What is claimed is:

CLAIMS

1. A method for treating an aqueous waste stream from a copper chemical mechanical polishing process including a concentration of dissolved copper and slurry solids comprising abrasive particles having a number weighted mean size of less than 0.75 μm, the method comprising:

introducing the aqueous waste stream into a feed tank;

flowing the aqueous waste stream from the feed tank into an ultrafiltration module;

filtering the aqueous waste stream through a membrane of the ultrafiltration module to form a solids-lean filtrate;

directing the solids-lean filtrate from the ultrafiltration module through an ion exchange unit to remove dissolved copper and produce a treated aqueous solution having a lower copper concentration than the copper concentration of the aqueous waste stream;

backwashing the membrane ultrafiltration module to remove the slurry solids from the membrane of the ultrafiltration module; and

combining the removed slurry solids with the treated aqueous solution to form a combined discharge stream having a copper concentration suitable for discharge into the environment.

2. The method of claim 1, further comprising directing the solids-lean filtrate from the ultrafiltration module into a filtrate holding tank and directing the solids-lean filtrate from the filtrate holding tank to the ion exchange unit.

3. The method of claim 2, wherein backwashing the ultrafiltration module includes backwashing the membrane of the ultrafiltration module with the solids-lean filtrate from the filtrate holding tank.

4. The method of claim 3, further comprising directing the solids-lean filtrate used to backwash the ultrafiltration module and the removed slurry solids into a backwash holding tank.

5. The method of claim 4, further comprising settling the removed slurry solids in the backwash holding tank.

6. The method of claim 5, further comprising directing supernatant from the backwash holding tank into the feed tank.

7. The method of claim 1, further comprising adjusting a pH of the aqueous waste stream in the feed tank.

8. The method of claim 7, wherein adjusting the pH of the aqueous waste stream in the feed tank comprises adjusting the pH of the aqueous waste stream to a pH of about 3.

9. The method of claim 1, wherein filtering the aqueous waste stream through the membrane of the ultrafiltration module include filtering about 40 gallons of the aqueous waste stream per square foot of membrane area per day (GFD) through the membrane of the ultrafiltration module while maintaining an inlet pressure of the ultrafiltration module below about 1.5 pounds per square inch.

10. The method of claim 1, wherein backwashing of the ultrafiltration module is performed after a predetermined amount of time of filtering the aqueous waste stream in each cycle of filtration and backwash.

11. The method of claim 1, wherein introducing the aqueous waste stream into the feed tank includes introducing an aqueous waste stream having a concentration of the abrasive particles with sizes of 0.50 μm and above of at least 10^6/ml.

12. A method of facilitating treatment of an aqueous waste stream from a copper chemical mechanical polishing process including a concentration of dissolved copper and slurry solids comprising abrasive particles having a number weighted mean size of less than 0.75 μm, the method comprising:

providing an ultrafiltration module, an ion exchange module, and a backwash holding tank;

fluidly connecting the ultrafiltration module upstream of the ion exchange module;

fluidly connecting the backwash holding tank to a backwash outlet of the ultrafiltration module;

fluidly connecting a solids outlet of the backwash holding tank to an outlet of the ion exchange module; and

fluidly connecting a supernatant outlet of the backwash holding tank to an inlet of the ultrafiltration module.

13. A system for treating an aqueous waste stream from a copper chemical mechanical polishing process including a concentration of dissolved copper and slurry solids comprising abrasive particles having a number weighted mean size of less than 0.75 μm, the system comprising:

a feed tank fluidly connectable to a source of the aqueous waste stream;

an ultrafiltration unit having an inlet fluidly connectable to an outlet of the feed tank;

an ion exchange unit including media operable to remove copper from a stream passing through the ion exchange unit and having an inlet fluidly connectable to a filtrate outlet of the ultrafiltration unit; and

a backwash holding tank having an inlet fluidly connectable to a backwash outlet of the ultrafiltration unit, a settled solids outlet fluidly connectable to a purified water outlet of the ion exchange unit, and a supernatant outlet fluidly connectable to the feed tank.

14. The system of claim 13, further comprising a filtrate holding tank fluidly connectable between the filtrate outlet of the ultrafiltration unit and the inlet of the ion exchange unit.

15. The system of claim 14, further comprising a backwash pump configured to direct filtrate from the filtrate holding tank through the ultrafiltration unit and into the backwash holding tank.

16. The system of claim 15, further comprising a controller configured to cause the system to perform a method comprising:

introducing the aqueous waste stream into the feed tank;

flowing the aqueous waste stream from the feed tank into the ultrafiltration unit;

filtering the aqueous waste stream through a membrane of the ultrafiltration unit to form a solids-lean filtrate;

directing the solids-lean filtrate from the ultrafiltration unit through the ion exchange unit to produce a treated aqueous solution having a lower copper concentration than the copper concentration of the aqueous waste stream;

backwashing the membrane of the ultrafiltration unit to remove slurry solids from the membrane of the ultrafiltration unit; and

combining the removed retained solids with the treated aqueous solution to form a combined discharge stream having a copper concentration suitable for discharge into the environment.

17. The system of claim 16, wherein the controller is further configured to cause the system to settle the removed slurry solids in the backwash holding tank.

18. The system of claim 17, wherein the controller is further configured to cause the system to adjust a pH of the aqueous waste stream in the feed tank.

19. The system of claim 18, wherein the controller is further configured to cause the system to adjust the pH of the aqueous waste stream in the feed tank to a pH of about 3.

20. The system of claim 16, wherein the controller is further configured to cause the system to filter about 40 gallons of the aqueous waste stream per square foot of membrane area per day (GFD) through the membrane of the ultrafiltration unit while maintaining an inlet pressure of the ultrafiltration unit below about 1.5 pounds per square inch.