



Nigerian Chemical & Engineering Industry

MAGAZINE

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**Professional Ethics
in Training &
Practice**

Prof. Joseph
Ajenka



**Quackery in
Engineering**

Engr. Ikemesit
Orok



**Effects of
Hydrocarbon
Flares**

Prof. Awajjogak
Ujile

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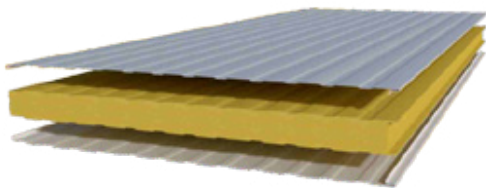
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NSChE VISION



“To be the Center of excellence for the Chemical Engineering Profession in Africa and the Prime Mover of Industrialization in Nigeria”.



NSChE MISSION



“To organize the Nigerian Society of Chemical Engineers into a virile professional body capable of promoting the relevance and versatility of the profession, achieving better training and updating of Chemical Engineers through its activities. Fostering of relationships with the academia, research institutes, industries, other professional bodies and government will be the basis for stimulating accelerated industrialization of the country and improving the quality of life of the Nigerian people”.

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FROM THE

Editorial SUITE

Time is like a moving current. Time has brought us to this latest edition of our widely read engineering magazine. As always, this edition presents opportunity for our readers to derive value from the information shared by the presenters of various articles and other features.

The first presentation by Engr. Anthony Ogheneovo (Executive Secretary, NSChE) is on NSChE Mentorship Program. The program was launched on November 4,

2023 at Warri during NSChE's 53rd Annual Conference. He makes the point clearly that the program is well structured and serves as a bridge between experienced and new talents to foster growth and knowledge exchange as well as achieve a sense of communal relationships within the engineering field. More details are available in www.nsche.org.

The 2023 Fellows Conference of NSChE was held on the theme "Professional Ethics". Essentially, all professional bodies need to inculcate professional ethics in their practice to achieve sustainable integrity. For NSChE Fellows, the event was one of its remarkable assemblies in recent times. During that event, memorable pictures were taken and are placed in this edition for posterity. Our Fellows are encouraged to attend the 2024 conference and continue to cherish the knowledge shared as well as the good memories of the professional meeting.

Still on Fellows Conference, the 2023 edition had an erudite scholar as the Guest Speaker in the person of Prof. Joseph Ajenka, FAEng (Former Vice Chancellor of University of Port Harcourt). His presentation was on "Professional Ethics in Training & Practice". We can describe his paper as a masterpiece on the subject matter. This edition could not contain the entire paper. Readers can go for more material in www.nsche.org beyond the abridged version published in this edition. Prof. Ajenka made the point, among other points, that entrenching and upholding professional ethics in training and practice in the quality of services rendered to society as professionals will contribute to the attainment of sustainable development goals, improve the quality of life and Nigeria will be better for it. He stressed that the quality of a life of enlightenment we desire in our graduates can be realized



Engr. Donatus Uweh, MNSChE
(Editor-in-Chief)



if teachers and professional mentors live by example.

Quackery in engineering is a big concern to registered engineering professionals. This subject is brought to the fore again by Engr. Ikemesit Orok (Chairman, Akwa Ibom/Cross River State Chapter of NSChE). The question is: "How can engineers protect their profession from infiltration of quacks? Engr. Orok has tried to provide answers. It is also widely known that the Council for Regulation of Engineering in Nigeria (COREN) has the statutory responsibility to ensure that qualified engineers derive the benefit of practising their profession without being short-changed by quacks.

This edition features Litilo Energy Limited. The company, headed by a distinguished Fellow of NSChE, Engr. Debo Oladunjoye, is gradually moving towards achieving a renowned status in consulting services in Energy, Oil and Gas, Manufacturing sectors, among others. We congratulate the company management for its value added services to various critical sectors in the economy.

'Effects of Hydrocarbon Flares on Structures' by Prof. Awajjogak Ujile, FNSE, FNSChE is an eye-opener to environmentalists and other stakeholders, particularly the regulators in Nigeria's petroleum industry. The solution to the environmental menace is what has to be addressed. There is need to take the author's recommendations seriously to bring relief to oil producing communities.

Engr. Olanrewajo Adebayo Bamidele makes a presentation on "Statistical Process Control for Process Engineers". Coming up with a novel approach in process control is a welcome development. Process engineers can seek ways of putting this into practice.

Engr. Mrs. Oluremi Ayeni, FNSChE, shares knowledge on "Work-Life Balance". It would be useful to put her ideas into practice to enhance healthy living.

Finally, we extend our gratitude to all contributors to the successful publication of this edition.

Enjoy your reading.

Engr. Donatus Uweh, MNSChE
(Editor-in-Chief)

NSChE MENTORSHIP PROGRAMME KICKS OFF

The Nigerian Society of Chemical Engineers (NSChE) Mentoring programme was launched at the 53rd Annual Conference of the Nigerian Society of Chemical Engineers on the 4th of November, 2023. Members are expected to key into this laudable programme by visiting our website: www.nsche.org and registering as either a Mentor or a Mentee. Mentorship within NSChE is an invaluable resource for both new and experienced Chemical Engineers. Here is how the mentorship programme would work:

Structured Mentorship Program:

NSChE offers a well structured mentorship programme where experienced Engineers volunteer to mentor younger or less experienced members.

This programme includes:

Matching Process: Mentees are paired with Mentors by the programme Administrators based on their interests, specialties, or career goals. The Administrators may also use applications or interviews to match mentors and mentees effectively.

Goal Setting: The mentorship programs involve setting specific, achievable goals for the mentorship period. These goals can range from career advancement to skill development or project completion.

Regular Meetings: Mentors and mentees typically meet regularly, either in person, virtually, or via phone/email, to discuss progress, challenges, and strategies. These meetings provide opportunities for guidance, advice, and feedback.

“Mentorship within NSChE is an invaluable resource for both new and experienced Chemical Engineers.”



Engr. Anthony Ogheneovo, FNSChE
(Executive Secretary, NSChE)

Benefits of the Mentorship Programme:

Knowledge Transfer: Mentors share their expertise, insights, and practical knowledge, accelerating the learning curve for mentees.

Career Guidance: Mentors can provide guidance on career paths, professional development opportunities, and navigating the complexities of the engineering field.

Networking: Mentorship often opens doors to new connections and networks within the industry, which can be invaluable for career growth and opportunities.

Skill Development: Mentors help mentees develop technical skills, soft skills, and leadership qualities necessary for success in Engineering.

How to Maximize Mentorship Opportunities:

Clear Communication: Establish clear expectations/objectives and goals at the beginning of the mentorship relationship.

Active Participation: Both mentors and mentees need to actively engage and invest time in the relationship.

Openness to Feedback: A willingness to listen to feedback and act on advice is crucial for mentees.

Respect and Professionalism: Both parties should maintain professionalism and mutual respect throughout the mentorship.

Overall, mentorship within NSChE serves as a bridge between experience and new talent, fostering growth, knowledge exchange, and a sense of community within the engineering field.

Terms and Conditions are clearly stated in the Mentorship Portal.

PHOTOS OF NSChE'S FELLOWS CONFAB



President NSChE, Engr. Anthony Ogbuigwe, Chairman of the 31st Fellows Confab, Past President, Prof. Emenike Wami, Guest speaker, Prof. Joseph Atubokiki Ajienska, Deputy National President and Guest Speaker, Engr. Bayo Olarewaju-Alo



National President, Engr. Anthony Ogbuigwe, FAEng, FNSChE, giving his address on the state of the Nigerian Society of Chemical Engineers



Deputy National President, Engr. Bayo Olarewaju-Alo, FAEng, FNSChE, giving his lecture as a guest speaker.



A group picture of some attendees at the 31st Fellows Conference held at NOVOTEL, Port Harcourt.



Past President Prof. Ayodele Francis Ogunye, FAEng, addressing Fellows at the Fellows Confab.



Past Presidents of NSChE with the guest speakers and the Executive Secretary.



A Cross section of some attendees at the NSChE 31st Fellows Conference held at NOVOTEL, Port Harcourt, Rivers State.

Factory visit to Matrix Lubricating Plant in Port Harcourt after the Fellows Conference.



A Cross section of some attendees at the 31st Fellows Conference held at NOVOTEL, Port Harcourt.

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Engr. Debo Oladunjoye, FNSE, FNSChE, MCI Arb, MAPM (CEO, Litilo Energy Limited)

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- Benchmarking and Assurance – gap to potential identification, design reviews, facility reviews, project delivery reviews, project valuation, peer reviews, value assurance at key project stages, cost estimates, competitiveness review, pre-start up and start-up audits
- Business, Asset Management, Plant, Inventory and Finance Improvement and Plant systems improvement
- Capacity & competency gap identification and focused employee development support on the job impacting tacit and implicit knowledge

PROFESSIONAL ETHICS IN TRAINING & PRACTICE

KEYNOTE ADDRESS AT THE 2023 CONFERENCE OF THE BOARD OF FELLOWS OF THE
NIGERIAN SOCIETY OF CHEMICAL ENGINEERS (NSCHE),
THURSDAY OCTOBER 5, 2023 AT NOVOTEL, PORT-HARCOURT
BY PROF. JOSEPH ATUBOKIKI AJIENKA

1.0 INTRODUCTION

Let me start by thanking the National President of the Nigerian Society of Chemical Engineers, Engr. Anthony Ogbuigwe, the Executives and the Organising Committee for inviting me to deliver this Keynote Address the theme of this year's Conference, 'Professional Ethics in Training and Practice'.

The expectation is that if we entrench and uphold 'Professional Ethics in Training and Practice', the quality of service

we render to society as professionals will guarantee sustainability and contribute to the attainment of the sustainable development goals (SDGs), improve the quality of life and the country will be better for it.

This Keynote Address is to stimulate discussion and at the end of this conference produce a beautiful outcome, beyond a communique, worthy of contributing to professional practice. Shall we say the outcome will be the Port-Harcourt Declaration of the Nigerian Society of Chemical Engineers that re-emphasises the 'Values of Professional Ethics in Training and Practice'.

Let us now examine the topic in three parts:

- i. The Practice of the Engineering Profession
- ii. Professional Ethics in Training
- iii. Professional Ethics in Practice.

2.0 THE PRACTICE OF THE ENGINEERING PROFESSION

Engineering is the application of science and mathematics in solving the problems of society. Rabi (2023) defined Engineering as the practice and method of applying scientific and empirical knowledge to improve the quality of life of society. It is the discipline and profession of applying scientific knowledge and utilizing natural laws and physical resources in order to design materials, structures, machines, devices, systems and processes that realize a desired objective and meet specified criteria.

Some important points to note are that Engineering is a profession and the practitioners are professionals who must ensure professionalism in their practice. Engineering utilises the natural laws of nature in practice. Engineering professionals are trained to utilise the best available resources, best available technologies and



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FISPON, FNES, PE (COREN, Nigeria), SPE, REP
(USA), Hon. Degree, IFP School Paris

best operating policies and practices efficiently and effectively in the service of humanity. We are trained to apply innovative skills in designing systems and solutions for sustainable development of society. Sustainability stands on four pillars: economic sustainability, social sustainability, environmental sustainability and cultural sustainability which includes effective and efficient governance. In recent times, sustainability of corporate organisations, institutions and states are being evaluated on the basis of Environmental and Social Sustainability and Governance (ESG).

Engr. Rabi, a veteran of COREN, noted that Ethics is a branch of philosophy that deals with questions about morality, right and wrong behaviour and how we ought to live. Ethics is concerned with answering questions about what actions are morally permissible or not permissible or obligatory in various situations. It is also concerned with identifying the values and principles that underpin moral decision-making as well as the ways in which these values and principles are applied in different contexts.

Engineering ethics, therefore, refers to the set of moral principles and values that guide the conduct of individuals in any professional setting. It is a set of standards that define the obligations and responsibilities of practitioners towards their clients, colleagues, society and themselves. Engineering ethics is based on the broad principles of trustworthiness, truthfulness, respect for human life and welfare, competence and accountability. These noble principles of ethics and cannons of the profession clearly underpin the need for 'Values Education'.

In his paper, Rabi also clearly stated that the Engineering Profession is regulated in Nigeria by the Council for the Regulation of Engineering in Nigeria (COREN), which was established as a statutory organ of the Federal Government of Nigeria by Decree No. 55 of 1970, as amended by Decree 27 of 1992 and it is now Engineers (Registration etc.) Act, CAP E. 11, 2004 as amended in 2018. One of the stipulated mandates of COREN is: to licence engineering practitioners and firms and make provisions for the control of engineering practice, determine the academic standards and ensure strict adherence to the curriculum of studies by institutions training engineering practitioners. Thus, COREN is by

Law mandated to ensure accreditation of Engineering Curriculum in higher education institutions to produce graduates with the right knowledge, skills, attitudes and values to the certified standards of proficiency and practice. On the whole, the main objective of COREN is to eliminate quacks and quackery in the practice of the engineering profession.

The Vision of COREN is - “To have the highest standards of professionalism in engineering practice in Nigeria”. Engineering Ethics have been compiled by COREN and known as “The Practitioners’ Code of Conduct Document”. It is meant to guide COREN Registered practitioners in practice and ethical decision making. This is also to ensure that engineering practice in Nigeria is in line with World best practices with particular reference to World Federation of Engineering Organizations (WFEO) Code of Ethics, so that all professional activities as well as the practitioner’s disposition towards colleagues, client, the public, service to humanity, etc, are done with utmost care and diligence.

The COREN Practitioners’ Code of Conduct Document is given to all registered practitioners to ensure that engineering practice is conducted to gain public trust in the areas of safety, health and welfare. The Council enforces the provisions of its Code of Conduct to preserve the dignity and highest standards.

Matawal (2023) in his paper defined Engineering Standards and distinguishes them from Codes which are basically standards that have become laws through years of practice and consistent experience, emphasizing that both are important in the technical field. He also highlighted the importance of ethical behaviour in the choices and decisions made to ensure that the acceptability is attained in a manner which is right or ethical.

3.0 PROFESSIONAL ETHICS IN TRAINING

There are two components in training namely training in the higher institution of learning and training on the job in the industry. The Professional Ethics in training is the foundation for professional practice. The trainers in both cases are professionals of the engineering profession. We have also realised that apart from the National Universities Commission (NUC), COREN is involved in the accreditation of engineering curriculum.

The Nigerian University curriculum had evolved from the minimum academic standards (MAS) to basic Minimum Academic Standard (BMAS) to Core Curriculum Minimum Academic Standards (CCMAS). These Statutory Documents of the NUC were co-created or co-developed with the universities in fulfilment of the NUC regulatory function. The Curriculum must be globally recognised and locally relevant. The CCMAS is quite innovative. Working with experts from the universities and professional bodies, the NUC developed 70% of the

curriculum to reflect global competitiveness. For the first time, the universities were given the opportunity to develop 30% of the Curriculum to reflect their uniqueness and competitive advantage. The basis of the review was that the curriculum of Nigerian universities should be rated among the best three in Africa in terms of its relevance to producing nationally and regionally-relevant graduates who are high-level human resources for delivering on Africa’s Vision 2063 and contribution to the attainment of the global SDGs. The curriculum re-engineering was necessary to align academic content with the needs of industry, society and national aspirations for local relevance and global competitiveness.

Faborode (2023), in a Sensitization Colloquium on the CCMAS at the NUC on 23rd August 2023, discussed the process of review of the curriculum from BMAS to CCMAS. He noted that quality education is the primary tool for national development. The curriculum and its effective implementation are at the base of attaining quality education. The ability of the Nigerian University System to meet national development needs is dependent on the availability of a dynamic 21st century-centered curriculum.

Significant generic and unique features of the CCMAS are as follows:

- i. General Studies (GST) and ENT courses are six and contribute only 12 Credit Units, enough to give students wide-world views as well as practical capabilities in entrepreneurship, but without Overcrowding the Core Compulsory Courses
- ii. Concomitantly, 21st century employability skills were keenly emphasised to help shape students’ ability in terms of technical, analytical and critical thinking, presentation and other relevant skills, as well as, personal habits and traits that will enhance their employability in the 21st century world of work.
- iii. ICT driven: Designed to promote student’s creativity, increase their problem-solving abilities and introduce them to the digital/ICT world of internet of things to broaden their horizons and help them to make better choices in their career pursuit.
- iv. Elaborate and contemporary equipment, materials needs and staffing list for each program.
- v. Learning outcomes are stated for each course in every program.
- vi. The core curriculum provides for only 70% of the minimum credit units required for graduation in each programme across board, leaving universities to provide the 30% balance.

Universities would thus create their own niches and areas of emphasis in the CCMAS.

- vii. The method of curriculum delivery is a blend of the conventional face-to-face contact and virtual to take advantage of technology and global post-COVID 19 realities.
- viii. Entrepreneurship courses (ENT) are intrinsically embedded in each program. Moved from the usual vocational trainings to proper entrepreneurial courses embracing concepts of Venture Creation and Entrepreneurship and Innovation, thus nurturing students' business creativity and management as well as ability to use their degrees to create ventures and jobs.

In adopting the new CCMAS, universities also took note of COREN guidelines on the Engineering Curriculum. Having drawn attention to the ongoing curriculum re-engineering, let us now examine professional ethics in training.

4.0 PROFESSIONAL ETHICS IN TRAINING IN HIGHER EDUCATION INSTITUTIONS

As you are aware, we graduate our students in the hope that they have been trained properly and declared to be 'found worthy in character and in learning!'

The purpose of education is to acquire knowledge, skills, attitude and values to be useful to society as responsible citizens and professionals. The assumptions are that the curricular are standard and all the tools for training and the conducive environment for effective and efficient teaching and learning are provided. In other words, to ensure quality assurance of the products, in this case graduates, we must use the best available resources (curriculum, human, material and financial resources), best available technologies (tools, techniques, technologies and industry standard software applications) and best operating policies and practices. The curriculum must be globally recognised and locally relevant with inputs from industry experts and other relevant stakeholders. This is the guarantee for a rich harvest of quality graduates from the universities who are further trained and refined on the job to make quality and worthy professionals.

A proper and deeper understanding of the word training is an important key to what we are considering. Like the locomotive train that runs on a track from one terminus to a destination, driven by a well-trained driver and experienced expert, the trainer/the teacher pulls the trainees like railway coaches along a path of experiencing to acquire what it takes - competencies, capabilities and capacities - to become true professionals. The expectation of quality management is that for us to deliver graduates found worthy in character and in learning, the teachers must first be found worthy in character and learning;

worthy in teaching and practice. The university environment must be worthy of a university (a universe of diversity of peoples in pursuit of truth, of diversity of contending ideas that thrive on a culture of excellence) and the rules and regulations are well respected in the process of admission, teaching and graduation. Consequently, quality assurance is not just about the output but starts from the input. It also considers the whole process of training. Otherwise, as we say in computer parlance, it would be 'garbage in, garbage out'.

The purpose of education goes beyond just intellectual training in the acquisition of knowledge, skills and attitude but the right emphasis is on 'Values Education'. Beyond the intellectual training is the more important fundamental training of what makes us genuine human beings, the values we respect and hold dear and the value addition we make and the benefits we bring to others and our environment. Real education and enlightenment go beyond earthly professional training in school and at work to spiritual development and maturity to what makes us real human beings, responsible for all our activities in society. This demands an understanding of the purpose of life and existence on earth and the beyond, in creation in general. A deeper understanding of this purpose guides us onto the path of responsible and ethical behaviour; and motivates us to ask ourselves fundamental questions:

Who am I?

What is the purpose of life on earth?

Where do I go after this earth life?

And anyone who knows and has experienced the widely recognised Law of Nature that whatever a man sows that shall he also reap. We shall discuss this later.

Meanwhile, with online learning and the emerging pervasive use of AI tools such as ChatGPT as well as the future of work which now includes remote working, there is more multitasking but also erosion of values in learning and practice. A recent study published by Times Higher Education (THE, August 17, 2023) showed that majority of students who wrote online exams cheated. The survey which involved more than 4,600 participants suggested that the rate of academic misconduct rocketed during the COVID-19 pandemic. A total of 54.7 per cent of respondents admitted cheating in online exams during the pandemic, compared with 29.9 per cent before the pandemic. The lead author of the paper published in the Journal of Academic Ethics, Phil Newton was reported to have observed that, if anything, the true rate of cheating was likely to have been higher. Professor Newton and his co-author, Keioni Essex found that many students cheated simply because an easy opportunity presented itself. It was reported further that when asked why, the most likely answer was, 'we cheated because we could', said Professor Newton. He thought that the switch to online testing may have strengthened some students' notion that their university "doesn't care" if they look up answers. Other learners may have justified doing it because everyone else did, and they didn't want their peers to have an unfair

advantage, he said. Professor Newton – author of an influential 2018 study - concluded that as many as one in seven students worldwide were guilty of cheating. The issue had not gone away post-pandemic, especially with the introduction of artificial intelligence writing tools such as ChatGPT. (https://www.timeshighereducation.com/news/majority-students-cheat-online-exams-study?utm_source)

While preparing for this Keynote Address, I had an interesting experience in a post graduate diploma class of less than 20 students that I taught. I gave a one-hour impromptu test and when I collected the scripts, I was shocked to note that the number of scripts was one more than the number in the class. And so, I checked the attendance and found that one copied for another who was absent in the class that day. The following day, I could observe the uneasiness in the eyes of the one who cheated. I discussed the matter openly in the class and the penalty for academic fraud. The class was sober, apologetic and pleaded for leniency. I decided to fail the one who cheated in the test (and of course the one absent was truly absent) as a mild punishment to teach them a lesson that honesty is peaceful and integrity is important.

Dear Fellows, dishonesty is in the air. We need 'Values Education' which leads to enlightenment. Such enlightenment will be a firm anchor on the path of rectitude and honour. The word enlightenment gives us another important key. Encapsulated in the word is light. We are to light up the spirit which gives life to the physical body, enlighten the intellect to follow the dictates and promptings of the intuitive perception, the faculty of the spirit.

Thus, where do we have the quality of 'Values Education' that makes us mature and responsible citizens. We shall reflect on the training of the graduates of the humanities vis-a-vis the training of science graduates to look for answers.

5.0 THE VALUE OF ENLIGHTENMENT

In the university, there are rules and regulations. The Matriculation Oath specifies what conduct is expected of a student and the recommended sanctions in the case of infraction. In a professional discipline like Engineering, there is a compulsory final year course in my University (ENG 501.1) called Professional Practice and Procedure that is taught to introduce students to the important elements of professional Standards and Codes, Professional Ethics and Codes of Conduct. There are also Quality Control and Quality Assurance (QA/QC) Procedures and Processes. From the admission requirement guidelines to graduation requirements, there are checks and balances to ensure compliance so that when a Vice-Chancellor stands on the Podium on Convocation Day to declare the students to be found worthy in character and learning, he or she does so conscious of the huge responsibility

involved in making this very important proclamation on behalf of the citadel of learning. He does so in the belief that the graduands had not been found wanting and guilty of any infractions. Please take special note that being found worthy in character takes precedence over being worthy in learning. That is how important character is which should rub off on practice.

6.0 THE SOUL OF A SCHOOL OR SOCIETY

The soul of a society can be said to be encapsulated in the Values embedded in their Constitution, Anthem, National Prayer and Pledge. For an Institution or organisation, it is embedded in the Statutes, Anthem, Mission and Vision Statements, Philosophy and Core Values. These contain values we all must be committed to and hold sacred. If we are lax in ethical conduct, it is not because there is lack of what could inspire us. The second stanza of our National Anthem, which is even taken as a National Prayer is rich and deep in content. So also, is the National Pledge. Properly understood and followed, these should inspire us to good conduct.

Apart from the Constitution, there are Laws to guide conduct, we also have a public service charter called Service Compact, with all Nigerians (SERVICOM), to influence ethical conduct. SERVICOM must be systemically entrenched in the University.

Today, there is erosion of values and corrosion of conduct due to so much unethical behaviour and impunity in high places to the extent that people simply let themselves go and most people do not care anymore. Today, ethics and professional conduct are like words spoken in the wind. Today, the soul of society is dying; some may even say it is dead. We are sinking into the abyss of death.

But we stand at a peculiar junction and time in world history. Despite the multiplicity of religious crusades, conventions and vigils, despite the rallies of concerned activists and professional conferences; despite the cultural renaissance and new discoveries, there is multiplicity of evidence of corruption of values, inhumanity and decay. The world is under intense Divine Pressure enforcing Purification; 'that everything must become new!' Everything must come before the Light and be exposed. Nothing will hide anywhere.

In the Scripture, The Lord Christ taught us 'You behold the mote in your brother's eyes and sees not the beam in your own eyes!' There is a cheating epidemic that has eaten deep into the fabric of society. May we all learn the necessary lessons in our character deficit and lack of humanity in our conduct. Let us look into this mirror! Unfortunately, the physical mirror only shows us our faces and not our inner character. But there is a Mirror that shows this, the Mirror of the Living Word of Truth! It shows us an inner reflection of ourselves if we look deep. It brings to us a Teaching on the Value of Enlightenment

and the importance of personal responsibility. It teaches us through the Laws of Nature; one of which is the Law of Sowing and Reaping, which Isaac Newton recognised in the third Law of Motion that 'Actions and Reactions are equal and opposite!' This Law is not very different from the Creation Law that our forefathers recognised in farming, as the Law of Harvest that whatever a man sows that shall he also reap and reap in multiples. No one will reap for another despite the self-deceit in religious blind faith. Through the uniformity and consistency of what they observed, our forefathers taught us this as a proverb. The limitation in Newton's third Law of Motion is that in human affairs actions and reactions are opposite but not equal. Those involved in the actions and not those who contemplate the reactions as our Vice-Chancellor at the University of Ibadan Professor Tekena Tamuno used to remind us. For when we sow corn, we reap cobs of corn at the time of harvest. Isaac Newton born in 1642 only "discovered" what is proclaimed in the proverbs and in the Scriptures in the simple Divine Law of Creation that whatsoever a man soweth, that shall he also reap (Galatians 6:7). This Natural Law and the Commandments derived from the Laws of Creation are imprinted in our spirits to guide us on how to live responsibly and protect us from the binding of propensities. They go beyond teaching us about compliance with professional ethics. If we seek earnestly, we really do not need any Code of Conduct. The Creator gives it to us in one simple, perfect and incorruptible Law, the Law of Reciprocal Action which we have recognised and couched in Proverbs and Parables. Whatever a man sows that shall he reap; and reap in multiples! Unless those who have completely let themselves go in temptation, those whose conscience had become leprous and thus eaten away, everyone knows what is good and right within and cannot deceive himself.

Let it be emphasised that the overriding purpose of university education is the pursuit of Truth. In a presentation at a Workshop on Building an Innovation and Entrepreneurial Ecosystem for a Sustainable Development of the University of Port-Harcourt in November 2022, Professor Emeritus Nimi Briggs clearly drew our attention to the Motto of Harvard University which is simply 'Truth' and that of the University of Lagos being 'In deed and in Truth' (see Figure 1).



Fig. 1: University Motto: Harvard and Unilag (Briggs, 2022)

Also, a line in the second stanza of our National Anthem, states Help our youth the Truth to know. And going further, it says And living just and true..

The question then is What is Truth? When Pilate asked the Lord Christ, this question, His answer indicated that the Truth is synonymous with the Will of God which He brought and taught. Also, in the Lord's Prayer He taught His Disciples "...Thy Will be done on earth as in Heaven..." meaning, the Truth that prevails in Heaven should also be done on earth. The common denominator, for all religions is the Knowledge of The Will of God. Put more succinctly, Who is the Truth? The profound recognition is that the Almighty God, the Creator of the Universe, is the Truth Himself, the Eternal Unchangeable Truth. All that we strive to learn in every discipline is about His Work, Creation and the manifestations in Nature. Thus, every study in every discipline is aimed at understanding the manifestations of His Will in Creation; understanding Nature and discovering the Laws of Nature; thus, discovering the Truth. Therefore, we are admonished in a very comprehensive way: Seek and ye shall find! We are to seek the Truth and we are assured of finding joyfully if we seek earnestly.

Let no man deceive himself that he does not know what is good and what is bad. We are human spirits with a conscience on which what is good is indelibly imprinted. For the Creator is Eternal Goodness Himself. The English spellings for God and Good have only one extra letter 'o' as difference.

More than our students being found worthy in character and in learning, we the teachers must be above board and be found worthy in character and teaching; we must be found worthy in lifelong learning through research. We should be such teachers that students will 'look up to' and not be obliged or forced to look down upon, through base conduct and character unbecoming of the noble profession of teaching.

Therefore, all teachers who conduct research to discover the infallible, inviolable Laws of Nature to recognize the Truth, must conduct ourselves with honesty, integrity and dignity and obey that important injunction: Let your light so shine before men that they may see your good works and glorify The Almighty Creator in Heaven. This admonition clearly shows a correlation between good works and the light of the soul. Through good works, thoughts, words and deeds, the light of the spirit within the soul so shines and people perceive the luminosity of spirit, see our example and glorify the Creator for His Goodness, Guidance and Grace. The corollary is also true. Through ugly, ignoble works, the soul is darkened, the lamp of the soul is dimmed to the point of being extinguished in men of leprous conscience. Through lack of ethical conduct in professional practice, people will also perceive the darkness of the soul and wonder whether we are indeed human beings. It is said no one lights a lamp and hides it under a bushel.

True teachers are those of whom it said their reward is in heaven. Indeed, such teachers will reap a rich harvest of rewards and values, here and hereafter. Also, every support staff must appreciate that a university is where the leaders of tomorrow are trained and so must imbibe the ethics of service delivery. A civil servant is expected to be civil, civilised and polished in his service delivery and treat students and other stakeholders with decorum, diligence and respect.

As human beings, we are endowed with two important faculties: the intellect and the intuition. The intellect is a product of our brains, of our body, whereas the intuition is rooted in the spirit. With the intellect, we study in schools and so the emphasis has been on the intelligence quotient (IQ). In recent times, we are beginning to pay attention to emotional intelligence (EQ) which goes beyond intellectual ability. The intuition which is part of our conscience or the inner voice, is better equipped to appreciate the Truth. Today, there is so much degeneration and decay in society. The intellect alone will not be enough to appreciate the Truth to make us true human beings. The intellect must be guided by the intuition to humanise us and appreciate the Truth.

In his Valedictory Lecture at the Niger Delta University, Bayelsa State, Professor Kingsley Alagoa, Professor of Physics, drew our attention to Albert Einstein, one of the most celebrated scientists, who made a profound statement: Religion without science is blind, science without religion is lame. He explained that scientific laws are not the making of any scientist but the discovery of already existing Laws in Creation. Similarly, religious concepts are the endeavors to understand and live in accordance with the Will of the Creator, which is expressed and anchored in Creation in the perfect Laws of Nature. The Truth is expressed in the fundamental Laws of Nature which are the foundation for the maintenance and sustenance of Creation.

I am an advocate of Nature Study, wherein we can learn about the Truth. Nature is ever green because Nature as the product of the Will of the Creator swings perfectly with the Laws of Nature, the Divine Laws, that bear the Will of God. And so, it said why look so far when the Truth is so near! Let us just look deeply into the evergreen Nature, and we can glean the Truth in the simple perfect Natural Laws of Creation.

7.0 ARTS VS SCIENCE EDUCATION AND PROFESSIONALISM

Those in the humanities are taught about human nature, society and culture through religion, law, psychology, philosophy, sociology (the science of society and of human nature and relationships), music, art, literature, poetry, proverbs, parables etc. On the other hand, the science student is not that exposed, they are grossly disadvantaged in their knowledge of the values of true humanity as far as university education is concerned. The fundamental General Studies, GES course, on Logic

and Philosophy is not enough to deepen understanding of human nature and the values of life.

Although the science students should have recognised the perfection of the Laws of Nature and gained conviction of the Will of The Creator, the teachers did not show the connection between religious teachings and scientific observations. This underscores the truism of the profound observation of Einstein that Science without Religion is lame and Religion without Science is blind. Both must work together to give us a comprehensive knowledge of Nature and lead us to the recognition of The Truth and the Knowledge of Creation in the Living Word. This will give us real values that swing in the Will of the Creator and the solid foundation for professional ethics.

So how do we teach the science and engineering students about what makes humanity; about responsibility, freewill and freedom; about the noble qualities, virtues and values that uphold the fabric of human society. As pioneer Director of the Institute of Petroleum Studies (IPS), I introduced the Elechi Amadi novels - The Concubine and the Great Ponds - to our students to read and review during the Orientation Week. The veteran author Captain Elechi Amadi was invited to be our guest to listen to the reviews by engineering and science graduate students after which he autographed their copies for them. This was my own way of liberalising engineering education. This made great impressions in us.

The quality of teachers and university leadership have effect on the progress of a university and by implication on the output of quality graduates.

8.0 THE AGE OF KNOWLEDGE

Today, we talk about a new Age of Knowledge. We hear about the New Knowledge Society or Knowledge Economy. In essence, the new Age of Knowledge is about the Knowledge of the Universe which we are to study through Nature Study. It is about the Knowledge of Creation, the Knowledge of the Perfect Will of The Creator anchored in the Laws of Nature also called the Divine Laws of Creation.

Global public intellectual, Professor Jeffery Sachs of Columbia University and powerful voice in the crafting of the SDGs wrote a classic, 'The Age of Sustainable Development'. He calls the new Age, the Age of Sustainable Development. The UNESCO also declared the Age of Education for Sustainable Development (ESD), 2005-2014. All these, coupled with the 4th Industrial Revolution (Industry 4.0), show a convergence of realisations and recognitions that we need knowledge to anchor us firmly on ethics and conduct fit for human beings.

The IPS program was a unique industry-oriented international collaborative graduate program. The petroleum industry is international, multicultural, multidisciplinary and multilingual. Staff work in multidisciplinary project teams. All these were carefully

considered in the setting up of the Institute. In IPS, we practised Triple Helix Plus+ in our course allocations and delivery. Professors teach philosophy and fundamental principles; Government Technocrats teach Policies (policy formulation and implementation, political economy); Industry experts and professionals teach practice and ethics, ESG to ensure sustainability, QHSE and SDG while the professional bodies are involved in professional certification and professional practice. We also have programs for Experts-in-Residence and Entrepreneurs-in-Residence to help in extra-curricular activities such as start-up training. During the Annual Anniversary and Induction Ceremony, the professional bodies induct our graduates into the relevant professional bodies. There is also a Professional Mentor they look up to as an example. All these initiatives are to give them a good head start in professional practice and mentorship. But we can do much more. I recently attended our 2nd Law Faculty Dinner and learn a lot about etiquette. The Law student is taught about ethics and etiquette up to dinner table manners and dress code. At the dinner, the Chairman, a retired Judge, and Senior Advocates and their Lecturers drummed ethics and etiquette into them. They were told the importance of dress code and manners in court and at dinners since they are learned and interact with the high and mighty and nobles of society. It was very impressive. I was not briefed about dress code and so looked very odd in their midst. The Engineering Professional Societies, the Academy and COREN can learn from these.

9.0 PROFESSIONAL TRAINING IN THE INDUSTRY

As I stated earlier, training does not end in the four walls of the university. Training continues under registered professionals in professional engineering bodies before the young engineer is registered by COREN. In fact, one of the new skills in the Age of Knowledge is lifelong learning.

So, we the teachers in the schools and you the teachers in the industry and professional mentors have a great responsibility in ensuring that we do not compromise Professional Standards, Ethics and Codes of Conduct in Practice.

10.0 PROFESSIONAL ETHICS IN PRACTICE

Every Professional Body has its Code of Conduct and Professional Ethics. Every company has well-defined Mission and Vision Statements, Core Values and Goals based on best operating policies and practices to guide their staff and their operations. Every member of staff is expected to know them in his heart and mind as an integral part of his professional practice. These are not just information published in structured career documents and posted on notice boards. They constitute the constitution that should guide conduct. Any infraction invites consequences.

11.0 THE WAY FORWARD

In times like this, where do we seek refuge and reclaim our true humanity and professionalism. Let us look into religion, culture, science and art, into philosophy and above all into Nature Study which bears witness to the Eternal Truth; let us draw valuable knowledge from the parables, proverbs and poetry, philosophy...

The way forward is real Knowledge, the Knowledge of The Truth we are permitted to imbibe in our striving for all that is good and pure!

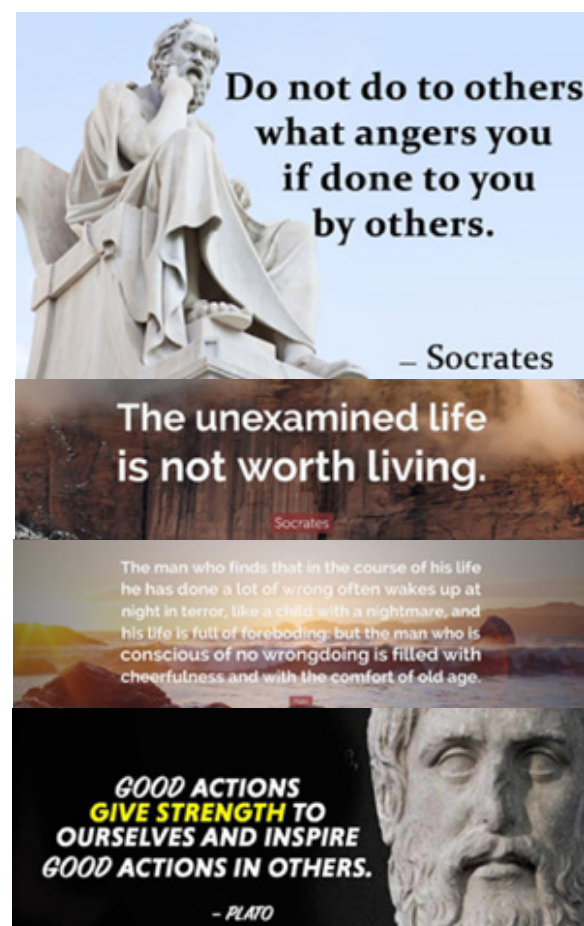
All of us profess one religion or the other that abhors ill conduct. In our religions we were taught to be good and God-fearing, that the fear of God, is the beginning of wisdom.

The great philosophers Socrates and Plato have also guided us with their deep insights that an unexamined life is not worth living and so many wise sayings..

12.0 WHAT PHILOSOPHERS SAY

And everything must become new if we are to survive the Divine Judgement.

The golden rule that we should do unto others what we expect others to do unto us, is also about the Law of Love, which long before these philosophers were born, the Lord Christ, the Love of God, taught humanity: Love thy neighbour as thyself! Such love would enlighten us to do only what is right and proper always; for what we do to our neighbour, to our community and society, in our professional practice we indeed do to ourselves according to the infallible Creation Law





Many people would be scared if they saw in the mirror, not their face, but their character. This was an article written by Aryan J. Director at Darwin Platform Group Company Ltd in January 25, 2017

He said most people go out of their way to make sure they look good on the outside. They pay other people to make their hair look good, they pay for products to make their skin look nice, and they buy clothes that they think will flatter them. They are concerned about the external appearance that they show to the world and are careful to take care of how they present themselves.

At the same time, very few seem to spend any time at all taking care of their character. They are only concerned with what they see in the mirror, not the things the mirror can't detect. What a different world this would be if we had the ability to see into a person's soul and character, instead of simply seeing their looks, which have been carefully put together to impress you. What if you had the power to see people's true spirit, instead of their external looks, like Hal did in the movie, *Shallow Hal*? How would you truly look in the mirror? How would your friends truly look? By all means take care of your body and your appearance. But, do not neglect to work on perfecting your character. And when you look at other people, don't be deceived by their appearance, but rather look deeper and discern who and what they truly are, no matter what they look like on the outside.

Thus, we can discern that many a person not physically endowed may be so beautiful, very polished and cultured within, whereas someone so handsome or beautiful may be very ugly inside!

In our cultures, is a wise saying that a good name is better than gold. A family name is dragged into the mud by one character-deficit in a person. Imagine names that have been stigmatized because of lack of character, immorality and criminality. The cost of character-deficit is huge! A good name is celebrated and named across cultures. Names like Alexander, George, Elizabeth, Samuel, , ,But imagine names like Nero, Hitler, Anini... Even names revealed in the Scriptures such Michael vs Lucifer; names of Disciples such John, Peter, ..vs Judas. Who wants to answer stigmatised names even as nicknames except criminals...

In all, we should have the courage to teach our students Professional Ethics, leadership skills, values, lasting values that lead to joyful activity, sense of balance, freedom of spirit, peace and happiness.

12.0 CONCLUSION

As I said in the 37th Convocation Lecture, I delivered at the Ignatius Ajuru University of Education, to be called a teacher is a great honour, in fact a Grace. Teachers bear great responsibility. For we mould the character of other human beings entrusted into our care and make them responsible citizens in society and thus responsible creatures in Creation in general. Responsible citizens are those who obey the Laws of Nature; obey the laws of the State and obey the Codes and Ethics of our professions. Responsible citizens obey the simple Ten Commandments of God and fulfil the Primordial Laws of Creation.

Since the university is established in pursuit of the Eternal Truth which manifests in the evergreen Nature, we who are teachers must be deeply rooted in Nature Study through which we guide our students to the conviction of the Will of the Creator and thus acquire lasting values of enlightenment.

In the university, we do not directly teach character but indirectly. We teach character by being exemplary teachers, proven worthy in character and in teaching. So why is character so important that it is considered first before learning and teaching? Character makes the real man, a responsible man. Character is about the characteristics we exhibit. A teacher must be humble and exhibit nobility of character. He must see his work as worship, he must stand in prayer without ceasing; in other words, he should let his work become prayer and worship. He must be the first to obey the Laws of Nature, which bear the Will of the Creator. He must be exemplary in obeying the Commandments. A true teacher must be upright like a candle selflessly giving light to his environment

“...to be called a teacher is a great honour, in fact a Grace. Teachers bear great responsibility.”

“To let the light of our souls so shine means to be so exemplary in all we do and reflect the Light of the Creator in our lives. Then the teacher will visibly enjoy the Grace of The Lord. This will ...manifest around him.”

in obedience to the Admonition: Let your light so shine before men that they may see your good works and glorify the Almighty Father in Heaven! (Matt.5:16)

To let the light of our souls so shine means to be so exemplary in all we do and reflect the Light of the Creator in our lives. Then the teacher will visibly enjoy the Grace of The Lord. This will become manifest around him.

What I have said about teachers apply to you worthy Fellows of the Nigerian Society of Chemical Engineers for you are the industry teachers who mentor the young engineers. What brings down an institution or nation is the lack of character. It is not a matter of choice to obey the Natural Laws. It is well known that to obey is better than sacrifice and ignorance of the Law is not an excuse. It is widely circulated in the social media that at the Gate of a University in Uganda the following message is posted for contemplation:

“Destroying any nation does not require the use of atomic bombs or the use of long-range missiles. It only requires lowering the quality of education and allowing cheating in the examinations by the students.”

Patients die at the hands of such doctors.

Buildings collapse at the hands of such engineers.

Money is lost at the hands of such economists and accountants.

Humanity dies at the hands of such religious scholars.

Gossip and bringing down others is built by them...

Justice is lost at the hands of such judges...

“The collapse of education is the collapse of the nation.”

Graduates from such institutions that lack character will lack values and the society will be worse off, totter and collapse.

The value of a life of enlightenment we desire in our graduates can be realised if we teachers and professional mentors lead by example.

BIBLIOGRAPHY

1. Alagoa, K. D. (2022): *Scientific and Religious Thoughts in the Natural Laws of Nature*, Valedictory Lecture, Niger Delta University, 29pp
2. Ajienska, J. A., (2014): *University of Port-Harcourt: From University to Entrepreneurial University*, University of Port-Harcourt Governing Council Retreat, Ibom Hotel Resort, Uyo, Nigeria, May
3. Ajienska, J. A., (2019): *Blessed are the Teachers!...*, 37th Convocation Lecture of Ignatius Ajuru University, Rumuolumeni, Port-Harcourt, Rivers State, 62pp

4. Ajienska, J. A., (2022): *Nigerian Universities and Leadership Value Proposition: Having Graduates worthy in Character and Learning*, 34th Convocation Lecture of Rivers State University, Port-Harcourt, Rivers State, December 8, 36pp
5. Briggs, N. D. (2022): *Global University Ranking and University Advancement. Is There a Correlation Between Them? Presentation at the Workshop on Building an Innovation and Entrepreneurial Ecosystem for a Sustainable Development of the University*, University of Port-Harcourt, November 11
6. Etzkowitz, H. (2008). *The Triple Helix. University-Industry-Government in Action*. New York, NY: Routledge Taylor & Francis Group, DOI:
7. Etzkowitz, H and Leydesdorff, L (1998). *The Endless Transition: A “Triple Helix” of University-Industry-Government Relations*. *Minerva* 36(8): 203–208.
8. Faborode, M. (2023): *The State of the CCMAS, Sensitisation and Implementation*, NUC CCMAS Colloquium, Idris Abdulkadir Auditorium, NUC, ABUJA, August 23.
9. Okebukola, P. A. (2022): *Nigeria in 2050 and the Future of Work: Blending Humanities with Science in University Education*, keynote address presented at the Inter'l Colloquium to Celebrate Emeritus Professor Ayo Banjo at 88, May 2
10. Sachs, Jeffrey D. (2015): *The Age of Sustainable Development*, Columbia University Press, New York, 543pp
11. Vollmann, Herbert (1995): *A Gate Opens*, Stiftung Gralsbotschaft Publishing Co. Stuttgart, Composite Volume
12. Matawal, D. S (2023): *Nexus Between Codes & Standards and Code of Conduct for Engineering Practitioners in Nigeria*, Paper at 31st COREN Engineering Assembly 7-8th August (with the theme: Entrenching and Strengthening Engineering Practitioners' Code of Conduct for Resilient Engineering Practice in Nigeria)
13. Rabiou, A. A. (2023): *Enforcement of Engineering Ethics and Regulations as a Requisite for Sustainable National Development*, Paper Presented at the Forum of the Academy of Engineering
14. <https://www.linkedin.com/pulse/many-people-would-scared-saw-mirror-face-character-aryan-jabbar-1/>
15. https://www.timeshighereducation.com/news/majority-students-cheat-online-exams-study?utm_source=newsletter&utm_medium=email&utm_campaign=the-download&spMailingID=27009414&spUserID=MTAxNzcxMzc2MjkxNgS2&spJobID=2291900920&spReportId=MjI5MTkwMDkyMAS2

EDITOR'S NOTE: This is an abridged version of the original presentation by Prof. Ajienska. Visit www.nsche.org for the full paper.

QUACKERY IN ENGINEERING: A NEGLECTED HAZARD IN THE SOCIETY

1.0 INTRODUCTION

The Akwa Ibom-Cross River States Chapter scheduled a radio visit to Comfort 109.5 FM, Uyo on August 10, 2023 to air discussions on “Quackery in Engineering- A Neglected Hazard in the Society”. The 4-man panel was led by the Chapter Chairman, Engr. Ikemesit Orok, MNSE, MNSChE and his co-discussants; the Chapter Vice-Chairman, Engr. Emmanuel Ebong, FNSE, the Chapter Secretary, Engr. Ahmed Isa, MNSChE and the Assistant Technical Secretary, Engr. Kufre Thomas, MNSChE. The radio discourse which was moderated by Mr Jai Abbah of Comfort FM bordered on the contextual elucidation of quackery in the engineering purview, the need for licensing and regulation in the general engineering profession and the threat on public safety.

In the prologue to the discussion, the panel introduced a Chemical Engineer as any professional and skilled individual equipped with the disciplinary knowledge and works principally in diverse industries across diverse sectors to convert raw materials into a variety of useful products, while developing designs and operationalizing plant equipment. Chemical Engineers are also at the frontline along with their engineering counterparts to proffer solutions that will improve our lives.

The Chapter Chairman precluded discussions by precisely defining engineering quackery as “the malpractice of any engineering endeavor by unlicensed individuals or groups who masquerade themselves as engineers and dishonestly make false claims to have acquired requisite engineering certifications and skills”, while defining a quack as an unlicensed individual practising in a regulated profession. He also noted that “quacks often come to the engineering space for self-gain without the necessary education, training or experience”. He also cited the recently amended COREN Act of 2018



Engr. Ikemesit Orok, MNSE
(Chairman, NSChE Akwa Ibom/Cross River Chapter)

section 19; Cap 1 and Nigeria’s criminal code, section 418 and 425 to buttress his points about false pretense vis-à-vis quackery.

The Chairman further stressed that since the law considers false pretense to be a punishable crime, the idea of aiding and abetting quackery through appointments to engineering offices, both in government and the private sector, should be stopped immediately, discouraged and offenders prosecuted.

On the contrary, the appointment of competently qualified and licensed engineers should be encouraged and appointed to take over their designated offices to accelerate development.

The Chairman expressed the importance of quality engineering practice. He pointed out that quality engineering practice is germane in achieving rapid development and avoidance of the risk associated with the disturbing frequency of engineering failures, associated loss of lives, waste of economic resources as well as deprivation of due dividends due to the citizenry.

After, the moderator opened the floor for other panelists to contribute to the discourse in successive segments.

“...discourse which was moderated by...of Comfort FM bordered on the contextual elucidation of quackery in the engineering purview, the need for licensing and regulation...”

2.0 LICENSING AND REGULATION

In this segment, the Vice-Chairman, Emmanuel Ebong, FNSE emphasized the importance of licensing and regulation across all categories of engineering professions. He explained that “licensing disallows unqualified individuals from the practice of engineering and protects the public from harm”. He added

that “regulation is imperative because it guards the integrity of the engineering profession”.

3.0 THE ADVERSE IMPACT OF QUACKERY ON THE ENGINEERING PROFESSION AND PUBLIC SAFETY

In the second segment, the Assistant Technical Secretary, Engr. Kufre Thomas spoke on the challenge associated with quackery in engineering practice. He noted that quacks often compete with qualified engineers for jobs, thereby undercutting the remunerations of qualified engineers. Consequently, qualified engineers are confronted with the difficulty of earning enough to make a living. Furthermore, he stated that “quackery often leads to the use of inferior materials and unskilled workmanship in engineering projects”.

Regarding the threat of quackery on the engineering profession and public safety, the Assistant Technical Secretary attributed engineering mishaps such as building collapse and flaws like infrastructure failures and fatal accidents to the unacceptable practice of quackery.

In the ensuing segment, the Lead discussant, Engr. Ikemesit Orok shared his thoughts on the following points:

4.0 HOW TO SPOT A QUACK

It may be difficult to detect a quack out rightly, but the easiest way is to request their registration number or certificate with the Council for Regulation of Engineering in Nigeria (COREN).

The only guaranteed way to identify a suspected



quack from a qualified and licensed engineering practitioner is to verify their registration details with COREN. Additionally, every licensed engineer is issued a seal and stamp by COREN.

Below are malicious impacts of engineering quackery spelled out by the panel:

- i. Quackery causes national economic losses. Professionals are nation builders whereas quacks' activities are detrimental to any nation. Through compensation, repairs, maintenance, loss of intellectual property and lives that may be lost as a result of quacks, the people and government suffer economic losses. It is patriotic to speak out against quacks in practice.
- ii. Quackery weakens the profession where they are prevalent - Quackery undermines the spirit of professionalism in any engineering endeavor. This is because poor, shoddy and unprofessional practices are associated with quackery.
- iii. Quackery discredits the profession. Professionals are frequently more visible to the public which makes it easier for them to be criticized for the unethical behavior of quacks. This inevitably breeds suspicion among the general public and a lack of confidence in the abilities of local professionals. Campaign against quackery should be seen as a defense of the professional engineers' reputation.
- iv. Quackery creates unhealthy competition. It is absurd to accept that licensed professionals and quacks can share the same title and the positions that are exclusively the domain of licensed professionals. Defeating quacks means protecting the engineering profession.
- v. Quackery can produce unpalatable

consequences. When quacks lead projects, their lack of requisite training, experience and expertise can lead to undesirable consequences such as project failures which can result in loss of lives and costly devastation of properties.

A case in point is the growing number of collapsed buildings in Nigeria that are attributed primarily to the use of sub-standard materials by quacks as revealed through investigations by the authorities.

- vi. Quackery impoverishes engineering. The economic hardship in the country has forced many firms to prefer cheaper materials and services. This has inspired quacks into exploiting this economic situation by engaging in projects and services at the expense of licensed engineers who would normally use more appropriate and more expensive materials to achieve desired professional standards. Therefore, most low-tier projects such as single-family residential buildings and small-scale factories are undertaken by quacks. Consequently, qualified engineers are experiencing deprivation of jobs and incomes as the trend becomes rampant.
- vii. Quacks lack professionalism. It goes without saying that quacks are unprofessionally qualified to take on any engineering job or project. Fortunately, engineering has a regulatory body, COREN that acts as a 'watch dog' to inhibit the spread of quackery. In addition, the licensing process should be made hassle-free and accessible for qualified engineers.
- viii. Quacks cause hazard to users. One of the fundamental principles of engineering and related professions is the safety of end user during and after the project but this is directly violated by quacks. Speaking up against quackery improves and guarantees public safety.

For this reason, COREN has delineated rules to guarantee quality and consistent service delivery, good ethical and best standard practices while enforcing punitive measures where necessary. As an example, Design Engineers are responsible for ensuring that design projects are followed through with construction to completion as per the engineering blueprint (of course, at a fee).

Licensed Engineers appreciate that it is their duty to protect the interest of their clients and avoid conniving with other professionals or contractors to swindle clients. The Chairman expressed the importance of quality engineering practice. He pointed out that quality engineering practice is germane to accelerated development and avoidance of the risk associated with the disturbing frequency of engineering failures leading to loss of lives and waste of economic resources.

Next, the Chairman shared his thoughts on four reasons why engineers should take the lead against quackery as follows:

- National Economic Loss: He states that professionals are nation builders. On the contrary, the activities of quacks impair national development. The people and government suffer economic losses through compensation, repairs, maintenance and loss of intellectual content and lives that may arise as end result of quackery. Therefore, the Chapter Chairman called for solidarity amongst engineering disciplines.
- Hazards to Users: The Chairman explained that quackery directly violates one of the golden tenets of design/procedures within engineering and akin professions which is safety of end users for and within a project's lifetime. Hence, he noted that speaking up against quackery enhances the safety of the public.



“...importance of individual responsibility in extinguishing quackery and taking necessary actions to defend the engineering enterprise by reporting infractions under equal application of the law.”

- **Key National Role:** The Chairman also highlighted the pivotal role of Engineering to other allied and non-allied professions and professional practices within the nation. He stressed that a campaign championed by engineering forces have great potentials for inspiring other professions to emulate. What affects Engineering affects all!
- **Excellent Communicators:** The Chairman recognized that the skill to express oneself and unambiguously articulate details was critical in Engineering. Correspondingly, possession of this skill is the differentiator in public awareness campaign and education of the society on pertinent issues like quackery.
- **of engineering schools** about the dangers of engineering quackery.
- **Professional engineering institutions** should provide more resources to ease the issuance of license to qualified individuals.
- **Empowerment of institutional capacities** to generate and proffer cutting-edge solutions.
- **The media** should be used as a megaphone to raise awareness of the undesirable issues fraught with engineering quackery.

The Chairman in his closing statements emphasizes the importance of individual responsibility in extinguishing quackery and taking necessary actions to defend the engineering enterprise by reporting infractions under equal application of the law.

5.0 ADDRESSING QUACKERY IN ENGINEERING

In the final segment, the panel discussed a range of measures and actions to clamp down on engineering quackery. One of such measures was the need to strengthen the enforcement of laws against quackery. Another way suggested was through public education about the dangers of quackery.

The discussants each recognized that only qualified engineers should merit a license to practice engineering because quackery harms people and undermines the science and engineering enterprise. The panel enumerated possible ways to stop quackery in engineering as follows:

- **Crafting an anti-quackery bill** that will be legislated for the engineering sector.
- **Enacting and enforcing policies** aimed at confronting and eradicating quackery. In particular, the government should end the practice of appointing non-professionals into technical and regulated portfolios.
- **Engineers should be obliged** to educate students

On top of that, the Chairman underscored the importance of collaboration across the engineering field. He stated that “global development is currently centered on engineering” and that this will remain so onwards.

The Chairman further pointed out the potency of engineering and technology in connecting and integrating communities from around the world, while calling for action over inaction from the engineering societies.

Finally, he recommended the need for regulatory enforcement of legislations by filing reports of all violations committed by wrongdoers for the betterment and advancement of engineering in the society.

Culled from the Publicity Department, the Nigerian Society of Chemical Engineers (NSChE), Akwa Ibom-Cross River States Chapter.

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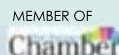
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EFFECTS OF GAS FLARES ON ENVIRONMENT – ZINC ROOF TOPS AS CASE STUDY

1.0 INTRODUCTION

Gas flaring is the burning of natural gas and petroleum hydrocarbons in flare stacks by upstream oil companies in oil fields during operations. The air pollution is the cause of deterioration of infrastructure in the environment. This study was carried out on the effect of flare on vegetation, roof tops made of corrugated iron roofing sheets and groundwater. Different specialists were assigned to carry out various functions depending on one's area of expertise. It was on this premise that the presenter was detailed to ascertain the impact of flare on roof tops with respect to corrosion.

Today, many communities in the oil-rich region are complaining of the destruction/decay of infrastructure and we are handicapped because of ignorance and the technology to be applied. Fig. 1 shows the sight of typical flares in Niger Delta regions



Prof. Awajiogak Anthony Ujile (PhD, FNSE, FNSChE, MSAChE)

of Nigeria.

The effects of gas flares are:

- Corrosion of Structure
- Climate Change – Methane in the hydrocarbon being burnt-off to carbon dioxide and water (Ujile, 2021b)
- Vegetation – defoliation of leaves, warmth, diseases of different kinds, etc.

“Gas flaring is the burning of natural gas and petroleum hydrocarbons...”

2.0 MASS TRANSFER APPLICATION IN CORROSION KINETIC STUDIES/PROTECTION

i. Electrochemical Corrosion and Ionic Mass Transport

Mathematical correlations were developed to predict the behaviour of iron roofing sheets on exposure to different environmental conditions. The analytical results from Atomic Absorption Spectroscopy (AAS) of chromium, iron oxide and zinc contents for the locations considered were fed into the developed equation. Corrosion rates were determined by weight loss method and model equation and the results from the two methods are in agreement. The rate constants for location A are 0.36/hr and location B = 0.174/hr; location C = 0. Corrosion rates by weight loss method were 0.514mpy and 0.221mpy for locations A and B respectively within the first five years. The corrosion effects on roofing sheet were noticed to be 0.0068mpy at location C from 5 – 10 years. The developed model provides solutions which have direct application to the prediction of corrosion rates on iron roofing sheets (Ubong, et al).



Fig. 1: Flaring of Associated Gas in Nigeria (Credit: <https://www.flickr.com/photos/foeaction/3201462147/in/album-72157612649194256/>)



Fig.2: Map of Akwa Ibom State showing sampling locations (https://www.researchgate.net/figure/Map-of-Akwa-Ibom-State-showing-Local-Government-Areas_fig6_320450251 Accessed on 8th September 2023).

ii. Methodology

Three locations were considered as shown in Fig. 2. A- ESIT URUA; B- IBAKA; C- IKONO. Zinc coated roof tops were removed at different periods for the three locations. The samples were subjected to destructive analysis with Atomic Absorption Spectroscopy. Chemical constituents were analyzed including chromium, iron oxide.

iii. Results

Results obtained from the developed model are presented in Tables 1 and 2. The results show that the corrosion rates are highest at location A, moderate at location B and low at location C.

*Final weight was taken after mechanical cleaning of the corrosion product by mild abrasive cleaning, Density = 7.909g/cm³, thickness, t = 0.015cm (for most areas); Surface area considered are those exposed to the atmosphere. ρ = 7.14g/cm³ *as given by home owners; Loss/unit area was calculated for the zinc.

3.0 CONCLUSION

The kinetic processes of corrosion rates established in this work are applicable in any environment similar to the one considered (coastal/industrial). The correlations of rate constants to corrosion rates are innovations that should be studied further for baselines to determine corrosion rates. This should override the weight loss method that most times gives low precision and unreliable data. The research has shown clearly that corrosion of the iron/zinc roofing sheet is more pronounced in the industrial/coastal environment when compared to the city of Ikono in the hinterland of Akwa-Ibom state. That is to say in the minimum, that the industrial activities in these regions have brought about an accelerated corrosion rate.

While working with Oil/Gas servicing company as Corrosion Engineer, the author was consulted to be involved on Air Quality, Precipitation and Corrosion Studies of Qua Ibo Terminal (QIT) flare and the environs. September 2001 pp 90-98. Client: Mobil Producing Nigeria Unlimited (Ubong, et al; Ujile and Ehirim 2014).

RECOMMENDATIONS

(a) The results of the studies indicted QIT flares, which cause the re-injection of the flare to Idoho reservoir, and have brought a boost to crude oil

Sample Location	Sample identification	g/100g		(mg/kg)		
Esit Urua (A)	A11	6.45	0.022	32.95	<1.0	25
	A21	1.67	0.019	26.07	<1.0	30
	A31	1.48	0.009	31.93	<1.0	20
	A41	0.98	0.015	22.14	<1.0	35
	A51	1.80	0.024	30.90	<1.0	28
Ibaka (B)	B11	2.56	0.019	26.66	<1.0	36
	B21	1.56	0.013	13.97	<1.0	52
	B31	1.14	0.011	14.81	<1.0	56
	B41	0.92	0.008	15.90	<1.0	49
	B51	1.25	0.014	18.61	<1.0	46
Ikono (C)	C11	1.39	0.013	26.89	<1.0	51
	C21	1.43	0.014	17.37	<1.0	49
	C31	2.08	0.021	15.59	<1.0	45
	C41	1.18	0.015	17.60	<1.0	40
	C51	1.29	0.024	19.47	<1.0	38
(Conc) new zinc roofing sheet		10.2	0.035	41.56	<1.0	<1.0
		zinc	chromium	Iron oxide	sulphate	chloride

Table 1: Concentration levels of active ingredient considered in roofing sheets in the study locations (Ubong, et al).

Sample Location	Sample identification	Surface area (cm ²)	Surface area (inch ²)	Initial weight (g)	Final weight (g)	Weight loss (g)	Duration* (Years)	Corrosion rate (mpy) (wt loss x 22300) / a.d.t.
Esit Urua (A)	A11	407	65.12	48	35	13	1-5	0.514
	A21	38	60.8	50	48	2	5-10	0.034
	A31	220.73	35.32	55	48	7	10-15	0.1225
	A41	364.64	58.34	50	37	13	15-30	0.091
	A51	385.2	61.63	50	48	2	<1	0.501
Ibaka (B)	B11	363.5	58.16	40	35	5	1-5	0.2214
	B21	208.52	33.36	30	25	5	5-10	0.1544
	B31	208.52	33.36	30	25	5	10-15	0.093
	B41	284.2	45.47	37.5	25	12.5	15-30	0.0965
	B51	418	66.88	50	48	2	<1	0.462
Ikono (control) C	C11	440	70.4	50	50	0	1-5	0
	C21	473	75.68	50	49.5	0.5	5-10	0.0068
	C31	404	64.64	75	74	1.0	10-15	0.00543
	C41	409	65.5	62.5	62	0.5	15-30	0.00268
	A51	517.5	82.8	55	55	0	<1	0

Table 2: Estimated corrosion on samples of zinc coated steel from the study areas (Ubong, et al)

- production output. Today, the flares are no more in existence. I recommend that other flares in the region be converted to boost production output.
- (b) Converting of flare gas flues into energy. Application of thermodynamics for such conversion is possible. Engineers should be consulted for such ventures.
- (c) The penalty issued for gas flaring should be made stringent as to compel oil/gas operators to redesign their facilities in such a way to avert environmental degradation.

“Converting of flare gas flues into energy. Application of thermodynamics for such conversion is possible. Engineers...”

REFERENCES

- Ubong, I.; Ujile, A. A.; Mbipom, E. W.; Inyang, L. D.; Nkanga, E. (2001): Modeling Corrosion Rates on Corrugated Iron Roofing Sheets in three locations in Akwa Ibom State, Nigeria, In: A Technical Report on the Air Quality, Precipitation and Corrosion Studies of Qua Ibo Terminal (QIT) flare and the Environs. September 2001 pp 90-98. Client: Mobil Producing Nigeria Unlimited.
- Ujile, A. A. and Ehirim, E. O. (2014): 'Mathematical Modeling of Corrosion Processes of Zinc/Iron roofing sheet in Coastal/Industrial Environment,' IOSR Journal of Eng. (IOSRJEN). ISSN (e): 2250-3021, ISSN (p): 2278-8719 Vol. 04, Issue 05 (May. 2014), ||V3|| PP 27-35
- Ujile, A. A. (2021b): Water-Energy-Food Nexus and Climate Change: The Challenges and Opportunities for Chemical Engineers, Plenary Session Paper, 51st Annual Conference/AGM Nigerian Society of Chemical Engineers (NSChE), Theme: "Chemical Engineering and the Changing World" 10th – 13th November 2021.
- Ujile, A. A. (2023): Inaugural Lecture Rivers State University, February: Contending with Reliability, Availability, Sustainability of Water and Infrastructure Protection using Chemical Engineering Mass Transfer, Series No. 85
- <https://www.flickr.com/photos/foeaction/3201462147/in/album-72157612649194256/> (Accessed on 8th September 2023)
- [https://www.flickr.com/photos/foeaction/3201462147/in/album-72157612649194256/\(https://www.researchgate.net/figure/Map-of-Akwa-Ibom-State-showing-Local-Government-Areas_fig6_320450251](https://www.flickr.com/photos/foeaction/3201462147/in/album-72157612649194256/(https://www.researchgate.net/figure/Map-of-Akwa-Ibom-State-showing-Local-Government-Areas_fig6_320450251) Accessed on 8th September 2023)

EDITOR'S NOTE:

For further information (e.g discussion of results) please refer to the author (Mobile: 0803 339 8876)

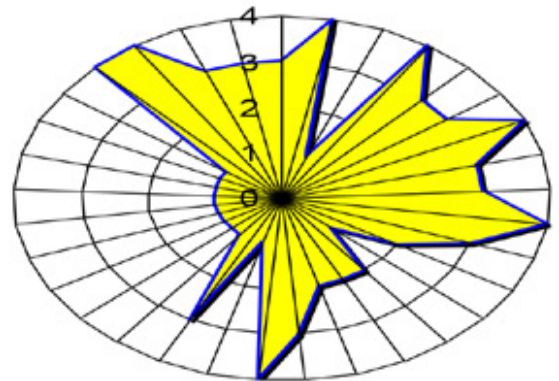
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STATISTICAL PROCESS CONTROL (SPC) FOR PROCESS ENGINEERS

1.0 INTRODUCTION

Statistical Process Control (SPC), as part of Chemical Engineering practice, is useful in ensuring the quality, efficiency and safety of chemical processes. It helps engineers to monitor, control and optimize manufacturing processes through statistical methods. Given the intricate nature of chemical processes, where minor changes can result in significantly different outcomes, the adoption of SPC is crucial.



*Engr. Olanrewaju, Adebayo
Bamidele, MNSChE, MNSE, AMIChemE
(Principal Consultant, Olanab Consults)*

2.0 BRIEF HISTORY AND EVOLUTION OF SPC

Statistical Process Control (SPC) is a technique used in statistical methods to identify deviations from a set standard. The method has evolved over the years as follows:

- i. **1920s:** Walter A. Shewhart of Bell Laboratories developed the foundational concepts of SPC, introducing the control chart.
- ii. **1940s:** During World War II, the U.S. military utilized SPC for war production, leading to widespread training on its techniques.
- iii. **1950s-1960s:** Post-war, while Western nations shifted focus from quality control, Japan embraced it. W. Edwards Deming, influenced by Shewhart, introduced statistical quality control to Japan, paving the way for their industrial renaissance and the emergence of Total Quality Management (TQM).
- iv. **1980s-1990s:** The West, inspired by Japan's manufacturing quality, rekindled their interest in SPC. Advancements in software tools and computers facilitated its implementation, and it became a cornerstone of the Six Sigma approach.
- v. **2000s-Present:** Modern technology has enhanced real-time monitoring and data collection in SPC. Its integration with digital manufacturing tools like MES and ERP systems has broadened its application. Today, SPC is also found in service industries, healthcare and other sectors.

3.0 WHY SPC IN PROCESS ENGINEERING?

Statistical Process Control (SPC) is a vital tool used in achieving the following in process industries:

- i. **Process Monitoring and Optimization:** Chemical processes are typically complex and involve many variables. SPC provides a systematic method for monitoring these processes, identifying deviations from desired conditions and optimizing process performance.
- ii. **Quality Control:** Quality control objective is to achieve product quality which is a major concern in chemical manufacturing. By implementing SPC techniques, chemical engineers can monitor critical quality attributes and ensure products meet specifications consistently.
- iii. **Cost Reduction:** Through regular monitoring and control of processes, inefficiencies and wastages can be identified and reduced. By detecting potential issues early, engineers can prevent costly breakdowns and ensure smoother operations.
- iv. **Safety:** Many chemical processes operate under conditions that can be hazardous if not properly controlled. SPC helps in monitoring conditions that might lead to dangerous situations, such as excessive pressure or temperature, ensuring that the process stays within safe operating limits.
- v. **Compliance:** Many industries have regulatory requirements for product quality and safety. Employing SPC helps companies ensure they are consistently meeting these regulations, thus avoiding potential legal complications.
- vi. **Reduction in Variability:** One of the primary aims of SPC is to reduce process variability. In chemical engineering, this means achieving a more consistent product quality and making the process more predictable.
- vii. **Enhanced Troubleshooting:** When a process goes awry, engineers need tools to diagnose and



Fig. 1: Animated illustration of statistical process control

rectify the problem quickly. SPC charts, such as control charts, can help identify the nature of the problem (whether it is due to common or special causes) and guide corrective actions.

- viii. **Feedback and Continuous Improvement:** SPC provides a feedback mechanism for processes. By continuously monitoring and analyzing data, chemical engineers can make incremental improvements, leading to better overall process performance.
- ix. **Documentation and Knowledge Transfer:** SPC charts and analyses can serve as documentation of process performance. This can be useful for training new engineers or for transferring knowledge between shifts or teams.
- x. **Predictive Maintenance:** Instead of following a set maintenance schedule, with SPC, engineers can perform maintenance activities based on observed performance and trends. This predictive approach can lead to more effective maintenance and reduced downtime. See animated illustration in Fig. 1.

4.0 DIFFERENCES BETWEEN STATISTICAL PROCESS CONTROL (SPC) & CONVENTIONAL ENGINEERING PROCESS CONTROL

Statistical Process Control (SPC) and the Conventional Engineering Process Control are both methodologies used to control and optimize processes, but they are based on different principles and have different applications. Here are the primary differences:

- i. **Definition and Focus:** SPC (Statistical Process Control): This is a method used primarily in manufacturing to monitor and control a process. It relies on statistical methods to detect variations in the process. The primary focus is on ensuring the process remains stable and predictable. On the other hand, Engineering Process Control (EPC) refers to control methods that are used to keep process variables close to a desired set point. The focus is on actively adjusting the process inputs to maintain the desired output.
- ii. **Tools & Techniques:** SPC: Uses tools such as control charts (like the X-bar chart, R-chart), process capability analysis, Pareto analysis, etc. EPC uses feedback and feedforward control loops, controllers like PID (Proportional-Integral-Derivative) and other automation techniques.
- iii. **Application:** SPC is typically applied to repetitive manufacturing processes where the output can be measured and charted over time. EPC is applied in scenarios where direct manipulation of process variables is possible and necessary, like controlling the temperature in a furnace or the speed of a motor.

- iv. **Control Approach:** SPC: Passive control method is used. If a process goes out of control (out of the established limits), it is an indication for the operator or quality control team to intervene. EPC uses active control method. It continuously adjusts the process to keep it near the desired set point.
- v. **Basis of Operation:** SPC is based on statistics and probabilistic reasoning. EPC is based on engineering principles and models of the process being controlled.
- vi. **Implementation:** Often, manual intervention is required when the process goes out of control, based on the indications from control charts. EPC involves automatic controllers and instrumentation to regulate the process continuously.

5.0 PROCESS VARIABILITY IN PROCESS SYSTEMS

This refers to the inherent fluctuations, inconsistencies, or differences in a process's outputs. For a manufacturing line, this might manifest as slight differences in the dimensions of produced items. In a service environment, it might refer to the varied time it takes to complete a task.

There are typically two sources of process variability:

- **Common Causes (or Inherent Variability):** These are the natural or expected variations that occur within a process. They are part of

the system and arise even when the process is under statistical control. Examples include minor fluctuations in raw material quality or ambient temperature changes.

- **Special Causes:** These are unexpected sources of variation, arising due to unforeseen issues. Examples might include a machine malfunction, an untrained worker, or an unexpected external event affecting the process. It is important to understand process variability for the following reasons:
- **Quality Control:** Understanding variability can help ensure products meet quality standards. See Fig. 2.
- **Process Optimization:** Minimizing variability can lead to efficient process, reducing waste, saving time and increasing profitability.
- **Predictability:** It enables better forecasting, planning and resource allocation.
- **Customer Satisfaction:** Consistent quality ensures customer satisfaction and loyalty.

6.0 PROCESS CAPABILITY AND PERFORMANCE

Process capability and performance refer to the ability of a process to produce output that meets customer requirements and specifications.

i. Process Capability: This represents the ability of a process to produce products that meet specification limits when the process is operating in a state of statistical control. Process Capability Index is used to compare the spread of the process capability to the spread of the specification limits.

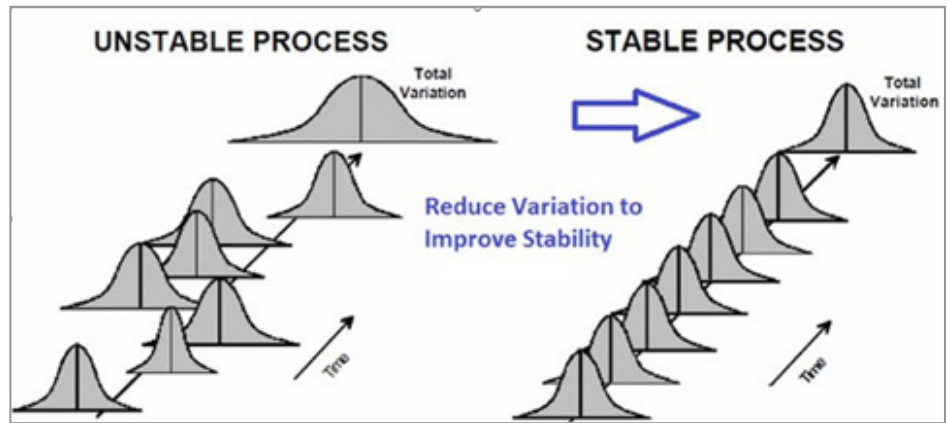


Fig. 2: Unstable and stable process.

Where, Specification Width = Upper Specification Limit (USL) – Lower Specification Limit (LSL) and, Process Width = 6 x Standard Deviation (if assuming the data follows a normal distribution). See fig. 3.

Process Capability Performance Index (Cpk): Takes into account the mean and variability of the process.

If Cpk is greater than or equal to 1.33, many industries consider the process as capable. However, these thresholds may vary between industries.

ii. Process Performance (Pp and Ppk): This represents the performance of a process when it may not be under statistical control or during its initial stages. Process Performance Index (Pp) is similar to Cp but refers to the overall performance, not inherent capability. Process Performance Performance Index (Ppk) is similar to Cpk but for overall performance.

iii. Interpretation:

- Cp: Indicates the potential capability of a process if it was centered perfectly between the specification limits. A CpCp of 1 indicates the process spread is equivalent to the specification spread. Values greater than 1 are desirable.
- Cpk: Takes into account the actual process mean and how far it is from the center of the specification limits. It gives a measure of the potential for the process to produce out-of-specification units. A CpkCpk of 1 indicates the process mean is one standard deviation away from a specification limit. The higher the CpkCpk, the better. A CpkCpk greater than 1.33 is often considered good in many industries.
- Pp: Similar to CpCp, but uses the standard deviation from observed data. It's an overall assessment of system spread to spec spread.
- Ppk: Similar to CpkCpk, but uses the standard deviation from observed data. It evaluates how the mean and variation of the process relate to the spec limits.

iv. Notes

- Cp and Cpk are based on short-term variation while Pp and Ppk are based on long-term variation.
- If Cp = Cpk, the process is centered perfectly.
- If Pp = Ppk, the process performance is centered perfectly.
- Capability indices should be used as part of a comprehensive

process control strategy, and not in isolation.

- Always make sure that the process is statistically stable (in statistical control) before calculating and interpreting capability indices. If the process is not stable, the indices can be misleading.

v. Differences between Capability and Performance

- a. Time Frame: Capability usually refers to the inherent capability of the process in the long term when the process is under statistical control. Performance refers to the short-term and might include special causes of variation.
- b. Purpose: Capability provides insights into how a process can perform when it is stable, while performance provides insights into how it is currently performing.
- c. Usage: Capability indices (Cp, Cpk) are often used once a process is stable to determine its potential. Performance indices (Pp, Ppk) can be used in the initial stages of process setup or during its running phase when it may not be under statistical control.

7.0 SPC TOOLS AND TECHNIQUES

SPC techniques rely on data, statistics and charts to analyze and optimize processes. Here are some common SPC techniques:

- i. Control Charts: These are the fundamental tools of SPC. They allow you to monitor the stability of your process. Common types of control charts include:
 - Individual/moving range chart (I-MR)
 - X-bar and R chart
 - X-bar and S chart

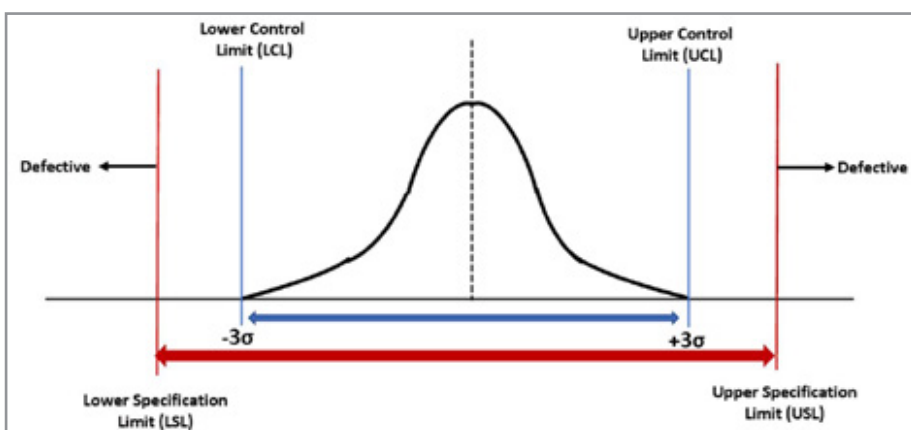


Fig. 3: Specification limits

- P-chart (proportion non-conforming)
 - NP-chart (number non-conforming)
 - C-chart (number of defects)
 - U-chart (defects per unit)
- ii. Process Capability Analysis: Once a process is stable (in control), it's essential to determine its capability. This involves comparing the natural variability of a process with the specified limits or customer requirements.
 - Cp, Cpk, Pp and Ppk are the common indices used for this analysis.
 - iii. Histograms: A graphical representation of data distribution, used to understand the process distribution and whether it fits the expected normal distribution.
 - iv. Pareto Analysis: Based on the Pareto principle (80/20 rule), this analysis helps prioritize the significant few causes from the trivial many. In SPC, it's used to identify and focus on the most significant sources of variation or defects.
 - v. Cause-and-Effect (Fishbone) Diagram: Also known as Ishikawa diagrams, these are used for root cause analysis. It visually represents potential causes of a problem, grouped into major categories.
 - vi. Scatter Plot: This is used to understand the relationship between two variables. If one variable changes, does the other one change, and how?
 - vii. Stratification: It's the separation of data gathered from a process into different categories to identify patterns or specific areas of concern.
 - viii. Flowcharts: Flowcharts are used to understand and visually represent processes, helping teams see the steps, inputs, and outputs.
 - ix. Run Charts: These are line graphs of data plotted over time. While similar to control charts, they don't have control limits. They can help in identifying trends or shifts in process data over time.
 - x. Check Sheets: These are simple data collection tools where you mark or check off data as events occur. They're useful in the early stages of data collection.
 - xi. Design of Experiments (DOE): This is a more advanced SPC technique that allows one to systematically change inputs (factors) in a process to determine their impact on the output

“By focusing on statistical measures and process capability, organizations can consistently produce products and services that meet customer specifications and expectations.”

(response). It's a structured way of determining the relationship between factors affecting a process and the output of that process.

8.0 SPC SOFTWARE APPLICATIONS

Some of the well-known ones include the following:

- **Minitab:** A widely used statistical software for quality improvement and statistics education
- **InfinityQS:** Offers quality intelligence solutions with SPC capabilities
- **WinSPC:** A real-time SPC software to improve product quality, reduce process variation, and optimize manufacturing processes
- **PQ Systems (CHARTrunner & SQCpack):** Provides quality control software solutions

9.0 STEPS FOR IMPLEMENTING STATISTICAL PROCESS CONTROL (SPC)

By focusing on statistical measures and process capability, organizations can consistently produce products and services that meet customer specifications and expectations.

The following are some steps in implementing statistical process control (SPC) in a typical organization:

- i. **Training and Awareness:** Train staff about the basics of statistics, process capability, and variation.
- ii. **Select Appropriate Metrics:** Determine what to measure based on customer needs, organizational objectives, or pain points.
- iii. **Collect Data:** Determine how frequently you need to collect data; Use sampling techniques when necessary; Ensure the data collection process is consistent and standardized.
- iv. **Construct Control Charts:** Use appropriate control charts based on the type of data; Common

charts include X-bar, R, p, np, c, and u charts; Determine control limits (usually based on +/- 3 standard deviations from the mean); Plot the data points and analyze patterns.

- v. **Monitor and Interpret:** Watch for out-of-control signals such as points outside control limits, runs of points above or below the centerline, or patterns indicating non-random variation; Investigate special causes of variation immediately.
- vi. **Improve the Process:** Use the insights from control charts to implement changes; Use other quality improvement tools such as Ishikawa diagrams, Pareto charts, and the 5 Whys for root cause analysis.
- vii. **Maintain Control:** Once the process is under control and improvements are made, continue to monitor with control charts.
- viii. **Integrate with other Systems:** Incorporate SPC into other organizational systems, like Quality Management Systems (QMS) or Enterprise Resource Planning (ERP) systems; Ensure cross-functional teams are aware of SPC results and improvements.
- ix. **Review and Audit:** Regularly review SPC processes and results; Audit the SPC system to ensure adherence to standards and protocols.
- x. **Foster a Culture of Continuous Improvement:** Ensure top management supports and promotes SPC and its principles.

REFERENCES

1. *Statistical Process Control*, Wikipedia.org, 15, February, 2023, https://en.wikipedia.org/wiki/Statistical_process_control
2. *Statistical Process Control*, Ted Hessing, 27 October, 2019, <https://sixsigmastudyguide.com/statistical-process-control-spc/>
3. *Statistical Process Control (SPC) Software*, SafetyChain, https://www.linkedin.com/products/safetychain-software-statistical-process-control-spc-software/?trk=organization_guest_product_card_related-content-card



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WORK-LIFE BALANCE FOR SUSTAINABILITY: AN ENGINEER'S PERSPECTIVE

BY ENGR. MRS. OLUREMI BOLANLE AYENI

1.0 INTRODUCTION

Success is essentially fulfilment. Sustainability implies something enduring. Stable life will encompass spiritual, physical and emotional stability. These require deliberate efforts, planning, focus, clear sense of direction, discipline, courage, knowledge, commitment, etc. You have to be intentional, strategic and proactive.



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of life. Evaluate where you are and document where you desire to be in the next 5, 10, 20, 30 years and onwards. The law of cause and effect or seed-time and harvest requires that plans and actions be tailored to birth the expected future. Do your SWOT and review constantly for improvement. Be consistent and organized. Set priorities and delegate work as may be necessary. Recognise distractions because your network will impact your network ultimately.

2.0 WORK-LIFE BALANCE IN ALL RAMIFICATIONS

Creating the quality of life that you desire is possible with prayer and the choices made along the journey

“Creating the quality of life that you desire is possible...”



“Let your family members know that you value them and care about them. Set goals for your immediate family members and carry...”



3.0 FAMILY AND KEY RELATIONSHIPS

This is the bedrock of a stable life from cradle to exit. There is a need to take this as very important. Be connected in the different roles in the family. Let your family members know that you value them and care about them. Set goals for your immediate family members and carry them along. Be present, attentive to various concerns. Communicate and listen. Encourage and build trust, confidence, love and respect. Ensure regular quality family time, create fun and exciting memories. Parenting is particularly demanding but rewarding; pay the price and expect compound beneficial effect overtime.

4.0 HEALTH AND WELLNESS

Physical and emotional wellness are premium resources. Time management and working smarter should be well applied at work and in the home. Avoid crowded schedules and exhaustion. Aim to be purposeful and productive, not just busy. Emotional intelligence is the ability to manage your feelings, thoughts and respond appropriately to situations with respect to the opinion of other people. This helps in managing teams and relationships. On the physical side, diet, rest, exercises, stress management, hobbies and necessary lifestyle adjustments should be applied wisely to achieve a healthy life.

5.0 FINANCIAL STABILITY

Imagine your ideal future and take responsibility for it. Set goals, dream big, aim high so you can at least achieve reasonably. Ignorance is not bliss when

it comes to money management. Build knowledge in financial literacy. Know the basics about savings, investing, budgeting, assets, liabilities, inflation, compound interest. Do annual review of your assets and retirement plan. Be frugal and teach your family to be good stewards of resources. Aim to be among the 20% that are estimated to be comfortable.

6.0 EVOLVE OR EXPIRE-SELF DEVELOPMENT IN A DIGITAL AGE

Time is life so avoid time-wasting activities. Who you become will be the basis of what you achieve. You need knowledge, insight, contacts, mental alertness, commitment to excellence and continual improvement to advance appropriately in life. Ensure you have your daily ‘me-time to read’ arrangement. Learn skills, update via podcasts on specific subjects that can propel you. Identify role models, mentors, coaches and pay to learn where necessary. Keep journals and notes as you plan and learn. Review your strategies and priorities from time to time.

7.0 CONCLUSION

Aim to create the quality of life that is in balance. Be intentional, disciplined, strategic and creative. Document your short and medium term goals (family-fitness-finance). Plan, prioritise and take consistent actions. Be proactive, not reactive. Scan the external environment and adjust constantly. Be open-minded, adaptable and motivated. Focus on the big picture. Take responsibility for your life.



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LEVELUPS

SERIES

10kVA - 8MVA

3:3

PHASE

3:1

PHASE



DATA CENTER



MEDICAL



TRANSPORT



INDUSTRY



EMERGENCY

ONLINE UPS



kW=kVA

96%
Efficiency



UPS ONLINE



TOWER



POWER FACTOR



SERVICE



- TELECOMMUNICATIONS
- CRITICAL ICT LOADS
- HEAVY INDUSTRIAL LOADS
- DATACENTER
- MANUFACTURING
- TRANSPORT
- EMERGENCY

HIGHLIGHTS

- True Three Level Rectifier and Inverter Technology
- Ultra High Energy Efficiency
- Full Rated Power Factor kW=kVA

Innovative 3 Level Technology

- LEVELUPS Series with Innovative 3 Level Technology is a true on-line double conversion, three-phase UPS system that provides one of the highest level energy efficiencies in the industry.
- Three level inverter & rectifier design LEVELUPS Series brings the newest power conversion technology and delivers efficiency up to 96% at 50-75% load operation which is the most common operating range.

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