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NOVEL METHOD OF REGENERATION OF EXHAUSTED LEAD ACID BATTERIES

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Abstract: We all know batteries are expensive and prices keep going up. The average family is spending more and more of their hard earned money each month on all kinds of batteries. But we can save this money by the regeneration of exhausted lead acid batteries and regenerate them to brand new again with easy method. Type of batteries 1. Car batteries 2.Invertor's batteries 3.Golf cart batteries 4.Batteries used in alternate energy system (like solar panel system) 5.Deep cycle marine batteries 6.Bike batteries 7.Heavy tranfort vehicle batteries 8.Residential wind turbine system batteries 9.Many other batteries we can save lakhs of rupees by the regeneration of dead lead acid batteries and it is easy method not time consuming and dead batteries works like new batteries. This would pretty much eliminate the need to buy new expensive batteries ever again and it would save folks lakhs of rupees over their lifetime! My main priority is to make sure the system is so easy to follow absolutely anyone could use it to regenerate any types of above mentioned lead acid batteries out there even people who have absolutely no technical skills and don't know the first thing about battery how battery work. Inside car their is a lead acid battery. Lead acid battery consists of reversible chemical reaction. Every lead acid battery having spongy lead plates & lead oxide mixed with electrolyte of diluted sulfuric acid which converts chemical energy to electrical energy and back again. Sulfate ions gradually accumulates and crystallized on lead plates called as sulfation and reduced electrical energy storage due to deposition of crystals resistant to electricity and gradually weakens when charged & discharged disposed so we introducing Eco-friendly methods of regeneration of exhausted lead acid battery.

Keywords: Regeneration, specific gravity, Test solution, Recharging, Discharging.

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INTRODUCTION

1. Every year 99 millions lead acid batteries are used out, 90 percentage batteries discarded or recycled produced new batteries and contributes to pollution. 2. Lead Acid Batteries are used in Automobile, Home appliance, Laboratories, Golf cart batteries , alternate energy storage system (like solar panel system), Deep cycle marine batteries, Bike batteries, Heavy transport vehicle batteries, Residential wind turbine system batteries, Many other batteries. 3. Life of Lead Acid Battery is about 4-5 years then it is exhausted. 4. Customer purchase new battery whose cost is 5% more than that of its previous one because batteries are expensive and prices keep going up 5. We introducing Eco-friendly methods of regeneration of exhausted lead acid battery.

Motivation:

1. Exhausted Lead Acid Batteries either re-cycle or through which generate large amount of solid waste. 2. Detection and regeneration of Lead Acid Batteries are complicated, more expensive & time consuming process. 3. Detection of exhausted Lead Acid Batteries is done from different test such as Specific gravity determination test, Terminal voltage determination test etc. 4. We have developed simple methods of detection of exhausted Lead Acid Batteries. 5. The average family spending more & more of their hard earned money on repairing and replacement of all kinds of batteries. 6. We have developed easy methods of Regeneration of Lead Acid Batteries.

Advantages:

1. It prolongs batteries lifespan. 2. It reduce waste disposal & protect the environment. 3. It overcomes the inconvenient battery changes frequently. 4. Saving lakhs of rupees of customer

5. Lengthening useful lifespan of new battery up to 8 years 6. It increases the performance of weakened lead acid batteries & prolongs the replacement cycle by two times or more

It is one of the revolutionary Indian Technology consisting a Ayurvedic inorganic salt having low cost and easily available in abundant quantity which increases the performance of weakened lead acid batteries prolonging replacement cycles by two times or more after addition of Ayurvedic inorganic salt i.e. Alum into a battery it react effectively to remove sulfation which produce new lead power to increase surface area of lead plates and recovering specific gravity of electrolytic solution resulting longer battery life cycle, higher current capacity and specific gravity of sulfuric acid reversed and raised from 1.22 to 1.27. After using 1 molar alum solution indicating sulfation recovered.

Materials and Methods:

Before using 1 molar alum solution conduct the following tests 1. Step-I: Analyze the battery using hydrometer and ammeter. 2. Step-II: add required amount of 1 molar alum solution in each hole of battery 3. Step-III: Recharge the battery slowly recovery will be seen between 8 days to 2 weeks. Benefits of regeneration of battery: 1. Reap real benefits from using 1 molar alum solution. 2.Drastic cost saving about 95 %by reduce cost of replacing batteries 3.It increases battery usage 4.It increase productivity & minimizes work disruption and unpleasant situations 5.Use once in year 100% 6.It save environment from pollution 7.Reduce & reuse, cutting cost & pollution 8.One more Indian eco-friendly efficient product introducing to you.

Types of batteries: 1. Gel cell battery more & more expensive than Lead acid batteries 2. AGM (Absorbed glass mat) Battery 50% more expensive than Lead acid batteries 3. Lithium batteries not currently available 4. Lead acid batteries

Regeneration of Dead Lead acid battery 12 volt & 60 AH

Regenerability test/ battery detector: 1. Detecting terminal voltage: Terminal voltage is 10 volt (without load) and 4 volt under load means battery is not working condition. 2. Detecting % of residual capacity: checking specific gravity (SG) value of 6 holes six SG values for a 12 volt battery SG_{max}-SG_{min} less than or equal to 0.04 means regenerable dead battery, SG_{max}-SG_{min} grater than or equal to 0.04 a non regenerable dead battery SG1=1.225 SG_{min}, SG2=1.240, SG3=1.255, SG4=1.260 SG_{max}, SG5=1.235, SG6=1.240, SG_{max}-SG_{min}=0.035<0.04

Calculations:

Calculation of amount of 1 molar alum solution in each hole:

Dosage (cc) for each hole=value of AH/number of hole i.e. Dosage (cc) for each hole= for 60 AH battery/6=10cci.e. 10ml in each hole, after addition of 1 molar alum solution keep the battery on charging then after six hours again determine the terminal voltage without load is 12.81 volt after regeneration (but it was and 11.25 volt before regeneration) with load is 10.63 volt after regeneration (but it was and 3.00 volt before regeneration) means battery is regenerated properly.

Electrochemical reactions:

Electrochemical reactions during discharging:

$Pb(s) + SO_4^{2-}(aq)$ ----------→ $PbSO_4(s) + 2e^-$ (Oxidation reaction)

$PbO_2(s) + SO_4^{2-}(aq) + 4H^+ aq + 2e^-$ ----------→ $PbSO_4(s) + 2H_2O$ (Reduction reaction)

$Pb(s) + PbO_2(s) + 4H^+ aq + 2SO_4^{2-}(aq)$-----→ $2PbSO_4(s) + 2H_2O(l)$ (Overall reaction)

H_2SO_4 is used up during the discharging as the result of which the density of H_2SO_4 falls when the density falls below 1.20g/cm3 battery needs recharging.

Electrochemical reactions during Re-charging/Charging: electrical energy is supplied during charging

$PbSO_4(s) + 2e^-$ ----------→ $Pb(s) + SO_4^{2-}(aq)$ (Reduction reaction)

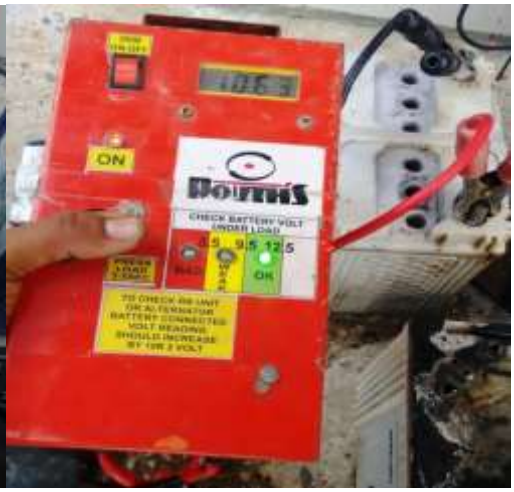
$PbSO_4(s) + 2H_2O$----------→ $PbO_2(s) + SO_4^{2-}(aq) + 4H^+ aq + 2e^-$ (Oxidation reaction)

$2PbSO_4(s) + 2H_2O(l)$-----→ $Pb(s) + PbO_2(s) + 4H^+ aq + 2SO_4^{2-}(aq)$ (Overall reaction)

Battery Detection


Testing of Battery without load **Testing of Battery under Load**

Battery Testing After Regeneration

Testing of Battery without load after Regeneration **Testing of Battery Under Load after Regeneration**

Regeneration Report of Exhausted Lead Acid Batteries Reading

Work Is Conducted At Balaji Batteries Dhamangaon Rly Dist-Amravati, Maharashtra

Sr. No.	Name of Company	Battery Capacity & Types	Detection of Battery without load Before Regeneration	Detection of Battery with load Before Regeneration	Detection of Battery without load After Regeneration	Detection of Battery with load After Regeneration	Date of Regeneration of Battery
1	Exide Xpress	150AH Heavy duty battery	12.02 V	9.96V	12.19 V	10.36 V	26/08/2016
2	Bosch	60AH Vehicle Battery	11.25 V	3.00 V	12.81 V	10.63 V	23/08/2016
3	Power zone	60AH Vehicle Battery	0.04 V	0.02V	12.02 V	10.50 V	21/07/2017
4	Exide 65D26 RMF	65AH	10.51V	3.92V	12.71V	10.49V	24/01/2016
5	Ultra power	60 AH	12.11V	10.69V	13.47V	10.52V	21/01/2017
6	S.F Sonic	35AH	12.69V	9.68V	13.45V	10.34V	21/01/2017
7	Amaron Hi Life LFO	44AH	12.52V	10.23V	12.88V	13.24V	21/01/2017
8	S.F Sonic	70AH	11.59V	0.26V	12.55V	12.36V	22/01/2017
9	Exide 65D26 RMF	65AH	12.05V	8.81V	12.73V	10.49V	22/01/2017
10	Exide DIN 65 LMF	65AH	12.73V	10.36V	13.47V	11.60V	22/01/2017

Table 1 shows date wise reading of Different companies and capacities

Conclusion: The detection of working condition of lead acid batteries is easy and with greater accuracy. After detection its regeneration is very simple, cost effective and eco-friendly.

Result: Terminal voltage of battery was 11.25 volt without load & 3.00 volt with load before regeneration & recharging of battery but it becomes 12.83 volt without load & 10.63 volt with load after regeneration & recharging of battery respectively.

Future scope:

1.My main priority is to make sure the system is so easy to follow absolutely anyone could use it to regenerate any types of above mentioned lead acid batteries out there even people who have absolutely no technical skills and don't know the first thing about battery how battery work. 2. It save not only money but also environmental pollution 3.It comes forward as a one of the revolutionary eco-friendly Indian technology 4. Every person regenerates their own batteries simply by the addition of calculated amount of 1 molar alum solution.

REFERENCES:

1. Anderman, M., 1994. "Ni-Cd Battery for Aircraft; Battery Design and Charging Options''. Proc. 9th Annu. Battery Conf. Appl. Adv., California State University, Long Beach, pp. 12–19.

2. Earwicker, G. A. 1956. "Aircraft Batteries and their Behavior on Constant-Potential Charge," in Aircraft Electrical Engineering, G. G. Wakefield, Ed., pp.196–224.

3. Royal Aeronautical Society, U.K. Evjen, J. M. and Miller, L. D., Jr., 1971. "Optimizing the Design of the Battery-Starter/Generator System," SAE Paper 710392. Flake, R. A., 1988. "Overview on the Evolution of Aircraft Battery Systems Used in Air Force Aircraft," SAE Paper 881411. Fleischer, A., 1956.

4. Alkaline Storage Batteries, pp. 466–472, John Wiley & Sons, New York, NY. Gross, S. 1991. "Requirements for Rechargeable Airplane Batteries."

5. Proc. 6th Annu. Battery Conf. Appl. Adv., California State University, Long Beach. Johnson, Z., Roberts, J., and Scoles, D., 1994.

6. 36th Power Sources Conf., Cherry Hill, NJ, pp. 292–295. McWhorter, T. A. and Bishop, W. S., 1972.

7. Cherry Hill, NJ, pp. 89–91. Miller, G. H. and Schiffer, S. F., 1971. "Aircraft Zinc-Silver Oxide Batteries," in Zinc-Silver Oxide Batteries, A. Fleischer, Ed., pp. 375–391, John Wiley & Sons, New York, NY. Scardaville, P. A. and Newman, B. C., 1993. "High Power Vented Nickel-Cadmium Cells Designed for Ultra Low Maintenance," Proc. 8th Annu. Battery Conf. Appl. Adv., California State University, Long Beach.

8. Senderak, K. L. and Goodman, A. W., 1981. "Sealed Lead-Acid Batteries for Aircraft Applications," Proc. 16th IECEC, pp. 117–122.© 2001 by CRC Press LLC

9. Vutetakis, D. G., 1994. "Current Status of Aircraft Batteries in the U.S. Air Force," Proc. 9th Annu. Battery Conf. Appl. Adv., California State University, Long Beach, pp. 1–6.

10. Vutetakis, D. G. and Viswanathan, V. V., 1995. “Determining the State-of-Health of Maintenance-Free Aircraft Batteries,” Proc. 10th Annu. Battery Conf. Appl. Adv., California State University, Long Beach, pp. 13–18.