

## Bringing a Complex Industrial Product to Market with Efficiency and Speed

**Given the unprecedented pace of technology today, speed-to-market is the number one priority for many customers. Developing complex technology as efficiently and cost-effectively as possible is what Benchmark does best, especially for applications that require reliability and precision, such as complex industrial products.**

### The Customer: Fluke

Since its founding in 1948, Fluke has helped define and grow a unique technology market by providing compact, professional electronic test tools and software for measuring and condition monitoring. Fluke tools and applications help keep businesses and industries worldwide up and running, from industrial electronic installation and maintenance to precision measurement and quality control. Typical Fluke customers include technicians, engineers, metrologists, designers, and computer network professionals, many in mission-critical manufacturing and service industries. These are people who stake their reputations on their tools and use them to help extend their abilities.

Meeting its promise to help optimize efficiency and reduce downtime in the industrial sector, Fluke developed the ii900 Sonic Industrial Acoustic Imager. The ii900 is an advanced ultrasonic leak detector that generates a spectrum of sound levels to produce real-time images that help maintenance teams accurately and quickly detect dangerous leaks in compressed air, gas, and vacuum systems. The device can save industrial facility operators hundreds of thousands of dollars by lowering energy costs, reducing CO2 emissions, and significantly improving uptime and reliability of production lines.



Image: Fluke ii900, Sonic Industrial Acoustic Imager

### The Challenge: Ambitious Timeline and Design

When Fluke set out to develop the ii900, there wasn't an industrialized acoustic imager on the market that could be reliably produced in significant quantities. Fluke's key priorities were creating a ruggedized design that could be manufactured at scale and be the first such product to market.

After creating a minimally functioning prototype, Fluke's strategy was to select a partner to productize the ii900 by ruggedizing and improving the design's manufacturability, then moving it into production at scale. The timeline for the design revisions and new product introduction was only six months. This extremely aggressive timeline would ensure the device was the first high-volume industrialized acoustic imager on the market. In addition to the ambitious schedule, numerous design challenges with the software and hardware still needed to be addressed.

Fluke selected Benchmark based on our expertise in design for manufacturability (DFM), new product

introduction (NPI) services, and our ability to meet tight deadlines without sacrificing quality. Our hardware, software user interface (UI) design, and ruggedization mechanics capabilities were critical in productizing the ii900.

## The Solution: Collaboration and Problem-Solving at its Finest

Benchmark's approach to a new product engagement begins with a workshop where company leaders, designers, and engineers from each organization and supplier come together in one room. The workshop aims to define the scope, create the development plan and timeline, and work through potential project challenges. The Fluke ii900 workshop proved to be highly productive and efficient. Design sketches were made, and the cadence for each development step was agreed upon to meet the aggressive timeline.

Like many early prototypes, Fluke's was a jumble of wiring and components. The teams worked quickly to begin the process of productizing and industrializing it. Members of each organization were grouped into multiple functional teams, including software, hardware, mechanical, and production. Each focused on the specific challenges and solutions in their respective area of expertise and shared information over the 'product dashboard' to keep everything on schedule.

One of the team's initial software challenges was getting the data from the acoustic array of tiny sensitive

microphones through the system and into a visual display format. This task required creative configuration of the components and data transfer sequences. The unique solution utilized a camera interface, like the ones used on a smartphone, to create a pipeline to transfer video and audio data to the platform in a high bandwidth information stream of 30 Mbps.

Once the data pipeline was solved, Benchmark helped to refine the UI. The sketch of the prototype's UI was static and simplified, so Benchmark and Fluke collaborated to work iteratively on the design to make it more user-friendly. Fluke provided Benchmark with a great deal of creative freedom, which enabled the team to make changes that allowed for a better user experience. These included incorporating unique transitions that intuitively guided users to the next step, a first for a Fluke product design.

Another challenge in this project was creating a robust housing around the large display that can withstand a drop from a 1-meter height. We managed this by a full integration of mechanical features and overall structure.

Solving the thermal management issues involved designing a method to remove the heat generated by the computer system within the device. The teams created a passive cooling solution in the form of a heat sink with a seal. On the opposite side of the heat sink, slots were added to push the heat out of the unit rather than relying on vents that would compromise the required IP51 rating for dust, water droplets, and condensation.

## The Results: Beating the Competition to Market

The team was able to adhere to the project's aggressive timeline, satisfying Fluke's goal of being first to market with a high-quality sonic industrial acoustic imager that could be manufactured at scale. Initial manufacturing began in Benchmark's Almelo, The Netherlands facility using a custom manufacturing cell that efficiently grouped resources to kick-off early production. Benchmark also developed a custom functional board and system tester for the production line.



Image: ii900 acoustic microphone array

Shortly after initial production, the product was transferred to Benchmark's Brasov, Romania facility to leverage its deep expertise in high-quality, high-volume production. Benchmark Brasov provides aftermarket services on the ii900, including obsolescence management and component/firmware upgrades.

Fortive, Fluke's parent company, presented Benchmark with the 2019 Gold Fortive Innovation Award for the ii900's innovative design and functionality. The Fortive Innovation Awards are given to groups and products that accelerate progress through advancing essential technology, and Gold is the highest honor one can receive.

Solving high-urgency, highly technical customer challenges when speed-to-market and quality are of critical importance are at the core of Benchmark's reputation. Development on the ii900 was intense

and fast-paced, but it was among the most rewarding engagements for the Almelo and Brasov teams because it proved Benchmark's commitment to getting the job done. Benchmark is proud to be a long-standing trusted partner of Fluke.

## About Benchmark

Benchmark provides comprehensive solutions across the entire product lifecycle, leading through its innovative technology and engineering design services, leveraging its optimized global supply chain, and delivering world-class manufacturing services. The industries we serve include commercial aerospace, defense, advanced computing, next-generation telecommunications, complex industrials, medical, and semiconductor capital equipment.

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