

Bunkering, Artisanal Refining and the Prospects of Modular Refineries in the Niger Delta.

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Abstract

The issue of crude oil and allied products theft and bunkering has been on since the late 1970s. This early illegal activity was mostly associated with top military personnel charged with the responsibility of safeguarding the flow of petroleum products in the country and their collaborators. Illegal bunkering by youths in the Niger Delta became popularized in 2007 when youths engaged in the siphoning of fuel condensate popularly known as “Asari Fuel” (in local parlance) from the Soku fields in Asari Toru Local Government Council of River State. This was in direct response to decades of environmental degradation, neglect, impoverishment, unemployment, human right abuses, severe shortages of refined crude oil products and state repression. Also, the widespread distillation of crude oil into low quality end-user products in the Niger Delta is even a more recent provenance traceable to, but not earlier than 2003/2004. These activities coupled with wilful vandalism of pipelines conveying oil and gas products had become of great concern by the time of Buhari’s first outing as military head of state in Nigeria, enough to be included in the economic crimes for which a death penalty was the prescription by the military administration. Against the backdrop of recent pronouncements by principal officers of the current leadership of the Nigerian state, this research considers the potential of modular refineries to serve as an alternative to crude oil theft, bunkering and illegal refining of petroleum products and observes that every where the concept of modular refinery has been embraced, it has been only a stop-gap measure either owing to dearth in funds needed to establish the more traditional refineries or as an interim measure to meet local demands and allow governments ample time to re-strategize on the growth of existing but ailing traditional refineries.

Key words: Crude petroleum oil, bunkering, modular refinery, artisanal refining,

1. Introduction: Definition of key words

Crude petroleum oil is a natural chemical compound consisting principally of aggregates of carbon and hydrogen atoms. It has been referred to as the Black Gold in local parlance, “the devils excrement” and an extra-ordinary natural resource. This singular resource has the potential to reconfigure the state, deconstruct governments, restructure the society and seduce the elite. Bunker, on the other hand means, amongst other things, a container for fuel. Therefore bunkering in the context it is used in this paper means stowing away of crude oil and allied products in bunkers. To that end, it has become impossible to dissociate oil theft from bunkering.

A modular refinery can be defined as a mini processing plant which has been constructed and mounted entirely on a skid structure. It is easier and relatively more cost effective to build, install and even more portable than the traditional refinery. Artisanal crude oil refining refers to the processing of crude oil into allied products by skilled workmen who may not be professionals.

2. Background

Since the early 1970s, no single natural resource has defined the trajectory of the global economy like crude oil. None has had the contrasting effects on the people, society and economy of the Nigerian state than oil. Globally, oil is reported to have lifted nations out of poverty, and transformed barren “desert kingdoms” into earthly paradises, but in the same vein, it has equally caused misery, conflict and wars in other societies, especially in the Niger Delta region of Nigeria. In Nigeria, the elites have united around the sharing of the oil proceeds and using same to either starve off or suppress sovereign separatism while alienating the downtrodden masses and engendering rebellion in the Niger Delta especially in the oil producing areas. Oil has made most people with access to power exceedingly rich, caused grinding poverty and impoverishment of the general population through mis-rule, environmental degradation, a collapsed wealth redistribution process and the stifling of sustainable wealth creation initiatives.

According to Naanen (2017), illegal bunkering was popularized at about 2007 in the Niger Delta by local youths who engaged in siphoning fuel condensates, then referred to as “Asari fuel”, from the Soku fields in Asari Toru LGA of Rivers State. This infraction became widespread through the massive distillation of crude oil into end-user products in the region. Within this period, the theft of petroleum products was still being referred to as “illegal bunkering”, indicating that the term, artisanal refining (illegal local refining) did not exist in the lexicon of the Nigerian oil/political economy until about ten years ago.

However, the etymology of oil theft (known then as illegal bunkering) in Nigeria is traceable to the late 1970s when it was mostly associated with military personnel entrusted with the responsibility of protecting the flow of petroleum products in the region/country. During the first reign of Buhari as Military Head of State (1983-1985), the activity in which the civilians were now key players, coupled with the attendant wilful vandalization of pipelines, had become of great concern, enough to be included in the economic crimes of the Nigerian State for which a death penalty was prescribed by the then military administration. Again, the infraction persisted and assumed an alarming dimension following the country’s transition from military to civilian rule in 1999- a period characterized by protests against environmental injustices, ranging from pollution, neglect, inadequate infrastructure, to mis-rule in the oil and gas bearing Niger Delta region. A few years into the civil rule, the trigger factors for conflict in the region, which have been brewing for decades seemed to have taking

roots and manifesting in livelihood concerns from decades of pollution, neglect, corruption, unemployment, impoverishment, severe shortages of refined petroleum products, human right abuses and latent state repression. The stage was set for insurgency in the region as civil groups and government representatives opted for resource control and self determination. These agitations resulted in two proclamations notably; the Ogoni Bill of Rights in 1990, followed by the Kaiama Declaration in 1998. These bold declarations gave impetus to militant wings which visibly took over the struggles for their realisation from the civic movements.

The insurgents caused a sustained massive and coordinated disruption of oil and gas production. The situation became so real and fraught with threats to economic stability that at the meeting of the Group of 8 (G8), the most industrialized countries of the World, the then Nigerian President, Umaru Musa Yar'Adua (2007-2010) requested assistance from the international community to tackle the twin menace of insurgency and oil theft in the Niger Delta. His call was made against the backdrop of popular public impressions and intelligence reports indicating that proceeds of stolen/bunkered crude oil were deployed in sustaining insurgency in the region. Evidently, the Niger Delta insurgency was (and still) a transient and insignificant part of a well syndicated network of crude oil theft in Nigeria.

3. The Effects of Crude Oil Theft, Bunkering and Illegal Refining

Many synthetic organic compounds are extremely resistant to natural break-down processes and once released into the environment may persist for years and even decades because of their chemical structure(s). And crude oil being one of them, pose very serious threats to environmental health, security and safety. Adverse effects of crude oil contamination on the natural environment include poisoning of biota (plants and animal species), alteration of the ecosystems in ways sometimes unimaginable and human health risk factors amongst others (McGuinness and Dowling, 2009).

3.1. The Fate of Crude Oil in the Environment

In the event of a spill or exposure to the environment, crude oil owing to its nature/chemical composition suffers the following fate:

- i) The volatile constituents volatilize into space (volatilization)
- ii) The water soluble components would dissolve into aqueous phase and either adsorbed to soils/roots, absorbed by plants or evaporated (evaporation).
- iii) The left over crude is thereafter acted upon by photolysis and chemical decomposition to break down the hydrocarbons bond over time.

3.2. Effects on Atmosphere

As stated earlier, volatile organic compounds (VOCs) and the poly-aromatic hydrocarbons (PAHs) are vapours emitted by various petroleum products, e.g. Oils, petrol, diesel, pesticides, paints, cleaning supplies and even adhesives- many of which have short and long term adverse effects and significantly induce carcinogenic and mutagenic reactions in the population (Gartner, 1994).

3.3. Effects on Groundwater

Groundwater is one of the numerous media by which humans, plants and animals come in contact with petroleum hydrocarbons pollution. Spilled petroleum hydrocarbons are usually drawn into sub-soil by gravitational pull and sustained until a bed rock is met depending on the volume of spill. The major concern with crude oil spill remains its contamination of ground water and the challenge to clean-up subsequently.

3.4. Effects on Soil

The presence of crude petroleum oil in the soil creates an unsatisfactory condition for life in the soil due to poor aeration, immobilization of nutrients, lowering of soil pH (Atuanya, 1987) and the alteration of the physical and chemical properties of the soil which in turn impact fertility and growth of plants (Chronopoulos *et al.*, 1997).

3.5. Effects on seed germination

The impact of petroleum hydrocarbons contamination includes retardation of seed germination, reduction of plant growth in height, stem density, photosynthetic rate, biomass or complete mortality (Pezesky *et al.*, 2000).

3.6. Effects on Food Security

One of the major concerns of crude oil contamination after every spill incident is the impact on farm lands or food production. For example, in Nigeria, 45 percent of crude oil spills that occurred on arable lands have affected farmlands in which crops such as rice, maize, yams, cassava, plantain etc were cultivated (Onyefulu and Owobajo, 1979).

3.7. Effects on Food Chain

Crude oil contamination impacts on the food chain. This is so because organisms at higher trophic levels tend to have greater concentrations of these bioaccumulated toxins stored in their fatty tissues than those at lower levels resulting in biomagnifications of the physical effects of the toxins in higher organisms. In the case of humans, ingested toxic organic compounds can be passed from mother to child either in *utero* via the placenta or *post-natal* via breast milk (McGuinness and Dowling, 2009).

3.8. Effects on Human Health

As stated earlier, many of the toxic synthetic organic compounds are persistent and stored in fatty tissues due to their hydrophobic properties (poor miscibility). The PAHs and BTEX components of petroleum hydrocarbons affect the liver, lungs, kidneys and nervous system leading to cancer, immunological, reproductive, fetotoxic and genotoxic effects (Akutam, 2012). Also, the Earth-Repair Report (undated but accessed in 2014) has indicated that many of the chemicals present in spilled crude oil cause headaches, nausea, vomiting, kidney damage, altered renal functions and irritation of the digestive tract, lung damage, burning pain in the nose, throat, coughing, pulmonary oedema, cancer, poor muscle coordination, dizziness, confusion, irritation of skin, eye, nose and throat, difficult breathing etc. Again and expectedly, the main pathways to chemicals and impacts are through indecent exposures, inhalation, skin and eye contacts.

Furthermore, just at the point of putting this paper together, news had it that about 20 operatives of an illegal local refining facility were burnt to death at a camp site (location not indicated).

3.9. Effects on the Marine Ecosystem

When crude oil spills into mangrove environments, the tidal influences that characterize the ecosystem provides for wider dispersal and distribution in the inter-tidal flats resulting in the deposition of crude oil and or other petroleum products on the aerial roots and sediments. Thus, crude oil covers the breathing roots and pores, thereby asphyxiating the sub-surface roots that depend on the pores for oxygen transfer (Odu *et al.*, 1985). This in turn impairs the normal salt exclusion process resulting in the accumulation of excess salt in the plant contributing to enhanced stress conditions of the plants and ultimately to death, loss of mangrove plants, habitat destruction and degradation (Imevbore, 1979).

3.10. Effects on the Economy

According to Naanen (2017), in 2014 crude oil theft through siphoning from pipelines and well heads and losses stood at 145,000 bpd. The estimate did not take into account losses due to 3rd party infractions on pipelines other than the Trans-Niger Pipeline (TNP), and the alleged famous loading theft at the export terminals which are increasingly not accessible; all of which could have made a daily loss of about 200,000 bpd. Therefore, taking into cognisance, the average OPEC price of \$105 per bbl by 2014, this would have amounted to a daily loss of 21 million dollars or US\$7.56 billion dollars per annum at the time. On its part, the Nigerian Extractive Industry Transparency Initiative (NEITI) estimated that about \$11 billion was lost by the Nigerian government between 2009 and 2011 due to the activities of oil thieves (Onoja, as cited by Social Action, 2014). The Nigerian National Petroleum Corporation (NNPC) put losses arising from theft of refined petroleum products from the pipelines at N1, 757 billion in

2016. There is no doubt that the unstable global oil prices since 2016 would affect these figures by today's reckoning but the loss definitely remains significant to warrant a sustained action against oil theft, bunkering and illegal refining.

4. The Modular Refinery: Prospects and Challenges

A modular refinery may be described as a crude oil processing plant which has been constructed and mounted entirely on a skid structure. It is easier and relatively more cost effective to build and install in terms of capital and time than the traditional refinery. They are usually available in a range of installed capacity units of 3,000 to 30,000 barrels per day (bpd) (Genam Energy Partners in Detailsolicitors.com, 2016) and therefore have a lower output capacity than the traditional refineries. Each structural unit may contain a portion of the entire processing plant and through a network of (interstitial) piping, the components link together to form an easily manageable processing plant. The relatively low capital outlay, speed and ease of construction have been prescribed as some of the advantages of modular refineries. The idea of modular refineries has been embraced in Asia and Middle East countries as a short term solution to meeting local petroleum products demands.

4.1. Etymology of Modular Refinery in Nigeria

The concept of modular refinery has been conceived since 2014/2015 following the dwindling fortunes of the Nigerian economy, particularly in the light of the drop in the value of her currency- the Naira and the fluxes in prices of oil at the global market. Thus, it became pertinent for Nigeria to seek alternative means of generating revenue to substantially reduce its import portfolio. One of the ways to achieve the objective was to ensure that Nigeria increased her refining capacity to the level that she would be less dependent on the importation of refined petroleum products which constituted and still constitutes the bulk of her imports. Also, it was the understanding at the time that this would put less pressure on the foreign reserves and ultimately shore up/boost the value of the Naira. It was indeed based on the above narratives that the federal government of Nigeria began to license modular refineries for operation in the country. However, to be able to increase the bankability of the modular refinery project and be able to attract private sector investments, there are the following conditions that must be fulfilled.

- i. Proximity and access to crude oil products and sizeable local markets to reduce transportation and distribution costs.
- ii. Access to funds on more favourable and preferential terms such as longer tenures and reduced equity contributions and

- iii. Availability of government incentives through a well balanced legal and regulatory framework that promote investments and guarantee returns on investments.

Furthermore, it would be of interest to note that there is generally a poor return on investments made in refineries and this reason is cogent enough to make government intervention an absolute necessity either directly – in which case refineries would be publicly funded and managed or indirectly – through various other government incentives/arrangements (Konstantinus Nikolaras, Dundee.ac.uk as cited by Detailed Commercial Solicitors, 2016).

4.2. Challenges

- i. As earlier stated, modular refineries have lower throughput and lower value products than the traditional refineries.
- ii. They require more staff per Effective Distillation Capacity (EDC) than the traditional refineries.
- iii. Consequent upon “ii” above, they are less efficient than the traditional refineries.

4.3. The Legal and Regulatory Framework of Modular Refineries in Nigeria

Following the law of the federal government to licence modular refineries in Nigeria, the Department of Petroleum Resources (DPR) concluded plans to issue twenty-three (23) licenses to investors seeking to establish modular refineries in Nigeria in order to increase local refining capacity, sustain supplies and achieve reduction in the importation of petroleum products into the country. The DPR then published the guidelines on the establishment of modular refineries in Nigeria in 2015. The guidelines contain three licensing stages which must be sequentially followed before a processing plant can be commissioned for operations as follows:

- i. License to Establish (LTE)
- ii. License to Construct (LTC); and
- iii. License to Operate (LTO)

License to Operate (LTO), whether to operate a petroleum refinery or a petrochemicals and gas plant, is valid for two (2) years. This may seem a grossly inadequate time considering the potential recovery time on investments in modular refineries. Also, it must be noted that 18 LTEs were granted, out of the 23, but only one (1) is operational – the Niger Delta Petroleum Resources Modular Refinery which produces automotive gas oil (AGO), popularly known as diesel (Vanguardng.com, 2015). Again, only recently in 2017, an EIA was conducted on another plant proposed for the Gbarain axis of Bayelsa State. It is interesting to state that the state of the 17 LTEs have not been explained to Nigerians by the DPR.

In 2015, the DPR further announced that it had reduced the licensing fee from US\$1 million to US\$50,000 in order to woo potential investors (Vangardng.com, 2015). This is, however, still above the average cost of purchasing a modest modular refinery which is put at about US\$5 million - less freightage, land purchase fee and installation charges. All of these costs/ fees/charges together may seem prohibitive and therefore put the affordability of the modular refinery beyond the reach of the average Niger Delta investor, unless there are substantial regional governments' investments in the modular refinery project.

Therefore, considering the cost, terms and conditions following a successful procurement of a modular refinery project, it is advised that, for a population and economy as large as Nigeria's, the successful operation of modular refineries can only serve stop-gap measures and should not be seen as ultimate solutions to her challenges. Accordingly, government should, as a matter of necessity, continue to pursue and explore options which maximize outputs from traditional refineries to meet local consumption and international demands.

5. Summary and Conclusion

The discussion was focused on the prospect or potential of modular refinery to serve as an alternative to traditional refineries. Initially, modular refineries were conceived to address theft and bunkering carried out on a large scale by syndicates connected to the topmost-official-levels. Thus the modular refinery dimension was only introduced as a result of the epileptic state of the government owned traditional petroleum refineries which created chronic shortages of refined petroleum products and in turn triggered the development of the thriving illegal local (artisanal) processing of petroleum products. This was, however, part of the grievances of the youths of the Niger Delta region. But having used environmental injustices as reasons for crude oil theft, bunkering and artisanal refining, to carry on in manners that further subject the environment to greater threat of degradation has put humanity at greater risks. This has made the grievances seemingly illegal and unsustainable.

Therefore, given the limited resources available for capital intensive projects such as traditional refineries, the idea of modular refinery has become more attractive and has therefore been embraced as a short term solution to meet local demands especially in less populated and less developed climes. But its slow pace of take off is becoming worrisome in Nigeria and it calls for further interrogation of the enabling processes for purposes of eliminating barriers to its implementation. Moreover, it has visible advantages in its relative small size (portability) and cost effectiveness to build and install over the traditional plants. Its man-day requirement per EDC makes it labour intensive and quite capable of mopping up a substantial number of the teeming unemployed youths of the region. However, it has been associated with very poor returns on investments which make government intervention absolutely necessary.

In conclusion, whereas the establishment of modular refineries seeks to increase local refining capacity, sustainable supplies of refined petroleum products and reduce the importation of finished petroleum products into Nigerian, this paper advocates that the use of modular refineries should not be seen as the ultimate solution. Rather, governments should refurbish existing refineries and build new ones as well as permanent alternatives to crude oil bunkering and artisanal refining in the Niger Delta.

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