

The Kerosene Marking Programme In India

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ABSTRACT

The majority of India's kerosene consumption of approximately 12 million kl is heavily subsidized. Diesel, with an approximate 40 million kl annual volume, is primarily used as a transport fuel, while kerosene is meant to be used as a cooking, lighting or heating fuel that is heavily subsidized so it can be purchased more easily by India's poor. However, given the huge price disparity between the two products, it is lucrative to divert kerosene from the Public Distribution System (PDS) and blend it with auto fuel. It is reported that this 15-year-old phenomenon, which hurts the poor, is costing the government and oil marketing companies as much as Rs 10,000 crores annually in lost revenue. This tax loss leads to a reduced government ability to support employment, prosperity and social development. The Indian government has recognised the magnitude of the issue and has partnered with Authentix/SGS to curb the problem. In October 2007, India began rolling out an ambitious solution – using a marking technology to detect the diverted fuel. To curb this illegal practice, Authentix markers are introduced into all government-subsidised kerosene. An extensive surveillance and testing programme conducted by SGS, along with proper management has been put in place, to decrease this unlawful activity.

KEYWORDS

Fuel Authentication , Revenue Recovery, Kerosene And Public Distribution System

INTRODUCTION

The government of India subsidizes the price of kerosene for the use of cooking and heating, as part of the Public Distribution System (PDS). This system was originally put in place to help eradicate poverty by ensuring food security for the poor. This subsidized

kerosene is distributed through an extensive PDS network to families whom are classified as having an

income Below the Poverty Line (PDL). Approximately 200 million Indian citizens are benefiting from the PDS system.

Approximately 72% of the population of India lives in rural areas. The majority of the rural population in India continues to rely on kerosene for fuel for cooking, heating, and lighting. Electrified households in rural areas also use kerosene as a back-up fuel due to the erratic and poor electricity supply. Many of these rural Indian residents also receive their kerosene through PDS.

Unfortunately, a significant portion of this low-priced product is stolen from PDS and diverted for use in higher taxed auto fuels. This substitution of fuels robs the poor of fuel they need, and brand owners and Government of substantial revenues necessary to support employment, prosperity and social development. It is estimated that annual losses due to kerosene diversion are as high as Rs 10,000 crores.

In late 2006, the Indian government began using an Authentix/SGS fuel authentication program to mark this subsidized kerosene. In partnership with SGS, an internationally recognised inspection and testing house, Authentix provided the technology & SGS implemented a program consisting of; a) audits of approximately 34,500 retail outlets including sampling & testing at site for presence of marker in the road fuel, b) marker delivery—to 300 plus terminals country wide, and c) terminal audits — each terminal is regularly visited to ensure kerosene marking is conducted according to specified procedures.

IF THE KEROSENE MARKER IS DETECTED IN AUTO FUEL, IT GIVES THE GOVERNMENT AN INSTANT POSITIVE INDICATION OF FRAUDULENT ACTIVITY. THE PAPER WILL EXPLAIN HOW THE COUNTRYWIDE

PROGRAM WAS IMPLEMENTED. IN ADDITION TO THE ECONOMIC RETURNS, IT WILL ALSO DISCUSS HOW THE PROGRAM POSITIVELY IMPACTS THE NATION’S POOR.

THE PROBLEM

Diesel & gasoline are the major transport fuels in India. Adulteration of these transport fuels takes place at the point of sale and during transportation. Transport fuels are often adulterated with cheaper products. For example, diesel and gasoline are widely adulterated with kerosene. Unfortunately, fuel adulteration is often an organised criminal industry and is growing rapidly; it is an unpleasant reality that impacts every brand owner and the government. In addition, fuel adulteration can lead to increases in air pollution and degradation of vehicle performance (which, in turn, can lead to brand erosion).

Adulteration is indulged primarily due to differential pricing mechanism of fuels & adulterants and easy availability of adulterants in the market. The adulterants being taxed lower than the base fuels or subsidized kerosene gives monetary benefits when mixed with a proportion of base fuel. The incentive is the huge price difference — while subsidised kerosene costs roughly about Rs. 10 a litre, gasoline is priced at Rs. 45 and diesel at Rs. 35 a litre.

Table 1: Retail prices for gasoline, diesel and kerosene

Fuel	Annual Consumption Millions (kl)	Price(Rs/litre)	Price(\$/litre)
Gasoline	8-9	45	1.12
Diesel	40	35	0.88
Kerosene	12	10	0.25

Additionally, the penalties that could act as a strong deterrent to fuel adulteration are often lacking. There are number of reasons for fuel co-mingling to take place, including poor governance/lack of monitoring systems, a lack of political will, weak regulatory framework and lack of public awareness.

In summary, the primary factors encouraging the practice of fuel adulteration are:

- *High profit* – fuel adulteration is extremely lucrative, particularly if an adulterated product is sold at or close to the price of the genuine product/non-adulterated product. The high profits are possible due to the existence of differential price levels amongst the fuels, intermediate products and byproducts – the adulterants are lower than the prices of the fuels to be adulterated, providing financial gains when mixing a proportion of higher priced fuel with lower subsidised products. The differential pricing mechanism of fuels and adulterants, and the availability of adulterants in the market, are also factors.

- *Low risk* – penalties, and the chance of getting caught, have been relatively low. Most jurisdictions regard fuel adulteration cases as civil crimes and prosecutors may be hesitant to pursue fuel adulteration cases unless they are "watertight". A lack of control systems, weak legal frameworks/penalty system and limited consumer awareness of the problem make fuel adulteration a low risk illegal activity.

Studies have shown that a significant portion of India’s subsidized PDS kerosene has been diverted for the purpose of adulterating diesel. In September 2005, a study by Indian’s National Council for Applied Economic Research (NCAER) study concluded that 38.6% of PDS kerosene was being diverted for black marketing and adulteration in petrol and diesel. The incentive being the huge price difference.

Several studies showed an alarming rise in the cases of fuel adulteration. It is estimated that 30% of the PDS kerosene was diverted to the black market for and adulteration during 1994. The same figure has now risen to 38.6%, an increase of 28.6% in 11 years.

The gap between the annual PDS kerosene supply (11,400 kilolitres) and PDS kerosene purchase (7,300 kilolitres) is high. However, not all kerosene diverted from the PDS scheme is used for fuel adulteration. The gap between estimated household kerosene consumption and PDS supply is in the order of 18%. Half of the diverted kerosene ends up in households for use by people who do not possess a ration card or it is purchased by non-PDS residents at black market prices. It is projected that the share of non-household kerosene use is 18.1%, the black market activity is 17.9% and the use by non-card holders 2.6%.

Various estimates have been made of the extent of financial loss to the national exchequer as well as the oil companies as a result of diversion of PDS kerosene and getting mixed with diesel, evasion of sales tax etc. If to this is added the social costs as the result of environmental pollution, damage to vehicles etc, the loss is substantially higher.

The findings in a paper entitled, “On Need for Urgent Adjustment of Prices and Taxes on Petroleum Products,” published by The Associated Chambers of Commerce and Industry of India (ASSOCHAM) states that the subsidy burden for the government at the prices in 2006-07 is estimated at Rs15,000 crore.

It is estimated that the losses for diversion are in the order of Rs10,000 crore (direct fiscal subsidy plus under-recovery by the oil companies).

THE SOLUTION

The government and public sector oil marketing companies (OMCs) have taken various steps to contain the menace of adulteration and one of these

was the introduction of a marker in the kerosene. In late 2006, the Indian government began using a unique Authentix/SGS fuel authentication program to mark this subsidized kerosene. The program initiated across India to mark kerosene (12 million kl per annum) and check the presence of kerosene (adulterant) in the road fuel. Authentix and SGS were selected to carry out the program due to the Authentix test based on immunoassay technology, which can measure marker at low concentration in the road fuel and SGS proven ability to fully manage the program with it's strong presence in India. This program not only controls fuel adulteration but is also meant to ensure that underprivileged sections of the society get their due quantity of heavily subsidized kerosene for cooking and other purposes. Additionally, the new generation marker system will also ensure quality for customers of diesel and petrol. The adulteration of diesel and petrol with marker-blended kerosene will immediately show-up when tested using a simple kit through a simple visual check.



Figure 1: Union Petroleum and Natural Gas Minister Murli Deora with Union Minister of State for Personnel Suresh Pachouri at the official launch of the Authentix/SGS kerosene marking program.

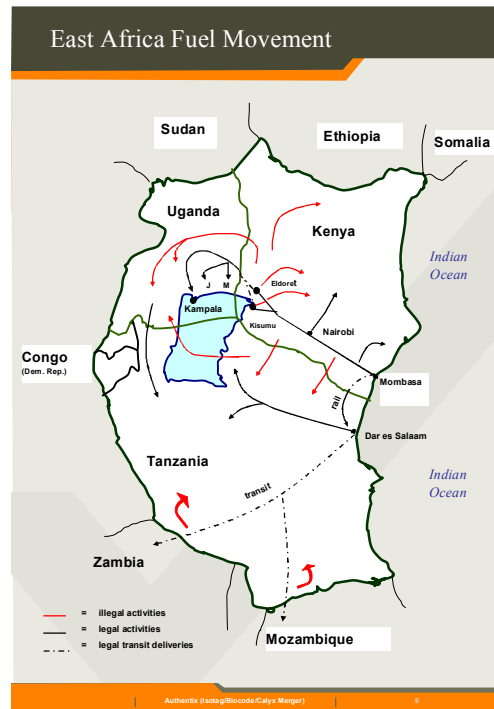
If the blended kerosene is used as an adulterant in other fuel, it is easily detected through a visual test procedure, using a special testing kit. Fuel diluted with Authentix-marked, government subsidized kerosene turns pink when it tests positive for adulteration.

By using the marker system of Authentix, adulteration up to one per cent could be detected on site. The marker system would help to detect adulteration of kerosene in auto fuels and ensure that PDS kerosene reaches the targeted group.

EXAMPLE OF THE BENEFITS OF TYPICAL MARKING PROGRAMME

Authentix and SGS work in American, African and Asia East African nations. A typical example is East Africa (Kenya, Uganda and Tanzania), where the fuel economies are linked. Programmes are in place for marking and testing fuel in all these countries to identify and control illegal activity such as smuggling,

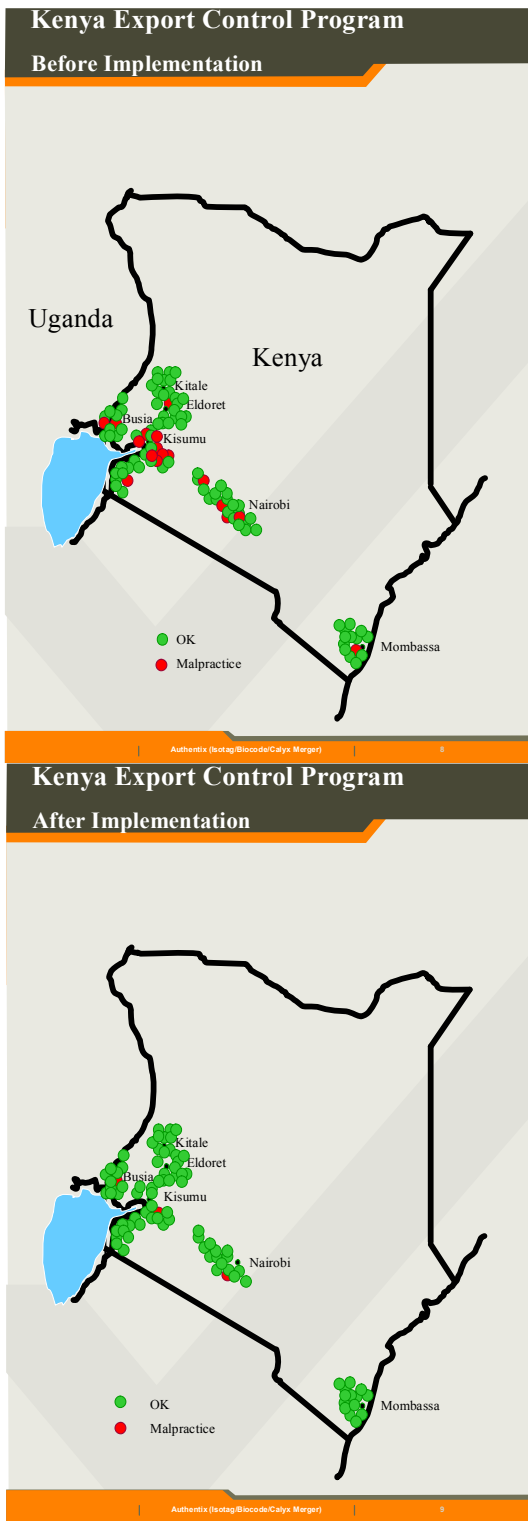
export dumping and adulteration. The benefits are readily apparent in the nation of Kenya.



In Kenya fuel sold domestically is taxed at a rate of 40%. However, when fuel is exported it is exported without tax and is therefore considerably cheaper than the price at the pump. This leads to the problem of "tax free" fuel designated for export being illegally rerouted back into Kenya and sold. To prevent this, all "zero taxed" exported fuel (~600,000 kilolitres per annum) has been marked since October 1998.

Fuel is then being tested at sites selling fuel to ensure that the export marker is not present. A similar marking program is also in place to identify when kerosene is used illegally in road fuel. As the diagrams below show, the program has resulted in a significant reduction in illegal activity estimated to save annually the Kenyan Government some **\$50 million in lost tax** and the oil companies some **\$ 75 million in sales** (based on a \$ 50 oil barrel).

Illegal Sites before implementation (marked in red) – where some 20% of sites are operating illegally



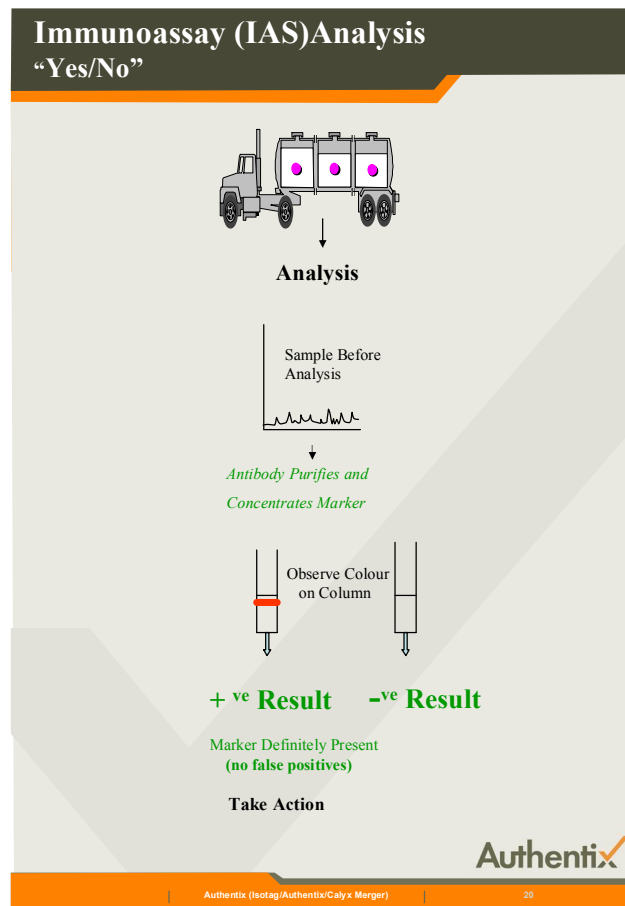
Reduction in Illegal Sites after implementation – where < 2.5% of sites are operating illegally

This programme in Kenya is supported by a strong infrastructure managed by SGS, a structure comparable to the kerosene marking programme used in India.

THE MARKER

The marker that is used to mark subsidised or low tax fuel products can be quickly tested on-site to identify whether these products have been illegally used in road fuel. The test is based on the use of

immunoassay technology, the key principles are shown below;



General characteristics of the markers:

Marker Homogeneity

The markers (as with other additives) are introduced into the solution in such a way as to ensure homogeneity

Marker Compatibility with Different Fuels, Hydrocarbon Solvents and Additives

Authentix markers have been tested with and are compatible with different fuels and hydrocarbon based solvents such as petrol, diesel, kerosene, naphtha and lubricants. A number of these tests have been completed in the IOCL Research and Development facility. Authentix markers have also been tested against a number of additives produced by the major additive manufacturers including Ethyl, BASF, Octel, Infinium, Lubrizol and Oronite. Tests confirmed that there was no effect on the additives.

Marker Specificity

The detection of the marker depends on an antibody which is specific for each marker chemical. Therefore no other chemicals or colours can be confused with the markers.

Marker Stability

The markers have been formally tested in fuels to ensure that there is no loss of activity over 6 months. In practice, they have been found to be completely stable in the field for periods exceeding 2 years.

Marker Safety

All markers meet stringent health and environmental requirements. In addition, the markers are normally added at levels of less than 500 parts per billion (ppb).

Marker Use

Authentix' markers are used in a number of countries and by all the major multinational oil companies as well as a number of national oil companies for marking fuel (gasoline, diesel, kerosene and lubricants). More than 500 million kilolitres of fuel (approximately 400 million tonnes) has been marked over the last 5 years with no adverse effects seen or reported.

Formal tests have also been carried out in the countries where we operate which demonstrate that the markers do not affect the specification of fuel.

LOGISTICS

a) Receipt of Marker Drums

- The marker concentrates are manufactured in the UK and sent in sealed drums to designate port(s) in India
- SGS clears the consignment and transports it to a their security warehouse for blending and distribution

b) Marker Preparation at Central Security Warehouse

- Marker concentrate is stored at a security warehouse with full security procedures in place for marker handling (double lock systems etc.)
- The marker concentrates undergo quality control checks to ensure they meet specification
- Marker is repacked in smaller containers in order to effect transportation and usage

c) Regional Marker Distribution

- There are a number of regional security depots for marker distribution
- Marker is dispatched from the centre to the regional depots
- Marker will then be dispatched from the depots to the terminals

d) Product Marking

- Marker is stored on-site in a designated security store

- Marker will only be released to nominated terminal personal
- Marker use is reconciled with the amount of fuel marked
- Samples marked fuel will be taken for immediate and subsequent QC purposes
- Enough marker is kept on-site to ensure it does not run-out

Note:

- All operations will be performed to Standard Operating Procedures
- All marker drums and containers are given unique numbers
- All marker movement will be recorded on standard forms and witnessed by at least 2 personnel
- All weighing and volume measurement instruments will be regularly calibrated

Testing

a) Retail Site Inspection (carried out by SGS representatives)

A key component of the programme, is testing for the presence of the marker at retail sites. Approximately a total of 34,500 sites are monitored, which are owned by the following OMCs;

- Indian Oil	15,393
- Bharat Petroleum	7,743
- Hindustan Petroleum	7,880
- IBP	3,440
TOTAL	34,456

The retail Sampling/Testing is carried out on a regular basis by SGS inspection teams at all retail sites.

In summary, the program involves;

- Country-wide implementation
- Marking entire kerosene (12 million KL, PDS & non PDS) within 300 plus terminals
- On site testing of Diesel and Gasoline at the retail outlets,(about 34,500 retail outlets) for the presence of marker in the road fuel
- Government taking enforcement action against identified illegal activity

RESULTS

An extensive surveillance and testing programme, along with proper management and interpretation of surveillance data, has been put in place. The results of the first year of the programme generated critical data about illegal activity. Fuel sampling is regularly conducted at India's 34,500 retail fuel outlets to detect the presence of the markers.

- a. **The NCAER (India National Council of Applied Economic Research)** indicated that some 4 million kl of kerosene is illegally diverted from the PDS kerosene program annually. If the majority is used to adulterate some 50 million kl of road fuel (in fact some is also diverted to the black market and for commercial use) then some 6-8% of retail sites will be carrying illegal fuel.
- b. **Results from the India Marking Program** have shown that some 5% of the sites in the high kerosene throughput area in the East of India (Orissa, Bihar etc.) have been adding kerosene to road fuel. In other areas (including the Metros) the level of malpractice is generally below 1% although this can be significantly worse in some districts within these regions.

This is supported by the finding in the NCAER report, which quoted very high to extremely high leakage (more than 50 per cent) of PDS kerosene in 6 states, Bihar, Chandigarh, Delhi, Jharkand, Orissa and Punjab.
- c. **The Marketing Discipline Guidelines** (MDG's) were revised and this resulted in the Oil Marketing Companies (OMCs) closing retail outlets where malpractice had been proven.
- d. **Program Effect** The program is having an effect at the retail sites. The dealers are "on alert" and aware that they can now be caught and punished for adulterating fuel. As the program has taken effect, there has been a return of the abused kerosene to the poor.
- e. **Fuel sales** have increased –There are several factors affecting the increase of fuel sales in the country because of growing economy, however, part of it can be attributed towards this program.

CONCLUSIONS

At a conservative estimate, Rs 10,000 crore is at stake for smuggling gangs. The new marker system being introduced for the first time by the oil industry in alignment with the international practices is expected to curb to a large extent auto fuel adulteration using kerosene. Adulteration in auto fuels is essentially driven by the huge price difference between auto fuels like petrol and diesel and potential adulterants like kerosene, naphtha and other industrial aromatic solvents. In the first phase, the marker was introduced in the entire quantity of kerosene that is supplied by oil marketing companies (OMCs).

All kerosene supplied by OMCs is now marked at the terminals/depots of the oil companies. Regular monitoring of the 34,500 retail sites for irregular activities is undertaken by the SGS in conjunction with the OMCs and the state government authorities.

The test kits used by the field officers of SGS will enable them to check for adulteration of auto fuels during their inspections. The tests are simple and it is possible to visually detect even small traces of kerosene e.g. 1% in auto fuels using a simple but highly accurate and effective test kit.

Since the start of the programme in Q4 2006, early reports in 2007 have indicated a substantial rise in taxable fuel sales.

In summary, fuel adulteration monitoring systems are an effective tool to curb illegal activities with a phenomenal return on investment. In India it has been a critical investment by the government and OMCs to reduce fuel adulteration activities by organized crime, and as a result, appropriate amount of taxes are being collected. An additional benefit of reducing illegal fuel adulteration is the reduction in air pollution, as the fuel quality is assured.

A comprehensive anti-diversion strategy safeguards the use of PDS kerosene to be used as an adulterant for auto fuels, brand owner's reputation and market share. The payback of a higher proportion of the PDS being used for its intended purposes is that this directly benefits the lives of the poor.

ACKNOWLEDGMENTS

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