CMP Treatment
Semiconductor CMP Wastewater Treatment

Key features & benefits
• Specialist processes developed for the semiconductor market
• Facilitates water reuse
• Designed for lowest chemical costs
• Reliable high quality results

How we create value
• Saves on wastewater disposal costs
• Saves on rainwater treatment costs
• Facilitates additional capacity
 CMP Treatment

Semiconductor CMP Wastewater Treatment

The fabrication of semiconductor devices requires large volume of ultra-pure water and considerable amounts of chemicals and therefore generates large volumes of wastewater.

The different fabrication processes (Chemical Mechanical Planarization (CMP), lithography, etching, stripping and cleaning) generate a wide variety of wastewater compositions. These wastewater streams (CMP Waste, Backgrinding Waste (BG), Acid and Alkaline Waste, Metals Bearing Waste and Organic Waste) require proper treatment to meet stringent reclaim and discharge regulations.

The contamination level in the wastewater is changing due to new chemicals used and to higher water reclaim. Ovivo developed several state of the art treatment processes to treat the different wastewater streams and meet current and future reclaim and discharge requirements. Ovivo is also active in developing wastewater treatment processes to meet the Industry’s new challenges.
CMP Wastewater Generation from Semiconductor Fabrication Facility

**CMP Wastewater Streams**
The different CMP wastewater streams are treated in dedicated systems to achieve effluent discharge and reclaim requirement.

The treatment systems can be listed with relation to the treatment objective as follows:
- Oxide CMP wastewater
- Copper CMP wastewater
- Tungsten CMP wastewater
- Ammonia Bearing CMP wastewater
**CMP Treatment**

**CMP and Backgrind Wastewater Treatment**

Chemical Mechanical Polishing (CMP) is an essential process in the semiconductor fabrication. CMP wastewater can be treated by flocculation and sedimentation in order to remove the slurry particles.

**Advantages of Ovivo systems:**
- \( \text{H}_2\text{O}_2 \) control to avoid sludge flotation
- Minimal chemical consumption and therefore sludge generation
- Treated water meets the most stringent discharge requirement
Through research and innovation Ovivo develops state of the art technologies and brings the right solution to our customers. Ammonia and water recycle from Oxide CMP and advanced oxidation process for Copper CMP are two examples.

Reuse, recycle, or reclaim of the CMP wastewater is becoming an important issue because of the high volume of UPW used in the CMP process. The use of ultrafiltration to remove slurry particles does not only achieve the discharge requirement but also enhances the possibility to reclaim or reuse the CMP wastewater.

Advantages of Ovivo systems:
• Silica control to avoid clogging
• Chemical free process
• Robust membrane and treatment process leading to low operating cost
• Treated water can either be discharged or reused
**Removal of Ammonia from CMP Process**

Ammonia (NH$_3$) is a widely used chemical in the different semiconductor device fabrication processes. Ammonium hydroxide is commonly used in chemical mechanical planarization (CMP) as a mild etchant in oxide process. Ammonium hydroxide solution is used in post-CMP cleaning after oxide, tungsten and copper CMP processes.

Ammonia is considered harmful to receiving water bodies such as lakes and rivers and therefore ammonia discharge is highly regulated.

Ovivo provides state-of-the-art treatment technologies enabling the removal and recovery of ammonia from semiconductor effluents.

**Advantages of Ovivo systems:**
- Robust system with optimized process with the lowest operating cost
- Ammonia recovery
- Water recovery

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**Diagram**

1. Concentrate Ammonia wastewater
2. Ammonia recovery
3. CMP/LIF
4. Ammonia removal
5. Neutralization/reclaim
6. Ammonia containing CMP
Treatment of Copper CMP Wastewater

Copper CMP wastewater and other copper bearing streams require appropriate treatment to achieve discharge requirements. Ovivo’s advanced oxidation process utilizes a tolerant but advanced process to remove copper from the wastewater. The process utilizes the oxidant present in the copper waste in addition to a catalyst to form a strong oxidizer. The strong oxidizer breaks the complexed copper and reduces the organic concentration in the wastewater. Copper can then be precipitated as copper hydroxide and removed with the slurry particles.

Highlights of Ovivo’s advanced oxidation process:
- Achieving wastewater discharge requirement
- Reduces not only copper but also organics
- Simple, flexible and cost effective