

# Economically Applying New Intervention Technology in Nigeria

*In 2004 Shell Petroleum Development Company of Nigeria Limited (Shell) sought to install almost 200 subsurface safety valves in older wells across the Niger Delta. A viable, cost-effective solution for installing the valves—one that could be deployed without a workover rig—was needed. The task was unprecedented, but Weatherford's proprietary SlickPump™ downhole hydraulic setting tool turned it into a groundbreaking success story.*

Many wells in the Niger Delta area were completed decades ago, when regulatory requirements were considerably less stringent and subsurface or downhole safety valves simply were not mandatory. Fast-forward to 2006, when protecting public health, safety and the environment by ensuring well integrity became one of the industry's chief objectives. At this point operators in the region faced a critical issue that required immediate intervention.

Safety valves had to be installed in some 200 wells located on land and in swamps across the Niger Delta. Shell estimated that the installation of safety-valve systems would save almost 30,000 barrels of oil per day and about US\$1.5 million per day per well in lost production. A viable, cost-effective solution for installing the kinds of valves needed was desperately needed, and it had to be identified quickly. To add an extra layer of complexity to an already challenging situation, Nigeria's political climate at the time was riddled with civil unrest, preventing deployment of major equipment-based well intervention methods that are typically used under such circumstances. The task the operator faced was by no means a small one. Without the luxury of a workover rig, a coiled tubing unit or even electric-line unit, the task was daunting—and unprecedented.

Through the implementation of Weatherford's proprietary *SlickPump* downhole hydraulic setting tool, more than 45 PB (protected bellows) safety valves were installed for Shell during an extremely economic campaign to rehabilitate its Niger Delta wells. More than 25 valves were set below PB packers, and all were conveyed with

The *SlickPump* downhole hydraulic setting tool eliminates the need for explosives, battery packs and timers for improved safety, transportability and reliability.

slickline, eliminating the need for a workover rig. In the end the campaign was a tremendous success.

"The only service company that could offer a solution that was economical and could meet our requirements for production was Weatherford," says Folorunso Afolabi, Production Technologist for Shell. "We evaluated a number of competing options that would allow us to resume production, but cost was a constant issue. Nobody else had the full package; but Weatherford had the safety valve, PB packer and a unique setting tool that brought everything together, breathing life into what seemed to be an operational impasse."

The operator's road to well rehabilitation in Nigeria was to be paved with innovation, expertise and an interesting series of events that would demonstrate how Weatherford can quickly respond to some of the most difficult challenges.

## From Prototype to Production

A thru-tubing engineer visiting Port Harcourt, Nigeria, on a completely unrelated assignment found himself in a conversation with his colleagues about a serious problem confronting an operator. The solution to the problem called for a specialized tool that could set a packer on slickline, but apparently there was no tool available within Weatherford at the time that was fit for that specific purpose. The engineer reached into his backpack and presented a full-scale, 20-foot (6-meter) drawing of a prototype tool with the potential to do the job. The drawing had been shelved, unused intellectual property. The engineer had recently discovered it and was seeking an opportunity to put it to good use. And this is where he made his lucky discovery.

"Before we knew it, a group of us were literally down on our hands and knees, rolling out that drawing and arriving at the unanimous conclusion that the prototype tool would work," says Rodger Lacy, Weatherford's Account Manager for Continental Europe and former Country Manager for Nigeria. "It was an amazing coincidence to have the *SlickPump* design drawing emerge exactly when we needed it. It was definitely a matter of right place, right time. The next question was: 'How fast can we get it?'"

It took two months to take the tool from a prototype

real results

## the human element

### amadi albert



"Intuitive and eager to learn are words that describe Amadi Albert best," says Bob Asher, who has trained local staff to run jobs in the field. He says that Albert was one of his brightest students.

Albert had been working as a toolhand for Weatherford's thru-tubing business when he was presented with an opportunity to be trained in gas lift and work for the company's Completions group. He learned quickly, and in a relatively short time he was maintaining the *SlickPump* setting tool and managing repairs on some other very complicated tools in the shop in Port Harcourt, Nigeria.

"Albert took a lot of pride in what he did, and it came across in his work," says Asher. "His ability to go out into the field and support expandable sand screen jobs, for instance, proved invaluable. Most important, it proved that local talent was available in Nigeria. It just needed to be developed through specialized training."

Today Albert works as a field supervisor in Port Harcourt. His educational background includes industrial safety and mechanical engineering.

real results

on paper to Nigeria in the form of parts and components for assembly and testing. But before that could happen, Weatherford's engineering team had to present the *SlickPump* design drawing to the operator and walk the engineering team through the attributes of the tool and how it would perform and be used to address their immediate needs.

"We were back on our hands and knees again," says Lacy, "but this time we were selling our solution to the operator. By the time our team walked away from that initial discussion, we had the operator's full confidence and trust that the *SlickPump* solution was real and would work. It also didn't hurt that we had established a long-standing track record for delivering results and were motivated to keep up the momentum."

### Collaboration is Key

Persistence and collaboration were among the many factors that contributed to meeting the operator's need for the *SlickPump* tool. Weatherford was pioneering an approach that had never been undertaken, and success depended on a new level of teamwork.

"The *SlickPump* setting tool was originally designed to set packers, but to our knowledge it had never been used to actually set one before," says Lacy.

"This is positive proof as to how we can provide the client with a complete solution to the challenge faced by the provision and application of Weatherford's multi-product-line integrated approach," says Bob Asher of Weatherford's Well Engineering Solutions Team (WEST).

A project of this caliber for the *SlickPump* tool was truly unique in every aspect. The physical parts for the job were pulled together on a very short turn and delivered to Nigeria. Weatherford then built and successfully ran a test fixture

with the operator's approval. Shortly thereafter a purchase order was issued to Weatherford, making the *SlickPump* tool commercially available.

### Achieving Major Results without a Rig

The *SlickPump* setting tool was designed with simplicity in mind; so a key benefit of its function is that it can be deployed on either slickline or wireline. Independent of a rig that requires a two- to three-day setup, at least one day to complete a job, and another two- to three-day rig-down, a slickline unit is much smaller—about the size of a standard truck.

Because of its size, a fraction of the time is needed, allowing completion of multiple jobs per day and greater mobility. These benefits were critical in the Niger Delta, where large equipment could potentially attract unwanted attention from the local community. In addition, the *SlickPump* tool was optimal for use in swamps where tiny, unmanned jackets with small platforms that were built more than 20 years before were structurally incapable of supporting the weight of a workover rig.

Eight months into the operator's well integrity campaign, 46 of the 85 purchased PB valves had been installed with the use of the *SlickPump* tool; however, civil unrest soon reached a level that forced suspension of all production operations in the region. The operator has evaluated the project as a success, although a considerable number of wells remain to be rehabilitated when conditions improve and staff and resources can be safely redeployed into the region to resume work.

"The tool did exactly what we expected and promised," says Lacy. "It provided a retrievable system that could be set and run on slickline and field dressed and rerun. Our objective was accomplished."