



Primary Strategy: Match Water Qualities to Water Requirements

 Segregate, Collect, Monitor, and Recycle Clean Spent Rinse waters back to the UPW facility for re-use as Ultra Pure Water

- Use unpolished DI water for lower water quality demands
- Re-use Reject Streams & Industrial Wastewaters in Scrubbers and Cooling Towers where appropriate
- Reasons

Intel MA saves 50+ Million Gallons every year in the <u>UPW Recycle System</u>, for a cost savings of \$ 200 K/yr (as water not purchased for Town of Hudson)

- Improves the final UPW quality used on the wafer
- Minimizes the seasonable variability from our municipal supply
- Provides a more reliable UPW system to the Fab, with less downtime
- Lower labor costs due to less regenerations, & membrane cleanings
- Intel reduces wastewater and water supply needs

UPW Recycle system

Intel Massachusetts

 Collects a portion of the drains from process tools and reprocesses it back to a quality to be reintroduced into the primary UPW system



- Used in other applications such as:
 - Cooling towers
 - Scrubbers
 - AWN Chemical dilution
 - Vacuum pump seal water

Reclaim Water a.k.a. "Grey Water" @ F17

Recycle/Reclaim Schematic

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Why was this recycle system installed

- Fab expansion required more UPW capacity
- Town of Hudson POTW did not have capacity
- Town sewer line was near capacity
- Town Water Supply System was near capacity
- Quality of UPW Recycle is guite reliable



- The fear and reality of contaminating the UPW System with TOC's during process ramp and tool start-up $% \left({\frac{{{\left({{{\rm{D}}} \right)}}}{{\left({{{\rm{D}}} \right)}}}} \right)$
 - Potential for fab tool x-connects and flushes
 - During Maintenance on fab tools drains etc. connected to UPW Recycle
 - Inferior DI Resins, sustaining resin quality
 Requires experienced operational staff to UPW Recycle
- Water & Wastewater conservation constraints
- Perceptions; water resources are without limits
 When TOCs diverted to sewer, risk of increased wastewater to POTW
- Increasing demand on Town water supply (UPW Makeup) during TOC divert
- Space constraints in $\ensuremath{\mathsf{CUB}}$ Future improvements are limited due to space availability

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Overcoming obstacles in Design & Construction

- · Collect water only from the best sources.
 - Work with design engineers to identify sources of TOCs
 - No tools with solvent baths
- · Monitor TOC's & Conductivity early in collection system with ability to divert to pretreatment system (Acid Waste Neutralization) / sewer
- · Installed improvements to detect/destruct/remove/reduce TOC's
- · Monitor TOC's in final product with ability to divert before introducing into the UPW system

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Overcoming obstacles in Start-up & Sustaining

- Work with Install / Tool Qualification Teams (IQ) to validate installation per design

 tighter IQ review and tool sign-offs
- Work with Process Engineers (PE) and Manufacturing Techs (MT) to verify tool qualification do not violate design criteria
- Work with PE to use flush permits for deviations from standard operations
- Need to work with PE & IQ and MTs to;
 - Explain what the system does and how solvents impact the system
 - Label each piece of equipment and drains
 - Repeat training frequently make sure transferred MT know difference
- Also, need to work closely with UPW operators to coordinate with Tool MT s during maintenance









Water Reuse Projects

- Recycle analytical streams
- · Direct filter rinse water to Reclaim System
- Install temperature compensated conductivity probes and TOC analyzers/diverter valves in Recycle System

Achieved 39.5k GPD savings

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Conclusions/ Lessons Learned **UPW Recycle Benefits** 1. UPW Recycle provides better feed water quality, final UPW quality 2. Improved reliability of UPW facility, Less downtime: Improved reliability of rol membrane cleaning processes. Reduced frequency of RO membrane cleaning processes. Reduced frequency of ion exchange regenerations. Reduced frequency of filter backwashes/rinses. Improved efficiencies in UPW treatment processing. Reduced chemical usage for ion exchange regenerations. Keduced chemical usage for for exchange regenerations. Cost savings: Less feed water and backwash water costs. Less regeneration chemical cost. Less industrial waste treatment (i.e. pH Adjustment) cost. Less maintenance and cleaning chemical cost. Improved RO water quality for other reclaim purposes (cooling towers) 6. Less demand on the municipal water supply and waste water treatment systems (POTW)