

THE NIGERIAN SOCIETY OF CHEMICAL ENGINEERS: CHALLENGES AND OPPORTUNITIES FACING CHEMICAL ENGINEERS IN NIGERIA.

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Preamble

Let me begin by expressing my profound gratitude to the Board and President of the A.I.Ch.E for the honor done to me and the Nigerian Society of Chemical Engineers, by inviting us to participate in the celebrations of your Centennial anniversary in the founding City of Philadelphia, Pennsylvania.

The Nigerian Society of Chemical Engineers (NSChE) was formed by a small group of graduate chemical engineers in Lagos in 1968. They met regularly at the BP (British Petroleum) House in Lagos, from 1968 until it was formally incorporated on the 3rd of December 1981. NSChE has held 37 consecutive annual conferences in the last 40 years.

On a personal level, I recall with some nostalgia and satisfaction my membership of the A.I.Ch.E, first as a student at University of Iowa, Iowa City in 1966; and later as a graduate member from 1967 to 1975 before I returned home to Nigeria in December 1969. I attended my first A.I.Ch.E Conference in Los Angeles California in 1975. At that time, I was on a special assignment with Union Oil of California (UOC) in Brea, Orange County, CA. I was a process engineer with the Nigerian National Oil Corporation (NNOC) which had licensed the (UOC) Unifiner process for hydro treating petroleum distillates in crude oil refining.

Introduction

Before addressing the substantive issues stated in the title of this paper, I consider it of utmost importance that I present the country called Nigeria to you in a brief but comprehensive manner. With the understanding of its geography, a bit of demography, natural resources and political economy, I hope to make it easier for you to appreciate the main issues addressed in their proper context.

Nigeria is a multi-ethnic and multi-cultural country situated on the West African Coastal region known as the Gulf of Guinea, between the Republics of Benin and Cameroon. Geographical Coordinates are between 4^o and 14^o latitude north and 2.30^o and 14.30^o longitude east. Zone standard time is GMT+1

Area

Total: 973,770 sq km; Land: 910,770 sq km, Water: 13,000 sq km
The land area is about 1.5 times the size the state of Texas.

Land Boundaries:

As shown in the **map of Nigeria** below, the perimeter or total length is about 4,047 km, with a coastal length along the Atlantic Ocean of 853 km. Border countries are: **Republic of Benin** 773km of common border to the west; **Republic of Cameroon**, 1690km of common border to the east; **Republic of Chad**, 87km of common boundary to the northeast and **Republic of Niger** 1497km of common border to the north.



Maritime exclusive economic zone:

Nigeria's traditional territorial limit within the Atlantic Ocean was 12 nautical miles. This zone includes a portion of the Continental shelf with water depths up to 200 meters. The internationally recognised exclusive economic zone extends 200 nautical miles into the sea, with water depths varying from 2600m to 3000 meters. The vast oil and gas offshore (proven) reserves consisting of about 18 billion barrels of oil and 80 trillion standard cubic feet of gas have been discovered in this area. These petroleum reserves offshore represent about fifty percent of the current national total reserves.

Climate

The Niger Delta coastal areas are equatorial; while the tropical region extends northerly to the middle section of the country and the arid region is in the extreme north. Temperatures average between 18°C - 35°C in the North and 23°C - 35°C in the South. There are two main seasons: rainy or wet and dry seasons of equal length of six months approximately; from April to October for the wet season and from October to April in the following year, for the dry season. There is practically no rainfall during the dry season.

Mineral Resources

Petroleum oil and natural gas deposits, oil tar sands, tin and columbite, iron ore, coal, limestone, lead; zinc and gold are available in commercial quantities. These mineral deposits except the oil and gas are geographically and naturally spread throughout the country, from north to south and east to west. Commercial quantities of oil and gas deposits have been found only in the southern lands, swampy Niger delta and offshore regions. There are some striking similarities between the large natural deposits of petroleum oil and gas of the Niger River Delta in Nigeria and the Mississippi River Delta in the state of Texas. These similarities, according to petroleum geologists, are based on the natural processes of the formation of petroleum many millions of years ago, from plankton deposited from rivers flowing into the seas.

Land use

Arable land consists of 33% as permanent crops: 3%, permanent pastures, about 44% of arable land still exists as forest and woodland about 12%. Irrigated land is about 12000 sq km. Natural hazards are periodic droughts in the far northern areas and soil erosion in the southern areas, especially in the south eastern parts.

Environmental Issues

Pollution, soil degradation, erosion and rapid deforestation, desertification in the northern areas, recent droughts in the northern areas severely affected agricultural activities.

Population

The last census figures (2003) indicate a population of about 140 million people. Growth rate is about 3%. The population is largely rural. There are 13 cities with population in excess of 500,000 inhabitants. These include the Lagos metropolis, also the commercial and financial capital with an estimated 12million; Kano, 8million; Abuja, the official capital, 600,000 people respectively. Nigeria has the largest population in Africa. Every one out of four Africans is a Nigerian. There are 60 Nations in Africa.

The main Nigerian ethnic groups are Hausa, Yoruba, and Ibo. In addition there are more than 250 minor ethnic groups, some numbering fewer than 50,000 people. Other larger groups include the Edo, Fulani, Gwari, Ibibio, Idoma, Igala, Ijaw, Jukun, Kanuri, Nupe, Tiv, Urhobo, Kalabari and Itsekiri

There are three main languages widely spoken throughout the country. However, there are as many spoken languages as there are ethnic groups. The official language is English.

Economic Indicators/factors

GDP: real growth rate increased from 31/2 – 7% during the last 8years.
GDP- per capita: purchasing power parity decreased to \$930 from \$1300 in the same period. This could be due to a combination of several factors including continuous increases in international oil prices, higher local inflation, higher living costs and low productivity. All these factors have characterised the Nigerian economy which has been highly dependent (more than 80%) on its oil earnings.

Agriculture: 28%

Industries: 53%

Services: 19%

Inflation rate: average 9 – 12% per annum

Labor force is about 45 million. Unemployment is estimated conservatively at about 40% nationally. There is a very high and varied informal employment sector which makes it difficult to ascertain any measurements.

Oil and Gas reserves are 37.9 billion barrels Oil and 179 trillion cubic feet of Gas respectively. Daily oil production peaked at 2.5mb/d in 2005, before the gradual decline to the current 1.5 – 2mb/d due to the crisis in the oil producing areas of the Niger Delta region. Nigeria is a member of OPEC (Oil Producing and Exporting Countries) and is the 6th largest producer of oil in the group. The oil- and- gas- rich Niger Delta region covers an area of 70,000 sq km, which is roughly 7% of the total area of the country, and contains about half of all of the oil and gas reserves referred to above. The other half is situated in the shallow and deep offshore areas in the waters of the Atlantic Ocean.

Industries:

Oil and gas exploration and production, refineries, petrochemicals, coal, tin and columbite mining, agro-processing (palm oil, peanut, cotton, rubber, wood, hides and skins), textiles, cement and other construction materials.

Agriculture: cash crops are cocoa, peanuts, rubber, oil palm and cotton; food crops are maize, sorghum, cassava, millet, yams, rice, plantain, Soya, tomatoes, onions; fruits are pineapple, oranges, grapefruits, bananas and Vegetables.

Infrastructures

Highways: 35,105 km

Railways: 3557km

Waterways: 8575km

Road network: Just over 16000km of intercity, paved roads, including dual carriage express trunks.

Pipelines: Crude oil 2100km; petroleum products 5200km; natural gas 1000km.

Electric Power generation: 5000mw installed, current production is about 3000mw (30percent of the national requirement).

Estimated requirement is 10, 000mw.

Estimated local production of petroleum fuels/lubricating oils is less than 50% of consumption.

Piped potable water production supplies less than 70 % of the homes in urban areas and non existent in many rural towns and villages.

Communication: This is probably the most developed industrial system in the country. There are over 40million users on the telephone networks in the country. Most users are on the Global System of mobile communications (GSM).

Ports and Harbours:

There are seven deep water ports in Lagos (2), Port Harcourt, Calabar, Onne, Sapele and Warri. Naturally these are all located along the coast of the Atlantic Ocean. Imports and exports of all dry cargo pass through these ports. In addition there are petroleum oil and gas terminals at Forcados, Escravos, Brass, Bonny, and Qua Iboe. These specially constructed seaport facilities are used exclusively for export of crude oils and LNG (Liquefied Natural Gas) to the world markets.

Government

The form of government operated in the Federal Republic of Nigeria is very similar to the USA. The president heads the country and the Federal Government. The government of each state is headed by the governor. There are 36 states plus a Federal Capital Territory, FCT. There is a tertiary level of elected officials consisting of 774 local governments intended to bring development to the grassroots level. All three levels are enshrined in the Nigerian Constitution. The current constitution formulated in 1999 is the third after the country won its independence from the British colonial masters in October 1960. The two previous Constitutions were abolished by military regimes which governed the country intermittently for 31years out of the 48 years since independence. The third republic started in 1999 after the last military government agreed to handover peacefully to democratically elected governments at the federal, state and local government levels.

Who is the Nigerian Chemical Engineer?

The first Nigerian chemical engineer graduated from the University of Manchester, United Kingdom in 1957. Since then another 12000 chemical engineering students have graduated from 14 Nigerian universities and colleges of technology. The University of Ife (now Obafemi Awolowo University), Ile-Ife, Osun State was the first to establish a faculty of

chemical engineering in 1968. Many Nigerian chemical engineers like me were educated in foreign universities in the USA, UK, Canada, Australia, East and West European countries. It is estimated there are more than 4000 Nigerian chemical engineers who graduated from Nigerian and foreign universities now work and live abroad. Most of the foreign based Nigerian chemical engineers live in English speaking countries such as the USA, UK and Canada. There are 2123 currently registered members of the Nigerian Society of Chemical Engineers. This number excludes student members in the Nigerian universities and colleges of technology.

CHALLENGES FACED IN NIGERIA BY CHEMICAL ENGINEERS.

All Nigerians living at home today face many common challenges, irrespective of age, gender, ethnic origin, and level of education, rich and poor, profession or occupation. As would be expected, these common challenges affect each person or group in different ways and in varying degrees. To the extent that, the opportunities for individual or group aspirations and growth or even survival, can become seriously curtailed temporarily or permanently.

Therefore in discussing the challenges that Nigerian chemical engineers face I will generalise the issues and be more specific on the effects, in order to differentiate them from other Nigerians or groups.

Corruption and poor governance:

In my humble opinion, corruption and bad governance in public life is the greatest challenge faced by every Nigerian living at home at this time. The simple reason for this position is that corruption and poor governance of government institutions are so pervasive, entrenched, and have become so endemic that most attempts, by the Nigerian authorities and private citizens' groups to tackle corruption have so far, failed woefully.

One of the products of corruption in all three tiers of government is bad governance, which in turn is the result the wrong or unqualified people in leadership and other important positions. The effects on Nigerians and Nigerian chemical engineers manifest in such areas as: perennial decline in the quality of education (Nigerian universities are worse off than they were a decade ago due to poor funding and inability to recruit and retain the right personnel); the inability of most of the new chemical engineering graduates to secure employment easily in a potentially developing petroleum based economy. Especially when there is an acute shortage of engineers required for very important and profitable projects.

The projects in the oil and gas industry are very large multimillion dollar projects. They are not only profitable but also serve other critical functions to the society, such as stopping the flaring of billions of cubic feet of gas into the atmosphere (pollution and waste of valuable resource), For example, as many as 12 of such projects worth over US\$ 10 billion have been advertised in the local press repeatedly in the last four years, but have not been awarded. This is due to interminable delays, ultimately attributable to the federal government and its responsible agencies.

The timing of the approval of Federal Government's annual budget and the release of funds always affects the operations of all the major oil and gas companies operating in Nigeria. This is because by law, all such companies operate under a joint-venture partnership agreement with the Federal Government. The Federal Government has the majority share holding with each operating joint-venture and is represented by the Nigerian National Petroleum Corporation (NNPC).

Hundreds of Nigerian engineers who could have been employed on these projects are either unemployed now or are underutilised in the companies which employed them, in the hope of winning some work advertised in the delayed projects.

The Shrinking Industrial base:

Another serious problem chemical engineers are facing is the closure of well established manufacturing plants which employed many of them in the past. Following are three examples:

Thirty years ago the Federal Government after an extensive studies conducted at great cost, for a period of five years, established an indigenous steel industry for the country. This consisted of two very large steel complexes for the production of steel from iron ore at Ajaokuta and Warri: and three steel rolling mills at Katsina, Jos, and Oshogbo. These Steel plant complexes employed more than 9000 people. The total number of chemical engineers recruited, trained and worked in the plants was about three hundred. Due to the bureaucratic nature of the Nigerian Steel Authority which controlled the management of those plants, all of them technically went out of business. Most of the chemical engineers lost their jobs.

As a result of continuous international pressure from the International Monetary Fund (IMF) and the Nigerian public for many years, the Federal Government recently made unsuccessful attempts to sell what remains of the plants to private investors. These attempts failed because of corruption and the insincerity of those bureaucrats charged with the assignment.

Recently the two largest local manufacturers of tyres and rubber products in the country have been forced, by a combination of fiscal, economic and infrastructural problems to close down their businesses and factories in Nigeria. These international companies, Michelin and Dunlop, are still leaders in this industry in France and the United Kingdom respectfully. Until their withdrawal from Nigeria these two companies obtained their feedstock, latex rubber from local rubber plantations and carbon black produced from the petrochemical plant in the Warri Refinery complex. Several engineers including chemical engineers, who had worked in the plants for many years, lost their jobs.

The Federal Government's policy of privatisation (at the insistence of the IMF) of the downstream sector of the petroleum industry has been reversed. The main objective of the policy was for the Federal Government to divest from its monopoly of the refineries in particular, to make them operate more efficiently and competitively under competent private ownership and management. This reversal has prevented the much needed rehabilitation and expansion of the refineries. The potential new job opportunities and hopes for the rejuvenation of existing jobs for chemical engineers have been dashed.

Lack of adequate infrastructural facilities

From the description of the infrastructural facilities above, it is clear that all the statistics show large deficiencies in all basic infrastructures such as national electric power generation and distribution; good road networks, water supply and distribution, urban mass transit, transportation fuels

All these infrastructural deficiencies not only adversely affect the quality of life of the people but also businesses and production of goods and services. Most factories in the country suffer from high cost of producing their own power from diesel generators. Worse still diesel fuel is in short supply and very expensive, because the local refineries produce only a small percentage of the total national requirements. The balance has to be imported.

OPPORTUNITIES FACING CHEMICAL ENGINEERS:

Entrepreneurship:

Entrepreneurial ventures appear to be one of the few areas of endeavour relatively free from the apparent stranglehold of government. Opportunities abound for chemical engineers with entrepreneurial capabilities and tendencies in Nigeria because of the available natural resources, sizeable labour force and a large national market. However, success in any ventures will still depend on a number of other factors, including those infrastructural challenges identified above.

Cooperation with foreign organisations for training and collaboration in projects are essential prerequisites for successful start up projects in Nigeria. The NSChE encourages its members to avail themselves all the opportunities available through close ties with organisations local and foreign, such as A.I.Ch.E, and N.O.B.C.Ch.E etc. to develop its capabilities and commercial interests. This will be especially useful in the area of small-scale industrial projects for which the Nigerian financial sector appears very willing and ready to participate. The availability of funds even in these trying times for obtaining credit facilities appears to be assured.

Employment in local industries.

The opportunities for chemical engineers still abound in large numbers if and when the challenges described above are mitigated by proposed reforms or eventually solved. The NSChE still avails the Nigerian government authorities of its findings and suggestions for solutions to the problems of the economy, and the industries in particular. We continue to do this in spite of the lack of appreciable improvements over the years. We use the use communiqués prepared during our annual conferences and personal contacts with important officials whom we invite to participate in our activities, to pass information and advice to the Federal and State governments.

CONCLUSION

I would like once again to thank the A.I.Ch.E for the unique opportunity I have had to present my country and my fellow Nigerian chemical engineers during such a historic occasion of the celebration of A.I.Ch.E Centennial. I wish to assure you that the cooperation between our two societies will be strengthened further for the benefit of all our members.

On behalf of the N.S.Ch.E, I will also thank the A.I.Ch.E for the opportunity extended to our members since 2007 to join A.I.Ch.E at discounted rates. This we know has opened up immense opportunities for our members to benefit in many ways, educationally and professionally.

Finally, in order to personally strengthen the ties between our two societies; I will rejoin the A.I.Ch.E and encourage my successors to do the same.

Thank you all.