CHEMICAL ENGINEERING PRACTICE

IN

CONTEMPORARY NIGERIAN POLITICAL & GOVERNANCE CLIMATE

LECTURE DELIVERED TO

NIGERIAN SOCIETY OF CHEMICAL ENGINEERS

OYO/OSUN/KWARA CHAPTER

BY

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SUMMARY

In this paper Chemical Engineering practice in Nigeria and contemporary politics and governance in the country are highlighted and reviewed. The performance and effectiveness of the political leadership and governance are further examined, followed by stock-taking on Chemical Engineering practice in the country. An inescapable verdict of poor governance outcomes is arrived at while the fortunes of Chemical Engineering practice are considered to be a mix of successes and failures. It is noted that Nigerian Chemical Engineers have demonstrated competence and strong capability over the years but have been hampered substantially by poor governance, while also highlighting their internal failures. The challenges for Nigerian Chemical Engineers in the years ahead are then situated in the context of compelling global changes and local demands, in a rapidly changing world. A comprehensive package of recommendations subsequently then proffered for enhancing the effectiveness and contributions of Nigerian Chemical Engineers to the economy and society.

1. PREAMBLE

This topic embodies two distinct concepts, thus:

- Chemical Engineering Practice
- Contemporary Nigeria Political & Governance Climate

1.1. Chemical Engineering Practice

i. What is Chemical Engineering?

For clear perspective it may be helpful to refresh the memories of all on what Chemical Engineering is really all about. It may be defined as: that

aspect of Engineering concerned with development, design, construction, operation, maintenance and optimization of processes for conversion of primary materials into semi-finished products required as raw materials for industry or finished products for consumers[1].

It may be pertinent to highlight that these processes may or may not entail chemical conversions. No wonder therefore that Chemical Engineers are often aptly referred to interchangeably as Process Engineers[1].

The traditional building blocks of Chemical Engineering are Chemistry, Physics and Mathematics. Biology is however assuming increasing importance while Economics remains a compelling side tool for reality checks.

ii. Chemical Engineering in Nigeria

a. Historical Prospective

The history of Chemical Engineering in Nigeria may be traced back to the mid- 1950s when the first Nigerian Chemical Engineers graduated from UK and USA universities. Even at that, there was only a handful of Chemical Engineers in the country subsequently and the profession was virtually unknown till the late 1960s when several young oversea trained graduates had returned to the country. Most of these were beneficiaries of the US Government special scholarship assistance program at the time, the African Scholarship Program for American Universities (ASPAU), as well as the Commonwealth Scholarship Program, spearheaded by the government of UK.

b. Education

The then University of Ife started an undergraduate Chemical Technology program in 1968. This metamorphosed into Chemical Engineering by 1972, paving the way for the graduation of the first set of 14 locally trained Chemical Engineers in the country from the university in 1973.[1] The University of Lagos and Ahmadu Bello University followed suite, with their first Chemical Engineering graduates emerging in 1976 and 1977 respectively. Now Nigeria boasts of over 35 university and 12 polytechnic Chemical Engineering programs.

c. Practice

It is estimated that there are 12-15,000 Chemical Engineers in Nigeria. They are involved in diverse sectors of society and economy. A recent survey indicates however that over 40% are engaged with the Oil & Gas Industry, while the Education Sector and Chemical/Process Industry account for 17% and 12% respectively **(Att. 1).**[2,3]

Nigerian Chemical Engineers also serve in a full range of work functions. About 24% are estimated to be engaged in Production Operations, while about 16% and 15% are in the Academia and in Technical Services, respectively **(Att. 2).**[2,3]

This current engagement profile of Nigerian Chemical Engineers is a clear departure from the past. About 4 decades ago the vast majority of the few Chemical Engineers available were engaged in Production Management in the Chemical/Process Industry.

1.2. Contemporary Political & Governance Climate

i. Framework

The contemporary era may be roughly equated to the Nigerian 4th Republic, which commenced in May 1999, following the return to civilian democratic rule, after over 15 years of continuous military rule. The political and governance framework which dictates the climate is provided by the 1999 constitution of the Federal Republic of Nigeria, with its subsequent amendments.

ii. Features of 1999 Constitution

Key features and provisions of the 1999 constitutions and its amendments include the following:

- A Federal Republic with 36 Federating States and a Federal Capital Territory (FCT).
- Presidential system of governance, modelled after the USA system.
- Separation of power between the Executive, Legislative and Judicial arms of government.
- 774 local governments across the country, as a third tier of government.
- Bicameral legislative chamber at Federal level and unicameral chambers at the State level.
- A Federal judicial structure comprising the Supreme Court at the apex, followed by the Court of Appeal and then the Federal High Court.
- A typical State judicial structure on the other hand consisting of the State High Court at the top and then the State Magistrate Court. There is also the State Customary Court of Appeal or the State Sharia Court of Appeal, as may be applicable.

2. JOURNEY SO FAR IN THE 4TH REPUBLIC

2.1. The Positives

i. Transitions

There have been several successful transitions from one regime to the other during the period, in 2007, 2010, 2015 and 2023. The 2015 transition however stands out, in the sense that it marked the defeat of a sitting President in an election and succession by a new President, which was unprecedented up till them.

ii. Salutary Reforms

There have also been several welcome reforms which have had positive impact on the economy and society. These include:

- The Pensions Reform, leading to the Pensions Act 2004.
- Establishment of the Economic and Financial Crimes Commission (EFCC) and the Independent Corrupt Practices Commission (ICPC), as platforms for the fight against corruption.
- Establishment of the Niger Delta Development Commission (NDDC) and creation of a Ministry of Niger Delta, as springboards for addressing the Niger Delta question.
- The Petroleum Industry Act (PIA) 2021, which introduced extensive reforms of the Oil & Gas Industry.
- Successful adoption of the Incorporated Join Venture business model for Public/Private Partnership (PPP) in NLNG Ltd.
- Successful privatization of EPCL, a petrochemicals company, and NAFCON, a nitrogenous fertilizer company, deploying variants of the acclaimed NLNG model.

2.2. The Negatives

On the balance however the country is considered to have grossly underperformed in its governance and political leadership. This may be further elucidated through a few of the lowlights, as follows.

- Existence of Political parties which have no ideological underpinnings, are bereft of internal democracy and are riddled with rampant crisscrossing or decamping of members.
- Fraudulent elections at all levels, Federal/State/Local Government/Party, marked by rigging, vote buying, intimidation, thuggery, violence, ballot snatching, and a host of other vices.
- Wanton corruption permeating all facets of society.
- Increasingly doubtful integrity of even the judiciary.
- Evident trust deficit between the rulership in the country and the followership.
- A federal structure which is more of a unitary arrangement in reality, with a very powerful and dominant federal government at the center surrounded by a constellation of 36 feeble states.
- Grave security situation pervading most parts of the country, disrupting economic and social life.
- A fractured nation, increasingly parted along its fault lines of ethnicity, religion and region.
- Poor economic performance and consequent stunted national development.
- Plethora of failed government policies.

It may be pertinent to further explore a few of these areas of failure.

2.3. Poor Economic Performance

Performance of Nigeria's economy since 1999 is summarized in **Att. 3**, with indications of world rankings and world averages[4,5,6,7,8]. The criteria highlighted are:

- Inflation Rate
- Unemployment Rate
- Poverty Rate
- GDP Per Capita
- GDP Growth Rate
- Debt Status
- HDI (Human Development Index)
- Corruption Index
- Ease of Doing Business

On virtually all the scores there have been marked deterioration in performance and global rankings are close to the bottom. The exceptions are GDP Growth and HDI which though have improved, albeit slightly, Nigeria remains close to the bottom globally and far below world averages. Ease of Doing Business however represents a significant improvement over the years.

2.4. Policy Failures

Painful examples of government policy failures may be found in:

- Broken NNPC Refineries, leading to complete reliance on imports for petroleum products.
- Continued regulation of petrol retail price and payment of wasteful consumption subsidy, up till recently.
- Oil theft from pipelines and related illegal oil refining in the Niger Delta.

- Protracted delay in the passage of the PIA for up to 15years.
- Power Sector Reforms which though were well intentioned but have failed to deliver steady power supplies.
- Curious discontinuation and abandonment of Ajaokuta Steel Company Project, at about 98% completion and after an investment of $8bn.
- Abandonment of the Iwopin Paper Project half way through construction.
- Failed privatization of key public industries: DSC/ALSCON/Oku-Iboku Newsprint/Federal Superphosphate Fertilizer Company (FSFC), Kaduna/etc.
- Relegation of Technology, Manufacturing and R & D in national agenda.

The failures are further illustrated in **Atts. 4 and 5**, showing comparative Power Generation Capacities and Manufacturing Outputs for Nigeria and other African and Third/Medium Power countries of the world[9,10]. Nigeria is virtually at the bottom in respect of all the indices considered: Power Generation Per Capita, Manufacturing Output Per Capita and Manufacturing Share of GDP.

3. TAKING STOCK ON CHEMENG PRACTICE IN NIGERIA

3.1. The Upsides

There have indeed been notable successes and upsides in Chemical Engineering practice in Nigeria over the years.

i. Oil & Gas Infrastructural Projects

Nigerian Chemical Engineers have successfully spearheaded and managed numerous vital industrial and infrastructural projects in the country, especially in the Oil & Gas Sector. Such projects include:

- The NNPC Products Pipelines & Depots Network
- Warri/Kaduna/New Port Harcourt Refineries
- WRPC/KRPC Petrochemical Plants
- EPCL/NAFCON/NLNG/FSFC Process Plants
- Several Petroleum Flowstation/Gas Plant/Pipeline/Terminal Projects.

ii. Top Industry Management Positions

Many Nigerian Chemical Engineers have attained top management positions in industry, especially the Oil & Gas Sector. These positions include:

- NNPC: Group Managing Directors (GMDs), Group Executive Directors (GEDs), Group General Managers (GGMs), Managing Directors (MDs) of Strategic Business Units (SBUs), General Managers (GMs), Executive Directors (Eds), of SBUs, etc.
- International Oil Companies (IOCs): EDs, GMs.
- Process Industry: MDs, EDs, GMs, etc.
- Board Chairmanship of a blue-chip company listed in the Nigerian Stock Exchange: VITAFOAM Nig Plc.

iii. Top Government Positions

Two Nigerian Chemical Engineers have been Governors in their respective States. One has been a Minister and a prominent member of the Federal Executive Council. A number have been elected to the National Assembly of Nigeria and to the State Assemblies. Several others have served as Commissioners at the State level and as Permanent Secretaries and Directors General of government agencies, at both the Federal and State levels.

iv. Business Entrepreneurship

A few Chemical Engineers have also successfully ventured out as entrepreneurs in diverse areas related to Chemical Engineering, notably: Manufacturing, Oil & Gas, Engineering/Design/Project Management, Chemicals Trading.

3.2. The Downsides

There are however several downsides and failures also associated with Chemical Engineering practice in the country.

i. NNPC Refineries Fiasco

The collapse of the NNPC Refineries in Port Harcourt, Warri and Kaduna cannot truly be the fault of Nigerian Chemical Engineers. However, the failure rubs off badly on Chemical Engineering and the Chemical Engineers, considering that petroleum refining is technologically driven by Chemical Engineering and the Chemical Engineers are the dominant professionals in the refining arena.

ii. Failure to Shapen Public Policy

Despite having occupied top government positions, including Ministers, Governors, Senator, Commissioners, Permanent Secretaries, Directors General, Chemical Engineers have not left a strong footprint of influence over public policy over the years.

iii. Drift Away from Process Industry

As illustrated earlier, Chemical Engineers and Chemical Engineering drifted away from the Chemical/Process Industry to the Oil & Gas Industry in the last 3-4 decades. With this, leadership and opportunity to influence the direction of the Chemical/Process Industry were ceded to other groups unwittingly.

iv. Absence of Chemical Intermediates Industry

Related to the drift away from the Chemical Process Industry, Nigerian Chemical Engineers have failed to engineer and trigger a Chemical Intermediates Industry in the country. The Chemical/Process Industry is therefore still limited mostly to compounding, blending and manufacturing of such chemical products as: paints, adhesives, inks, soaps, detergents, cleaning products, personal care products, cosmetics, pharmaceuticals, food products, foam products, etc. Meanwhile virtually all the input chemical feedstocks and chemical building blocks required for these remain imported.

v. Entrepreneurship Shortfall

Though Nigerian Chemical Engineers can count a number of successful entrepreneurs from our ranks, this is considered grossly insufficient and inadequate. Chemical Engineers are on the balance trained to be job

creators and not job seekers. We should in fact own and dominate the space for basic Chemical Products such as paints, soaps, foam products, cleaning products, personal care products, etc. It is imperative that we wake up from slumber and proceed to systematically recover the space from non-Chemical Engineers.

vi. Unemployment

This is essentially a general problem in the economy. Nevertheless, it is also a reality for us in Chemical Engineering and it is biting hard. We must therefore find a means of helping ourselves and the numerous unemployed Chemical Engineers, through deliberate initiatives, irrespective of what happens elsewhere in the economy and society.

3.3. Stock Taking Balance

On the balance, it is evident that the fortunes of Chemical Engineering practice in Nigeria have been a mixed bag of ups and downs. Undeniably, Nigerian Chemical Engineers are smart and capable but they have been impeded and stunted by a number of debilitating factors, such as:

- Poor public policies and governance
- Inadequate influence over public policy
- Deficiency in entrepreneurial drive
- Mismatch of output and demand for Chemical Engineers in the economy, thereby exacerbating the unemployment situation.

Clearly, Chemical Engineering practice has been grossly impaired by politics and governance but there also remain a lot that we Chemical Engineers can do to help ourselves, calling for considerable introspection on our part.

4. CHEMICAL ENGINEERING & THE FUTURE

These are indeed rapidly changing times globally, occasioned by such momentous developments as[11]:

- The Energy Transition
- Climate Change & Environmental Concerns
- Emergent Technologies: IT/AI/Robotics/3D Printing/Data Analytics/ etc.
- Population Explosion

The Chemical Engineering profession is tasked globally to respond to these changes. Indeed, Chemical Engineering has an active role to play in addressing each of these changes and containing their impacts. The implication, for instance, is that Chemical Engineers will be less involved in Petroleum Refining which has been one of our major pre-occupations and fancies for several decades. Instead, we shall be more pre-occupied with development and deployment of varied new renewable and clean energy technology options. Tacit in this is that globally Chemical Engineering is recalibrating between the large-scale continuous processes, typified by the petroleum refineries, and small batch processes for specialty chemicals, many of which find use in renewable energy processes.

Nigeria and Nigerian Chemical Engineers are not exempt from these global changes and challenges. Indeed, in addition to the factors highlighted above, other home-grown pressures are expected to be at play for Nigerian Chemical Engineers, arising from the following factors[12]:

- Imperatives of Resource Improvement & Utilization
- Petrochemicals Development

- Establishment of a Chemical Intermediates Industry
- AfCFTA Challenge
- Reinvigoration of R & D

Nigerian Chemical Engineers, as individuals and as a group under the aegis of NSChE which is the professional association, must be at the forefront and spearhead the response to these changes and challenges. Failure in this regard may indeed call to question the continued relevance of the profession in the economy and to society. It must therefore be addressed with the seriousness it calls for, within the structures of the prevailing political and governance regimen. In effect, we must be able to contain the deleterious effects of bad governance and politics and adjust to the changing demands of society and the economy.

5. GOING FORWARD

Consequent on the above discourse, a few recommendations are proffered as a way forward towards enhancing Chemical Engineering practice in Nigeria, as well as its contribution to the economy and society, despite the pains of bad governance and political leadership.

i. As many Nigerian Chemical Engineers as possible who are sufficiently motivated and have the makings are encouraged to go into politics or take up political positions, at various levels, in the executive and legislative branches of government. In politics and positions of authority they must however be committed to the ethics and values of our profession and to contributing to shaping public policy in the right direction.

ii. Nigerian Chemical Engineers must be more savvy and knowledgeable about public policies impacting on the practice of the profession and contribute at their various levels to upholding positive policies and values.

iii. NSChE as the professional umbrella of Nigerian Chemical Engineers is enjoined to devise structures and mechanisms for interfacing regularly with Chemical Engineers in politics and high office and ensuring accountability from them.

iv. Governments at all levels in Nigeria are also called upon to commit to consultation with relevant professional associations, including NSChE and the Chemical Engineers, in matters of public policy, as is practiced in most successful countries.

v. Significant reforms in the training and education of Chemical Engineers in Nigerian Universities are called for, especially in the following areas:

- Curriculum: ensuring a balance between the traditional Chemical Engineering subjects, new technologies (AI/Robotics/3D Printing/Data Analytics/Process Intensification/etc), necessary soft skills (Ethics/Leadership/Technical Writing/Presentation/ etc) and entrepreneurship.
- Quality Control: optimum class sizes aligned with facilities, infrastructure, faculty and the needs of the economy.

vi. Deliberate efforts are required at all levels to reorientate and tilt Chemical Engineers back to the Chemical/Process Industry, especially in the face of the reality of the ongoing global energy transition.

vii. Nigerian Chemical Engineers are encouraged to increasingly venture out as entrepreneurs for professional fulfilment, realization of the potentials of

the profession and playing the expected dominant role in the relevant sectors of the economy.

viii. NSChE in particular should pay special attention to the response of Nigerian Chemical Engineers to the changing demands of a changing society and economy, championing measures in Chemical Engineering training and practice required to re-position the profession appropriately.

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