Fully Flexible Chemical Dispense System for SEZ Single Wafer Wet Cleaning Tools.

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Customer requirements for single wafer wet cleaning tools

1 High process stability:

- Constant etch rates on wafers
  - concentration of process media
  - temperature of process media
  - media flow rate onto the wafer
- lowest Contamination
  - particle contamination
  - metal contamination
  - cross contamination

R&D

2 Low cost of ownership

- Small Foot print of tool
- High wafer throughput
- Low media consumption

Prod.

Contradictory requirements for flow concept

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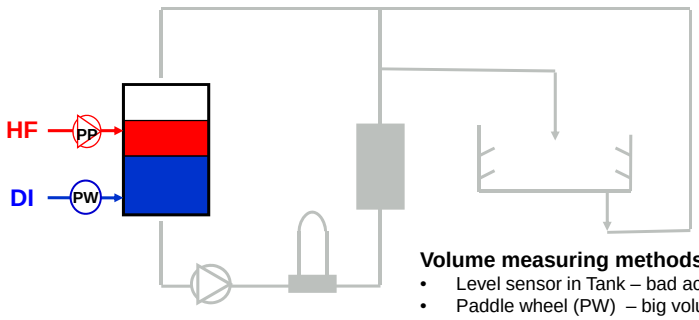
Standard SEZ flow concept – Filling by measuring volumes



Volume measuring methods:

- Level sensor in Tank – bad accuracy
- Paddle wheel (PW) – big volumes, good accuracy
- Puffer pump (PP) – smaller volumes, good accuracy

Mixing dHF

1. Adding DI into Tank – using paddle wheel
2. Adding HF into Tank – using puffer pump

Not ready to use
Inhomogeneous temperature

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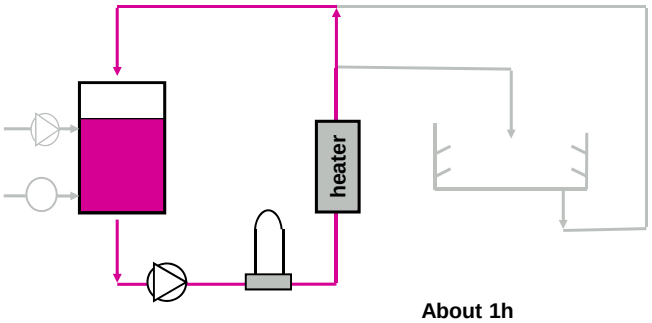
Standard SEZ flow concept - mixing



Recirculation of mixture:

- Make mixture homogenous
- Heat mixture with inline heater
- Multi pass filtration

About 1h

DHF is ready to use

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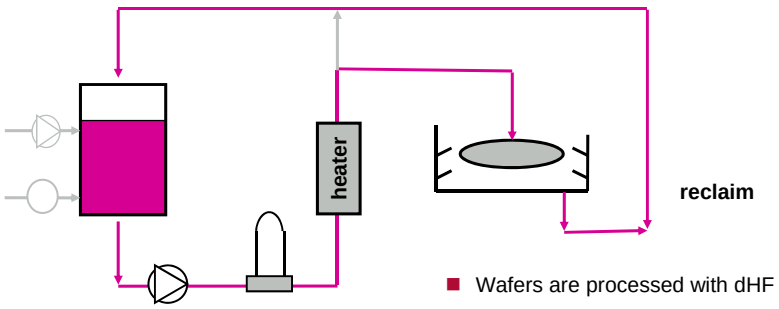
Standard SEZ flow concept - processing



- Wafers are processed with dHF
  - Constant etch rates over wafer
  - Constant temperature
- Low cost of ownership
  - Low media consumption - reclaim

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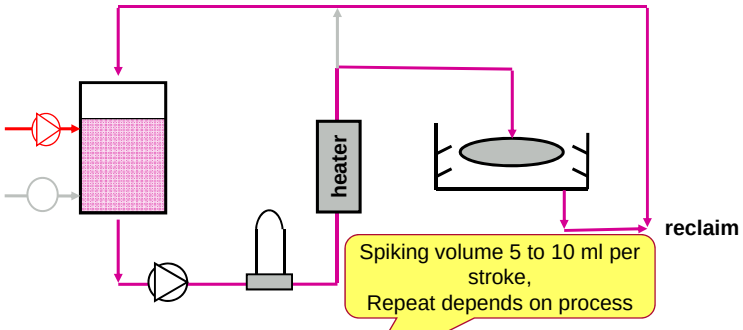
Standard SEZ flow concept - spiking



- Slow concentration change of HF due to
  - HF consumption during etching
  - Evaporation of DI and HF

spiking

- Low cost of ownership due to spiking
  - Bath life time is increase dramatically
  - Spiking is done during processing (wafer through put)

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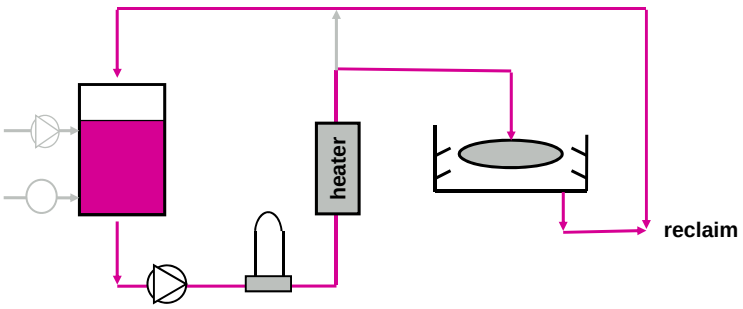
Standard SEZ flow concept - processing



- Continue with processes
  - spiking

After x wafers

- bath lifetime is reached
  - After certain time
  - After certain wafers

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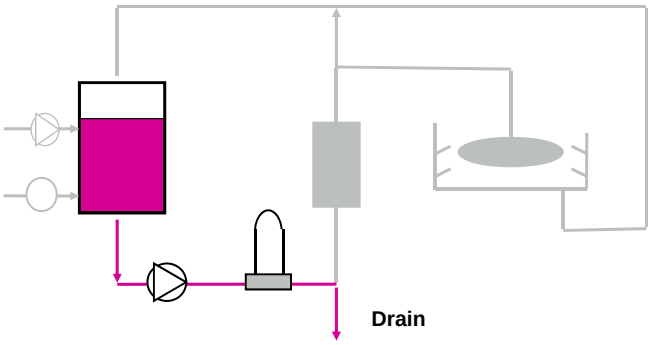
Standard SEZ flow concept - emptying



- whole tank is drained

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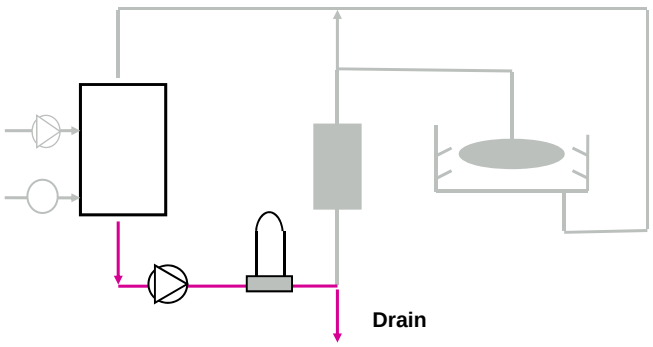
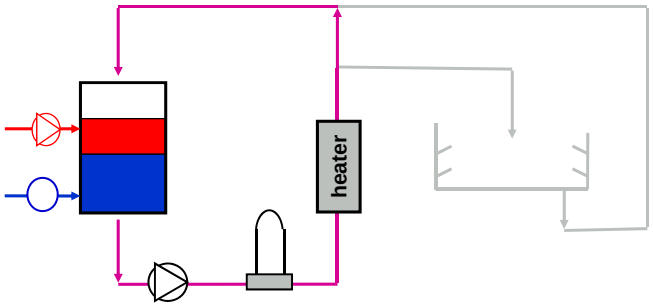
Standard SEZ flow concept – empty total system

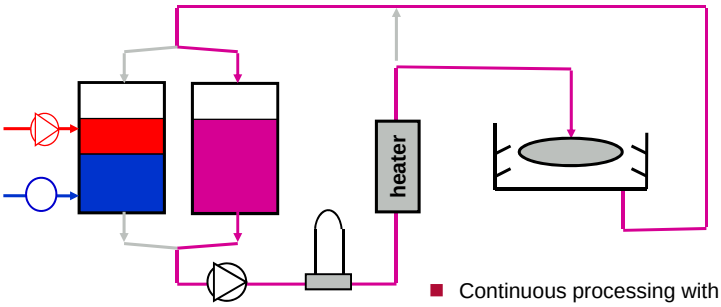


Standard SEZ flow concept - Mixing



- Standard filling procedure

Two tank SEZ flow concept – continuous processing possible



- Continuous processing with two tank system - high through put
  - One tank is for processing
  - One tank for mixing

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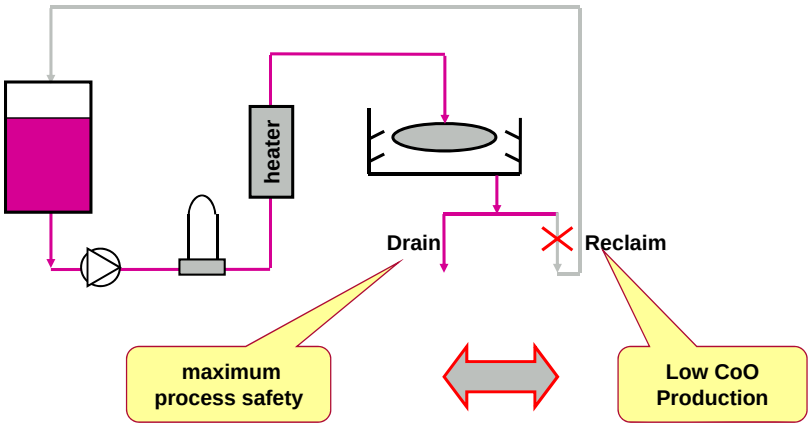
New requirements: process to drain



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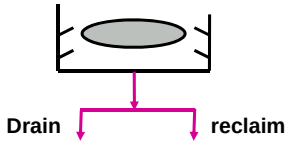
Different arguments for Drain and Reclaim mode



- no contamination from previous processed wafers
  - No metal contamination
  - No particle contamination
  - No cross contamination
- For high diluted Chemicals
  - dHF
  - SC-1
  - SC-2, dHCl
- Increase requests in 45nm nodes
- R&D prefers process to drain

- Low cost of owner ship
  - Less amount of chemicals used up
  - Less volume for disposal
- SEZ spin processors are able to reclaim up to 3 medias
- Mass production tools prefer reclaim option

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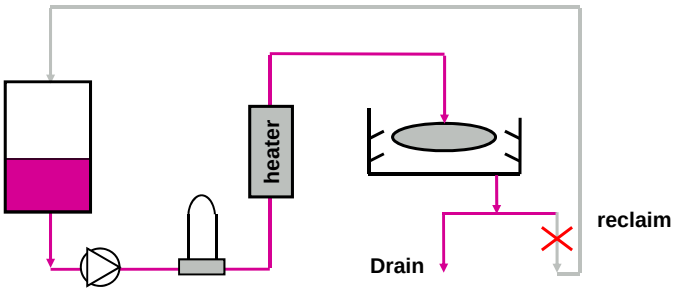
Process to drain mode consumes big volume of media



- Huge volume of media goes into drain
  - The tank will be empty very soon

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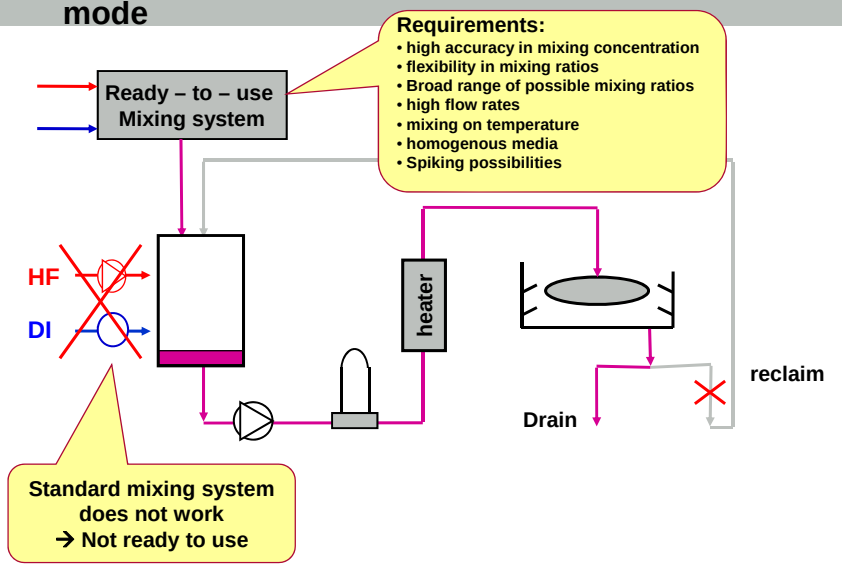
Special mixing system is required for Process to drain mode



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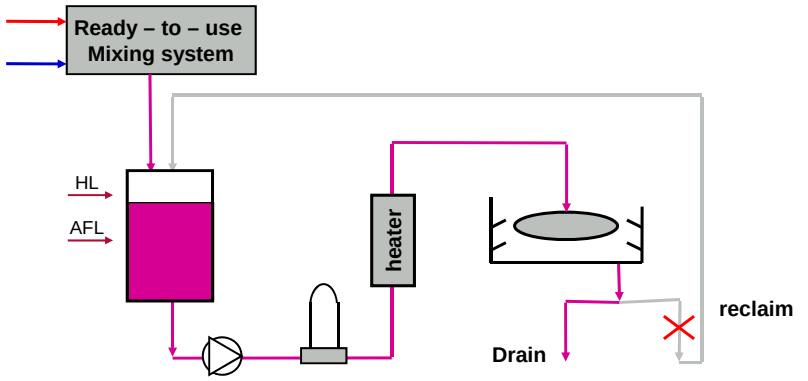
Ready – to – use mixing system keeps tank filled with media



- Ready to use mixing system refills tank within minutes
  - Starts to mix when media level is below auto fill level (AFL)
  - To High Level sensor

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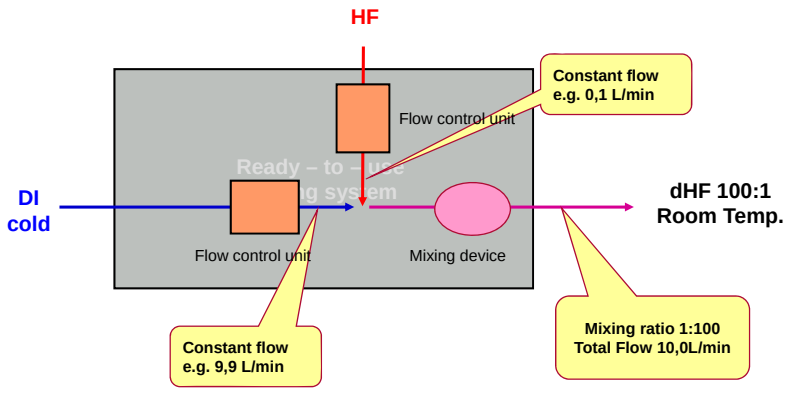
Ready - to - use mixing system need high quality flow control units



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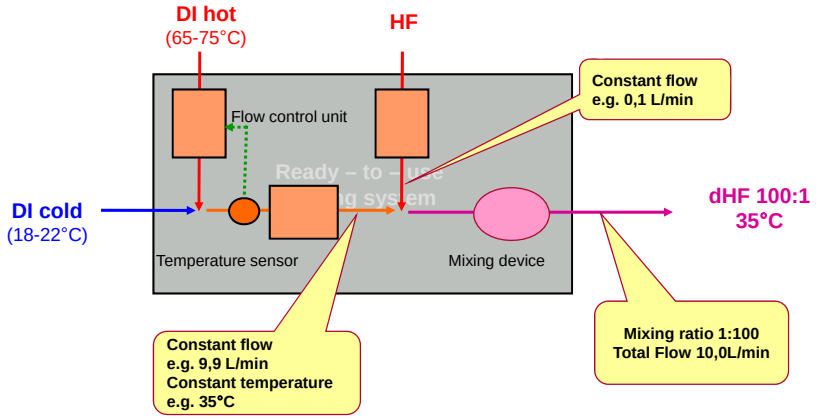
Ready - to - use mixing system with temperature mixing possibility



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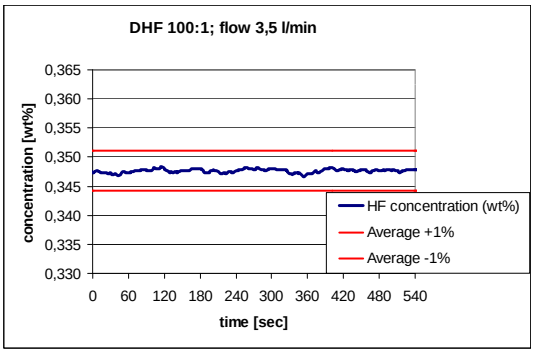
dHF Data of Ready – to – use mixing system



Max: 0,3483 wt% (+0,19%)
Min: 0,3467 wt% (-0,27%)
Aver: 0,3476 wt%
σ=0,000316

Measuring device: Horiba HF-96

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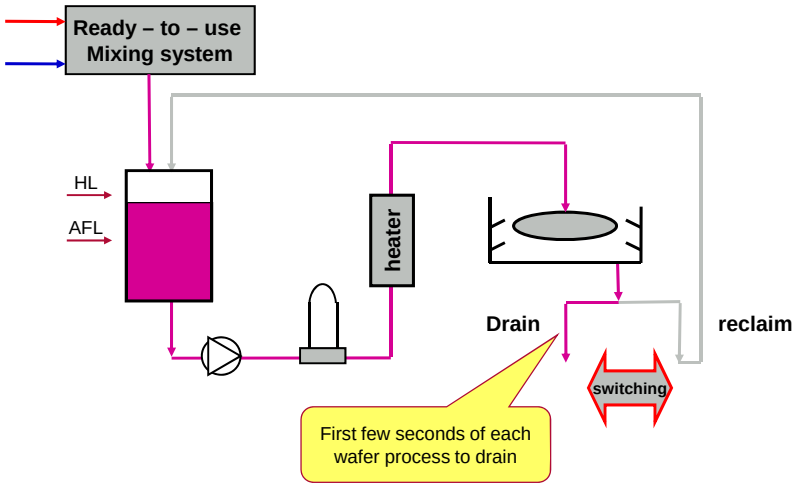
Optimization of highest process safety and CoO - process to drain and reclaim within one recipe



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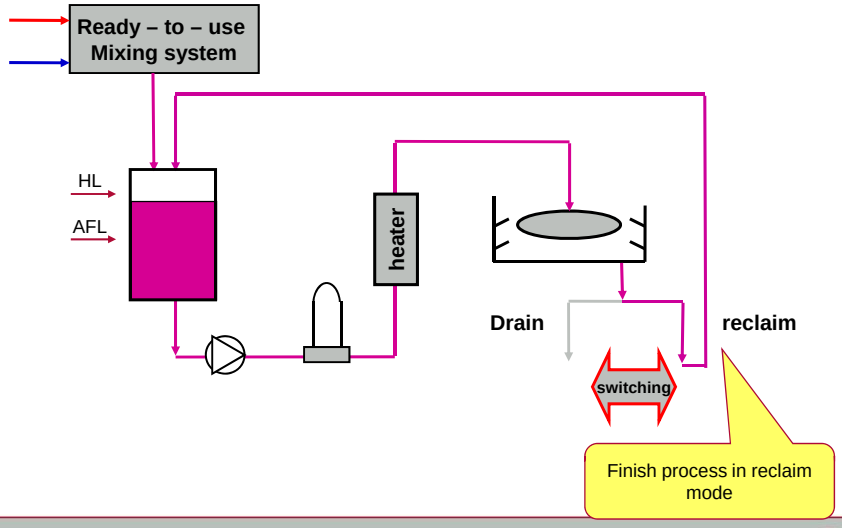
Ready – to – use mixing gives full process flexibility



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Advantages – SEZ flow concept

Excellent technical performance of ready – to – use mixing system

- Mixing ratios up to 1 to 5000
- Broad flow range of part streams without hardware changes (factor 1000 - from 4 – 4000 ml/min)
- Mixing flow rates up to 25 L/min (increase possible)
- High mixing accuracy: better than +/-1% of target concentration
- Up to 3 part streams (mixing DSP+: DI+ H2SO4 + H2O2 + HF)

Long lasting experience

- Installed system at different customers in Asia, Europe and US.

Flow concept is suitable for all process requirements

- Process developing tools prefer process – to – drain mode
- Production tools prefer reclaim mode (CoO)
- Switching within one recipe between Process to drain a reclaim is possible to optimize process results and CoO.

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Thanks for your attention

SEZ

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