

Title

Description

Preservation/Storage Method For Armored Vehicles, Battle Tanks, Transport Vehicles, and Self-Propelled Howitzer Guns.

Background

The present invention relates to a preservation/storage method and the integration of its apparatus for preservation of Armored Vehicles, Battle Tanks, Transport Vehicles and Self-Propelled Howitzer Guns

In these days of downsizing of manpower and declining population, Armed Forces throughout the world are looking for a more efficient way to preserve the above said military equipment.

Currently, in order to maintain its land vehicles in war readiness at all times, the Armed Forces employs its manpower to manually change the engine oil of every vehicle every three months, according to Original Equipment Manufacturers' recommendations, on top of getting the engine started and running. They realized that repeating this manual procedure every three to six months is tedious, time-consuming and taxing on manpower. Very often, accidents occur. Moreover, to the Army's dismay, it does not effectively preserve their armoured vehicles and battle tanks in pristine condition. Over time, parts and joints begin to corrode, rubber and electrical components breakdown and need replacing. Manual maintenance becomes altogether too costly.

Humidity, moisture, and big temperature variations with the resultant condensation take their toll on vehicles left to stand whether indoors or outdoors. Gearboxes, engines and even replacement parts are highly susceptible to changes in humidity. Weapon systems and electronic systems, in particular, are prone to breakdowns if left in an atmosphere of uncontrolled humidity. Oil and grease when exposed to high humidity will degenerate over time leading to components breakdown and the life span of the vehicle is shortened.

Aging is a collective term for changes in property of materials that occur on longer term storage without the action of chemicals and controlling the humidity of the environment. Hence, lead to partial or complete degradation. These changes can occur in the form of degradation processes, and crack formation.



Rubber seals are especially prone to such aging effects if left unprotected. The unsaturated groups in rubber present a sensitivity toward oxygen, ozone, UV irradiation, bacteria attack and other active substances. These reactions cause changes in the rubber seals and resulting in leakages of the hydraulic, fuel and lubrication system.

SUMMARY OF THE INVENTION

The current method is an old fashioned tedious way and requires heavy dependence on physical manpower for maintaining the operational readiness of the above said vehicles and equipment. .

The intention of the present invention is to create a new method and the integration of its apparatus into a preservation system for above said vehicles and equipment without experiencing the drawbacks referred to above.

A special object of the invention is to develop an effective method and the integration of its apparatus to control the relative humidity of the environment by using dehumidifiers, humidity sensors, and a centralized battery charger and corrosion detection system in any enclosures that reduce the need of manpower after the said vehicles and equipment are kept in storage.

Another object of the invention is reducing the time or manpower required to change the engine oil of every vehicle every three to six months, thereby enhancing operational readiness and better deployment of soldiers to combatant role.

A further object is to convert redundant multi-storey car park, open car park, hangar, warehouse, bunker, and building into useful storage units for the preservation military vehicles and equipment.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with this discovery, it is an object of the invention to provide the novel process of the integration of apparatus used, and the process involved and materials used for converting redundant multi-storey car par, open car park, warehouse, hangar, shelter and building into useful storage units.

The method and the integration of said apparatus are herein described.

In the preservation method and apparatus according to the invention shown in figure 1, a multi-storey car park has been converted into storage units for armored vehicles, battle tanks, transport vehicles and self-propelled howitzer. All existing ventilating louvers or openings of the multi-storey car park have been sealed with fire-retardant modular wall. An entrance with a roller-shutter door is installed at the exit of each floor of the car park facilitating quick and ease movement of the preserved or storage vehicles during emergency mobilization.

In the preservation method and the integration of its apparatus according to the invention shown in figure 2, dehumidifiers, air ducts are installed in storage units, with humidity sensors held in suspend in the storage units of each floor of the multi-storey car park. The said apparatus are connected to control panels and are powered by either 110 Volts or 230 Volts AC power supply.

In the preservation method and the integration of its apparatus according to the invention shown in figure 3, Corrosion Sensors are also installed inside the preserved or storage said vehicles to monitor the corrosion rate of the vehicles. The Corrosion Sensors are connected to the Modular Battery Charger and the modular battery charger is connected to the main control panel monitoring system via the zone controller. Each zone controller controls up to 50 vehicles.

In the preservation method and the integration of its apparatus shown in figure 4 the functional block diagram and the centralized battery charger unit consists of the following:

Transformer

Protection Circuit to prevent the system from being over current or over voltage.

AC/DC Converter & DC Voltage Regulator Module to convert the AC input to desired DC voltages required.

Battery Charging Circuit to output the battery power (pulse charging) when it is required, the voltage, current of the power is controlled by Battery Charging Management Circuit.

Battery Charging Management / monitoring circuit which continuously monitor the battery current/voltage over the battery terminals therefore to determine health of the battery and generate respective control signals for controlling the battery charging circuit. This circuit also functions to pass the current/voltage feedback to microcontroller for further control and monitoring. This circuit is able to receive the control command from microcontroller for optimization of battery charging.

Microcontroller has a serial input/output interface to communicate with external host devices through RS 485 interface. The Microcontroller is able to generate to log file which includes the information about battery charging status, charging profile, battery health, microcontroller status and upload it to the host device through the RS 485 port.

In the preservation method and the integration of its apparatus according to the invention shown in figure 4a, the Modular Battery Chargers connectors both the corrosion sensor and battery charging are connected to the terminals of all the batteries onboard the preserved or storage vehicles to maintain the right voltage of the said batteries, thereby facilitating ease of starting of the preserved or storage vehicles during mobilization of said vehicles.

The Modular Battery Charger is scalable up to 50 units and is connected to the Main Control Panel Monitoring System via the Zone Controller which controls up to 50 Modular Battery Chargers.

In the preservation method and the integration of its apparatus according to the invention shown in figure 5, all the plastic and rubber parts of the said vehicles are protected by silicon chemicals against ozone and dryness of the storage units.

In the preservation method and the integration of its apparatus according to the invention shown in figure 6, Carbon Monoxide Sensors are installed on the roof of the storage units.

In the preservation method and the integration of its apparatus according to the invention shown in figure 7, dehumidifiers, air ducts are installed in storage units converted from a multi-storey car park, with humidity sensors held in suspend in the storage units of each floor of the multi-storey car park. The said apparatus are connected to control panels and are powered by either 110 Volts or 230 Volts AC power supply.

In the preservation method and the integration of its apparatus according to the invention shown in figure 8, the corrosion sensor is connected to the one of the sockets of modular battery charger and is powered by either 110 Volts 230 Volts AC power supply.

In the preservation method according to the invention shown in figure 9, Battery Chargers connectors are connected to the terminals of all the batteries onboard the preserved or storage vehicles to maintain right voltage of the said batteries, thereby facilitating ease of starting of the preserved or storage vehicles during mobilization of said vehicles. The Modular Battery Charger is scalable up to 100 units depending on the number of vehicles been preserved at a specific location. The battery chargers are connected to the control panels powered by either 110 Volts or 230 Volts AC power supply.

In the preservation method and apparatus according to the invention shown in figure 10, an open space or open car park have been converted into storage units by erecting fire-retardant modular wall with a tapered roof for the purpose drainage of rain water and with de-humidifiers installed.

Claims

What is claimed:

1. A preservation method and the integration of its apparatus into a preservation system for Armored Vehicles, Battle Tanks, Transport Vehicles, Self-Propelled Howitzer Guns, using dehumidifiers and its auxiliaries to control the Relative Humidity of enclosures converted from redundant multi-storey car park, open car park, warehouses, bunkers, shelters, and buildings.
2. The method of claim 1 wherein the preservation method and the integration of its apparatus into a preservation system for above said vehicles and guns are based on the principle of Controlled Humidity Environment of an enclosure at a relative humidity below 50%.
3. The method of claim 2 wherein the preservation method and apparatus consist of sealed storage units, desiccant dehumidifying equipment and its' auxiliary components.
4. The method of claim 3 wherein the number of desiccant dehumidifiers to be installed ranges from 1 up to 30 units corresponding to the size of enclosures.
5. The method of claim 3 wherein sealed storage units can be converted from redundant multi-storey car parks, open car parks, shelters, warehouses, hangars and buildings.
6. The method of claim 3 wherein sealed storage units can be constructed in any open space, field or car park with fire retardant modular wall system.
7. The method of claim 3 wherein the preservation method and apparatus consist of Desiccant Dehumidifiers with build-in blower and exhaust fan, Air Ducts, Humidity Sensors, Corrosion Sensors, Battery Chargers, Zone Controllers, Control Panel, Monitoring System, Carbon Monoxide Sensors and Chemicals for treating rubber and plastic parts of the preserved or storage vehicles.
8. The method of claim 7 wherein the rated airflow of the Process Air of the desiccant dehumidifier ranges from $250\text{m}^3 / \text{hour}$ to $9500\text{m}^3 / \text{hour}$ and the rated airflow of the Reactivation Air ranges from $50\text{m}^3 / \text{hour}$ to $2500\text{m}^3 / \text{hour}$.
9. The method of claim 7 wherein the air ducts are sized in accordance with ISO 7807 recommendations. The length of the air ducts are kept below 60 meters to minimize static pressure losses. The air ducts are insulated to prevent condensation developing on the outside of the air duct whenever the temperature of the air within the duct falls below the dewpoint of the air through which the air duct is routed.

10. The method of claim 7 wherein humidity sensors are located at least 1 meter above the floor level so that it can sense a representative level of humidity in the enclosure to be controlled.

11. The method of claim 10 wherein the humidity sensors are mounted in a position where it will not be directly subjected to the influence of either dry or moist air or to avoid draughts from opening doorways.

12. The method of claim 10 wherein the humidity sensors are not be located to heat-producing equipment, or exposed to direct sunshine, since changes in temperature will have a direct effect on the relative humidity.

13. The method of claim 7 wherein the corrosion sensors are attached to cables ranging from 5 to 50 meters.

14. The method of claim 13 wherein the cables are made from 5 core screen cable and has a drain wire (7/0.5) and are connected to Zone Controller Panel.

15. The method of claim 13 wherein the corrosion sensor is suspended at least 0.5 meter above the base of the vehicle by means of a cable connected to one of the sockets of the battery charger.

16. The method of claim 7 wherein each battery charger is designed to charge the batteries of each preserved/storage vehicle.

17. The method of claim 16 wherein each battery charger is connected to the Control Panel of the monitoring system via the Zone Controller.

18. The method of claim 17 wherein each Zone Controller controls from 1 up to 50 battery chargers.