



Materials and Conditions Used to Optimize Thinning, Processing, and Dismounting of GaAs Wafers

**SEMICON-West
Innovations in Substrate Technology**

**John Moore
General Chemical Corp.**

GaAs Wafer Backside Processing

**Step 1: Mounting - Adhesive Application,
Sapphire Bonding**

Step 2: Thinning - Grinding, Polishing

**Step 3: Backside Processing - Vias,
Cleaning, Plating**

**Step 4: Demount & Cleaning - Immersion
Clean**

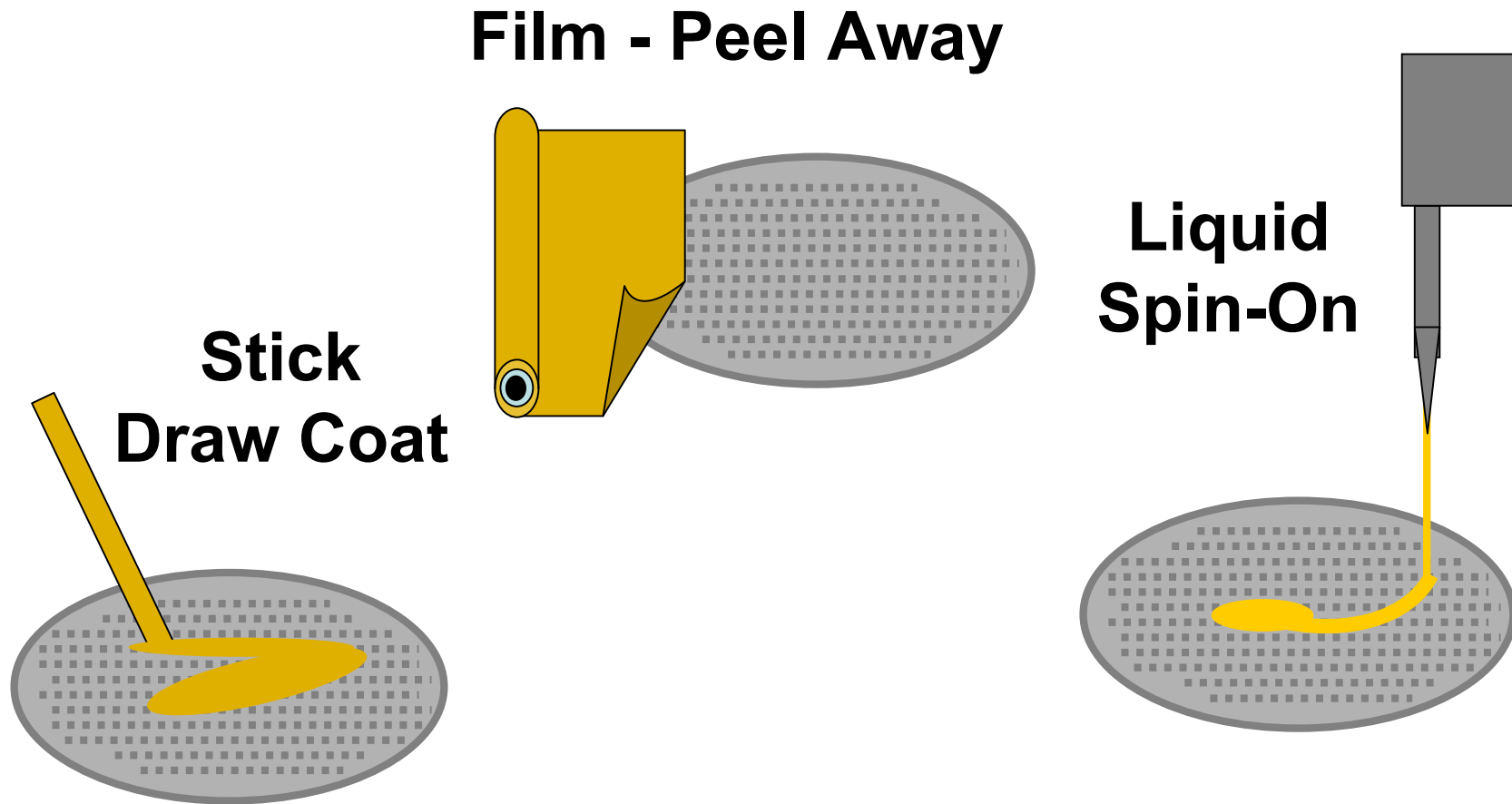
Step 1 - Adhesive Materials

Mounting GaAs Wafer to Sapphire

<u>Trade Name</u>	<u>Manufacturer</u>	<u>Form</u>	<u>Bond Temp. (°C)</u>	<u>Requires Perf. Sapphire</u>
Ablefilm WF5801	Ablestik	Dry Film	140	Y
Staystik 432	Alpha Metals - Cookson	Dry Film	150	Y
Staystik 336T	Alpha Metals - Cookson	Thick Liquid	125	Y
Crystalbond 509	Aremco	Resin Stick	120	Y
Pentalyn-H	Hercules	Rosin Pellet	110	N
GenTak 230	General Chemical	Thin Liquid	150	N



Step 1 - Adhesive Application



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Thickness Uniformity



Stick - Irregular



Film +/- 5%



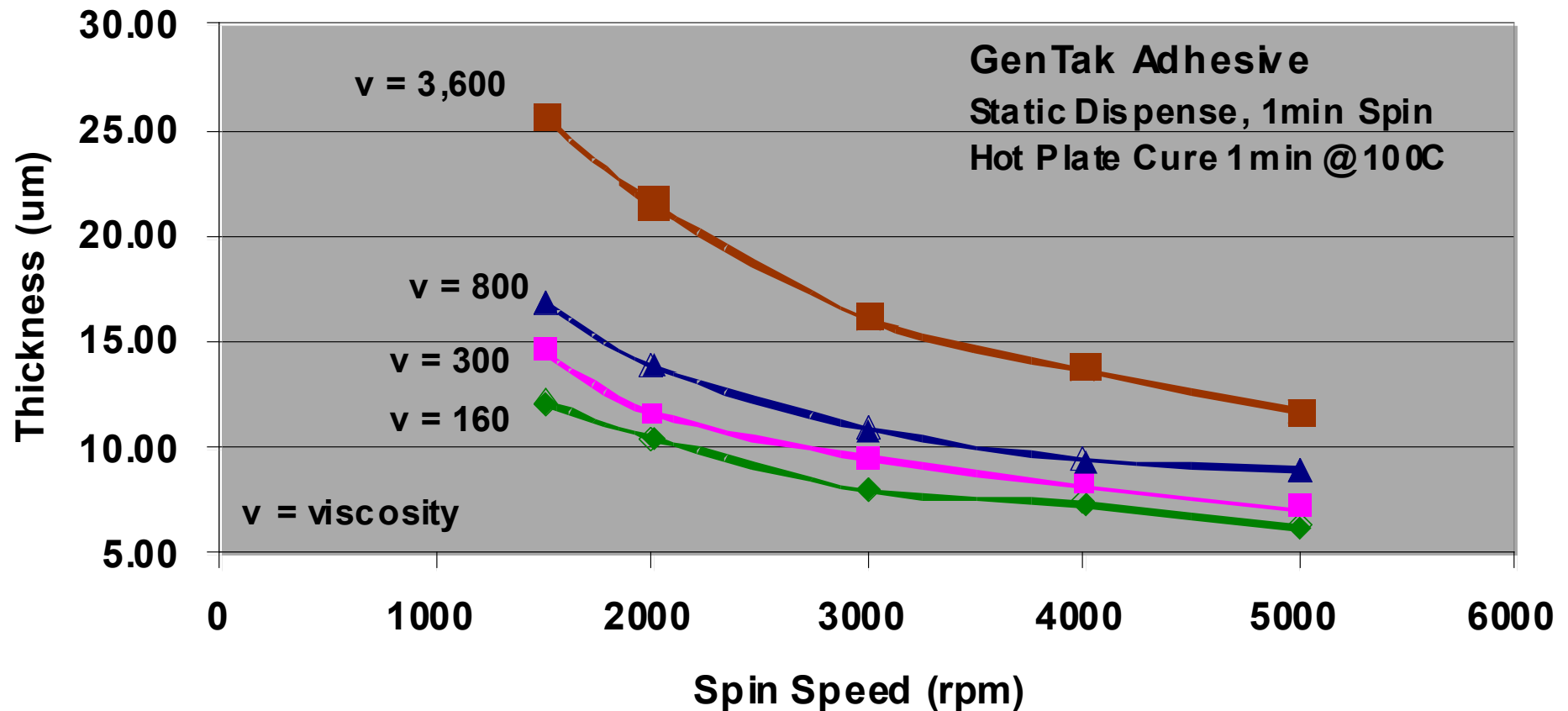
Liq. (Pentalyn) +/-15%



Liq. (GenTak) +/-0.3%

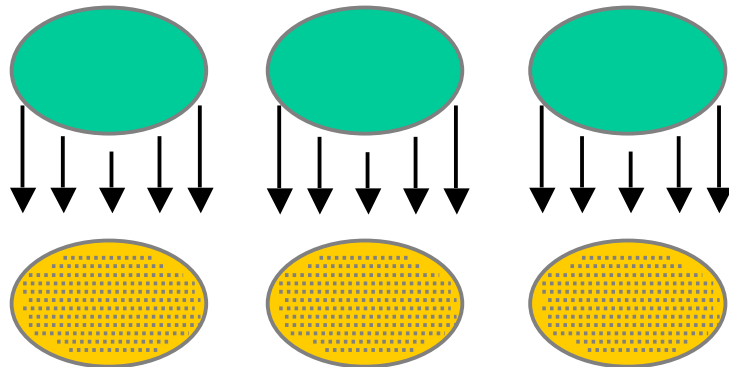
Resin Application via Spin Coater

Thickness vs Spin Speed



Step 1 (Cont.) - Bonding

Thermally Bond Wafer to Sapphire Substrate



- Adhesion
- Planarize Material
- Eliminate Voids
- Clarity - Identify Wafer ID



Courtesy of Sharon Vacuum Co.
Brockton, MA

Step 2 - Wafer Thinning

Backside Grinding and Polishing

- Thinning to $<150\mu\text{m}$
- Uniformity to $\pm 10\mu\text{m}$
- Rigid Bond line
w/Pressure
- High Shear Stress
- Heat Resistance
- Vibration Resistance



Single Wafer Grinder
Strasbaugh
San Luis Obispo, CA

Step 2 - Wafer Thinning

<u>Adhesive</u>	<u>Manufacturer</u>	<u>Form</u>	<u>Softening Temp. (°C)</u>	<u>Physical Property</u>
Ablefilm WF5801	Ablestik	Dry Film	120	Ductile
Staystik 432	Alpha Metals - Cookson	Dry Film	130	Ductile
Staystik 336T	Alpha Metals - Cookson	Thick Liquid	110	Ductile
Crystalbond 509	Aremco	Resin Stick	105	Brittle
Pentalyn-H	Hercules	Rosin Pellet	95	Brittle
GenTak 230	General Chemical	Thin Liquid	130	Rigid w/Relief

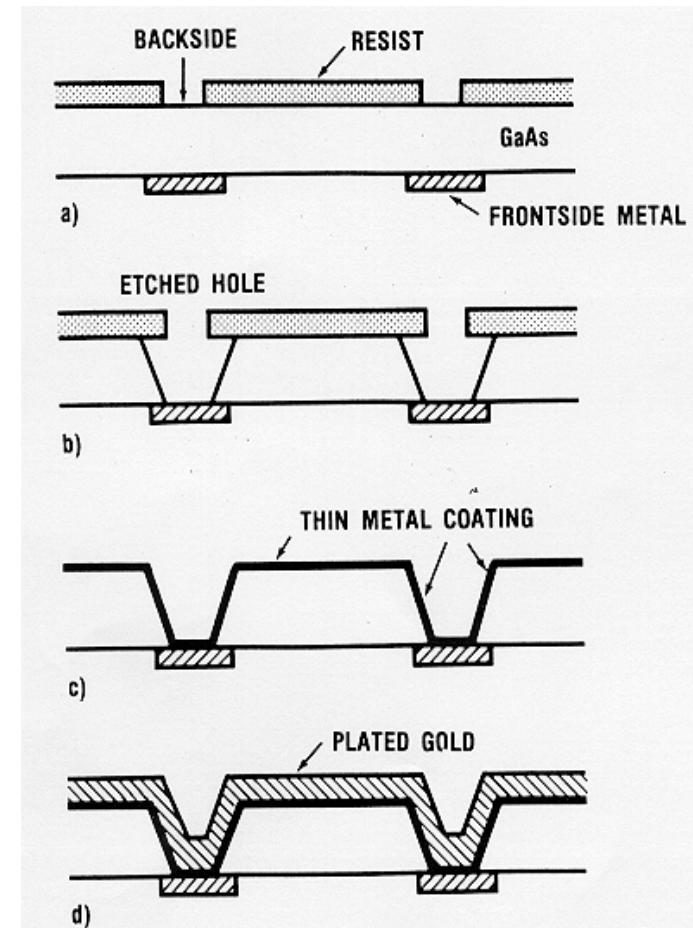


Step 3 - Backside Processing

Etch and Metal Deposition

- a) Define Photoresist Mask
- b) Plasma Etch Vias
- c) Metal Seed Deposition by Sputtering or Electroless.
- d) Electrolytic Gold.

R. Williams, Modern GaAs Processing Methods, Artech House Inc., Norwood, MA, 1990, p. 325.

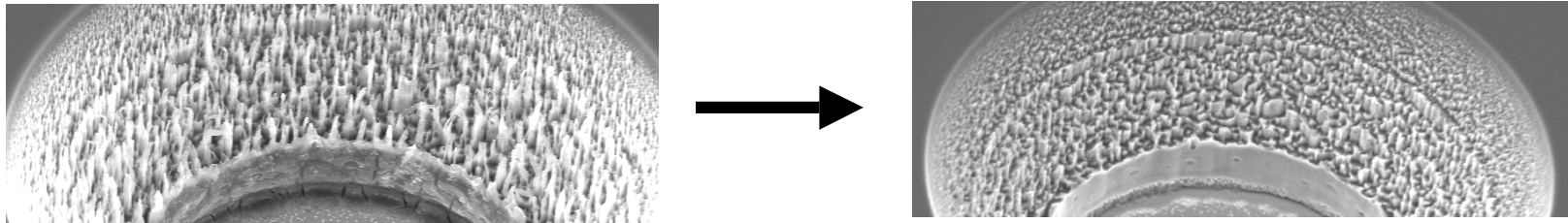


Step 3 - Backside Processing

<u>Adhesive</u>	<u>Resist Strip Safe</u>	<u>Proc. Chem. Safe</u>	<u>Via Clean Safe</u>
Ablefilm WF5801	N-NMP & Acetone	N-Acids & Oxidizers	N
Staystik 432	N-NMP & Acetone	Y-Acids & Oxidizers	N
Staystik 336T	N-NMP & Acetone	Y-Acids & Oxidizers	N
Crystalbond 509	N-NMP & Acetone	Y-Acids & Oxidizers	N
Pentalyn-H	Y-NMP & Acetone	Y-Acids & Oxidizers	N
GenTak 230	Y - GenSolve	Y-Acids & Oxidizers	Y - U/S Process



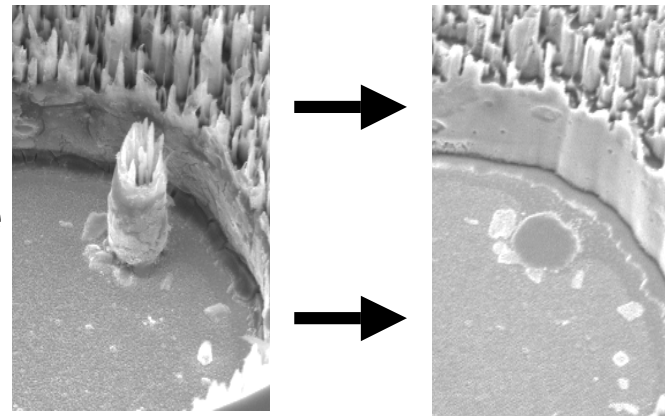
Step 3 - Backside Processing



Veils - Resist Removal and Smoothing

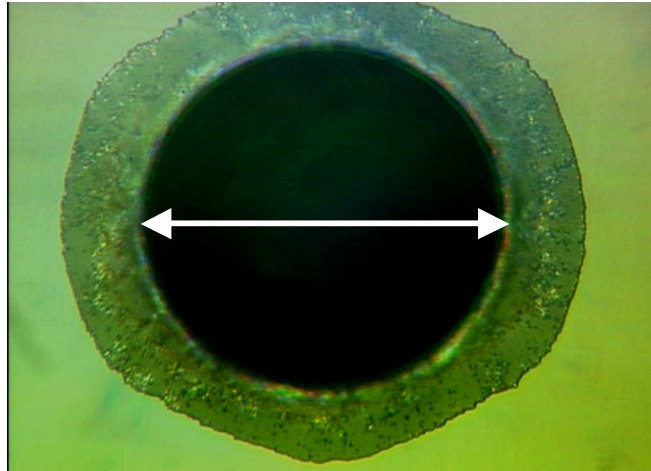
Via Cleaning

**Walls & Bottom
Resist and Particulate
Removal**

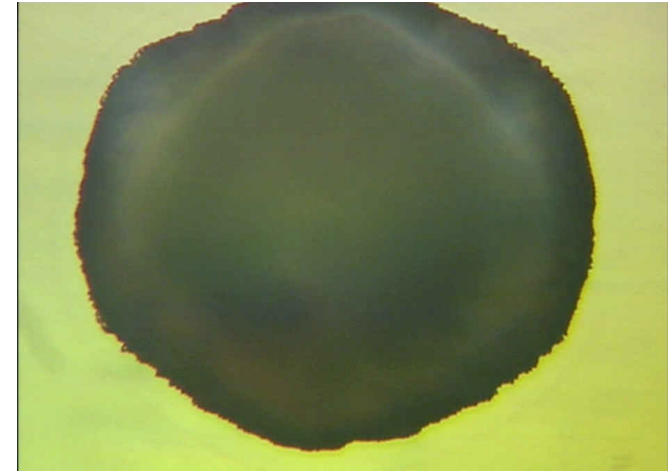


Step 3 - Backside Processing

**Backside
Via
Cleaning**



35 um



Veil Smoothing

Process (<10 min.)

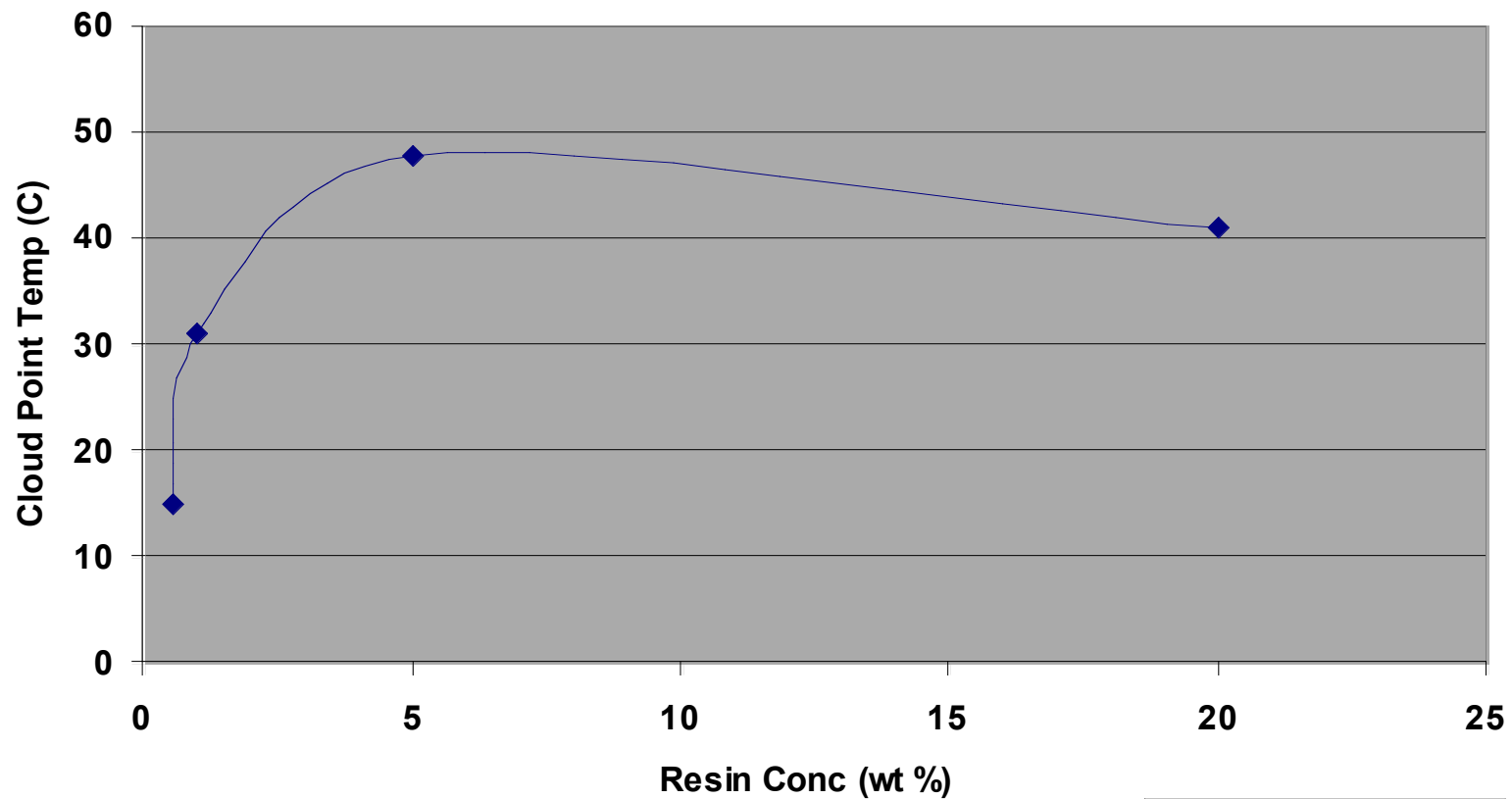
- a) Clean - Immersion + Sonicated Agitation
- b) Pre-Rinse - Low ST Particulate Lifting
- c) Rinse - DI Flush

Step 4 - Demount and Clean

- **Immersion Solvent System**
- **Temperature Near Adhesive SP**
- **Agitation Using Sonication**
- **Pre-Rinse @ Low ST**
- **Rinse in DI Flush**

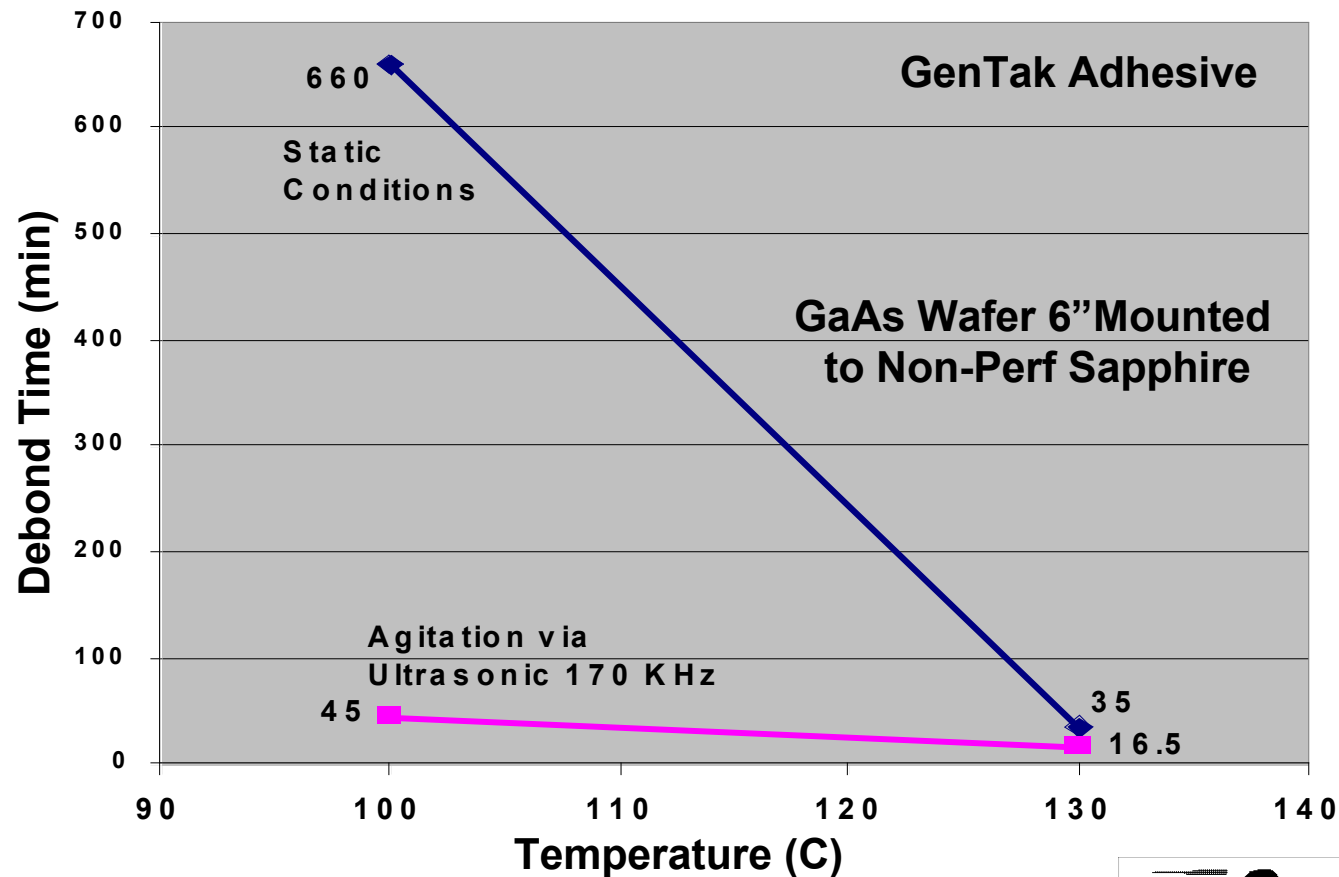
Step 4 - Demount and Clean

Resin Solubility Using Cloud Point

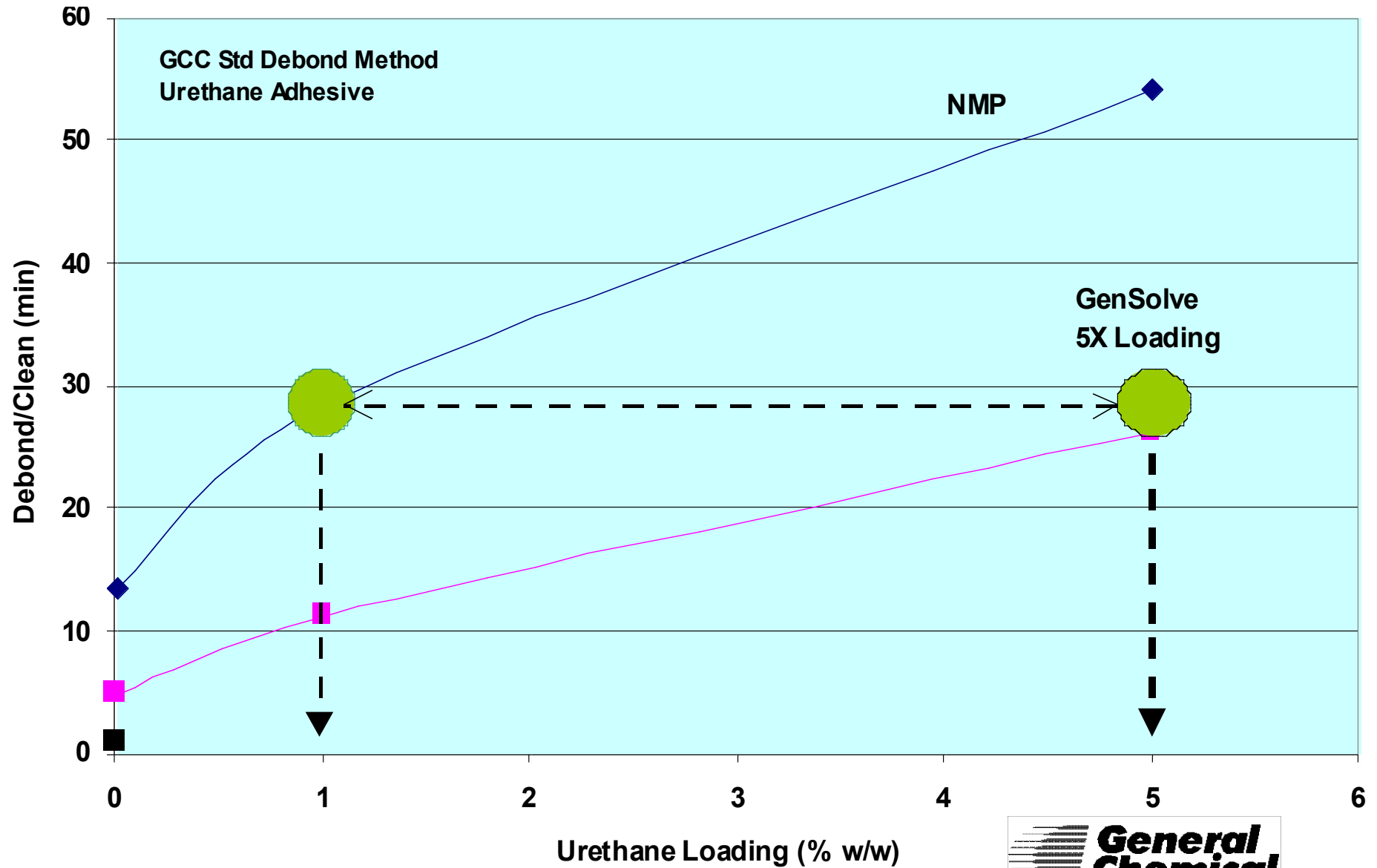


Step 4 - Demount and Clean

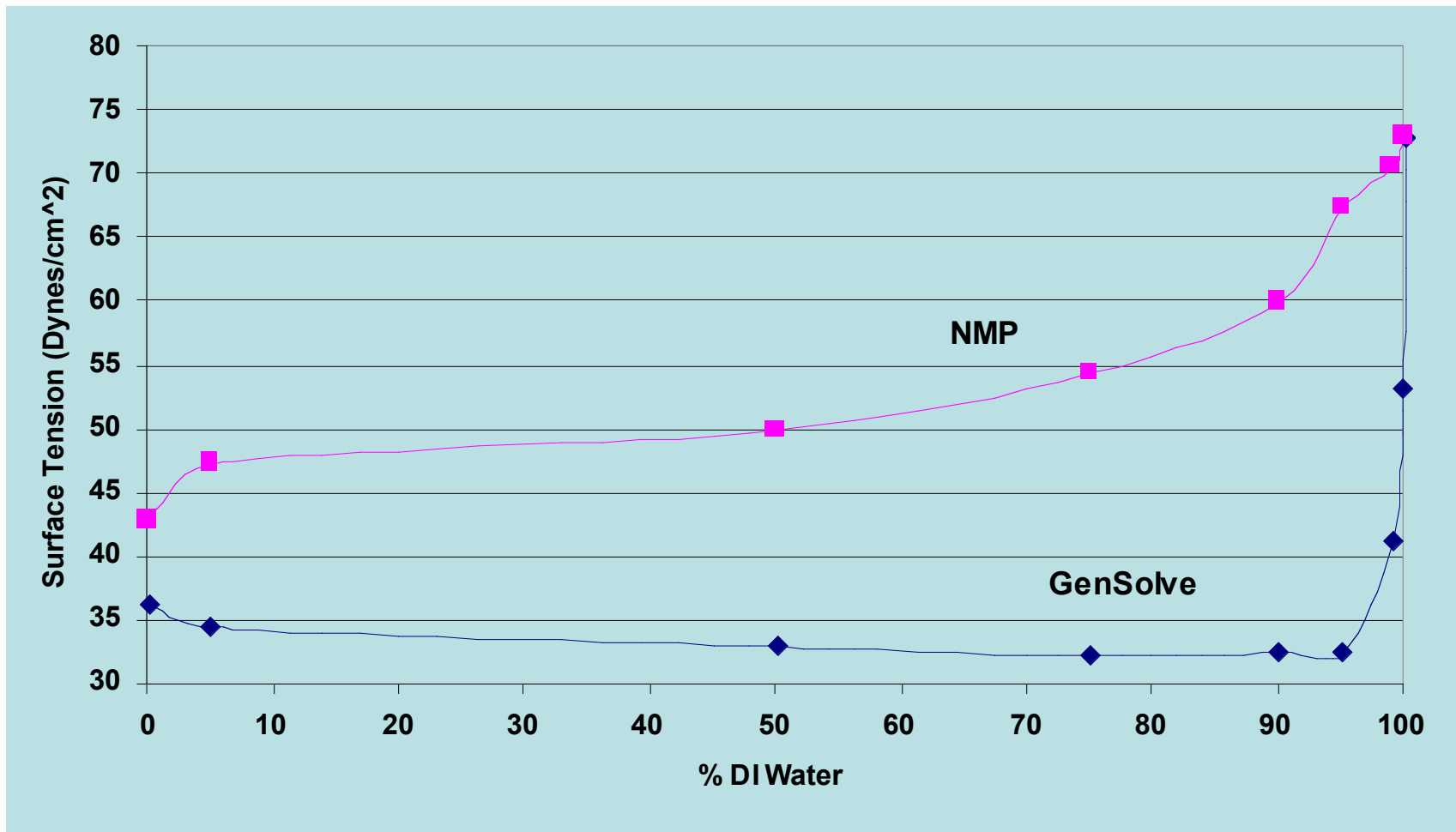
Debond Performance vs Agitation & Temperature



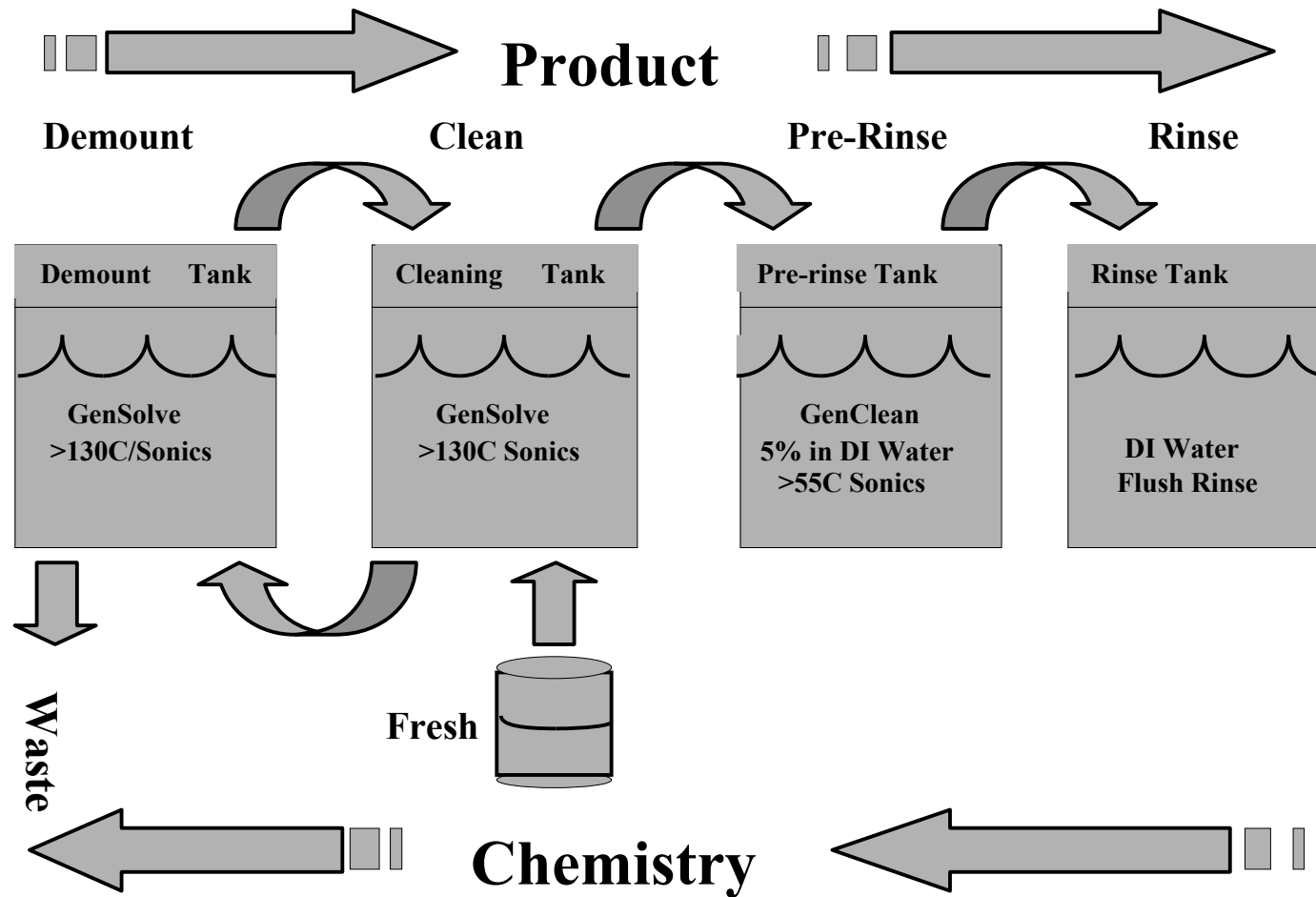
Debond Time vs Polymer Loading



Post-Demount Rinsing



Demount & Clean Process



Summary

- **Spin-On Adhesive - Uniformity & Planarization**
- **Adhesive - Resistance to Resist Strip and Process Chemical.**
- **Via Cleaning - Quick and Effective**
- **Demount - Solvent Match for Good Performance & Bath Life**
- **Pre-Rinse - Minimize Redeposition and Facilitate DI Flush**