

TELECOMMUNICATION SITE REMOTE MONITORING

TECHNICAL PROPOSAL



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ABOUT VERICOM NETWORKS.

Our Background

Vericom Networks has positioned itself as a market leader in the provisioning of turnkey enterprise solutions that have multiple facets which include managed services, communication solutions, converged network, security solutions as well as machine to machine solutions

We specialize in the combination of key technologies to create a wholesome solution customized to our clients' specific needs. We make it easy to take advantage of ICT to enhance your business by packaging all our products as turnkey solutions.

Executive Summary

As Vericom Networks, we offer a solution that provides real-time continuous monitoring of critical elements within a remotely located telco site. Our solution offers monitoring for the below:

- Diesel generators
- Mains/utility power status
- Temperature at site
- Battery bank systems
- Site visibility/Camera
- Site Access (Door open/Door closed)

We as a solutions provider understand that there are many variables within a telecommunication site that contribute to its availability and we have partnered with Maven technologies to empower our customers have remote visibility of these variables.



Our solution utilizes GSM technology to provide continuous real-time monitoring of generators, site access, mains power status, site visibility and battery bank operations at any remote location.

Unlike other systems which provide site statistics at irregular time intervals, our technology will immediately identify and notify you of all critical events including, DG run hours, fuel fills, delivery volumes, spills, low fuel, fuel theft, battery power dissipation, access to site, loss of mains power and fluctuations in temperature.

Diesel Generator Monitoring

Energy is a crucial element in every facet of life be it running a business or in

domestic life use but when it comes to the wastage or inefficient utilization of energy the consequence is an increase in energy related expenditure which will inevitably impact the bottom line.

Vericom Networks in partnership with Maven systems developed a solution geared towards mitigating challenges faced in efficiently managing energy use and remotely getting information from remote DG engines.



A comprehensive solution with 100% assured results and 3 year warranty to:

- Stop fuel thefts and generator abuse
- Continuous monitoring of diesel quality in the tank
- Extend generator life
- Eliminate the use of low quality or adulterated fuels
- Eliminate unnecessary service costs
- Increase billing accuracies with a friendly and easy-to-use system



- Remote monitoring and reporting
- SMS / emails notifications

The solution is based on a server-client architecture which enables our customers monitor and manage multiple sites from a dashboard which in turn creates extensive cost savings.

More than just a monitoring solution

- Monitoring Operating Statistics of the DG Engine
- Monitor fuel consumptions by the Engine
- Monitor quality of fuel refilled into your generators
- Energy from the Generator
- Know the total HMR and Maintenance schedule

'Our solution empowers you to actively track the DG fuel consumption, quality of fuel used and DG engine performance by providing supporting reports which can be used to aid in decision making.'

Power and Environmental Monitoring

Mains power monitoring

The Vericom monitoring platform provides a capability to monitor instances of mains power loss where the lack of mains power triggers the relevant sensor to signal loss of power.

This provides our customers with the capability to monitor and ensure that their critical sites are always operational irrespective of presence of mains power.

Temperature Monitoring

The platform as well provides a capability to monitor the temperature levels of equipment rooms/cabinets within remote sites. Drastic increases in temperature can cause damage to critical equipment and this platform ensures that operators are aware of the temperature levels within their installations and are immediately alerted in the instance the levels are detrimental to the equipment at site



When we say real-time we mean real-time

Most competitor products will only take a measurement and communicate back to the monitoring centre at preset intervals, sometime as infrequently as once per day. Our technology provides onsite intelligence by continuous monitoring your diesel levels, battery power ,onsite temperatures, engine performance, energy being produced, load on the DG, site access, presence of mains power and provides instant alerts of critical events including;

- Fuel Delivery Verification
- Fuel Theft or Tampering
- Fuel Spills
- Fuel density
- Fuel temperature
- Presence of water in fuel
- Battery power dissipation
- Door open/closed alerts
- Loss of Mains power
- Low fuel alerts
- Mains present and still DG running alerts
- Engine high water temperature
- Engine low Oil Pressure
- Any drastic increase in temperatures within sensitive installations

Lowest TCO (Total Cost of Ownership)

The Vericom Solution will deliver the lowest overall cost of ownership based on the following factors;

- Quality Approved: Meets all recognized quality standards.
- Low Installation Costs: Each site is fitted with highly affordable sensors. The design, quality and reliability of our technology will also reduce ongoing maintenance costs

 No IT Set-up Costs: Our software is cloud-based which means no extra IT investment in hardware and no integration cost with your existing company IT systems

Secure, User-friendly Management Reporting

- Our secure web-based application is highly intuitive and suitable for a range of users including operations, finance and business owners.
- It provides continuous monitoring for every individual site within your network
- Our management reports provide a verifiable record of your diesel stocks ,proactive management of diesel, operational costs for each site and consolidation for your entire operation
- The remote real-time two way polling visibility provided by our system will aid in highlighting the return-on-investment for your operation.



Solution Components

GeoHEMS

Telematics device with GSM + GPRS +Modbus

(RS232/485) + Fuel monitoring capabilities

GSM antenna

High accuracy fuel Sensor

With 98.5% and above accuracy

Temperature sensor

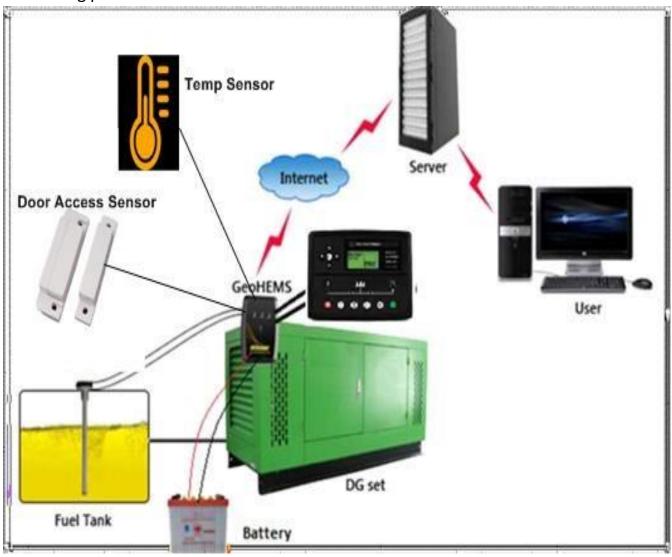
Door Access Sensor



Mains power monitoring







The below diagram shows the flow of information from the IEMS device to the user monitoring platform.



Reports generated from the platform

All reports generated by the platform have been designed to provide easy to use analytics that will aid the stakeholders take quick measures in instances where the business maybe impacted.

Main System Dashboard

Asset number ≎	Engine status \$	Active alarms	Current location	Mains status ≎	Fuel (ltrs) ≎	Temperat ure ≎	Last connected on	Action ≎
AK-TRIAD-MUTHAIGA-91	OFF	-	Muthaiga, Nairobi, Kenya	ON	467	20	02-Feb-2017 10:55 AM	5

The main dashboard has been designed to provide a quick summary of the current status of each site from an indication of what power source it is currently on to what the temperature of the site is as well as critical alerts on site accessed, battery disconnection or tampering.

Generator status

- Engine on/off status displayed on dashboard
- Business rules can be implemented to send alerts on email and sms

Mains/utility power status

- Mains on/off status
- Business rules can be implemented to send alerts on email and sms if an agreed threshold of downtime on mains power is exceeded.

Temperature levels

- Current site temperature in degrees Celsius
- Business rules can be implemented to send alerts on email and sms if an agreed temperature threshold is exceeded.

Fuel levels

- Current amount of fuel present in a DG tank
- Density of fuel in DG Tank
- Water presence in DG Tank
- Temperature of fuel in DG Tank



Fuel Reports

Know fuel consumed, density, filled, removed and hourly consumption

rate

- This enables the site management team and finance team accurately plan for fuel to ensure a higher availability of service.
- Business rules can be implemented to raise sms and email alerts when fuel levels are getting low as well as when a site is refuelled.
- Business rules can as well be implemented to notify the NOC team of presence of water in tank or delivery of low quality/adulterated fuel.
- Generation of detailed reports and trends on fuel consumption for each site



Identify DGs consuming excess fuel

CCAUCUC		¢	\$	k	4			F				Hello, Y	Vericom ዕ
<u>GE®HEMS</u>	Dashboard	Locator	Configuration	Reports &	Analysis	User Profile	e Advanc	ed Monito	ring				
Classic Engine run hour Fuel													
Start date: :31/7/2016	Fuel usage	(2)											
End date: :6/8/2016	Select Asset:	All	• Sel	ect								Search	× ee
▶ Daily			-	Total run		Fuel	Δverane		Total fuel	Total fuel			
> Weekly	Asset r \$	number	Date \$	Total run hours	Kilometers ≎		fuel usage	Unit ¢	filled (ltr)	(ltr)		Fuel filled details	
Monthly	AK-TRIAD-		T annual rates	1	SAVE:	¢		141104		\$	Start time	End time	Fuel filled (ltr)
, Fronkiny	MUTHAIGA		04/Aug/16	18:19	N/A	27.926	1.525	ltr/hr	0	0			
 Custom selection 	AK-TRIAD- MUTHAIGA		06/Aug/16	03:03	N/A	10.995	3.605	ltr/hr	0	0			
4/8/2016	1 - 2 of 2	2 Record	5										
	Total			21:22	0	38.92	0		0	0			
6/8/2016													
Show													

Energy Generation Reports

- Know energy generated and spending on every unit generated
- Know load patterns for each generator

0	Date	Total run hours	Fuel Consumed (Itr)	itrs / hour	¢ kWh	kWh / ltr
Ig29 DG-000063	05/Aug/1	5 24:00	795	33	2429	3.06
ig29 DG-0000068	05/Aug/1	5 24:00	775	32	2428	3.13
ig29 DG-0000063	04/Aug/1	5 24:00	665	28	1881	2.83
1929 DG-0000060	04/Aug/1	5 24:00	656	27	1895	2.89
ig29 DG-0000060	06/Aug/1	5 24:00	633	26	1739	2.75
					_	
01:00 02:00 03:0 High	an a fundamentaria da anticiparte da anticiparte da anticiparte da anticiparte da anticiparte da anticiparte d	0 09:00 10:00 11:00 12:00	13:00 14:00 15:00 16:00	9 17:00 18:00 19:00	20:00 21:00 22:00 23:	
Detailed analysis	Low Normal	Off NA	Load summary	0 17:00 18:00 19:00	20:00 21:00 22:00 23:4	00 Load tren
Detailed analysis	Low Normal	Off NA	Load summary	9 17:00 18:00 19:00	20:00 21:00 22:00 23:	
High Detailed analysis High (> 81%) Start time	Low (< 20%) O M	Off NA	Load summary	9 17:00 18:00 19:00	20:00 21:00 22:00 23:	
High Detailed analysis High (> 81%) Start time	Low (< 20%) O M End time	Off NA	Load summary	9 17:00 18:00 19:00	20:00 21:00 22:00 23:	
High Detailed analysis High (> 81%) Start time 03:28	Low (< 20%) • Mormal	Off NA Iormal (21% - 80%) Total time 01:14	Normal High	9 17:00 18:00 19:00	20:00 21:00 22:00 23:	
High Detailed analysis High (> 81%) Start time 03:28 04:50	Low (< 20%) • r	Off NA	Load summary Normal High Low	9 17:00 18:00 19:00	20:00 21:00 22:00 23:	



Modbus Based Monitoring

- Connect to the controller on Modbus for monitoring health and performance parameters of DG
- Monitor alarms related to the DG and controller
- Poll parameters every 30 seconds and perform historical analysis

		Dashboard Real Tin		cator Configuration	Reports & Analysis	User Profile A	f dvanced Monitoring	Hello, Cummins 👌
stomer: All		• ESN: Orchid_gurgon	Go	Model: K-series4	Location: Pune	Last updated	: 06-Apr-2015 02:06 PM	X
Battery Voltage (Vdc)	27	Engine Run Time (hrs)	3435	Lube Oil Press	sure 🥙 E	ngine Status	Radiator Coolant Tem	р
Engine Speed (RPM)	1501	Lube Oil Pressure (kPa)	50.8					
Coolant Temp (DegC)	72	Oil Temp (DegC)	77	50			72	
L1 N Voltage (V)	242	L1 Current (Amps)	18	0 50	150	۱ I	0 125	
_2 N Voltage (V)	240	L2 Current (Amps)	21		×.	10 15		Battery:(27 V)
_3 N Voltage (V)	240	L3 Current (Amps)	17		- 5	15	20 -	Duttory (21 V)
Net KWH (kWh)	427915	Total kW (kW)	127		-	15	-	Radiator
IMT 1 (DegC)	18331.75	Fuel Level (Liters)	O	Fuel Level		25	LTA Coolant Temp	Coolant Level
Exhaust Temp (DegC)	18331.75	Ambient Temp (DegC)	18331.75	i dei Level		X100	ETA coolant temp	
Total Fuel Consumption	0	Alt Voltage (V)	416			RPM		LTA Coolant Leve
Total kVA	N/A			0	ERT	3435	0	
				0	1000		0 125	

Fault Table

Powered by Maven Systems Pvt. Ltd.



Full Dash Board

	Dashboard Real T	ime Data Locator Co	onfiguration Re	ports & Analysis User	Profile Advanced M	onitoring	
ustomer: All	ESN: Orchid_gurgo	n 🔻 Go Model:	K-series4 Lo	ocation: Pune Last	updated: 06-Apr-	2015 02:06 PM	CSV
Low Fuel	Low Coolant Level	Parameter	Value	Parameter	Value		Live Analysis
Overspeed	Low Oil Pressure	L1 Current (Amps)	18	Rated L1 Current	24		
Pre Low Oil Pressure	High Engine Temp	Li current (Amps)	10	(%)	27	V1	
Pre High Engine Temp	Low Coolant Temp	L2 Current (Amps)	21	Rated L2 Current (%)	25	V1	
Fail to Start	Charger AC Failure	L3 Current (Amps)	17	Rated L3 Current	22		
Low Battery Voltage	High Battery Voltage	× 1 7	17	(%)		V2	
Not In Auto	Modbus Running	Average Current (Amps)	19	L1 N Voltage (V)	242		
Modbus Supplying Load	Modbus Common Alarm	L1 L2 Voltage (V)	416	L2 N Voltage (V)	240	V3	
Emergency Stop	Utility Breaker Trip	L2 L3 Voltage (V)	415	L3 N Voltage (V)	240		
Genset CB Trip	Load Demand	L3 L1 Voltage (V)	416	kW L1 (kW)	43	кw	63
Fail To Close	Fail to Synchronize	kVAR L1 (kVAR)	4	kW L2 (kW)	46		
Reverse Kvar	Reverse KW	kVAR L2 (kVAR)	4	kW L3 (kW)	39	C1	24
Short Circuit	Over Current				127		
Overload	Under Freq	kVAR L3 (kVAR)	7	Total kW (kW)			
Low AC Volts	High AC Volts	Total kVAR (kVAR)	16	Net KWH (kWh)	427915	C2	25
Ground Fault	Check Genset	Net kVARh (kVARh)	40444	Total Power Factor (PF)	0		

Powered by Maven Systems Pvt. Ltd.



Maintenance Reminder Interface

Vehicle number	Model	Oil change	Filter change	Servicing
Yestenin Strategict	BAGESHALLCE.	39	2	55
Vehicle-SK480LC	SK480LC	71	69	150
Vehicle-SK210LC	SKOLLIC	10	6	200

-Maintenance oil change details -

Vehicle number: Vehicle-SK350LC								
Oil type	Due in hours	Last changed date	Expected change	-				
Engine Oil				Reset				
Engine Coolant	48	Apr 06	Jul 23	Reset				
Swing m/c Gear Oil	58	May 02	Jul 24	Reset				
Track m/r Caar Mil	71	Eah ne	111 76	(n				

Maintenance filter change details

Get Reminders

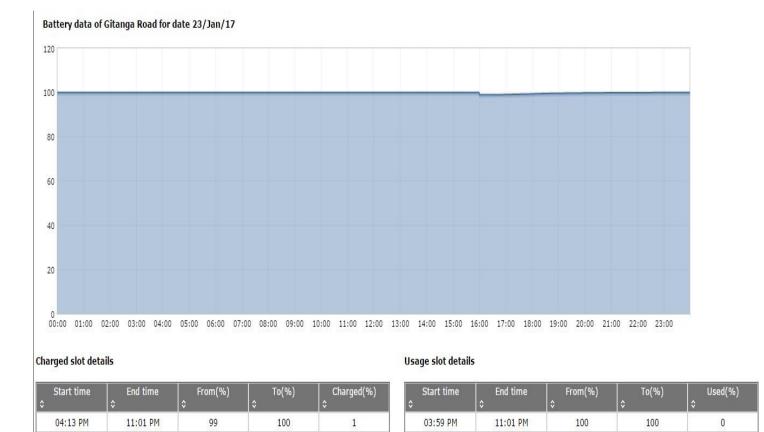
- Oil change
- Filter change
- Servicing
- Insurance
- Permit
- Authorization
- ➢ P.U.C.
- DG engine Fitness





Battery Bank related Monitoring

- Charge dissipation tracking
- Charging tracking
- Percentage utilization of the unit
- Business rules can be implemented to send email and sms alerts when an agreed discharge threshold is exceeded.



Temperature Related Reports

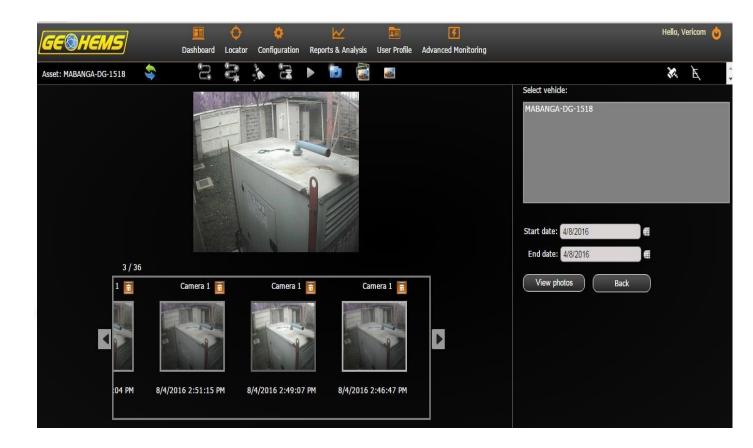
- Change in Temperature
- Temperature Trends
- Alerts on drastic temperature changes
- Business rules can be implemented to send email and sms alerts when an agreed discharge threshold is exceeded.





Camera Related Reports

- Provides on demand real time view of the site
- Motion sensor cameras
- On demand snapshot of site
- Audit capabilities in case of resource misuse or theft





Site Access Related Reports

- Tracks when a site has been accessed
- Business rules can be implemented to send alerts on email and sms when a site is accessed.

Event reports (22) Select grou	p: All assets Sele	ect Asset: Isiolo Start o	date: 1/1/2017 III End date: 2/2/2017	III Ok
			Search	Details
Asset number ≎	Date ≎	Total door open count \$	Total door open hours ≎	Start time End time Total time \$ \$
Isiolo	12-Jan-2017	1	09:07	14:52 23:59 09:07
Isiolo	13-Jan-2017	1	23:59	1 - 1 of 1 Records



Salient Features in a Nutshell

- > 24 x 7 monitoring of generators
- SMS / emails for alerts
- > Analysis and reports
- Camera interface for onsite images
- > Web based applications
- ➤ Tamper proof
- Sustains vibrations up to 8G



Conclusion:

We as Vericom networks look forward to having your organization as a valued customer. We are honoured to be given the opportunity to offer your esteem company our service.

