

# Analog maestro plays TO MEDICAL AND OTHER EMERGING MARKETS

*By mixing its marketing expertise with engineering talent, Texas Instruments has become an analog powerhouse.*



## TEXAS INSTRUMENTS SENIOR VICE PRESIDENT

Gregg Lowe presides over the high-performance-analog- and high-volume-analog-business units. As he fosters innovation among TI's analog engineers, he looks to opportunities in medical-electronics, energy-generation and -consumption, and safety and security applications.

➤ **You have an electrical-engineering degree from the Rose-Hulman Institute of Technology.**

Rose is one of the few undergrad schools teaching analog. I had quite a few analog-circuit-design classes. That probably is what first got my interest going in the analog sector.

➤ **Did you go right from school to Texas Instruments?**

I graduated from Rose-Hulman in 1984, got married, and nine days later was an employee of TI. Our honeymoon was driving from Cleveland, OH, to Texas. I'm one of 11 kids, so I come from a very large family. TI really had kind of a family feel to it.

➤ **Beyond your college experience, was there someone who helped you along?**

There are a lot of people in Texas Instruments that have certainly helped my career. There are a lot of customers that have helped me, but my dad was the single biggest influence in my life. My dad

is not an analog engineer. He was a cement finisher. I think what he taught me was hard work and strong ethics will help you do anything.

➤ **Do you consider yourself an analog guy?**

Absolutely. I've been in charge of the analog business now for about seven years. It is the most fun I've ever had at TI. The most different things about the analog business are the personalities of the people in the business—the passion they have. The engineers are so excited about the things they're doing that it's contagious. Relatively small teams give the individuals on them a real sense of ownership of a project. When you have a team meeting, the three folks get together and decide what to do, and each of you is one-third responsible for the outcome of your project.

➤ **Did somebody plan a strategy about adding analog to TI's DSP focus?**

There was a huge strategy around that. When we acquired Burr-Brown, it was

the largest acquisition in the history of semiconductors. Obviously, [TI made] that decision with a lot of thought. TI has been in the analog business for quite some time. We tried on our own to get into the high-performance, high end of the business, and it was very difficult. In 1999 and 2000, we made the decision that the best way for us to get in is through acquisition. Those [decisions] turned out to be transforming events for TI. It injected a new way of thinking about the analog business into TI.

It's very difficult to integrate all these large companies. I think we pulled it off for a number of reasons. One is that [TI based] the strategy on a very important premise: We were acquiring companies that could give us something very important but needed something very important, as well. Obviously, what they gave us was great engineering talent, great products, and really cool circuit techniques. But all of these companies were severely lacking in process-technology capabilities. TI has historically been strong in process technology and manufacturing. So, there was a nice, natural fit between the companies.

➤ **Would you say marketing was more sophisticated and developed at TI, as well?**

Yes, just because of the nature of our large portfolio. Marketing enabled us to take all of these products and then really implement what is Phase 2 of the strategy, which is leveraging the scale of TI as a strategic advantage. I think what happened during the TI integration with Burr-Brown and Unitrode is that TI's sales force was so large compared to what these companies were used to that there was an immediate external pull. The groups quickly focused on solving customer problems, doing things with customers, and winning programs and customers. I think it helped us get off the ground running.

➤ **Why is TI divided into high-volume analog and high-performance analog?**

If you have a customer that's running a high-volume piece of end equipment, form factor is going to be an important thing. Integration is going to be an important thing. A custom high-volume chip will be much more acceptable to a customer heading into a high-volume-handset application, a hard-disk drive, or what have you. So, we have those teams that are end-equipment oriented.

In the [high-performance]-catalog business, customers place a huge importance on the specs of a device, the performance of a device,

SNR [signal-to-noise ratio], SFDR [spurious-free dynamic range], bandwidth, and efficiency. The catalog business is quite spec-elastic versus price-elastic. If you can get 2 dB better on SNR, your customers are going to be more excited about your parts, and you'll be able to grow your volume because they can use it in many more applications. There is a different model between the two, and that's why we're organized that way.

➤ **Are there impedance mismatches between the high-performance and the high-volume employees as well as the freewheeling sales and marketing folks?**

There's less of a difference between the various groups, whether they're in India, whether they're in Japan, whether they're in Dallas or Tucson, AZ. We take any of those mismatches you talk about and put them in the context of how we can work together to solve customer problems. Everybody loves doing that.

[The development group is] highly passionate about what they do, which to an outsider could sound a bit geeky because they're going to be passionate about bandwidth and SNR and SFDR and 1/f [flicker] noise—all of the kinds of stuff that really gets them excited about doing parts. But both groups get excited about having their parts be successful with customers. The impedance mismatch between a development organization and a sales and marketing organization is dramatically attenuated by focusing on how to solve customer problems. We've brought into customer [meetings] engineers that weren't

dressed in suits. They probably haven't combed their hair in a while, yet the customers loved them because they were bringing ideas on how to solve problems.

➤ **Why are there so many US companies in analog?**

The analog business tends to be a business where you get designed in and then you stay in for a long period of time. Also, the birth of the semiconductor industry was largely in the Western world. There's just been a historical large foothold.

The second thing is education. Universities in the United States and Western Europe have embraced analog as a curriculum. Analog universities in the United States and Western Europe have been at it a lot longer than anywhere else in the world.

The last piece is [the fact] that the analog market is highly fragmented. There are tens of thousands of customers, and many Asian companies tend to focus on quickly ramping consumers, single-hit, high-volume things. The analog market is really hard to attack because it's so fragmented.

➤ **What does TI do to foster innovation?**

We have new-product reviews on an ongoing basis. A very significant portion of that review is looking at how this [part] helps customers do things more efficiently, more effectively. What kind of ca-

pabilities does this [part] give our customer to deliver to the market so that they can win? You can achieve that [goal] only through innovating.

The second thing we do is encourage risk taking. Sometimes, you find out about halfway through the design that nobody's ever done it before because it can't be done, and that's OK. You have to encourage risk. In fact, you have to embrace and celebrate [risk] because we need people taking risks and really trying to go after the impossible. Most of the time, we find we get breakthroughs when people think that way. A lot of people talk about fostering innovation, but unless you really embrace taking those risks, it's hard to do that.

Finally, we try to give our engineers and our design community really unique tools. Those tools are in the form of process technology. I think process technology has been at the heart of innovation in the analog world. Certainly, circuit design is really important as well, but if you look at any of the large and successful analog companies, nearly all of them have a high percentage of their manufacturing

analog processes. This [approach] gives our designers an ability to do things they've never done before. We're at the beginning of a new wave. TI introduced these technologies to the Burr-Brown designers, the Unitrode designers, and so forth back in 2000. It took them a few years to understand the technologies and what they could do with them. It took them a few more years to design chips on them. We released those chips to the market. We're at the relatively early stage of new revenue ramp based on these new process technologies. It's really exciting to see that.

➤ **Is innovation different between TI's high-performance and high-volume groups?**

Not really. I think innovation is really all about solving customer problems. Obviously, in a high-volume world, you have one or two customers that are going to take your chip and drive it into the next-generation hard-disk drive or the next-generation MP3 player or what have you. Your engagement with the customer tends to be a little bit more one-to-one. In the catalog business,



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in-house on proprietary technologies that they invented for one reason or another.

At TI, [we've been] unique. We've taken what has historically been an outstanding capability in digital CMOS and have translated that into an unbeatable capability in

you have to visit a dozen or two dozen customers to get a better sense of it. Both [groups] are doing the same thing. You're trying to get a product to make it easier for customers to choose to do business with TI.

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➤ **Are there awards for innovative employees?**

Absolutely. We have a technical ladder where great technical people can move up in compensation and rank, without having a single employee reporting to them. We certainly have patent awards, and there's financial recognition for that. The most interesting one we've got is an award system we call Mach One. Management will recognize you for a successful chip that has been released to market and has been accepted into the market and is ramping in revenue. At every department meeting, people whose chips have been awarded Mach One get recognized. By the way, that [recognition] includes designers and product engineers and the marketing person because these are all team events. [It may be that the] chip was able to have an SNR that was unbeatable in the industry and that allowed three customers in the medical-

imaging business to enable their scanning machines to let doctors get closer views of smaller tumors. That [innovation] has probably saved the lives of 10,000 people.

➤ **What's in the analog future?**

As music went from records to tape and tape to CD and CD to MP3, it became more digital, and yet, each step along the way, there was more and more analog content. I think in the future you're going to continue to see that trend. As more things go digital, there's going to be a continued groundswell of analog-semiconductor spending.

In end markets that are going to be very exciting, there are things like medical. I think medical electronics is really in the first inning of this game. Doctors and physicians and universities are just beginning to understand how to utilize semiconductor chips and analog chips in medical electronics to help patients lead better lives and more satisfying lives. I think we're at the early phase there and

that [market is] a very exciting business for us.

Energy is another one, whether it's consumption or generation. [We will see] more efficient products, less heat dissipation, and semiconductors being used in alternative-energy production. I think we're at the early stage of that, as well.

Safety and security [are other areas of interest]. They have become real issues worldwide. Analog chips, which are right at the front end of imaging technology, communication technology, and so forth, are going to be [used in] scanning technology for luggage compartments of airplanes and so forth. I think these are areas where analog semiconductors can really make a big difference.

➤ **Do you have any other thoughts regarding analog?**

One last thing. TI has had a college/university program and, over the last 50 years, has been a big sponsor of universities. We're celebrating multiple decades of having

analog university programs with places such as the University of Texas—Dallas, the Georgia Institute of Technology, and others.

The thing that will hurt our industry the most is just simply the lack of talented kids getting interested in analog technology at the university level. If you look at the talent pool of any analog company, a generous way of describing it is that it's very seasoned talent. We really have to get more kids in colleges excited about and interested in studying analog because it's not something that you just switch into during your eighth year of your career. You have to get it from the ground up.

TI also sponsors a lot at the grade-school and high-school level, not necessarily in analog, but just getting kids in high school interested and excited about studying engineering because engineering is something you don't switch into [during] your third year of college.

—Paul Rako