

ISMI Readies 450 mm Test Bed, Wafer Bank

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The International Sematech Manufacturing Initiative (ISMI, Austin, Texas) will establish a test bed for 450 mm wafer-handling equipment next year at the **Advanced Technology Development Facility** (ATDF) in Austin, ISMI officials said at the ISMI Symposium on Manufacturing Effectiveness.

The 16-member consortium also plans to establish a wafer bank, providing equipment vendors with the sintered silicon test wafers with the same weight and thickness as the eventual single-crystal wafers needed for mechanical testing of the carriers and load ports. Later, single-crystal 450 mm wafers, required for process equipment development activities, will enter the wafer bank. One benefit is to reduce the cost by buying in volumes.

The 450 mm activities are part of an ISMI strategy to position the 450 mm generation as an evolutionary scale up from the 300mmPrime program, which is intended to reduce cycle times and improve throughputs at 300 mm wafer fabs.

Joe Draina, associate director of ISMI, said, "We want to begin a dialogue with the equipment manufacturers to tell them that we have a strong presence in improving the 300 mm productivity. 300 mm is the here and now. We see those 300 Prime designs as being forward-compatible, as complementary, to the 450 mm generation."

The test bed will involve companies making the front-opening universal pods (FOUPs), robotics, wafer handlers, track and others involved in wafer movements, he said. ISMI is considering building a test piece of mainframe process equipment, with the standard equipment front-end modules (EFEM) interface.

The goal is to avoid the standards glitches that plagued the 300 mm wafer standards effort, when vendors realized that not enough work had been done in the early stages to ensure interface standards for wafer handling. By developing a pilot line within the ATDF, companies can iron out interface standards much sooner than they did in the 300 mm wafer development process.

Standards are needed for the thickness of the 450 mm wafers, the notch, edge characteristics, diameter tolerances and other metrics.

One key challenge is wafer sag, said Mike Goldstein, an **Intel** (Santa Clara, Calif.) materials scientist. If the 450 mm wafers are kept at the 775 μm thickness, gravity can pull down the center of the wafer by a millimeter or more, particularly if the full periphery of the wafer is not supported. Modeling shows that three- or four-point supports result in fairly large sag measurements. Sag is particularly high when wafers are heated in vertical furnaces.

Goldstein, who works closely with the wafer manufacturers, said a 450 mm wafer thickness proposal will be discussed at a **SEMI** (San Jose) wafer standards meeting in Japan in December. A meeting scheduled for next week in San Diego was cancelled because of the fires in the area, he added.

Goldstein said the 450 mm wafer thickness may need to increase from the 775 μm used in the 300 mm generation to 925 μm . A prototype spec had called for a 825 μm thickness for the larger wafers.

"Modeling shows that an 825- μm -thick wafer will bow about five times as much as a 775 μm 300 mm wafer. There is a lot we have to learn about how to support the wafer," he said. A 925- μm -thick 450 mm wafer will weigh about 340 grams, he added.

Draina, an **IBM** (White Plains, N.Y.) assignee to ISMI, said, "These kinds of concerns are not unique to 450. They may be more severe, but the concepts are the same as what the industry faced with the 300 mm transition. As we went from 200 to 300, the industry faced an all new automation scheme. As we go to 450 mm, the plan is for 100% automation."

While technical discussions process and ISMI's test bed plans go forward, the industry remains deeply divided over the cost benefits of going to 450 mm. An ISMI economic analysis, which contends that 450 mm wafers would produce a 30% improvement in wafer processing costs at some point, is being strongly challenged.

Iddo Hadar, an economist working for [Applied Materials Inc.](#) (Santa Clara, Calif.), said, "There are critical flaws in the ISMI analysis, and yet most people think that it is based on solid analytical work."

He said many companies are accepting the 30% cost benefit blindly.

"The 30% ISMI expectation is a wishful thinking kind of statement, with no foundation," said Hadar, who is the CTO of Applied's foundation engineering group.

He argued that the equipment industry and device makers alike would be better served by putting its resources into 300mmPrime, with reduced cycle times and other efforts to improve fab productivity.

During the ISMI Symposium, 11 members of SEMI -- including representatives from [Axcelis Technologies Inc.](#), [ASML](#), Applied, [Tokyo Electron Ltd.](#), and [KLA-Tencor](#) -- met with managers from ISMI and the member companies to discuss the ISMI benefit analysis.