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# Analog design alive and growing in India

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BENGLAURU, India — A decade ago, Anand Valavi had an idea for starting an analog design group at his company, Wipro Technologies, where he worked as an ASIC engineer. Analog, he thought, could be strategic for India as well as his company, which was trying to develop a portfolio of silicon blocks for licensing.

"At that time, newspaper articles were saying there weren't 40 analog engineers in all of India," predicting the shortfall would impede the growth of the country's semiconductor business, Valavi said.

Three years ago, Wipro executives finally decided Valavi was right and hired him back from a job at Microsoft in the United States to found the new group. Today Valavi heads a 150-person analog group at Wipro, arguably one of the largest in the rapidly emerging country.

"It took nearly 10 years [for Wipro] to be at the leading edge of digital design, but with this analog effort, we couldn't wait that long," he said in an interview in his office here.

**Wipro analog engineer Anand Valavi**

So Valavi quickly created a core team made up of India natives he convinced to return from jobs in South Korea and the United States at companies such as Intel, Linear and Texas Instruments. Then he rounded out the group with handpicked candidates from India's universities.

To date, the group has designed a range of 90- and 65-nanometer phase-locked loops, 65-nm read channel chips for a hard-disk drive and even a few blocks at 45 nm. The group is particularly proud of a medical mixed-signal chip that had to be able to run for up to three years off a button cell, with some blocks drawing just nano-amps of current. "A lot of the circuits had to operate at sub-threshold levels," said Valavi.

The thirty-something manager still has big ambitions in analog. "Our steps so far have been fledgling moves," he said. "In the next three years or so, we want to get to the point where people think if they have some state-of-the-art analog work to be done, India is a good place to do it."

Indeed, India has made great strides in recent years in the field of analog design, which is often considered more art than science. Companies such as Conexant, Intel, Infineon, Marvell and TI all have analog work done here.

"There are definite pockets in India where the kind of work that is done here is on par with the best in the world, but what we are lacking are the numbers," said Shanthi Pavan, a professor in the electrical engineering department at the Indian Institute of Technology (IIT) in Madras. "There [still] are too few analog engineers and a paucity of middle-level managers."

TI India has more than 100 engineers working on analog projects. "Analog has always been a key focus, and our India team always works with our worldwide programs on cutting-edge R&D work," said Poornima Mohanachandran, general manager of analog at TI India, who has more than 18 years of analog experience.

TI's India branch has spun off three local analog startups. Cosmic Circuits is the most prominent of the trio since it may be India's only pure-play analog startup. The other two, Karmic Design and Sankalp Semiconductors, provide design services that include analog work.

"The analog market is not easy to enter, but once you get going, it is one of the most profitable businesses," said Ganapathy Subramaniam, co-founder of Cosmic Circuits, which licenses analog IP. "The critical factor is that it is talent-intensive, and talent is scarce."

Vivek Pawar, who left TI a few years ago to set up Sankalp, agreed. "India has a very small and a very disproportionate share in the global analog market. Unless companies as well as engineering schools come up with a viable model for ramping up and training engineers, the going will be extremely tough," said Pawar, whose small but successful analog services firm is based in Manipal.

Analog is important because the system-on-chip business in India is booming and as much as a third of SoCs consist of analog blocks, said C. Muthukrishnan, vice president of business and strategy at Karmic Design Center India, which provides services to TI's India and Dallas offices.

"More and more companies are realizing that you cannot do away with analog and that's the way forward for success," he said.

IIT's Pavan expressed optimism that more companies such as TI, Wipro and the startups will help expand India's fledgling analog sector.

"India is in a similar stage where the U.S. was 20 years back," Pavan said. 'When the whole world was going digital, there were some schools in the U.S. who had removed the analog courses from their curriculum because no one was really sure where it was headed and whether it would be needed. But once the wireless and telecom revolution began, analog design came back with definite vigor."

The potential for India to grow in analog expertise may depend on its success in attracting more people like Valavi to return home.

According to Valavi, starting salaries for recent engineering graduates are significantly better in the United States than in India, which could mean the best and brightest will always head overseas. However, unlike their counterparts abroad, India's analog engineers can expect to see salaries increase eight- to ten-fold over their careers as they gain the expertise so deeply valued in the analog field and the maturity to fill India's hunger for good engineering managers. "At the high end, engineers can do well in India," Valavi said.

He should know. Valavi is one of a recent wave of engineers returning to India, attracted by a combination of new management opportunities and a desire to come home.

Valavi started his career in 1994 at the age of 23, when Wipro recruited him from IIT at Kanpur. At the time, Wipro, like other big Indian conglomerates, was making computers and other systems under its own label following government decisions that basically shut IBM and other large OEMs out of the Indian market.

He helped design PC motherboards until government policies shifted, inviting the multinationals back in. Like many of its counterparts, Wipro rolled with the punches, refocusing its engineering teams on outsourced projects in areas such as ASIC

design.

"The whole thinking about what an ASIC was, was new to us, but we figured there was no magic to it," Valavi recalled. "We put a group together, set up a tool flow and did some basic designs. We designed standard interfaces and implemented them in a way so people could put them in their chips and we could license the blocks to others."

Eighteen months later, Wipro had its first USB and Firewire blocks available to license. It currently has nearly 90 Firewire licensees and has acquired Bluetooth and Wi-Fi expertise.

In 1998, Wipro decided to spin off its silicon IP business as a subsidiary called EnThink. Headquartered in Santa Clara, Calif., its goal was to provide ready-to-use building blocks that would enable OEMs to develop intelligent Internet appliances and gateways for home networking, mobile computing and other consumer and business applications.

But the group failed to attract the business or venture capital needed to stay afloat, and many left, including Sridhar Mitta, the former Wipro CTO who was co-founder and chief executive of EnThink. Valavi left, too, to join then-hot startup WebTV Networks. When the startup was acquired by Microsoft Corp., Valavi joined the software giant, spending some time working on its Xbox video game console.

Valavi maintained his contacts at Wipro, and over time his family began to think about returning to India.

"Every time I met some of the Wipro top management visiting the U.S., I would ask them what had happened to their plans of starting an analog team, and invariably there was no answer," Valavi said. "Then, suddenly one day in 2005, Siby Abraham, who was at that time the vice president of Wipro's semiconductor division, asked me if I was interested in returning to India to set up an analog team, and I came back to set it up."

"We had to make the business case for analog design services, and it wasn't very different from what we did 10 years earlier in digital design," he said. "We realized a lot of state-of-the-art devices would have significant analog components such as PLLs, temperature sensors, ADCs and more complex circuits."

There's little doubt that, globally, analog expertise is as relevant--and as hard to find--as ever. Whether India becomes a significant force in the sector will depend to some extent on how successful managers like Valavi are in convincing others to follow in their footsteps.

*—Rick Merritt contributed to this report.*