

Kerosene Adulteration in Nigeria: Causes and Effects

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ABSTRACT

Kerosene is a combustible hydrocarbon liquid which is distilled in modern refineries as one of the numerous products of crude petroleum oil. Its chemical characteristics make it a versatile product in usage. In Nigeria, it is the main fuel used for cooking and lighting especially by the majority of the poor citizens as an alternative to electricity and gas. Kerosene scarcity is a serious problem in Nigeria. Scarcity was caused mainly by; inadequate importation of the product and its diversion from domestic uses to other areas. Kerosene scarcity has led to kerosene adulteration which has become prevalent in Nigeria. Kerosene adulteration could be deliberate or inadvertent. Most kerosene adulteration was for economic gains. Kerosene subsidy has also encouraged kerosene diversion. Kerosene adulteration had been implicated in all the kerosene explosions that were recorded in Nigeria. Each time such explosion occurred, several persons were brought to death and several hundreds of victims were incapacitated or disfigured. The paper concluded that subsidy is injurious to the Nigerian economy and therefore recommended the removal of all petroleum product subsidies and the liberalization of all the downstream activities in the petroleum industry and that government should provide the enabling environment for the industry to thrive and attract private investors in the productive sector of the Nigerian economy.

Key words: Kerosene, Adulteration, Explosion, Subsidy, Scarcity

INTRODUCTION

Kerosene is a combustible hydrocarbon liquid (Anon, 2009). The early production of kerosene was distilled from oil extracted from shale and bitumen (Zayn, 1995). Today, kerosene is distilled in modern refineries as one of the numerous products of crude petroleum oil. It is called kerosene in Nigeria and paraffin in some countries. Thus, kerosene and paraffin can be used interchangeably. Kerosene is of two grades; the domestic kerosene which is called the House Hold Kerosene (HHK) and the jet kerosene which is called the Aviation Technical Kerosene (ATK). This work was on HHK and it was simply called kerosene except where clarification became imperative.

Characteristics of Kerosene (HHK): Kerosene is a colourless thin mineral oil whose density varies between 0.75 and 0.85 g/cm³. It has been described as a mixture of carbon that contains between 6 and 16 carbon atoms molecule. While kerosene is miscible in petroleum solvents, it is not miscible in water. The flash point of kerosene is between 37°C and 65°C and its auto ignition temperature is 220°C (Anon, 2009). The volatility of kerosene is very low.

Hence, a lighted match stick if thrown into a pool of it will quench. If not properly combusted as fuel indoor, it produces unpleasant odour and emits fumes which becomes poisonous in insufficient concentration.

Uses of kerosene: Kerosene has many uses. In Nigeria, it is the main fuel used for cooking and lighting especially by the poor, who are in the majority, as an alternative to electricity and gas. Some other uses include:

- fire breathing, fire juggling and fire dancing in the entertainment industry for fire performances because of its low flame temperature when burnt in free air.
- powerful antidote for snakebites.
- poured on the surface of stagnant pond of water as local insecticide .
- local disinfectant to treat cuts, burns, athlete foot, ring worm, hemorrhoids and stop bleeding.
- as a solvent in engineering for the removal of hard to remove mucilage, candle wax on

glass, degreaser and lubricant for cutting glass, machining aluminum and its alloys.

Storage and transportation: In Nigeria, the three popular petroleum products that are in general use are; Petroleum Motor Spirit (PMS), Automotive Gas Oil (AGO) and House Hold Kerosene (HHK). These products are commonly and regularly moved and stored. By legislation, both their transportation lines, vessels and storage tanks are to be coded (NNPC, 2001). The table below shows the approved colour codes.

Table 1: Colour Codes of the storage and transportation vessels of petroleum products

Product	Colour Code
Motor Spirit (PMS),	Red
Automotive Gas Oil (AGO)	Green
House Hold Kerosene (HHK)	Yellow

Source: NNPC Operations Manual, 2001.

Unlike gasoline, kerosene only expands and contracts very slightly with ambient temperatures. Since kerosene is less volatile, expands and contracts very slightly at ambient temperature, it is safe to store it in plastic containers and any steel tank which is provided with a vent or some head space left in the tank (Miles, 2011).

Method of distribution and sale of kerosene: In most Countries, kerosene is readily purchased at filling station or delivered to homes. In Nigeria, kerosene consumers have unhindered access to the product from various outlets which include; NNPC licensed and unlicensed petroleum products filling stations, unlicensed surface tank operators who locate surface tanks of various sizes within their residential houses, roadside hawkers and the very small mobile hawkers.

Kerosene adulteration: Kerosene may be adulterated by adding other liquids which may be miscible or immiscible. In Nigeria kerosene Adulteration comes from the addition of water or PMS, or AGO or gas condensate depending on the price deferential between the product and the adulterant. In a recent survey by the Department of Applied Science and Technology in the Oyo State ministry of Industry, four out of the five samples of diesel taken from filling stations within the Ibadan

metropolis in the south west of Nigeria indicated up to 70% kerosene adulteration (Adeniran, 2010).

The aim of this paper is to find the sources, causes and consequences of kerosene adulteration and its effects on the Nigerian economy.

METHODOLOGY

Data were collected from by structured questionnaire and personal interview with the relevant stake holders (the operators in the industry and the end users). Data were also collected from the various publications of the Nigerian National Petroleum Corporations and press releases of the various governments and petroleum products' operators.

Findings

The findings are as follows:

Sources of kerosene adulteration: In his recent alert message to Nigerians, Ajuonuma (2011) reported that, some unscrupulous kerosene dealers in the country have cultivated the habit of adulterating HHK in their bid to cream off excess profit from the sale of the product. The major sources of adulteration were discussed under two broad headings, deliberate and inadvertent Sources

Deliberate sources: Several times, there had been controversy over the sources of adulteration. Often times, blames had been traded between the NNPC, Petroleum Products Marketing Company (PPMC) and the dealers with each body passing the bulk. Recently, officials the National Union of Petroleum and Gas workers (NUPENG) confirmed that some major dealers mix kerosene with other products in various proportions to obtain the product of higher monetary value and in high demand to make abnormal profits (Udeme, 2011). They also reported that, some transporters had also been involved in product adulteration. In their investigations, the Petroleum and Natural Gas Senior staff Association of Nigeria (PENGASSAN) reported that, some marketers adulterated products in their tank farms (Ogun, 2010). Kerosene was also adulterated through deliberate addition of water to increase its volume.

Inadvertent Sources: Water was found to have inadvertently adulterated kerosene through seepage into the underground tank from the surrounding soil. It was also found that, the method of transportation of the products by most dealers aided adulteration.

Most dealers who were expected to have different colour coded trucks for each product possessed only one truck which was used to convey all the products, whichever that was available. In the process, the left-over product in the tank got mixed with the new, thus adulterating the new product inadvertently. Similarly, adulteration was found to have resulted at the PPMC depots' pipeline, where care was not taken to properly flush out the first product pumped before the line was used to pump a different product. The local poor, who distilled kerosene from AGO by simply dissolving some quantity of alum in the AGO.

Causes of kerosene adulteration: One major cause of kerosene adulteration is the scarcity of the product in the market. In spite of the repeated assurances from NNPC that, several million litres of kerosene had been pumped into the market, kerosene scarcity remained a reality in Nigeria ((Shosanya, 2011 and Babalola, 2011). Kerosene scarcity was blamed on the below listed economic factors:

- low capacity utilization at refineries resulting in low outputs
- poor maintenance of refineries which resulted in frequent and prolonged shut down
- the closeness of the characteristics of the HHK and ATK encouraged adulteration and diversion of HHK to ATK uses (Nwachukwu, 2011)
- illegal tampering of pipelines to siphon petroleum products the large price differential between the price of kerosene and the other products motivated the dealers to adulterate one product with the other product and divert the product for other uses thus creating scarcity (Babalola, 2011).

Other factors that encouraged kerosene adulteration in Nigeria included:

- the government controlled price regime of petroleum products and government subsidy which have been grossly abused by government functionaries and their agents
- mismanagement of kerosene subsidy
- undercutting of government subsidy on petroleum products through smuggling and products diversion

- some locals distilled HHK from AGO to gain access to the use of the product because of scarcity of kerosene and its attendant high market price.
- the use of common storage tanks, pipelines and vessels interchangeably without proper cleaning after each use resulted in product adulteration
- the failure of the relevant petroleum products regulatory bodies to ensure and enforce compliance with the regulations governing the handling of petroleum products.

Consequences of Kerosene adulteration: Kerosene scarcity has been the major cause of kerosene adulteration which has forced consumers to the use of other alternative hydrocarbon substances which has also led to deforestation, generation of large quantity of carbon monoxide and other ozone layer depleting substances. It has also put pressure on domestic gas demand thus forcing the price of cooking gas upwards. Kerosene adulteration had been implicated in all the various kerosene explosions in Nigeria.

Kerosene explosions in Nigeria: The first major kerosene explosion in Nigeria occurred in March 1984 in Lagos ((Emewu, 2001). There have been several other kerosene explosions in Nigeria since then particularly in the oil petroleum producing areas of the south-south Zone of Nigeria (Enogholase, 2007). The recent being the ones that occurred almost at the same time in the Rivers and Edo states of the south-south zone of Nigeria. Each time such explosion occurred, people have been incapacitated or disfigured. Loss of lives and property has also been recorded (NAN, 2011 and Naija4life, 2011).

It was reported that, each time that an explosion occurred, neither the NNPC, PPMC nor the dealers has accepted liabilities or responsibilities for the treatment of the victims (Emewu,2001). NNPC which in 1984 accepted responsibility to compensate the victims later reneged, on its promise seventeen years after. Since the number of the victims in Nigeria was more in Edo state than any other parts of the Country, the governor of Edo state approved the setting up of a committee in August 2003 to raise funds for plastic surgery and rehabilitation of the 2001 kerosene victims of the state (Okhomina, 2003). The committee was expected to source for assistance from NNPC/PPMC, major and independent marketers of

petroleum products as well as philanthropic Nigerians. Though more than two billion naira was reportedly raised, the programme failed as the fund was mismanaged. The few victims who were taken out of the country for plastic and skin surgery were sponsored by some non-government organizations (Amaize 2003 and Amaize 2004). However, one major cause of kerosene adulteration which often resulted to explosion was the scarcity of kerosene.

Management of Kerosene subsidy: Kerosene subsidy which though was planned by government to as welfare facility for kerosene users had on the contrary created fortune for the petroleum products dealers and hardship for the kerosene users.

Table 2 below is used to present the computation of the subsidy values, profits to the dealers and the attendant costs to the kerosene users.

Table 2: Computed Profits and subsidy on the popular Petroleum Products

	Import landing cost (₦ /litre)	Marketer Markup Margin (₦ /litre)	Expected Open Market Price (₦ /litre)	Approved Retail price (₦ /litre)	Government Subsidy (₦ /litre)	Dealer's Official Profit (₦ /litre)	Current Market Price (₦ /litre)	Dealer's Super normal Profit (₦ /litre)
HHK	130.28*	13.20*	143.48*	50.00*	93.48	13.20	120.00	83.20
ATK	130.78*	9.50*	140.28*	140.28*	0.00	9.50	140.28+	9.50+
AGO	127.03*	13.20*	140.23*	140.23*	0.00	13.20	140.23+	13.20+
PMS	118.12*	13.20*	131.32*	65.00*	66.32	13.20	65.00	13.20
HATK	130.28*	13.20*	143.48*	50.00*	93.48	13.20	140.28+	103.48+
HHK + AGO	128.66	13.20	141.86	95.12	46.74	13.20	140.23+	58.31+

Sources: Computed from the figures on the Website of the Petroleum products pricing Regulatory, Agency daily Market Template, as at March 22, 2010 and the operating market prices.

*Prices as quoted by the Petroleum Products Pricing regulatory Agency daily Market Template March 22, 2010.

+ The market price stated is the minimum price. The dealer is at liberty to sell higher.

Computed Subsidy Values: The cost of subsidy on HHK is ₦93.48 per litre. Given that the daily demand of HHK in Nigeria is 10×10^6 litres, the annual demand of HHK is approximately $3,650 \times 10^6$ which amounts to ₦341.202 x 10⁹. Although ATK is not officially subsidized by government, the government inadvertently subsidized it, at a cost of ₦93.48 per litre when HHK is diverted to aviation usage by adulteration and sold as ATK (For identification, it is labeled as HATK in the table). Similarly, AGO is inadvertently subsidized to the value of ₦46.74 per litre when HHK is diverted to automotive usage by adulteration at equal proportion with HHK and sold as AGO (For identification, it is labeled as HHK+AGO in the table). This is not peculiar to Nigeria. About 40% of the kerosene supplied for domestic use in India was diverted for some unintended purpose (Anon, 2008). The report added that, half of this was used for

adulteration of diesel and lubricants. In another study by the Indian National Institute of Public Finance and Planning (NIPFP), the subsidy on Kerosene created undue price advantage against other fuels and created ground for smuggling to neighbouring countries.(Anon, 2008).

Profits to the Dealers: If HHK is sold at the approved price of ₦50.00 per litre, the Profit to the dealer is ₦13.20 per litre. If it is sold at the market price of ₦120.00, the dealer makes an abnormal profit of ₦83.20 per litre. When HHK is sold as ATK, the dealer makes a supernormal profit of ₦103.48 per litre. When HHK is mixed with AGO and sold as AGO, the dealer makes a supernormal profit of ₦58.31 per litre. Similarly in India, dealers were reported to have been making a rough yield of \$90/barrel, which was more than what an oil producing company could make pumping crude oil from the ground (Anon, 2011).

Costs to the Kerosene Users: Subsidy is injurious to the Nigerian economy. It is also injurious to the world economy. President Bush in 2008 was reported to have observed that the subsidy paid on petroleum products by some nations had negative consequences on the United States economy as demand did not cause the market to adjust as rapidly as it ought to be (Bradsher, 2008). Most Nigerians had never bought HHK at the subsidized

cost of ₦50 per litre. They have been buying at prices that range between ₦100 and ₦150 per litre. The dealers who make abnormal profits from subsidy are risk averse. They preferred to invest in the building of more petroleum products' sales stations which gave them quick returns instead of investing in the productive sector. This problem is not peculiar to Nigeria.

RECOMMENDATIONS

- Government should supply kerosene adequately.
- Government should fast track the passage of the Petroleum Oil Bill (POB) to increase substantially the level of domestication of oil technology and indigenous participation.
- Government should rehabilitate and repair the refineries.
- The regulatory agencies that are responsible for the monitoring and enforcing standards should collaborate and harness synergy in the checking and enforcement of standards in the management of petroleum products.
- Once, there is a reported case of kerosene adulteration or explosion in a state, sale of kerosene should stop immediately. The states' branches of the relevant regulatory agency should embark on immediate monitoring of the products in the state to stop further circulation of the offensive product.
- NNPC and its subsidiaries should be responsible enough to accept guilt where they make mistake. This will make it possible to immediately stop further circulation of the adulterated product and also withdraw that, which had already been sent out.
- In their analysis of preparation of five fuel-adulterant mixtures in different proportions by volume Yadav Sh. R., *et al.*, (2005) found that kinematic viscosity and opacity value were the useful test parameters. NNPC should introduce colour markers into petroleum products to differentiate them visually and by simple chemical test that is guided by Yadav and his colleagues.
- All petroleum storage tanks and transporting trucks should be properly colour coded. The public should be educated on these colours

and the security agents should enforce compliance. Violators should be prosecuted.

- The local chiefs should be contracted to maintain, monitor and provide securities to protect pipelines and the petroleum installation within their communities.
- While many attributed vandalism of pipeline to steal petroleum products to poverty, the negative consequences that it leaves behind on Nigerians is enough stimulus to fight the vandals with all the security apparatus of government. Pipeline vandals are economic saboteurs. They should be prosecuted and their names published in at least three national dailies soon after conviction.
- Members of the joint Task force that is saddled with the monitoring of petroleum facilities in the Niger delta should be redeployed regularly before they become too corrupt.
- The rehabilitation programmes of the Niger delta ex-militants should be regularly reviewed.
- Any of the security personnel who are employed to ensure that petroleum products were not diverted to unauthorized locations but who are found to have aided product diversion should be treated as economic saboteurs.
- The downstream of the petroleum industry should be liberalize and the subsidy which actually had never benefited the generality of Nigerians should be removed.

CONCLUSION

This work has shown that kerosene adulteration has become prevalent in Nigeria. Subsidy and price differential among HHK, ATK and AGO encouraged kerosene diversion, scarcity, adulteration and consequently, explosions that have continually negatively affected the Nigerian Economy. Kerosene adulteration could be deliberate or inadvertent. Most of those involved adulteration did it for economic gains. Kerosene adulteration had been implicated in all the kerosene explosions that were recorded in Nigeria. Each time such explosion occurred, the victims were usually abandoned both by the governments and the NNPC.

Scarcity of kerosene is real in spite of the repeated denials of Petroleum Products Pricing Regulatory Company (PPPRC), NNPC and PPMC. Scarcity of kerosene has forced consumers to using firewood, sawdust and charcoal to cook, while palm oil and other fats are being used for lighting lamps. The negative effect of this on the environment is enormous.

To encourage real investments, all the downstream activities in the petroleum industry should be liberalized. The government should provide the enabling environment for the industry to thrive and be attractive enough to private investors. Taking the decision requires government political will, the sincerity of purpose by the leadership of the labour unions and the support of all Nigerians.

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