Sourcing refurbished semiconductor equipment

Erik Hanson, Refurbished Products Manager, Cascade Microtech, Inc tells Silicon Semiconductor why going straight to the OEM for refurbished equipment reduces both the risk and cost.

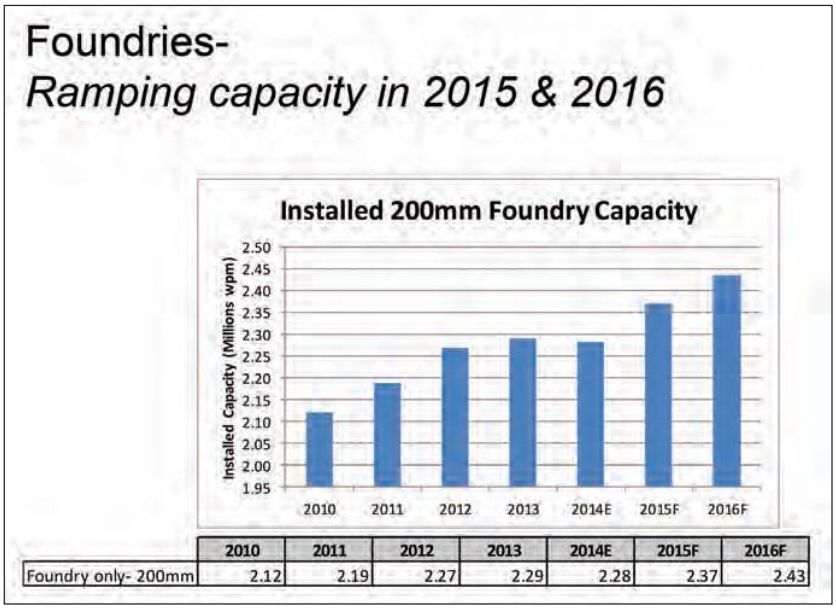
WHILE ADVANCED node device manufacturing has transitioned to 300 mm equipment and the industry anticipates the transition – someday – to 450 mm, a quiet renaissance is taking place in the 200 mm equipment market. The Trillion Sensors initiative and the Internet of Things (IoT) are breathing new life into 200 mm fabs, especially in analog chips, power management devices, image sensors, and new emerging applications in biomedical, MEMS, and other areas. As many of these devices (destined for consumer markets) are based on mature technologies, there are significant advantages to outfitting 200 mm fabs with certified used test and measurement equipment that has been either refurbished or remanufactured, rather than purchasing new 200 mm equipment.

There are three main options for purchasing refurbished equipment:
1. Open market
2. Third-party vendor
3. Original equipment manufacturer (OEM)

Each option has its advantages and disadvantages. In this article, we will look at the market for refurbished semiconductor equipment, examining the three procurement options. Finally, through a brief case study, the best approach will be presented.

200 mm semiconductor fabrication capacity is on the rise

In January 2015, SEMI published its latest Secondary Fab Equipment Report to determine the market size and identify key trends and issues impacting this important industry segment. [FIG.1]



	2010	2011	2012	2013	2014E	2015F	2016F
Foundry only- 200mm	2.12	2.19	2.27	2.29	2.28	2.37	2.43

Figure 1. Chart from SEMI Secondary Equipment Market and Trends, February 2015
200 mm fab capacity is on the rise, led by foundries that are increasing 200 mm capacity by about 7 percent through to 2016, compared with 2012 levels. This is driven by new applications related to mobility, sensing, and IoT.

According to the report, 150 mm and 200 mm fab capacities represent approximately 40 percent of the total installed fab capacity in the world. Additionally, 200 mm fab capacity is on the rise, led by foundries that are increasing 200 mm capacity by about 7 percent through to 2016 compared with 2012 levels. This is driven by new applications related to mobility, sensing, and IoT. For 2014, 200 mm fab investments by leading foundries and independent device manufacturers (IDM) resulted in a 45 percent increase in spending for secondary 200 mm equipment.

While SEMI did not include test equipment and assembly and packaging equipment in this report, it's safe to assume that the ratio of used test equipment versus total used equipment sales is the same as the ratio of new test equipment versus new equipment sales. This gives us an indication of the volume of devices that are being fabricated at 200 mm, which will ultimately require 200

mm test equipment to characterize these devices quickly, at low cost, with minimal setup, and in parallel.

Despite the growing demand for capacity at 200 mm, the global economic climate and new production strategies have led to the consolidation of many semiconductor manufacturing companies, as well as the closing of many 200 mm fabs. This has contributed to an estimated 6,000 used tools now on the global market in various states of repair. Many of the tools on the market are incomplete, harvested for spare parts, and/or improperly maintained.

The majority of used equipment today is between 7-13 years old. Much of it has not been properly decommissioned and decontaminated, presenting further legal, environmental, and health risks for purchasers, shipping companies, installation and operations personnel. Clearly, the risk accompanying used equipment has increased exponentially. It is more critical than ever that purchasing agents apply their full due diligence to mitigate that risk.

Figure 2. Of the three procurement options for refurbished equipment, original equipment manufacturers are the logical choice to reduce risk and improve overall cost of ownership.

Why buy refurbished?

A number of factors come in to play when deciding where to spend equipment dollars. To remain competitive among the low-cost producers, legacy fab managers need to balance tight process and time-to-market budgets. In fact, according to a SEMI survey of top 200 mm fab managers, secondary equipment will be the number one source for future productivity improvements.

As major OEMs have shifted efforts to 300 mm and in some cases 450 mm, they have mothballed 200 mm tooling. Used 200 mm equipment that has been refurbished or remanufactured to meet new device requirements can be a very desirable way to upgrade legacy fabs while remaining competitive in the market.

Sourcing options and scenarios

Buying test equipment on the secondary market can be compared with purchasing a used car. It all comes down to buyer expectations and their willingness to take risks. Options range from eBay or other online resellers, used car dealers, or through a certified pre-owned program at new car dealership. This logic can be applied to the secondary equipment market as follows. [FIG.2]

The open market option

Purchasing used equipment on the open market through an online broker or an auction website is like buying a used car online. Generally, the ones who benefit the most from this option are mechanically inclined, and can handle the inevitable repairs. Many are engineers with years of experience using these systems. They are comfortable taking the risk on an “as-is” system. In these cases, the purchase is based purely on price, which is typically the lowest initial purchase price available. The only other clear advantage of purchasing used equipment through the open market is the equipment’s availability for immediate pick up. However, it may be sitting in the previous owner’s lab, or a reseller’s warehouse.

The disadvantages far outweigh the advantages. There is no guarantee of the tool’s functionality, or whether it will be suited to the customer’s application. As-is means there are no software updates, and in all likelihood, electronics hardware is outdated. The customer has to arrange pick-up logistics including installation, and assume additional costs including packaging, freight, and import/export logistics and fees. The most a customer can hope for in the way of a warranty is a 14-day money-back guarantee. Essentially, the customer is on his/her own. They may rely on the OEM service provider to get a system up and running, and to obtain spare parts and service. This is, of course, not included in the purchase price. All things considered, it adds considerably to the total cost of ownership.

Third-party vendors

Slightly less risky than purchasing used test equipment on the open market is to purchase it through a third-party vendor. This can be compared with purchasing a used car from a used car dealership. Third-party equipment vendors frequently contract with former field service engineers of the OEMs whose tools they sell. These engineers install the equipment, put it through diagnostics, and make sure it’s operational.

One advantage third-party vendors have is the ability to reconfigure an existing tool because they often purchase equipment in lots that include several stations complete with assembly parts and accessories. This allows them to swap out accessories sold with a probe station to cater toward a DC application or an RF application based on the customer’s requirements. These third-party companies advertise they can guarantee some level of performance, but they typically don’t employ

Figure 3. A refurbished Cascade Microtech SUMMIT™ semi-automated probe station with an eVue™ Digital Imaging System is a reliable, robust solution for today's 200 mm test and measurement requirements.

professionally certified installation and service experts. While they may have a certain level of experience working on tools, it is not necessarily with equipment from the specific OEM in question. With regard to warranty for purchase, the longest standard third-party warranty on the market is 90 days, and additional warranties for service and parts need to be considered as part of the tool's overall costs.

Online purchasing won't save you money

Take for example this actual situation of a purchase made from an online marketplace for a used wafer probe station originally manufactured by Cascade Microtech, a supplier of wafer probe equipment to the semiconductor test market.

The tool was sold by an online merchant for $25,000. The customer, a high-end semiconductor device designer and manufacturer, was looking for a tool for their Failure Analysis group. The tool was non-functional when it arrived at the customer site, so the customer spent an additional $2,500 with a third-party service provider to get the system up and running. Unable to successfully get the system running properly, they contacted the OEM – Cascade Microtech – who provided updated control hardware and software, as well as other components to replace those that were not well maintained by the previous equipment owner. After paying an additional $15,000 for necessary parts and service, the system was restored to full functionality. At the end of the day, the total out-of-pocket cost for the tool was $42,500.

Had the customer gone directly to the OEM (Cascade Microtech), the required replacement parts would be included as part of the standard certified refurbishment process. The price for a similarly equipped certified used system purchased directly from Cascade Microtech would have been approximately $32,000, and would include the company's standard warranty. The customer actually spent $10,500 more than if they had gone directly to the OEM, and could have avoided the headaches incurred. Additionally, the customer lost opportunities, time, and revenue while the tool was not operational.

The OEM advantage

Many semiconductor OEMs sell used systems that are fully factory refurbished. Parts that wear out are replaced, and the latest compatible control electronics and software are added. Each piece of equipment is fully tested and must pass the same functional specifications it did when it originally shipped as new. Professional packaging, transportation, and installation ensure equipment functionality at the customer site, not just the manufacturing facility. The tool comes with a standard warranty similar to the warranty provided with new equipment. The systems are certified-used and eligible for service contracts, and are serviceable by the OEM's field service engineers. [FIG.3]

The OEM will either use the same sales channel and sales process as with its new equipment, or it will have a separate selling organization for used equipment. Used equipment in stock is sold on a first-come, first-served basis, and is delivered in about half the time of new equipment. In many cases, the OEM is actively seeking used equipment and can pay cash or provide credit for returned equipment toward future products or services.

Go to the source

It's clear from this brief example that going straight to the OEM for refurbished equipment reduces both the risk and cost in comparison with the open market or third-party vendors. While the initial purchase price may be slightly higher than other options, the quality and support are superior, and overall cost of ownership is far less.

References

1. 2015 SEMI Secondary Equipment Market Report, http://www.semi.org/en/node/53676
2. New Dynamics Changing the Secondary Equipment Market, SEMI, http://www.semi.org/en/issues/productivity/CTR_027251
3. J. Gates, T. Johnson, D. McDaniel, "Managing legacy fabs and the role of secondary equipment," Solid State Technology, http://electroiq.com/blog/2013/10/managing-legacy-fabs-and-the-role-of-secondary-equipment/
4. M. Rosa, "200 mm equipment market gaining new lease on life," http://electroiq.com/blog/2014/06/200mm-equipment-market-gaiting-new-lease-on-life/