



Design and process: chicken or egg?

TEXAS INSTRUMENTS BASED ITS decision to build a \$3 billion 65-nm fab in Richardson, TX, in no small part on a desire to closely couple design and process manufacturing. Company officials stated on Oct 25, 2004, that it would on Nov 18 break ground on the new 1 million-

sq-ft project to build DSPs and analog system-on-chip devices.

TI examined a range of options, such as using a foundry or locating its own fab elsewhere. At one point, Singapore, Virginia, and New York were in the running. In the end, TI stayed close to home. TI Vice President of Silicon Technology Development Dennis Buss explains how linkage between designers and process factored into the decision.

"Commitment to internal manufacturing means that the [process] technology will be matched to the designer's needs. That it is in Richardson is not a first-order factor. The important consideration is that designers can control the process," he says. "Designer input starts when we begin [defining] the requirements of the process. When I leave [this interview], I am going to a meeting with a wireless-design manager who is going to tell me what [designers] need for 45 nm in 2008. We are finalizing the definition of our 45-nm node."

Keeping design and process engineers in close proximity with its obvious advantages wasn't the only reason keeping the huge facility in the United States. Technology and equipment as the key expense helped, too.

"Labor in wafer manufacturing is a small percentage of overall cost. Most of the cost is dominated by the equipment and materials," says Buss. Do the math. Assuming that TI invests \$3 billion into the facility over several years and employs 1000 workers at its peak, the cost of

each new job is \$3 million.

IDC Vice President and Semiconductor Analyst Mario Morales says that closely linking design and process is more important than ever.

"What we are starting to find is the different areas—manufacturing, tools, and design—have to be coupled together because of the new materials and the cost associated with each design. For a supplier to be successful, [it has] to do it right the first time," he explains.

A captive fab as opposed to outsourcing to foundries also gives TI

ing control of the process and design allows them to better take advantage of chips they think will perform better," says Jim Feldhan, president of Semico Research. A foundry keeping 300 customers happy is no small feat, he adds.

To be fair, the IDM's advantage has not gone unnoticed by foundries, especially with the challenge of smaller feature sizes. And intention can be just as powerful as working under the same roof.

"Altera and Xilinx are at the forefront of process technology and work closely with the foundries to get designs more in tune with the process," says Semico's Feldhan, adding that there's no reason that designers and foundry process engineers can't be just as linked at the hip as if they worked for the same company.

Either way, smaller feature sizes are forcing designers to better un-

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the ability to tune product lines and, as a result, more nimbly respond to demand.

"That's not to say [foundry] TSMC is not going to get to 45 nm. But TI will have the ability to tweak the fab for a high-performance product," says Forward Concepts analyst Will Strauss. "TSMC has to have a fab tuned to serve a lot of...companies. Foundries have very strict design rules, saying this is what you can do and no more. They have to be plain white bread," adding that he expects the new TI fab to be cranking out a billion chips by late 2009 or early 2010.

"From an IDM (integrated-device-manufacturer) viewpoint, hav-

erstand the capabilities of the process, according to Strauss, and as Technical Editor Gabe Moretti's cover story reveals, starting on pg 50. "It's really a chicken-or-an-egg thing. There's no point designing something you can't make," says Feldhan. *As an IC or pc-board designer, how close to manufacturing are you or should you be? Write me at john.dodge@reedbusiness.com.* □

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