INTRODUCTION

Africa captures our imagination. From charging lions, to diamonds, to interesting cultures, it offers something for all of us. Those of us in the oil business are excited about Africa today. Africa has yielded immense oil and gas production, and promises even more in the future. West Africa is particularly interesting, and is the topic of this conference.

This paper addresses some of the oil business in West Africa and provides insight concerning the activity, and some points which should be considered in executing projects.

THE COUNTRIES

The major West Africa producing countries are Nigeria, Angola, Gabon, Republic of Congo, Cameroon, and Equatorial Guinea. Other West African countries are developing their resources, but do not currently have the production of those listed above.

**Nigeria**—Nigeria is one of the world’s largest crude oil exporters, produces about 2 million barrels per day, and has oil reserves of around 22-24 billion barrels. It plans to increase production to 4 million barrels per day, and increase reserves to 40 billion barrels by 2010. Most of these reserves are along the Niger River Delta, with increasing amounts in deepwater. The country is heavily dependent on the oil business, with agriculture (mostly subsistence farming) being the second most important part of its economy. Nigeria hopes to reduce its dependence on oil (90% of its total foreign exchange revenue), by continuing an aggressive expansion into gas utilization. It has some 124 trillion cubic feet of gas reserves (some estimate much higher), with about a 50/50 distribution between associated gas and non-associated gas. Around 3 million standard cubic feet of gas is produced annually. Much of this gas is being flared, but good progress is being made to take full economic advantage of the gas, via a number of recent and planned projects. Most of the flaring will be progressively eliminated by the year 2010.
Angola is sub-Saharan Africa’s second largest oil producer after Nigeria, with nearly 800,000 barrels per day production. The Angolan government would like to increase this production to over a million barrels per day. As with Nigeria, Angola is heavily dependent on oil for its revenue. It has natural gas reserves of 1.6 trillion cubic feet, with the majority of gas production being flared. This will change with time, as Angola is vigorously looking at ways to utilize its gas.

Gabon is sub-Saharan Africa’s third largest oil producer, with over 300,000 barrels per day of production. Although its proven reserves are increasing, the government is concerned about a decline in production over the long term. Accordingly, Gabon’s oil ministry is working hard to attract new exploration. Its natural production is around 3.5 billion cubic feet on reserves of 1.2 trillion cubic feet.

Congo Republic is sub-Saharan Africa's fourth largest oil producer, with 1.5 billion barrels of reserves. Congo's total oil production is on the order of 265,000 barrels per day. Natural gas reserves contain about 3.2 trillion cubic feet, putting it behind only Nigeria and Cameroon. The majority of the gas is associated gas.

Cameroon is the fifth largest oil producer in sub-Saharan Africa, with 100,000 barrels per day of production. It has reserves in the order of 740 million barrels. With the new 225,000 BPD pipeline from Chad, it will have a significant oil transport center at Kribi. Cameroon’s gas reserves are estimated at 3.9 trillion cubic feet.

Equatorial Guinea has had a sixfold increase in production in the last four years and produces 102,000 barrels (80,000 crude oil) per day. Its proven oil reserves have been estimated at 12 million barrels. Equatorial Guinea’s natural gas reserves are estimated to be 1.3 trillion cubic feet.

**BRINGING RESOURCES TO LOCAL MARKETS—PRODUCT DISPOSITION**

With its immense resources, West Africa has the further challenge and opportunity to satisfy its local markets for the production. These can be split into two primary categories. Gas utilization and refining. As indicated below, each of the West African countries have their own unique challenges and needs.

Gas Utilization

Nigeria completed its Bonny Island LNG plant in 1999, a annual plant production of over 7 billion cubic meters of LNG. A third train is underway, which will increase production to nearly 11 billion cubic meters. Possible fourth and fifth trains are also being studied. The new Soku Gas Plant supplies feed gas to Bonny Island LNG. The Escravos Gas Project (Phase 1) processes 165 million standard cubic feet of gas per day from the NNPC/Chevron offshore Okran and Mefa fields in the western Niger Delta.
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Phase 2 will supply Benin, Togo, and Ghana through the West African Gas Pipeline. Phase 3 is expected to be completed in 2004. Near Escravos Gas Project, will be a new Gas to Liquids plant, which will use Sasol technology. Another major project is the Oso NGL plant, located on Bonny Island, which has a production rate of 110,000 BPSD of condensate. Other gas utilization projects are planned or underway.

**Angola** is developing an LNG project to take advantage of its natural gas production and Reserves. They are also developing plans to reduce flaring and increase internal consumption of gas.

**Gabon.** The majority of natural gas produced is utilized in Gabon.

**Congo Republic.** Congo's gas output will continue to be vented or flared until gas utilization facilities are built.

**Cameroon** is working to utilize its gas by increasing the proportion of its power generation fired by natural gas.

**Equatorial Guinea** is working to take advantage of the natural gas from the offshore Alba field. A new methanol plant will be built at Bioko, which will utilize 120 million cubic feet of gas per day. The Alba field gas production will continue to be flared until the new plant is in production.

**Refining**

- **Nigeria** has four refineries, owned by NNPC. Two in Port Harcourt, Kaduna, and Warri. They have had various problems which have sharply reduced production.

- **Angola.** Sonangol has announced plans for Angola’s second refinery. The facility, with a capacity of 150,000-200,000 bbl/d is planned for Lobito, and will export most of its products. The World Bank is pressing to close the existing Luanda refinery.

- **Gabon** has one petroleum refinery at Port Gentil, with a nameplate capacity of 21,000 BPSD. The World Bank is pressing to close this refinery.

- **Congo Republic** has one refinery, Congolaise de Raffinage (CORAF), in Pointe Noire, with a nameplate capacity of 21,000 BPSD.

- **Cameroon’s** Societe Nationale de Raffinage (SONARA) refinery is located in Limbe, and has a nameplate capacity of 42,000 barrels per day.

- **Equatorial Guinea** imports all of its refined petroleum products.
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Field Development Schemes

There are a number of technical drivers which affect the technology selection and field layout. These will include:

- Reservoir configuration
- Product composition
- Product disposition. Will the crude be refined locally, or will it be tanked to other markets? In the case of gas, will it be flared, re-injected, or utilized in LNG, Gas to Liquids, or pipelined to regional power plants?
  - Product delivery mode (FPSO, FSO, Subsea pipeline, etc.)
  - Product delivery point
  - Water depth and drilling/production platform preferences
  - Wave height and frequency
  - Offset
  - Gathering system - what type of reservoir?

Bringing the contractor(s) on early will help the operator to take advantage of a combined team’s ideas and experience.

There is no “one size fits all” in West Africa. Since there is limited infrastructure available to take the products, we have to ask, how will we get the products to market, and how this will affect the design? Each country situation, and each reservoir offers opportunities to optimize and/or adapt to the circumstances. Production engineering is straightforward, and poses no technical challenges which have not been addressed elsewhere in the world. Engineering has to be flexible to accommodate the needs of the partners in the venture, as well as the local community.

The bigger challenges will be in project execution.

Making It Happen

Great technology and brilliant designs make for highly efficient and cost effective production. However, the greater challenge in West Africa is implementation, or project execution. This section will list a number points to consider when executing a project in West Africa. The solutions to the challenges will remain unknown, until we focus on a particular project, the companies, the team, and the country.

The Project Team

Local West African Oil Companies
The foreign entities will be working with one the local national oil companies.
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These include:

- Nigerian National Petroleum Corporation (NNPC)...Nigeria
- Sociedade Nacional de Combustiveis de angola...Angola
- Societe Nationale Petroliere Gabonaise...Gabon
- Societe Nationale des Petroles du Congo (SNPC)...Congo Republic
- Societe Nationale des Hydrocarbures (SNH)...Cameroon
- Others

Partnerships between foreign companies:
Partnerships bring tremendous advantages like spreading of risk, sharing of project initiation costs, production reserves, product purchase, area experience, financing, etc. They also bring challenges. These can include bickering and in-fighting among the partners, or a partner unable to deliver on his part of the bargain. Obviously, the advantages far outweigh the disadvantages.

Alliances with local companies
Alliances with local companies are critical to the success of the project. Local companies provide functions including:
- political expertise
- area knowledge
- hiring
- office staff
- language translation
- infrastructure
- local procurement
- local public relations
- local functions

Local Suppliers
Local procurement will need to be maximized, or at least, optimized. The potential sometimes exists for a foreign supplier to set a local operation to serve the production effort over the long term. This can be done in a partnership arrangement, or through licensing of the technology for local manufacturing. Consideration should be made of the extent of modularization vs. potential to fabricate locally.

Local Contractors
As with suppliers, local contracting will need to maximized. Contractor surveys early in the project will establish soft spots and areas which need to be supports by foreign content. Keep in mind, future projects. Building a competent, experienced contractor base will help everyone in the future.

The Entire Team
The larger project will involve operator partners, the national oil company, contractors, subcontractors, financiers, and suppliers. Some of the challenges added by a large, diverse group of companies include:
- Teambuilding, getting everyone to work together towards a common goal
- Acceptance of the management team decisions
- Interface management
- Requirements imposed by selected team members
  - Financing restrictions
  - Commercial or technical requirements for the field development process
  - Speed of the field development process
- Communications, uses for a project web site, and e-commerce.

**Local Infrastructure**
Local infrastructure has to be arranged. This will include office space, warehousing, communications, and the like. It may not be available in the configuration desired.

**Local shipping logistics**
Some factors will need to be considered in shipping to the project area:

- Customs. Obtaining detailed agreements in advance, to establish duties, procedures, and timing.
- Equipment and material handling facilities at the dock
- Security of the equipment and materials prior to installation
- Pro-active expediting, to anticipate delays

**Labor**
Expect labor challenges. What is the union situation? What union agreements will be required? How are strikes to be handled? What types of skilled labor are available? What are the applicable labor laws? Some may be onerous. Hiring will have to be done with a plan, which includes fairness (maximum number of people having an opportunity to work), communication (to actually reach the people) and project wide consistent wage scales. In boom areas, are there shortages of people? How will you bring the people in from outlying areas? How will they be provided for (busing, camps, mess, medical etc.). Establish basis for use of foreign workers (Third Country Nationals). Determine local legal restrictions on working foreigners.

**Training**
Start training early to meet schedules. Watch for future supervisory talent. Devise tests to ensure that the skills are actually learned.
Socio-Economics
The socio-economic aspects of projects have always been important. However, in recent years, this discipline has emerged to become even more critical to project success. Some aspects to consider:

- **Public Relations**
  - kick off immediately. Keep the populace informed. Otherwise, the rumors almost certainly will not be right.

- **Effect of oil windfall monies on the local economy**
  - Expect local costs to increase in a boom environment

- **Effect of foreigners on local fabric**
  - Train your staff to minimize their impact on the people in country, and how to do deal with the local cultural aspects (nightclubs, personal safety, traffic accidents, local girlfriends, etc.)
  - Victim compensation will be expected for problems

- **Dealing with corruption/business ethics**
  - Establish a corporate position immediately and communicate it to all for consistency

- **Occasionally inconsistent tax law interpretation**
  - As project taxes are often significant, expect occasional problems in this area.

- **In Country Politics**
  - Gabon has remained relatively peaceful and stable. Gabon's President Omar Bongo, re-elected on December 6, 1998, is Africa's second longest serving head of state, in power since 1967
  - Angola civil war
  - Equatorial Guinea..relatively stable
  - Cameroon..relatively stable
  - Nigeria..civil unrest, ethnic, and religious violence, border disputes directly affecting projects
  - Republic of Congo..civil strife is simmering down, but the political environment remains tense (africa.com)

**Language Barriers**
Encourage your team to learn as much as they can of the locally predominant language, with company sponsored classes at the beginning of the project.

**Health**
Train your team in the health aspects of the particular area of the project. Monitor happenings, with a company sponsored medical resource. Make your medical resources available to your local employees and their immediate families.
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Safety
- Cultural attitudes
Worldwide cultural attitudes on safety are improving. Apply your own company safety requirements to the project. Many world class projects have achieved outstanding safety records.

- Driving
Utilize local employees to do the driving. Make and enforce a strict rule against driving at night

- After the accident
Establish a plan in advance, on what employees should do in an accident

- Over the long term...
Pro-actively look ahead to the longer term production operation safety aspects. The recent Nigerian Oil Pipeline accident in Lagos is just one example of the dangers to the local people.

Environmental
New pressures/world standards are now being applied. Environmental Organizations have and will continue to apply enormous pressure on operators. In Nigeria, millions of dollars in fines have been assessed for environmental damages. Pro-active planning at project commencement will avoid big problems in the future.

Non Governmental Organizations (NGO’s)
Non Governmental Organizations (e.g. Sierra Club, Environmental Defense Fund, etc.) may decide to get involved in your project, depending on its visibility and impact on the country/environment.
Plan ahead for the eventuality.

Security
- Crime will be a problem
- Illegal bunkering—how can it be prevented?
- Facilities sabotage/vandalism
- Ethnic vigilante groups
- Kidnappings could be an issue in some areas
- Local political situation could impact the safety and security of your team
- Put in an Emergency Evacuation Plan in place for your employees

Land & Resource Acquisition
- In the event that land is purchased, determining who the local owner may be a problem
- Politics may again come into play in national border disputes on resource ownership
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Export Licensing
-U.S. laws on exports of certain technologies carry stiff penalties, not only for the supplier, but also the purchaser. Compliance should be established early in the project.

Financing
Financing could very well be one of the project’s major driving forces. The financing can affect contractor selection, schedule, budget, partner selection, supplier countries, supplier selection, bid process, timing of awards, and even environmental aspects of the project.

SUMMARY

In this paper, we have looked at West Africa, some of its opportunities, and identified many of the challenges in executing projects in West African countries. The solutions to the problems identified are unknown until a particular project is examined in detail. However, many projects have been executed successfully in West Africa to date, and our industry’s challenge is to learn from them and share those aspects which benefit our industry, as well as each of the host countries.

West Africa is an exciting place to work, and Foster Wheeler looks forward to continuing its presence there in the future.

References:

The following www references were used:

- yourdotcomforafrica.com
- eia.doe.gov
- nigerianoil-gas.com
- mbendi.com