

## Stripper-Scale Oilwell Technology for Africa?

Ben Ebenhack believes reworking abandoned wells can provide cheap local energy and other economic and human benefits.



One evening in 1986 Ben Ebenhack, then a log analyst with Union Oil Co. of California, was watching a television documentary on famine in Ethiopia. As a petroleum engineer with experience in research and international exploration, he appreciated what a cheap energy source could do for productivity and survival in the region. He wondered about a feasible way to exploit known but small pockets of oil and gas reserves that exist in most African countries. Relatively few have reached commercial development.

He realized that Third World reserves must be enormous to be commercially viable for export, yet knew that in the U.S. mid-continent small-scale operators profitably exploit reserves with wells producing as little as 10 B/D [ $1.6 \text{ m}^3/\text{d}$ ]. He pondered the problem and an idea began to evolve. He started talking about his concept with others, and mentioned it to colleagues at the 1986 SPE Annual Meeting in New Orleans. Today that idea has become AHEAD.

### Organizing a Campaign

The Access to Hydrocarbon Energy for African Development (AHEAD) project seeks to find and produce small hydrocarbon reserves in lesser-developed African countries for local energy use. The energy will provide a basis for economic development, improve the local balance of trade by replacing costly imported fuels, and enhance the environment by providing an economically viable alternative to firewood.

AHEAD considers it possible to exploit known reserves for local use by adapting to African conditions a mode and scale of operation successful in the U.S. The project proposes to provide access to research, educational opportunities, practical know-how and on-the-job training, and a low-overhead organizational strategy for non-profit but self-supporting operation.

Ebenhack found a home for his idea in New York at the Frederick Douglass Inst. for African & African-American studies at the U. of Rochester, where he now has research facilities and a part-time teaching post.

"The education and training aspect, as well as the need for expertise from numerous disciplines without running up a huge overhead, made me realize that a university

was the ideal setting for the project," said Ebenhack. He also is president of the AHEAD Energy Corp. The group now is approaching private foundations and hopes to raise the \$2 million necessary for startup by this time next year.

"Simply put, the idea is to redrill shallow oil and natural-gas wells and locate new ones, preferably near population centers, that commercial developers have abandoned or overlooked as unprofitable for export," he said. "The gas could then be piped either to the edge of a village or town or to individual residences, or liquefied and sold in bottles for cooking and household purposes." The accompanying water would be a valuable byproduct.

"Even though the produced water is saline, it could be distilled fairly inexpensively and used for drinking water or for irrigation," Ebenhack said. "We could use the oil or gas to fire a steam generator to produce steam and drive a turbine. The condensed steam could then be used as distilled water.

"Apart from the very obvious benefits of having a cheap, local source of energy, it would also remove some of the pressure on the forests," he continued. "A small gas well producing 100 Mscf/D [ $2863 \text{ m}^3/\text{d}$ ] would produce the energy equivalent of burning 109 tons [ $98\,900 \text{ kg}$ ] of firewood per day. This amounts to saving approximately 23 acres [ $9.3 \text{ ha}$ ] of forest every day." Ebenhack estimated that a ton of firewood costs about \$78 locally and produces approximately the same amount of energy as 1 Mcf [ $30 \text{ m}^3$ ] of gas. He calculated that the African communities could produce this much energy for only about \$1.10.

### Developing Field Strategies

"The plan is to use U.S. midcontinent, oil-patch technology to develop energy in a region near a local population center, and hire a resident manager while training the local workforce to take control of the project eventually so that AHEAD can move on to other regions," Ebenhack said. "We estimate that each additional well will cost about \$200,000.

"The project is also designed to provide opportunities for education in energy and development for both U.S. and African stu-

**"Simply put, the idea is to redrill shallow oil and natural-gas wells and locate new ones, preferably near population centers, that commercial developers have abandoned or overlooked as unprofitable for export."—Ebenhack**



Photo by Kevin Higley, courtesy Rochester Democrat and Chronicle

Ben Ebenhack is organizing resources to test whether an international program can apply old technology to nonproducing wells in Africa as an inexpensive source of local energy. Now at the U. of Rochester in New York, Ebenhack's work through the AHEAD project taps his own background in oil and gas production and promises to help impoverished communities in Africa where firewood is the dominant household fuel.

dents," Ebenhack said. "I believe the timing is good, as enrollment in many petroleum geology schools is very depressed, and good training and jobs are not easy to find. This project offers a unique opportunity for students to stretch themselves beyond the confines of their chosen disciplines, to understand the relationships of energy to society and development, and to apply their skills to the understanding of the world we share.

"Of course, before, during, and after implementation, the project must provide clear answers to numerous questions," Ebenhack pointed out. "What are the lead times and lifetimes of hydrocarbon energy reserves to be developed? How many wells must be drilled, and at what ultimate cost, to meet regional energy demand? How will the energy be delivered to consumers, and at what cost to consumers? Will the project be more cost-effective than other energy development possibilities? These and many other such

questions must be anticipated, studied, and answered."

Ebenhack is excited about the project, and has no regrets about resigning in May 1987 from his management position with Union Oil. "I believe I have found what I would like to do for the rest of my professional life," he said.

Ebenhack was a Technical Information Committee member from 1984 to 1987 and chairman of the Wyoming Petroleum Section in 1978. He also was chairman of the Los Angeles Basin Section during 1984-87. He was Wyoming Petroleum Section program chairman (1979), student chapter liaison officer (1980), and U. of Wyoming SPE Student Chapter faculty sponsor (1981). He was Los Angeles Basin Section director in 1987 and has served on the Editorial Review Committee since 1984. He holds a BS degree from Marietta C. and an MS degree from the U. of Wyoming, both in petroleum engineering.

## **Africa: Burning for Energy**

Energy use is one index of national welfare. The U.S., for example, consumes 80 times more energy per capita than a typical African nation. Yet, on a different scale, energy has an equally vital importance to the Third World, as many publications of the United Nations, the World Bank, and other development agencies document repeatedly.

The poorest nations, which must allocate a large proportion of scarce foreign exchange to finance energy imports, appear to suffer most. This is the case in many sub-Saharan countries.

The absence of a cheap local energy sup-

ply also increases the pressure on an energy resource most African countries do possess: firewood. The demand for firewood and charcoal is so great in many urban areas that a large black market has grown up to meet the need. Ethiopia, for example, consumes an estimated 30 billion lbm [ $13.6 \times 10^9$  kg] of firewood each year (1985).

Firewood as an energy source drives the massive deforestation that plagues the region. Deforested areas and increased surface erosion contribute to the cycle of drought, famine, and disease endemic to large parts of Africa.