

Fleet Tracking and Monitoring System in Production Industries using Nova Tracker

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ABSTRACT: This paper primarily focuses on the development of Truck Tracking Device (TTD), used for the improvement of fleet activities, with the aid of GPS-GSM devices. TTD is a truck tracking device that make use of an integrated Global Positioning System and Global System for Mobile Communication (GPS-GSM) to track real time location of fleet of trucks with the aid of Google Map, the actual location of trucks using the registration number issued by government agency and Cab number branded by the company to search the real time location and status of the trucks. The TTD is an integration of hardware component mounted on a strategic place on the truck, and the software component uses a Nova tracker software installed on a computer networking, GSM, Palmtop. An auxiliary tracking device is also installed on the truck, that make use of local area network and powered by solar battery mounted on the truck to give a back-up power to the auxiliary tracking device in case, the TTD has been tampered. With the adoption of the modern technology for dispatchment of consignments, there was significant improvement in the tracking of the trucks and the Turn Around Time was drastically minimized.

KEYWORDS: Tracking, TTD, GPS, GSM Hardware, Nova tracker.

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I. INTRODUCTION

Fleet (vehicle) management can include a range of functions, such as vehicle financing, vehicle maintenance, vehicle telematics (tracking and diagnostics), driver management, speed management, fuel management and health and safety management [1]. Fleet Management is a function which allows companies which rely on transportation business to remove or minimize the risks associated with vehicle investment, improving efficient productivity and reduce their overall transportation and staff costs, providing 100% compliance with government legislation (duty of care) and many more [2]. Vehicle Tracking System is the technology used to determine the location of a vehicle using different methods like Global Positioning System (GPS) and other radio navigation systems operating through satellites and ground-based stations [6]. Transport is one of the important infrastructures of any country. The main problem about the transportation is the uncertainty of wasting time due to traffic jams and any other issue like abnormal conditioning. The safety of private and public vehicles is a major concern, so global position system-fleet tracking system ensures their safety while travelling. In the existing system, different tracking techniques were used which are integrated with Google maps for route allocation, automatic transit directions or real time tracking and arrival time prediction. Either an in-house fleet-management department or an outsourced fleet-management provider can deal with these functions. Vehicle tracking system, the most basic function in all fleet management systems, is the vehicle-tracking component. This component is usually GPS based but sometimes it can be based on cellular triangulation platform [3]. This paper describes a model for routing and tracking with mobile vehicles in a large area outdoor environment based on the Global Positioning System (GPS) and Global System for Mobile Communication (GSM). The supporting device SIM CARD and the network subscribers (Globacom) are used to control the operation of the fleet. GPS real time vehicle alarm monitoring and alerting system using GPRS was used on an embedded, compared with the conventional single mode of GPRS, this method makes up the disadvantage of the high time delay and the incertitude of the time delay in data transmission[8]. Transportation is a very important shared resource that enabling efficient and effective use of resources like GSM modem and

GPS unit that can be installed on a vehicle and used to track its location. This system is located on the bus and GSM modem communicates via SMS with a server connected to a basic GSM phone, overcome the previous system and develops a system for navigation assistance to visually impaired people[5]. Portable terminal unit is an embedded system having RFID reader, GPS and analog compass as input device to obtain location and orientation. In navigation mode start robot reaches destination by avoiding obstacles using ultrasonic and infrared sensor input. [4] Proposed the automatic transit tracking, mapping, and arrival time prediction system based on Google map application, which is installed on Smartphone. This level of automation is possible through a set of algorithms that uses GPS traces collected from transit vehicle to determine routes served, locate stops and predict the arrival time at upcoming stops. [7] Proposed land vehicle application on android platform. A land vehicle tracking system combines the installation of an electronic device in vehicle with purpose designed computer software at least at one operational base to enable the owner to track vehicles location. The vehicle information can be viewed on electronic map via internet or specialized software.

II. MATERIALS AND METHODS

Tracking of trucks can be in two ways:

2.1 Real time location-based tracking system can be classified as follows:

- i. Real time monitoring using LCD (Liquid Crystal Display)
- ii. SMS (Short Message Service) Based Vehicle Tracking System
- iii. Web based application
- iv. Mobile application

Some hardware devices are used for automation and controlling of the other supporting devices, these devices are Global position system (GPS), GSM, Accelerometer sensor compass sensor. Although this thesis gives the theoretical modeling and simulation of a vehicle tracking system which can do routing, tracking of moving vehicles in large geographical areas within the geo-fence of the assigned path using the Google map and manual surveillance of the various route. This device consists of two sections, first which will be an inbuilt GSM inside the truck cab together with a slotted in sim-card, using one of the network providers (MTN, GLO, ETI SALAT, AIRTEL) etc. The GPS act as a relay as the trucks moves from one location to another within the geo-fence. The location of the trucks goes on changing continuously; the GPS find the location of the trucks using two of the co-ordinates that is Longitude and latitude. These co-ordinates communicate with another section of the base station. The GSM is connected to the computer through a special processor driver, which should have internet connection in it. So, that as soon as the co-ordinates are received, it can be located in the Earth Google map to ascertain the specific location of any truck. Other sensors are used as an accelerometer sensor to sense weather the truck is moving or stationary base on color code preview and a compass sensor for identifying the direction of moving truck using the four-cardinal point as a focal point, other sensors for the speed regulatory is also used.

WORK ORDER FORM

TO LIASON UNIT: _____ FROM _____
 TRUCK NO: _____ CAB NO: _____
 DRIVER'S NAME: _____ FLEET NO: _____
 DRIVER'S I.D CARD: _____ DATE: _____
 TRAILER NO: _____ PHONE NO: _____
 TIME OUT: _____ WORKSHOP TIME IN: _____

Please arrange and attend to repairs of the above-mentioned Truck/ Trailer with following defect (s).

S/NO	FAULTS	DESCRIPTION OF FAULT
1	ENGINE	
2	ELECTRICAL SYSTEM	
3	TRANSMISSION SYSTEM	
4	BREAKING SYSTEM	
5	STEERING SYSTEM	
6	SUSPENSION SYSTEM	
7.	TRACTOR CHASIS	
8	TRAILER/BODY	
9	CABIN	
10	WHEELS/TYERS HUB	

EXPECTED DATE OF COMPLETION _____

PREPARED BY: _____ CHECKED BY: _____

FLEET ANALYST _____ FLEET WORKSHOP COORDINATOR _____

DATE ADMITTED: _____ TIME ADMITTED _____

KILOMETRE ADMITTED: _____ NOTIFICATION NO: _____
 NAME OF MECHANIC: _____ RESERVATION NO: _____

2.2 Prediction tracking system

Real Time Location Based System uses the current location and speed of the truck to calculate its arrival time and prediction system takes into consideration the traffic pattern on the route to calculate the arrival time of the truck. However, here the emphasis is on real time location-based system.

2.2.1 Daily status Report of Trucks: The operation department in IBESE DANGOTE CEMENT TRANSPORT is made up of a total of three thousand trucks (3000) both the operation and nonoperational trucks. These three thousand trucks is sub-divided into ten (10) fleet. A fleet is a collection several numbers of vehicles used for a specific purpose. Each fleet handle three hundred (300) trucks under the supervision of the Senior Transport Manager (STM). Each STM has six (6) truck coordinators or fleet managers handling fifty (50) trucks, and each fleet manager has two (2) fleet analyst under their control with each fleet analyst managing twenty-five (25) trucks each. All the three thousand truck at dangote cement transport have registration number assigned to those trucks by the government agency responsible for the plate numbers that is, the Federal Road Safety Corporation, the other number assigned to the truck is the cab number, which is assigned by the company. Each of the fleet has the following cab number for proper identification.

Fleet1

1A-001, to 1A-050

1B-001, to 1B-050

1C-001, to 1C-050

4A-001, to 4A-050

4B-001, to 4B-050

4C-001, to 4C-050

These are fleet one trucks with their cab numbers making a total of three hundred (300) trucks.

Fleet2

2A-001, to 2A-050

2B-001, to 2B-050

2C-001, to 2C-050

3A-001, to 3A-050

3B-001, to 3B-050

3C-001, to 3C-050

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Fleet Wise Report Newer Fleet

Fleet 13 = 49/00

Fleet 14 = 61/03

Fleet 15 = 50/01

Fleet 16 = 35/00

Issuance/ Balance = 195/04

Sub Total Issued/Bal = 462/07

Export Fleet

Togo = 50

Ghana = 65

Total Issuance For Export = 115

Overall Issued/ Bal = 577/07

Biometric Evaluation Domestic = 460

Biometric Evaluation Export = 110

Total Biometric Evaluation = 570

Physical Evaluation Domestic = 455

Physical Evaluation Export = 105

Total Physical Evaluation = 560

Dispatch = 580

Weigh Bridge

Dan-transport = 580

Export = 100

Dan-commercial = 150

Commercials = 80
Total = 910
Measurements in Tonnage
Dan-transport = 26,100
Export = 3,000
Dan-commercials = 6,750
Commercials = 2,400
Grand Total Tonnage = 38,250 TONS
Empties trucks at line 1 and 2 loading Bay Report
Dan-transport =13
Dan-commercial = 04
Commercial trucks = 03
Export trucks =00
Loaded Trucks at line 1 And 2 Loading Bay
Dan-transport = 06
Dan-commercial = 04
Commercial trucks = 01
Export =00
Empties Truck At Line 3 And 4
Dan-transport = 11
Dan-commercial Trucks = 00
Commercial trucks = 01
Export =00
Loaded trucks at line 3 And 4
Dan-transport = 05
Dan-commercial = 02
Commercial trucks = 00
Export trucks = 00
Grand total empty/loaded = 30.

III. RESULT AND DISCUSSION

GPS tracking system unit is a self-contained tracking device that can quickly and effectively locate any truck, this new technology combines the universal coverage of global positioning system (GPS) satellites with cellular based communication cellular provider. Tracking fleet management solution lets fleet officers and managers view multiple interactive maps; each map displayed in its own independently controlled window. For instance, users can display one map showing all the trucks, but use other windows to stay zoomed in several specific trucks. This helps fleet officers and managers make better operational decisions by getting the big picture while focusing on potential problems and emergent situations in detail.

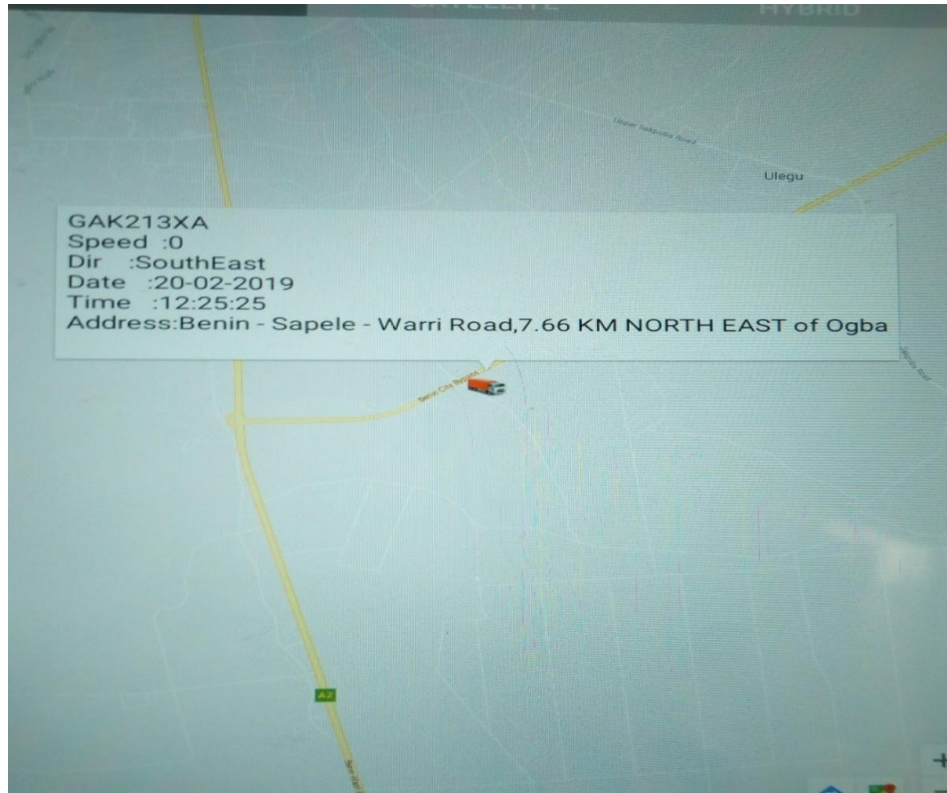


Fig.1.0: Breakdown Vehicle for 24hrs

From figure 1.0 above, the truck with registration GAK213XA has been on highway breakdown for more than 48hrs along Benin-Sapele highway. The speed record indicates 0m/s, which revealed that the truck has not move from the position of breakdown for the past 48hrs. This will help the fleet manager to know the status of the truck and inform the workshop unit on how to fix the truck to make it operational again.

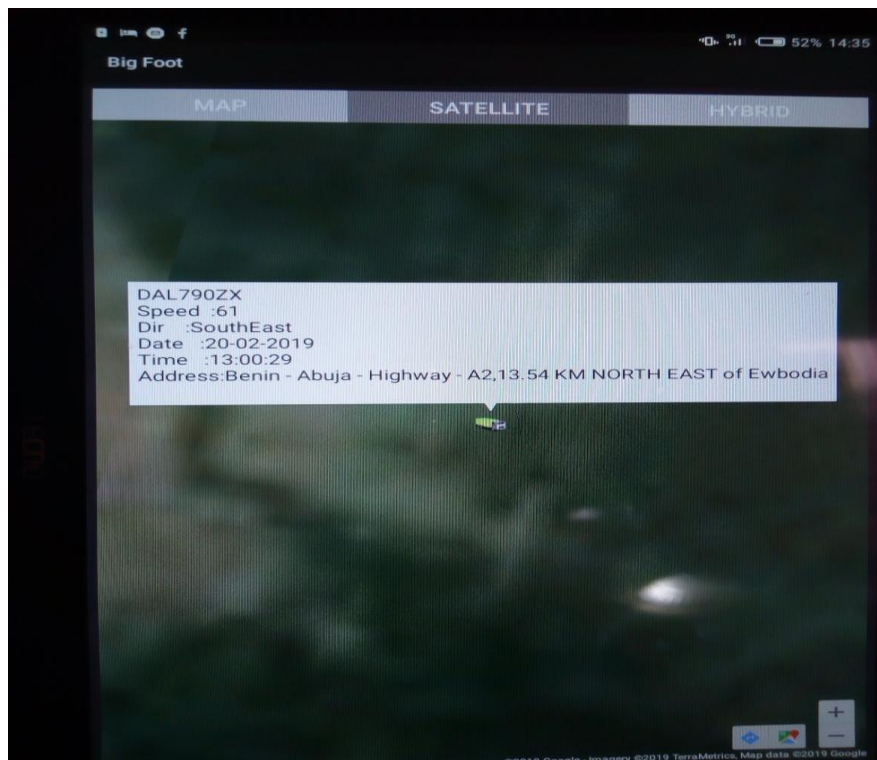


Fig. 2.0: Simulation of Truck

The above figure shows the simulation result of truck with registration number DAL790ZS with an average speed of 61km/hrs. in the direction of south east, along Benin-Abuja highway on a Google map. The result of the simulation shows that the status of the truck to be on transit either to destination or back to the company.

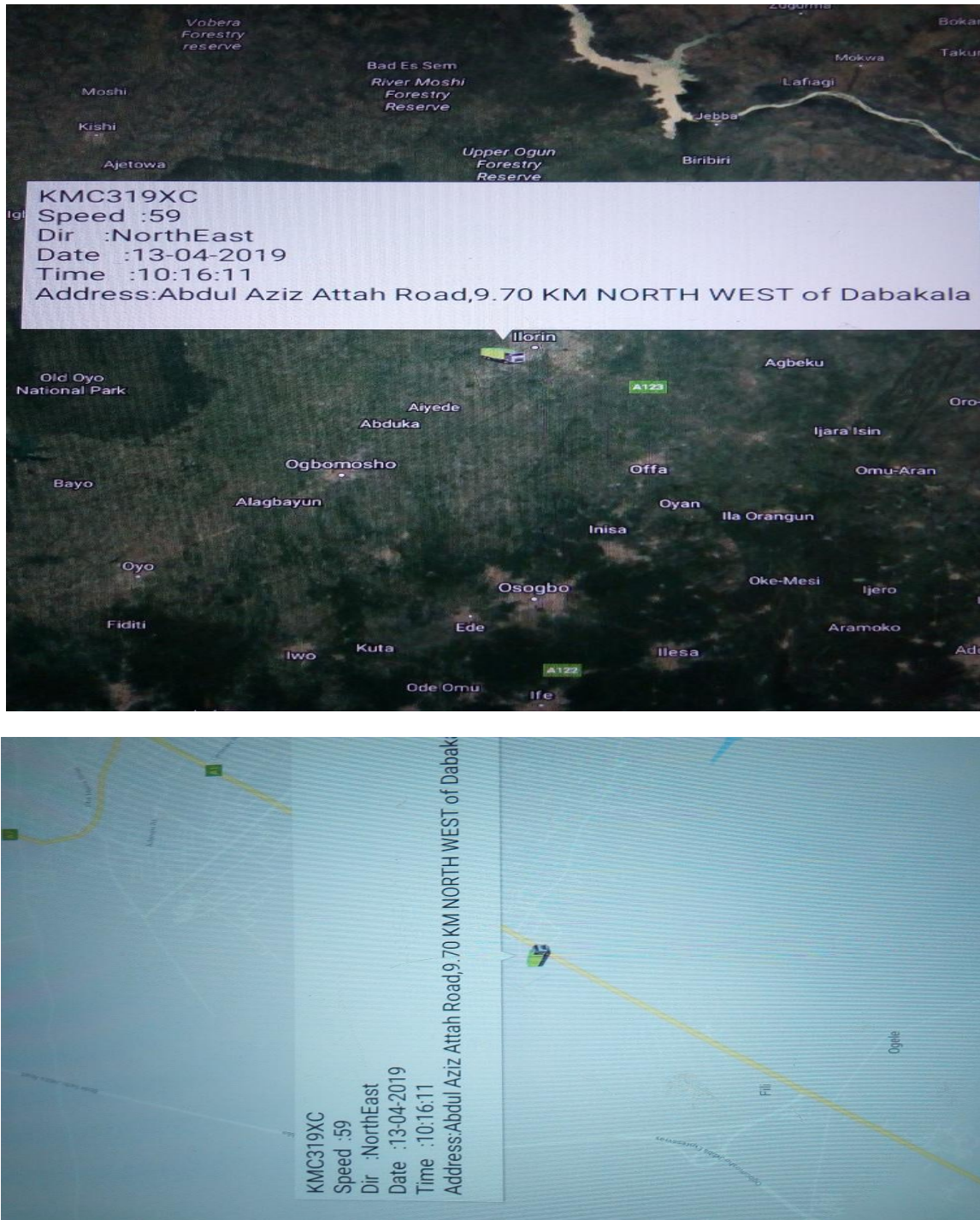


Fig. 3.0:Tracking of Truck

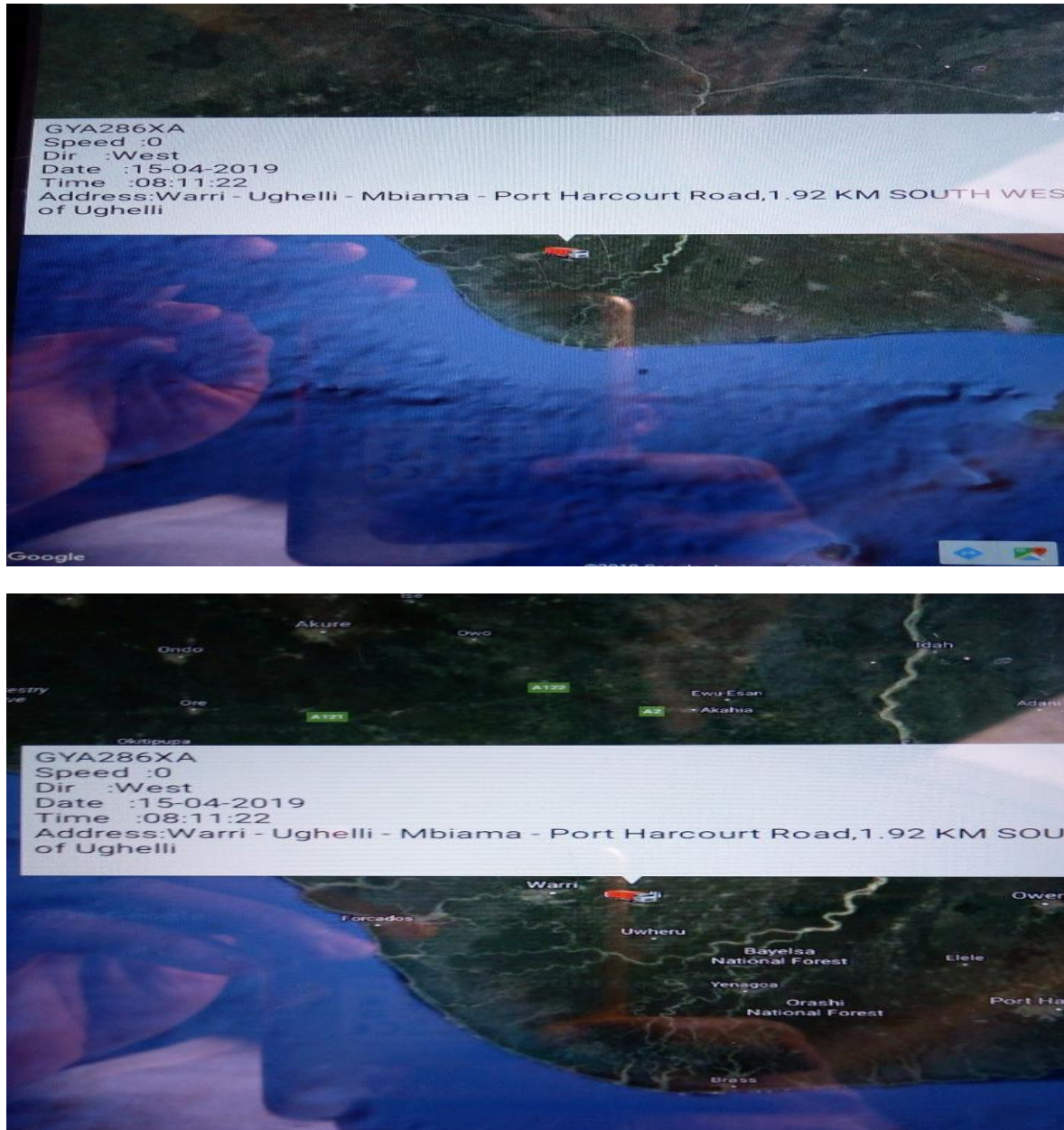


Fig. 4.0: Truck Broke down on Highway

The above figure shows truck GYA286XA on a highway breakdown along Warri-Ughelli-Mbiama road, Port Harcourt. The speed of the truck is 0 showing the truck as park loaded for a period exceeding 72hrs.

IV. CONCLUSION

The GPS and GSM integration for truck tracking had helped in providing real time truck tracking and giving the actual status of trucks in Dangote Cement Transport. This fleet tracking system are used in solving some of the challenges faced by the transportation unit, which could be further extended as follows anti-theft system for trucks, managing of public transports likes trucks and trains, tracking of valuable assets.

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