FractalFill™ Blending Products

Product Description

FractalFill™ Blending Products are turn-key solutions for implementing real-time closed loop control and dispense of multi-variant chemical mixes to meet exacting requirements in advanced semiconductor wafer cleaning and etching processes. As chemical mixes become more highly diluted and varied, process engineers are insisting that fabrication lines, existing and new, include Point-Of-Use (POU) chemical management systems and expect that closed loop, feed-forward/feed-back control features be in place. FractalFill™ Blending Products meet these semiconductor industry needs.

Core Competencies

The FractalFill™ technology set fulfills today's and tomorrow's International Roadmap for Semiconductors (ITRS) wafer-to-wafer control by incorporating three core technologies:

Controller Analytical Delivery

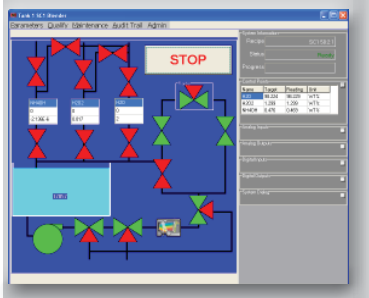
The significance is that with this technology the wet bench is always in a "chemisty ready" and supplied mode with an analytically confirmed blend, and has the ability to change recipes on the fly. This results in reliable, always on target chemical mixes, elimination of scrapped wafer lots, increased wafer throughput, production line efficiency, conservation of considerable capital outlay, and elimination of tool-to-tool variability in terms of the chemical mix.

Theory of Operation

FractalFill™ software receives data from an analytical monitor and calculates the information needed to feed the flow controllers. The flow controllers use a "Delta P" method of control that allows the FractalFill™ tool to very accurately dispense chemicals and DIW. Once the fluid is released into the recirculation loop, the FractalFill™ tool uses our patented methods of determining homogeneity of the blend. The blend is constantly monitored to maintain homogeneity even as the wafer tool requests delivery of a chemical mix. At this point the precise mixture is fed into the "long loop" where it can be fed to spray nozzles, wafer baths or returned to the FracalFill™ tool for continued blending and monitoring.

Footprint of the TAKLDM

depth - 31"
width - 34"
height - 63.43"



3709 Promontory Point Dr., Suite 114
Austin, TX 78744 USA
www.tresark.com
512.804.0700
fax - 512.804.0900

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Features

Software

Information at your Fingertips - The machine operator can track blending progress in real time with on-demand chart creation capability that automatically updates with the live device state information.

Remote Automation - The ability to control multiple processes from a single host application allows machine operators complete access to the tool in order to changes recipes in a seconds notice.

First to Know - The software provides detailed information about any errors that may occur. It responds to device-failure or system anomalies keeping the process running without reacting to noise through attempts to identify and flag anomalies in the system.

Getting Efficient - Graphics-driven reporting removes the need for a spreadsheet based program and it streamlines work flow.

Environmental Clean-Up - Data logging reports recipe and chemical blend history revealing chemical consumption data, resulting in the ability to plan fab chemical consumption logistics.

"Green-Up" your Process Line - The FractalFill™ tool reduces chemical consumption, extends chemical bath life, and greatly reduces chemical waste; zero waste from all products in production thus far.

Hardware

Easy Integration - Multiple interface ports are provided for tool interface and factory host automation.

Flexible Integration - Can be integrated into any spray or immersion type system.

Multiple levels of control offered -

QC Blending - Confirmation of chemical mix with inline analytical: no feedback

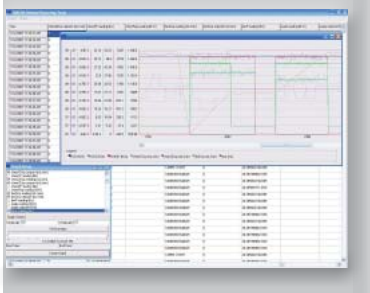
Blending with FractalFill™ - Feed-forward/Feed-back control

Continuous closed loop control

Auto-replenish of analytically confirmed and controlled chemical mixes

Open in Architecture - Tools can be manufactured to fit multiple blending systems into one compartment with a small footprint, or custom made for integration into any system.

Reporting Tools



Return On Investment

The TAK M+, from the FractalFill™ Blending Product line, has demonstrated a return on investment in less than a quarter when factoring in uptime, the prevention of yield loss in etching and cleaning, and chemical savings.

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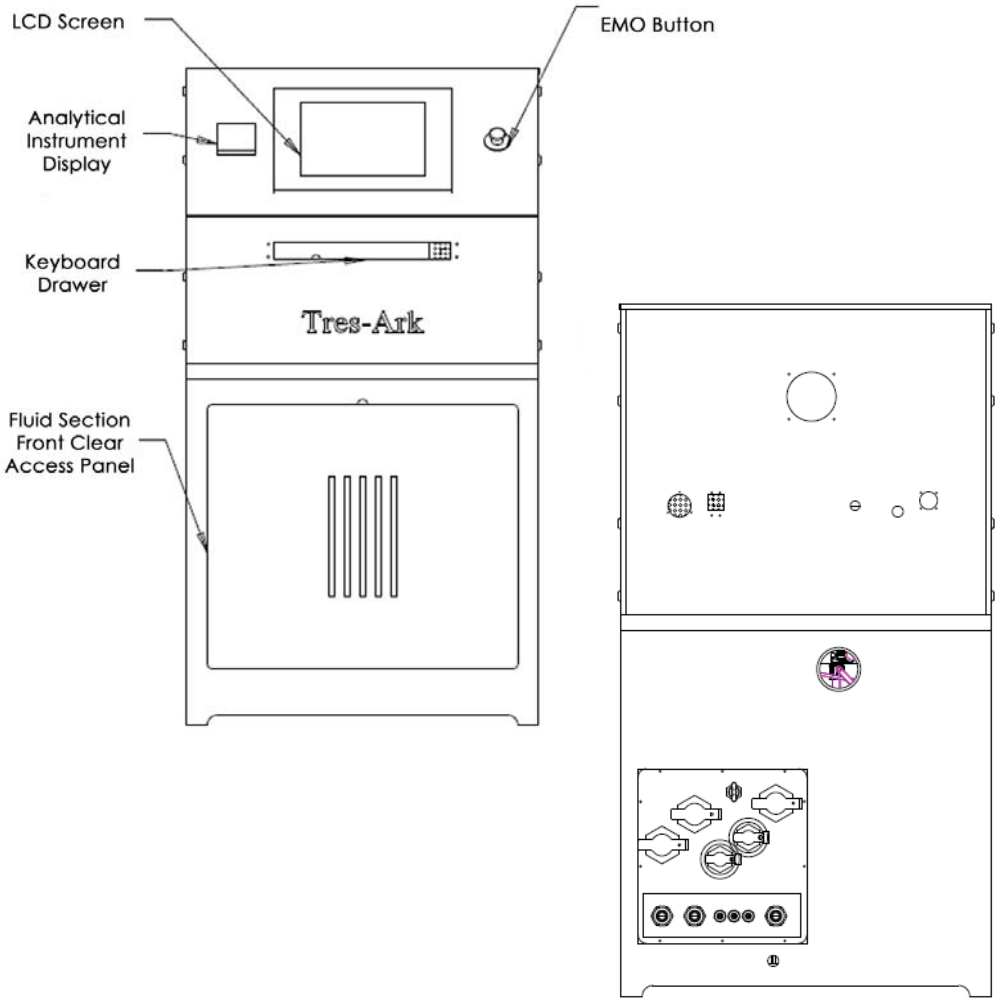
Tool Architecture



Mixing & Blending Features

Chemical Mixes - APM, HPM, DHF, BHF, HCL, etc.
Intermediate Mixing Tank - 20 liters, contact for customization needs
Dilution Ranges -
- APM to 1 : 1 : 300
- HPM to 1 : 1 : 100
- DHF to 1 : 10,000 (250 ppm)
- DHCL to 1 : 10,000 (250 ppm)

Auto-Replenish - 6 liters/min

Note - This can be improved by increasing the full scale range of the input device.

Concentration Control of Instrument -
- Blending Chemicals to +/- 0.05 wt% (APM)
- Closed Loop Maintained to +/- 0.05 wt% (APM)
- Blended Chemicals binary to +/- 10 ppm

Note - Limitations based on analytical instrument specifications and stability

Awards

2007
Flow Control Magazine
Innovation Award
Nomination

2005
Micro Magazine
Greatest Hits of 2005

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Facility Requirements

Power -	208 - 240 vac single phase, 2 amp
CDA -	12 SCFM at 100 psig
N2 -	15 psi, 1/4" connection, 0.2 lpm
DIW -	55 - 60 psi, 1/2" connection, 20 lpm
Chemicals (2) -	30 to 60 psi, 1/4" connections, 1-3 lpm
Exhaust -	100 scfm, 4" connection
Drain -	3/4" connection
Sump Drain -	1/2" connection

Contact for customization questions; varies per model

FractalFill™ Standard Product Options

The FractalFill™ Blending Product line offers scalable solution sets that allow a fab to reduce the number of tools needed to provide blended chemical mixes throughout the facility, thus preventing tool to tool variability. The TAKLDM supplies a single tool with a single chemical solution, while the TAKLDM+ supplies two tools with a single chemical solution. The TAK M Series can provide a number of chemical mixes to the fab allowing for all chemical monitoring to be done on one machine. The ability to handle multiple chemical mixes on one machine results in the ideal tool to support all chemical needs in a facility.

	TAKLDM	TAKLDM+	TAK M2	TAK M2+	TAK M3	TAK M3+	TAK M4	TAK M4+
Max number of chemical mixes supplied	1	1	2	2	3	3	4	4
Number of tools that can be supplied to	1	multiple	2	multiple	3	multiple	4	multiple
Tool liter per minute flow rate	12	12	24	24	36	36	48	48

Mixing & Blending Intellectual Portfolio

4 US Patents Awarded -
- 7,198,753 B1
- 7,281,840 B2
- Application 11/484,014
- Application 11/484,020

4 US Patents Pending
3 Taiwan Patents Pending
3 PCT Patents
1 Singapore Application Pending
1 Provisional Patent Pending

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Fully Certified

FractalFill™ Blending Products meet all industry standards for safety and ease of operation and installations: CE, Semi S2 & S8, IEC, EN & F47 Certified. Other certifications available upon request.

February 15, 2008

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