



Greg Davis began working on the MiSeq i100 project three years ago. Photo by Kristy Walker

## Scale it up! Taking the MiSeq i100 Series from development lab to factory floor

*How Illumina's Greg Davis ensures the new instrument is developed with manufacturability in mind*

*Illumina recently launched the MiSeq i100 and MiSeq i100 Plus Systems, two powerful, compact benchtop sequencers that incorporate more than 140 invention disclosures and 60 patent families. On our News Center, we are celebrating outstanding employees who helped develop this breakthrough technology.*

"THE ILLUMINA MISEQ i100 Series\* is by far the most complicated and challenging project I have worked on," says Greg Davis, a principal engineer who has been with Illumina for 12 years. Davis works in operations, and describes his role as one that exists in a sort of middle ground: "We're parked between development [R&D] and manufacturing."

His job is to take the ideas coming out of the R&D team and determine how they can be manufactured at scale—and then transition that plan to the manufacturing operators. As he describes it, he ushers a project from what's being done in our lab to what's being done on the manufacturing floor.

The new MiSeq i100 is an easy-to-use benchtop

platform with streamlined workflows and expanded output offering high-quality data enabled by XLEAP-SBS chemistry. Also notable are the instrument's sustainable solutions, including reduced plastic waste and room-temperature shipping and storage.

But according to Davis, it's a very different story making kits for an instrument like the new MiSeq i100 a few times on a bench versus producing it at scale in a manufacturing setting. An untold number of changes, tweaks, adjustments, and considerations factor into getting a sequencer to launch and into customers' laboratories.

Davis was pulled into the confidential MiSeq i100 project three years ago. "I think we set pretty aggressive goals," he says. MiSeq i100 was designed around the desire for faster run times, more stability, and room-temperature storage. The new instrument boasts a run time of four to 16 hours and, for most applications, two hours or less for onboard data analysis. Its output is four times greater than the MiSeq, for those who want to scale their studies.

Early in the program, Davis spent a lot of time with the

\* [illumina.com/systems/sequencing-platforms/miseq-i100.html](https://www.illumina.com/systems/sequencing-platforms/miseq-i100.html)

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R&D team thinking through user requirements, evaluating technologies, and assessing whether certain features or designs had any drawbacks or might pose a burden to Illumina's manufacturing team.

"I really appreciated early exposure to some important technical architectural decisions, and I think that's really going to bear fruit in this project long-term," he says. "I was able to influence how the product was made and designed for manufacturability."

He assesses vendors and consults on whether a third party would have the ability to manufacture on a large scale and meet Illumina's quality requirements. He also assesses technologies that could be integrated: Does a piece of equipment get results but require a lot of fine handling by trained experts? Or can a technician working a night shift read a set of work instructions and get the same results every time?

Once the product is well defined and designed, he'll spend more time on the manufacturing side, helping those teams create and learn a consistent process.

### **Understanding chemistry in machines and people**

Davis earned both his bachelor and master of science degrees in chemical engineering from the University of California, Berkeley. Within chemical engineering, he focused on product development, materials science, and other biotech applications. Following graduation, he worked in materials science at a few life sciences and tech companies.

When he came to Illumina in 2012, he began in a more traditional engineering role, working to improve or speed up processes in various technologies. Over time, he assisted with new product releases and gradually moved into leading teams on technical projects. He now manages teams of over 100, taking responsibility for the work of many different people.

"I've found that people skills are the most important," he says. "I have a chemistry background, but I work with people who are developing the instrument, the optics, lasers, plastics, et cetera, not to mention the marketing and commercial departments. All these disciplines that come together in a core team need to be able to work with each other. People at Illumina have very strong passions and that means they feel very strongly about their ideas—and for good reason. I help them come to agreement and find solutions. The key is to make sure people feel valued and that their perspective matters and is heard."

For the past few years, the MiSeq i100 project has taken up most of his time. Davis works as a hybrid employee, splitting his time equally between the office and home. This summer, some intense deadlines were emerging, but he still found time to bring his nine-year-old daughter to Illumina's Bring Your Kid to Work Day.

Davis has traveled a few times for the project: He has visited Illumina's facility in Singapore and vendors in Taiwan, while other members of his team have headed to Illumina's Madison, Wisconsin, location for raw materials. He highly values face-to-face contact and always packs in a full schedule of meetings whenever he's with the Singapore team or global partners.

Back at home in California, he also uses his people skills volunteering outside of work. He mentors international students at UC San Diego. In addition to helping them adjust to student life, he offers opportunities to practice speaking English and writing an American-style resume. He has also hosted students in his home for Thanksgiving and other holidays. "Some of them have never eaten turkey before; it's a joy to have them over!" he says.

The ability to have a healthy work-life balance at Illumina, and the chance to work on endless ideas and new technologies, has made for a very enjoyable career. As Davis prepares the MiSeq i100 for launch, he expresses great pride in the work and the end product—and the talented team that has made it possible.

Out of all the instrument's features, Davis anticipates that customers will be most excited about its room-temperature storage and run times. He says that people will like not having to use a freezer anymore. "I don't think anybody thought that was really possible because the chemistries are just so sensitive," he says, adding that customers will also be excited about being able to get answers much faster. "It's really going to blow people away how much shorter the run times are. I was on the team that released the original 600 cycle MiSeq kit. The run times are not even close—it's days versus hours. I'm really excited for how people can use these much more efficiently and get a lot more work done."

The MiSeq i100 features multiple unprecedented advancements in a single instrument. Davis says: "We've ambitiously brought together probably the most new technologies of any sequencer we've launched in a while. Our R&D team is bringing these ideas to life, and my org is turning them into repeatable, scalable products our customers will love and use to drive real benefit." ♦