# Utilizing Big Data Methods within the Semiconductor Industry

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Semiconductor manufacturing technology has evolved from planar to vertical transistors, EUV lithography, ALD and ALE, N7 and beyond. With increasing complexity, costs for each technical node increase for both semiconductor manufacturers and supporting equipment vendors. [1]Historically the semiconductor industry has taken a lead generating and storing data while only analyzing about 0.5% of the over 2.8 zettabytes stored worldwide. If adoption of advanced analytics occurred within this industry, insights would provide sustained competitive advantages, stronger customer relationships and greater operational efficiency.

Tokyo Electron (TEL) collects and stores sensor data in the form of Tool Process Logs (PLOGs). Additionally TEL's Ingenio Server collects and summarizes the PLOGs. Customers decide to restrict or grant TEL access to this data on a case by case basis. A TEL high volume manufacturing customer has partnered with TTCA granting complete access to multiple microwave etch chambers. Automatic daily downloads of lot and wafer summaries (Figure 1), alarms, counters, chamber definitions with automated endpoint file collection filled 2.5TB. Auto alignment with 800K+ customer critical dimension (CD) wafer measurements auto fed machine learning algorithms such as principle component analysis and deep learning. This moved the analytics beyond human capability to the Desktop AI realm, methods beyond fault detection control that waferfabs utilize or competitors offer. 7 hours of analytic calculations created ranked signals (Figure 2), translated into high probability actions (Figure 3), vs. three months of traditional troubleshooting.

A discussion regarding the big data methodologies, with hidden insights uncovered, will occur.

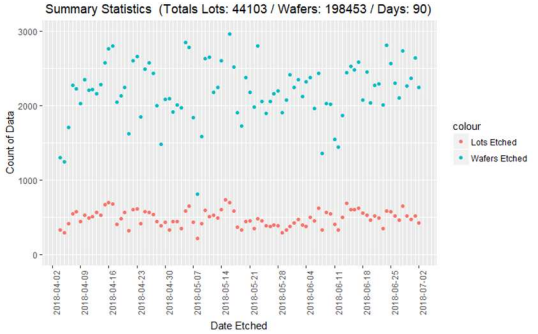


Figure 1: Downloaded Lot and Wafer Data

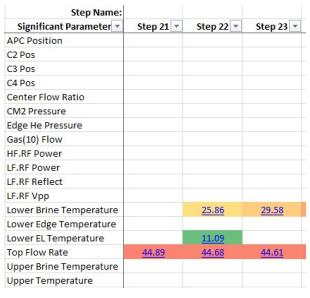


Figure 2: Ranked Signals

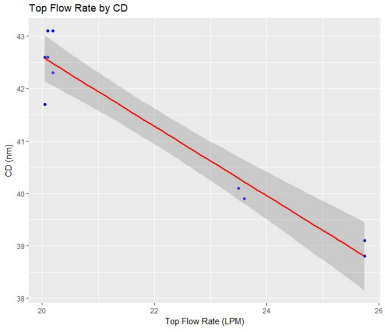


Figure 3: High Probability Action

## References

[1] G. Batra, Z. Jacobson, N. Santhanam, McKinsey on Semiconductors, March 2016, Improving the semiconductor industry through advanced analytics.