LIBERTYCES — WASTEWATER TREATMENT REFERENCE

Why Semiconductor Wastewater Isn't One Stream

Fluoride, metals, CMP slurry, and ammonia each need a different treatment chemistry. Segregating streams before treatment can be the highest-value engineering decision in the whole system.

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INTRODUCTION

One Mixed Stream Is a Harder, More Expensive Problem

Semiconductor wastewater should be segregated according to chemistry and treatment requirement — not combined into a single mixed stream and treated as one problem. A relatively clean rinse stream, kept separate, can become reclaim feed. Mix it with fluoride, concentrated acid, copper, and organics, and the facility has manufactured a much harder wastewater problem than any of those streams individually presented.

THE STREAMS

What Actually Needs Its Own Treatment Train

Fluoride-containing wastewater

From HF and fluorinated cleaning/etching chemistries. Treated by calcium-based precipitation to insoluble calcium fluoride.

Copper / metal-bearing wastewater

Treatment depends on whether the metal is dissolved, complexed, or free — each behaves differently under the same pH adjustment.

CMP slurry wastewater

Extremely fine suspended particles plus process chemicals — solids-handling equipment a clean acid stream never needs.

Ammonia-containing wastewater

Approach varies with concentration, pH, temperature, discharge limit, and any existing biological treatment train.

Acidic / alkaline wastewater

Still incompatible with fluoride, metals, or CMP streams if mixed upstream of treatment.

Low-contamination rinse streams

Kept separate, a real reclaim candidate. Mixed with anything else on this list, ordinary wastewater treated to the strictest standard in the mix.

FLUORIDE TREATMENT

The Calcium Precipitation Train

HF and fluorinated chemistries produce a fluoride stream treated by calcium-based precipitation.

1 **Segregated fluoride waste**
Kept separate from acid, metals, and CMP streams from the point of generation.

2 **Equalization**
Buffers flow and concentration swings before the reaction stage.

3 **Calcium reagent addition**
Converts dissolved fluoride to insoluble calcium fluoride solids.

4 **Controlled pH adjustment**
Precipitation efficiency is pH-dependent — held to a controlled range.

5 **Coagulation / flocculation**
Aggregates the fine precipitate into settleable/filterable floc.

6 **Clarification or membrane separation**
Removes the bulk settled solids from the treated water.

7 **Filtration / polishing**
Final solids removal before discharge or further reclaim treatment.

8 **Discharge or additional reclaim treatment**
Meets permit limits, or feeds a further polishing step for reclaim.

REAL DOSING CAPABILITY

MODEL	CAPACITY	PRESSURE
ProMinent Sigma/1 Basic	17–144 l/h	4–12 bar

ProMinent Sigma/2 Basic	50–420 l/h	4–16 bar
ProMinent Sigma/3 Basic	146–1,030 l/h	4–12 bar

CMP TREATMENT

CMP Wastewater Is a Different Problem Than POU Delivery

Point-of-use slurry delivery keeps a colloidal suspension stable on its way to the wafer. CMP wastewater treatment does the opposite downstream: deliberately destabilizing and removing those same particles before discharge or reclaim.

The Treatment Train

1. **Equalization**
2. **pH adjustment**
3. **Coagulation**
4. **Flocculation**
5. **Clarification**
6. **Micro/ultrafiltration**

Real Slurry-Duty Pumps

Schurco L Series — up to 30,000 GPM, alloy or thick elastomer liners for erosion/corrosion resistance.

Schurco P Series — process slurry pump for dirty water and light slurries (SG ~1.05), double-volute impeller reduces radial loads.

Schurco V Series — fully cantilevered, no submerged bearings or seals, for sump/pit/tank service.

Run This on Your Next Application

LibertyCES engineers segregation and treatment-train equipment around the actual chemistry and solids loading — not a catalog guess. For a spec review, call, text, or email James directly.

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