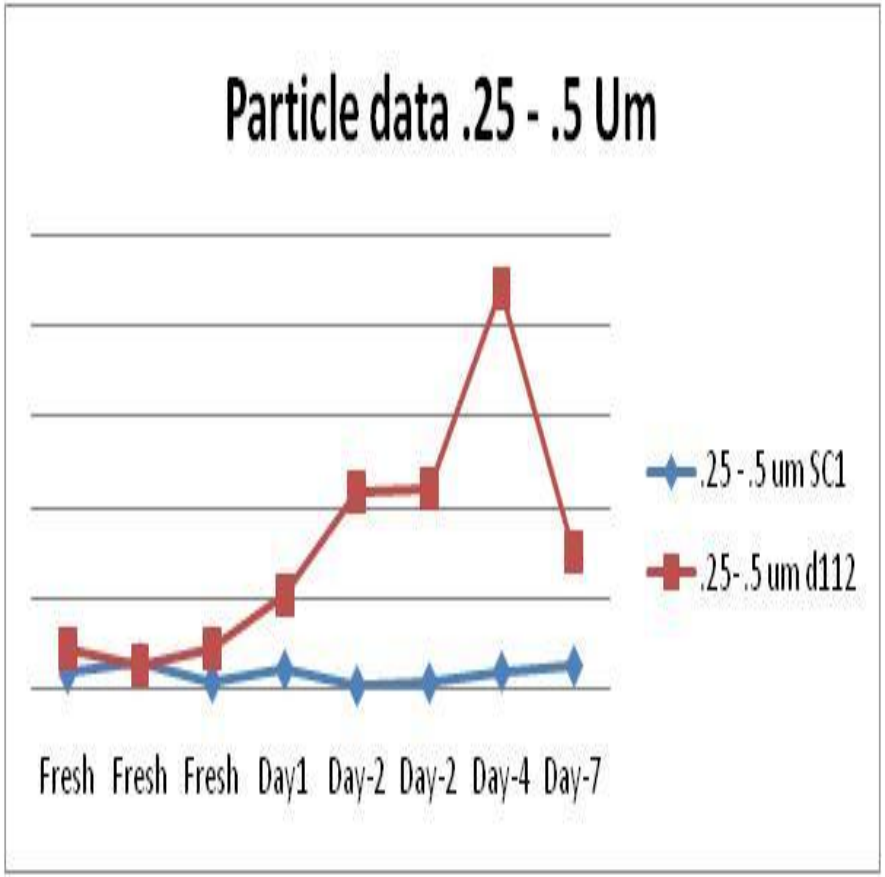
- **Pattern NITRIDE wafer polish with 30% pattern density**
- **D112 showing slower Removal Rate then SC1.**
- **D112 has better uniformity then SC1**

Experiment Summary OXIDE and NITRIDE

- Experiment Summary:
  - Blanket wafers OXIDE polish showing lower removal rate and better uniformity with D112 slurry
  - Pattern wafers with 30% and 45% pattern density OXIDE and NITRIDE showing same difference of lower removal rate and better uniformity with D112 slurry
  - With SVTC complicated and unique processes base on experiment data needed to look at a simple low impact adjustment to resolve the lower rate issue
  - Solution:
    - Show statistical data to our customers with process effected and implement fix.
    - By a small tweak to process recipe can achieve same rate results as SC1 with out impact to learning and process.

Experiment Particle Data





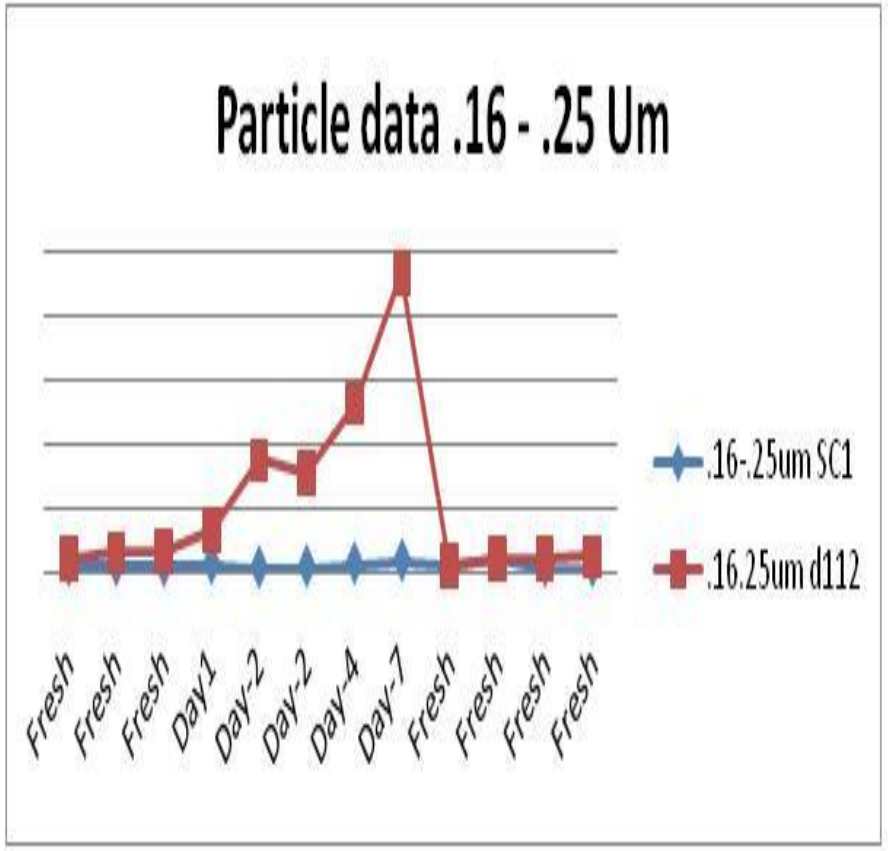
Summery:

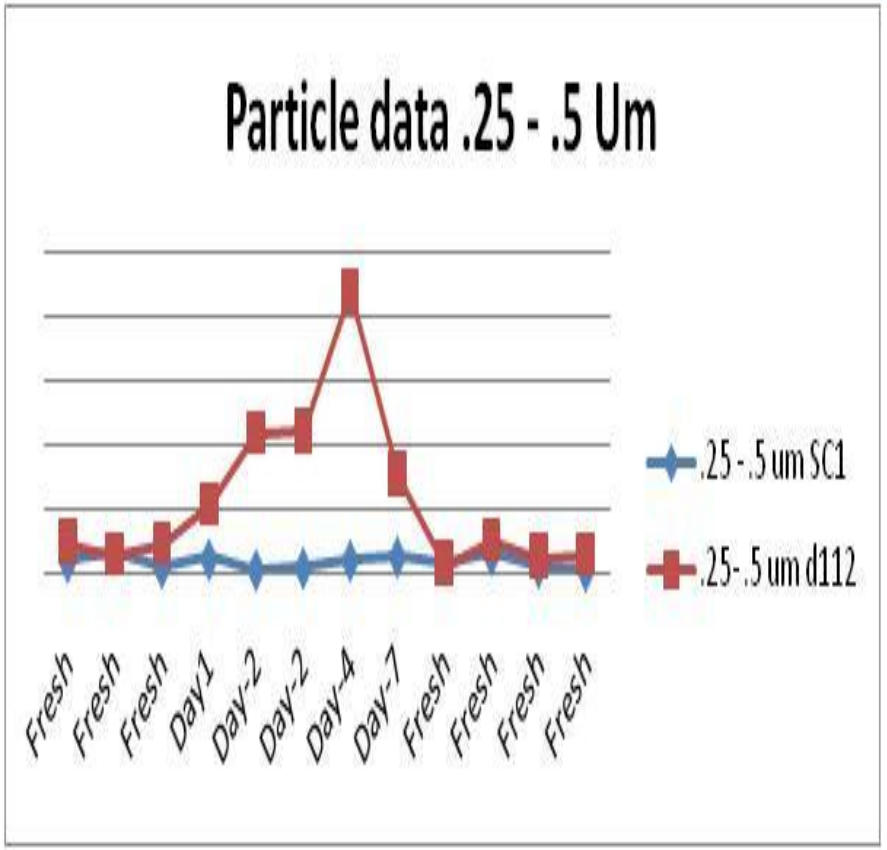
- **With Fresh D112 slurry can achieve save particle counts as SC1**
- **D112 Slurry increase in particle when same slurry used multiple days.**

Experiment Summary Particle

- Experiment Summary:
  - D112 slurry showing same particle results as SC1 when slurry is fresh
  - Problem:
    - When same slurry used multiple days particle results incress
    - Slurry showing crystallization when slurry is exposed to ambient air
    - Slurry was not going through filtering
    - Repeat same experiment with only fresh slurry to see repeatability.

Experiment Particle Data Repeatability test.





Summery:

- Repeating particle With Fresh D112 slurry can achieve save results again.

Second Experiment Summary Particle

- Experiment Summary:
  - Repeating experiment with fresh D112 slurry
    - Achieved same particle results as initial experiment
  - Solutions:
    - Look at our slurry distribution system
    - Filtering D112 slurry same as SC1

Conclusion

- Conclusion:
  - Blanket, pattern OXIDE and NITRIDE polish showing lower removal rate but better uniformity with D112 slurry and can archive same removal rate as SC1 with tweak to process recipe
  - D112 slurry showing same particle results as SC1 with fresh slurry and repeatable
  - Repeat experiment with solutions added (filter, distribution)