

POREX® Tubular Membrane Filter (TMF)™ Applied in Die Saw Wastewater Reclaim System for a Microelectronics Company in Shenzhen, China.

Introduction

Die sawing and backgrinding are processes which are used to cut large silica wafers into smaller discs. After either of these processes, the wafer chips must be rinsed with Ultrapure Water (UPW) to remove fine silica particles and any other contaminants. Backgrinding wastewater and die sawing wastewater are typically discharged from the Integrated Circuit (IC) packaging plant. This discharged water normally contains only UPW and fine silica particles, but on occasion some grinding fluid is also present. Removal of the fine particles from the wastewater is critical to allow recycle and reuse of this large volume of water.

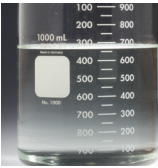
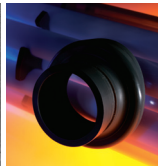
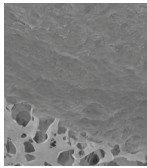
This document will review a working reclaim system for backgrinding and die sawing wastewater using POREX® Tubular Membrane Filter (TMF)™ system. Facilities using this process find it to be an excellent option for this application.

Wastewater Information

This facility generates 35m³/hr sawing and backgrinding wastewater which is fouled by numerous fine suspended silica particles, 90% of which range in size from 0.5 to 1.0 micron. These particles settle very slowly, and only partially settle even after an extended period. However, other parameters (TDS, TOC, heavy metal level, hardness) are typically better quality than normal potable water, almost similar to water treated by Reverse Osmosis (RO).

Treatment options include:

- Discharge without treatment—Suspend solids level does not meet typical discharge standards, and valuable recyclable water is wasted.
- Chemistry precipitation treatment—The fine particles are very stable, thus good precipitation is difficult to achieve even with expensive coagulant and polymer dosing.



POREX FILTRATION

CASE STUDY

Wastewater Information Continued

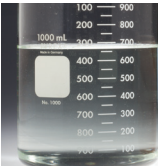
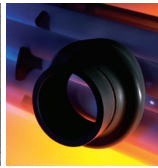
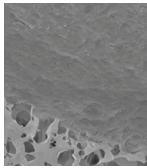
- Cartridge filter or bag filter—Poor removal efficiency, low flux, and frequent filter changeouts.
- Hollow fiber reclaim system—Good separation performance can be achieved, but the hollow fiber membrane element is very easily choked or clogged. The membrane fibers are easily broken and flux is difficult to recover even after chemical cleaning.

Hollow fiber Ultrafiltration (UF) technology had been in use at this facility, however, three systems with different brands of hollow fiber UF membranes failed due to fouling problems and fiber breakage. A Porex Tubular Membrane Filter (TMF) system was already in use at another of the company's facilities in Malaysia with very good operational performance. Therefore the facility in Shenzhen decided to use Porex TMF membranes in their process to replace the existing hollow fiber UF membrane system.

POREX TMF Characteristics & Advantages

When used to treat backgrounding and die sawing wastewater the advantages of the Porex TMF process are:

1. Combined with a filter press, this system will divide the wastewater into two parts: filtered water and dewatered sludge cake. There is no concentrated or reject water drain resulting in a nearly 100% recovery rate.
2. No chemical dosing into the wastewater is necessary. Therefore, if desired, sludge can be reclaimed for future reuse.
3. No pretreatment stage; the entire system uses simple physical solid/liquid separation.
4. The proprietary POREX® Tubular Membrane Filter™ has very high abrasion resistance. The membrane layer is not destroyed by acute silicon particles. Normally this is the biggest challenge when hollow fiber UF membrane technology is utilized for this kind of water. Hollow fiber plugging or breakage can occur due to the small particles size, high concentration and very abrasive nature of the particles.
5. Maintenance of the system is simple. The system can be designed for automatic operation, and can be placed into service mode from standby mode without any upsets or problems.
6. The Porex Tubular Membrane has good resistance to fouling compared with hollow fiber membranes and flux is more easily recovered after chemical cleaning.
7. The system design allows for a skid frame requiring less space than other methods.
8. Expansion capability; water capacity can be enlarged by simply adding more skids or modules.



POREX FILTRATION

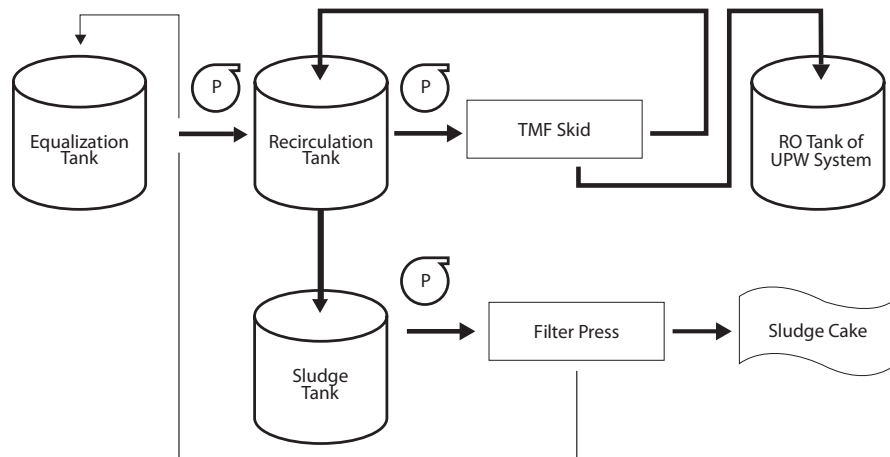
CASE STUDY

POREX TMF System Information

The details below describe the installed Porex TMF system.

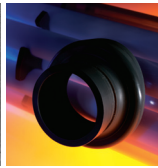
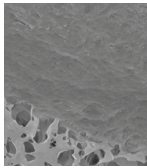
Water capacity:	35 m ³ /hr been divided into 3 different skids, 12 m ³ /hr per skid.
Module Specification:	Porex TMF system (module model # MME3005613VP).
Tubes per Module:	13
Membrane tube diameter:	1 inch
Membrane:	0.05 micron
Active membrane surface area:	1.82m ² per module
Module housing:	PVC
Module quantity:	11 modules per parallel, 2 parallels per skid, total of 22 modules per skid.
Membrane flux:	approx. 280 Lit/m ² /hr

Process Schematic



Process Description

The sawing and backgrinding wastewater is collected in the client's factory, equalized in an Equalization Tank and transferred into a Recirculation Tank. The water is then fed into the Porex TMF unit for treatment. Water that does not pass through the membrane as filtrate will recycle to the recirculation tank. Processed water is sent to an RO product water tank of the UPW system for reuse. Suspended solids are concentrated during recirculation and some of this concentrated liquid will be periodically sent to a filter press for dewatering. The resulting sludge cake is transferred out of factory; any liquids from the sludge operation are sent back to the equalization tank. No chemicals are fed into the system.

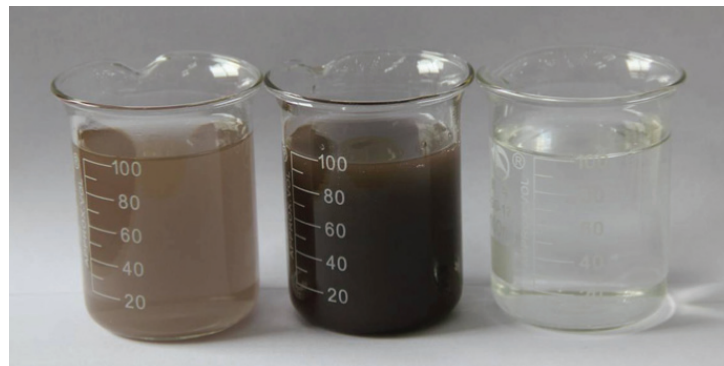


Operation Status

The system became operational in April 2011 and system performance has met or exceeded the design specifications.

Initial filtrate water flow rate is higher than 16 m³/hr and filtrate water turbidity is less than 1 NTU. Filtrate water conductivity is less than 100 µs/cm.

During the initial commissioning period, membrane flux decreased due to a wastewater stream becoming contaminated by an unknown organic substance. After bleach cleaning, flux was recovered. The organic contaminated wastewater stream was subsequently eliminated.



Raw Wastewater, Concentrated Water, Filtrate Water.



Raw Wastewater Turbidity (509 NTU)



Concentrated Water Turbidity (Out of measure range)



Filtrate Water Turbidity (0.21 NTU)

Summary

The Porex TMF system is widely used for backgrinding and die sawing wastewater. The excellent filtrate quality, high recovery rate, lack of needed chemical dosing, and ease of operation make the system superior to other processes and technologies in this application.

For more information, contact Porex Filtration at www.porexfiltration.com.