## A Tool Journeys from Research to Commercialization: A Client's Perspective

To say Chevron shared in Schlumberger sonic-logging tool development would be an understatement. Through the years, I recognized that tool development, like most science, requires collaboration and that success is critically dependent on human relationships like those we forged with Schlumberger R&D people. A couple of decades ago, as a relatively new Chevron employee, I got my first taste of collaboration with an engineering prototype of the Array-Sonic* tool. This was Chevron's first experience with an array tool, and it seemed we were entering a new world of borehole acoustics.

Some years later, we organized a test of dipole sonic tools in the Sacramento Valley, California, USA. Steve Chang, then at Schlumberger-Doll Research, brought an experimental prototype of the DSI* Dipole Shear Sonic Imager, and Mobil brought their groundbreaking proprietary sonic tools. Such tests let us build our in-house expertise. For example, we showed the original DSI development team that waveforms contained large dispersion, therefore justifying filtering at frequencies as low as 1.5 kHz, although we could not explain the cause for the dispersion in those early days.

Our involvement with MSIP (Modular Sonic Imaging Platform), the engineering name for the Sonic Scanner* acoustic scanning platform, began in 2001, when Schlumberger Kabushiki Kaisha (SKK) requested a field test of an experimental prototype in diatomite formations in California's San Joaquin Valley. Diatomite poses challenges for sound waves, as illustrated in "Sonic Investigations In and Around the Borehole," *page 14*. Hitoshi Tashiro, the MSIP project manager at the time, visited us from SKK and bravely showed results that were worse than those from the older DSI tool. This is not surprising for an experimental prototype tool, and Hitoshi said, "We have work to do." Three more experimental prototype tests followed, with sustained field support from Chevron's Dale Julander. On the following visit, Vivian Pistre, the next project manager, demonstrated truly impressive results with the prototype. We at Chevron sensed the new tool's potential and its complexity. We requested a written client guide, which David Scheibner wrote and let us review at several stages. We awaited the transition of this sonic tool to engineering-prototype status so we could have the acoustic waveforms to understand and use this technology in Chevron.

The first time we got these waveforms in 2004 was interesting. David oversaw the field acquisition in California and he used *The Sunday Los Angeles Times* as padding material for protecting the data DVDs in shipment. For the package going to SKK, he wrapped a DVD in the sports section, presumably for the sports lovers there, and for me, he used the delightfully colorful food section. When I saw the data file—a 1-GB file seemed huge then—his thoughtful choice allowed me to enjoy a huge photograph of a cantaloupe before attacking the data. Today, we are undaunted by 6-GB waveform files.

Upon recovering from the initial jolt of handling waveforms from three dimensions—well azimuth, well axis and time—and a long dipole chirp signal, we began our own journey of learning about this new tool. This path had its highs (as when we discovered a polarity error during acquisition, offered a solution and Vivian readily agreed to implement it) and lows (as we waded through hundreds of mysteriously named mnemonics). Vivian kept a growing list of our suggestions, many of which Schlumberger implemented. Throughout this time the development team was unwaveringly patient in answering our multitudinous questions. In addition to Vivian and David, we turned to Takeshi Endo with questions. John Walsh, Tom Plona and Jeff Alford also helped us. In all, the tool had at least eight field tests in Chevron wells, the most extensive one being in a Gulf of Mexico well, with strong support from Chevron's Larry O'Mahoney.

Now that MSIP technology has become the Sonic Scanner tool, we are entering another new world of borehole acoustics. This tool can probe the formation around the wellbore in new ways, opening the door to better decisions in drilling, completions and petrophysical predictions. Other new applications will emerge. History shows sonic technologies advanced faster when both Schlumberger and clients had easy access to raw waveforms. We must remember this history lesson of collaboration and sharing raw data; otherwise we risk stagnation.

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