

Fluidigm to Expand Singapore Operations to Meet Rise in R&D Projects, Asian Sales Growth

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Officially, Fluidigm is headquartered in South San Francisco, Calif. But from the vantage point of its facilities in the Republic of Singapore, one can see that the integrated fluidic circuit maker's business has become a global operation.

Established in 2005, Fluidigm's Singapore subsidiary was originally set up as a manufacturing hub that would take advantage of the Southeast Asian island country's background in semiconductor production, geographic location, and reputation for stringent protection of intellectual property rights. Since its founding, Fluidigm Singapore has expanded to become an R&D arm of the firm and serve as the base for its Asian operations — activities that will require the firm to increase its headcount in Singapore this year.

"We have had to double the [production] volumes over the last few years, and we will soon double again," said Grace Yow, vice president of worldwide manufacturing and managing director of Fluidigm Singapore. Yow gave *BioArray News* a tour of Fluidigm Singapore during a site visit last month.

"We will probably have to grow the team to 90 this year," she said. The firm currently employs around 70 people in Singapore. Beyond the need for increased output, though, Fluidigm Singapore is also taking on more responsibilities within the firm, particularly in R&D.

"Our engineers have been working on chips for five years and they know the designs and functionality, so that's the next step, an R&D expansion," said Yow. "Right now there are so many things that the company wants to do and we don't have the resources to do it all in the US."

Fluidigm spokesperson Howard High confirmed this week that the company has plans to expand its presence in Singapore. Fluidigm "continues to grow rapidly in terms of number of systems sold and variety and volume of chips sold, so expansion of output would be a key reason," High told *BioArray News*. "Even though there are productivity gains, we are growing faster than that will cover," he said.

High noted that Fluidigm is considering increasing the number of R&D projects that are based in Singapore. "Singapore has done R&D for a while as it relates to innovation for our manufacturing process," High said. "On the product side, much of the initial thought has come from the US because the R&D team in the US has typically worked most closely with our customer base, which has been predominantly US and European based," he said.

While the company's US-based R&D team has spearheaded the firm's product development in the past, Fluidigm Singapore is likely to play an increasing role

in developing new products as time goes on. "This is an emerging trend within Fluidigm," said High. "As we grow our customer base in Asia, I would anticipate that increasingly some of our Singapore R&D team will regularly interact with that customer base and therefore ideas for new products are likely to also be conceived and developed with Singapore taking the driving position."

Manufacturing Hub

Fluidigm opened its Singapore operation in October 2005, around the same time that Affymetrix also decided to move its GeneChip production to the island, a decision that was later echoed by Illumina in 2007 ([BAN 3/30/2010](#)).

Both Affy and Illumina have cited Singapore's background in semiconductor production as a reason for their decision to locate their plants there. As Wayne Woodard, Affy's senior vice president of global operations, told *BioArray News* last month, his firm's employees previously might have worked for Seagate or ST Microelectronics or National Semiconductor and now are "finding themselves again in a clean room, but instead of laying down electronic circuits they are laying down DNA and RNA."

Compared to Affy's GeneChips or Illumina's BeadArrays, Fluidigm's IFC platform is perhaps more similar to the semiconductors that Singapore has produced historically. IFCs are silicon wafers that contain microscopic channels, pumps, valves, and other components needed for the manipulation of nano-volume scale fluids. They compose the main consumable in Fluidigm's technology systems including the BioMark, which supports digital PCR, gene expression, and SNP genotyping; Access Array for library preparation and massively multiplexed sequencing; and the EP1 for digital PCR and SNP genotyping. All the chips and systems are manufactured and shipped from Singapore.

High said that Fluidigm selected Singapore as a site for its production because the company shares a portion of its manufacturing process with the semiconductor industry, and "wanted to leverage an existing infrastructure of trained people, network of suppliers, clean rooms, transportation capabilities, education level, IP protection, *et cetera*, and do so without having to create it on our own."

The company looked at sites in the US and Europe, as well as China, Taiwan, and Malaysia, but was enticed to Singapore because of local support. Beginning in 2000, the Singapore government began to focus on attracting life-sciences companies, in part to replace other manufacturing sectors that were being moved elsewhere. For instance, after nearly 40 years in Singapore, National Semiconductor in 2005 moved its local operations to Malaysia and China. That, in turn, created an opportunity for smaller biotech firms like Fluidigm to move in.

According to High, Singapore's EDB helped the firm "secure good facilities" and "gain access to top talent," including Yow, who had served as director of assembly operations, plant facilities, and environmental health and safety for

National Semiconductor Singapore from 1991 to 2004. Ninety percent of Fluidigm Singapore employees worked previously in the semiconductor industry.

According to Yow, it was this background in building semiconductors that allowed Fluidigm to reduce the cost of manufacturing its products. "Most of the scientists in the US come from an academic environment, but here we have more of an engineering background," Yow said. "We build millions of semiconductors, daily," she said. "We are used to that mechanization, as well as process interaction."

As an example of cost reduction, Yow pointed out that the cost of plastic carriers for Fluidigm's chips cost \$30 to make in the US, but \$3.50 in Singapore, after the materials and production were locally sourced. The firm's IFCs originally cost \$800 to make, but the cost was cut to \$120 thanks to manufacturing innovation done on site. "We reuse the [IFC] molds," she explained. "A mold used to cost \$200. Now we reuse it twenty times," she said. "It sounds straightforward but there is a lot of work in between to make sure we do not lose the functionality."

The advances Fluidigm has made in cost reduction as well as the manner in which its Singapore subsidiary continues to expand its functions are common to biotechnology firms that locate manufacturing in Singapore, according to some experts.

Beh Kian Tiek, director of the biomedical science division for Singapore's Economic Development Board, told *BioArray News* during an interview at the EDB's headquarters last month that companies like Fluidigm typically upgrade their operations as they become more familiar with what the country has to offer.

"If you look at these companies, you will see an evolution of the activities that they do," said Beh. "The first thing they do is establish a location with quality control and in-house assembly and produce products," he said. "Once they become more familiar with Singapore and Asia they will start to localize the supply chain, to produce products of the same quality at a lower price," he said. Firms then might branch off into things like product development, taking advantage of local talent, according to Beh. This "evolution" doesn't happen overnight, he said, but is "always step-wise moving to the future."