Subjective and Comparatively Studied of Batteries on Different Parameters Efficiently Performance of the Batteries

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Abstract –

The main objective of this research work is to focus on the subjective and comparative performance of batteries in terms of various parameters the method used is a subjective and comparative study of car batteries available in the market. The various parameters studied for these batteries are: B-S, B- P, B-C-T and B-C .The study and data collection revealed that the ranking of the batteries was based on power output and charging time, as these two parameters are considered critical. Following the high-ranking batteries were mapped for future analysis of a battery combining these two high-ranking batteries. The S-N-C-B and the A-I-B have the highest performance for each factor, i.e., "power capacity" and "B-C-T". S-N-C-B and A-I-B offer maximum power and minimum charging time because they have high power output and low charging time. A combined experimental study of these two batteries is essential for high performance and optimized batteries for automotive applications. Their high energy density enables best efficiency batteries to power complex.

Key Words: **Subjective and Comparative, Battery Mapping, B-S, B- P, B-C-T, B-C, Ranking and Score.**

1. INTRODUCTION

Batteries gave the primary wellspring of power before the improvement of electric generators and electrical lattices around the finish of the nineteenth hundred years. Progressive upgrades in battery innovation worked with major electrical advances, from early logical examinations to the ascent of transmits and phones, in the long run prompting convenient PCs, cell phones, electric vehicles, and numerous other electrical gadgets Researchers and architects fostered a few monetarily significant sorts of battery. "Wet cells" were open compartments that held fluid electrolyte and metallic anodes. At the point when the terminals were totally consumed, the wet cell was recharged by supplanting the anodes and electrolyte. Open holders are unsatisfactory for versatile or convenient use. Wet cells were utilized financially in the message and phone frameworks. Early electric vehicles involved semi-fixed wet cells one significant arrangement for batteries is by their life cycle. "Essential" batteries can deliver flow when gathered, however when the dynamic components are consumed, they can't be electrically re-energized. The improvement of the lead-corrosive battery and resulting "auxiliary" or "chargeable" types permitted energy to be reestablished to the cell, expanding the existence of forever gathered cells. The presentation of nickel and lithium based batteries in the last 50% of the twentieth century made the advancement of countless versatile electronic gadgets doable, from strong spotlights to cell phones. Extremely enormous fixed batteries discover a few applications in framework energy capacity, assisting with settling electric power conveyance organizations In view of certain discoveries by Luigi Galvani, Alessandro Volta, a companion and individual researcher, accepted noticed electrical peculiarities were brought about by two unique metals combined by a clammy delegate. He confirmed this speculation through tests and distributed the outcomes in 1791. In 1800, Volta created the primary genuine battery, which came to be known as the voltaic heap. The voltaic heap comprised of sets of copper and zinc plates heaped on top of one another, isolated by a layer of material or cardboard absorbed saline solution (i.e., the electrolyte). Not at all like the Leyden container, the voltaic heap delivered constant power and stable current, and lost little charge after some time when not being used; however his initial models couldn't create a voltage sufficiently able to deliver flashes. He explored different avenues regarding different metals and found that zinc and silver gave the best outcomes. Volta accepted the current was the consequence of two unique materials essentially contacting each other an outdated logical hypothesis known as contact pressure - and not the aftereffect of compound responses.

2. LITERATURE REVIEW

We have studied around 50 articles related to the batteries out of which 20 relevant articles hasbeen short listed for a detailed and subjective , comparatively studied on different parameters efficiently performance of the batteries .The study of various batteries is done both subjectively and comparatively. [1] Rafael B. Araujo et.al, Chalmers University of Technology 8 April 2021, Towards novel calcium battery electrolytes by efficient computational screening which was presented screening strategy is initially based on a combined density functional theory (DFT) and conductor1like screening model for real solvents (COSMO-RS) approach, which allows for a rational selection of electrolyte solvent based on a set of physico-chemical and electrochemical properties. Recommended as a time and effort saving tool prior to undertaking any experimental studies to fast evaluate Ca conducting electrolyte candidates. [2] Meng Liao et.al Fudan University2019, Extraction of oxygen anions from vanadium oxide making deeply cyclable aqueous zinc ion battery, it was presented stability over 200 cycles with high specific capacity of ~400 mAh·g -1 , achieving 95% utilization of its theoretical capacity, and long cycle life up to 2000 cycles at high utilization of 67%. This work opens up a new avenue to synthesize novel cathode materials for advanced batteries by designing oxygen deficient structure, [3] Sefu kitaronka Siirt University turkey January 2022, lead-acid battery it was presented a recent study on economic and environmental impact suggests that lead-acid batteries are unsuitable for domestic grid-connected photovoltaic systems. [4] Cesar a.c. sequeira1, Mario r. pedro2 02 June 2014. Lead-acid battery storage it was presented. This paper includes a few pertinent comments on these rechargeable systems in their present stages of research and development. [5] Yiqun Liu, Y. Gene Liao and Ming-Chia Lai Wayne State University 27 January 2020 Lithium-Ion Polymer Battery for 12-Voltage Applications: Experiment, Modeling, and Validation it was presented Modeling, simulation, and validation of the 12-volt battery pack using a 20 Ah lithium–nickel–manganese–cobalt–oxide cell in this paper, influence of ambient temperature and charging, discharging currents on the battery performance in terms of discharging voltage and usable capacity. The proposed simulation model provides design guidelines for lithium-ion polymer batteries in electrified vehicles and stationary electric energy storage applications. [6] D. U. Sauer et. al ,University, Germany, 2003(1)Sli Battery specification and capacity 12 v or 6 volt DC which was used for automobile application and its life span should be 3 to 4 years and its cost around 112 / pices high current discharge, low internal resistance, and ultra-long life with a cycle life of more than 100,000 times.[7] S.R. Nelatury and P. Singh, 621-625 (2002) lead-acid the pure lead at the negative side and the PbO_2 on the positive side, plus the aqueous sulfuric acid. UPS systems, starting lighting and ignition power sources for automobiles, and its life span should be 3-4 years its cost should be 7500 large current capability Tolerant to abuse, Tolerant of overcharging, it can be charged slowely it takes 14-16 hours. Its limited life span it was used in hybrid vehicles Ford and Volkswagen. [8] Deng, D., M. G. Kim, J. Y. Lee, and J. Cho. Sic 2009 [9] lithium-ion batteries maximal capacity of 1339 C/g (372 mAh/g) spectrum- from energy storage is about two to three years or 300 to 500 charge cycles its high energy density sensitive to high temperatures.it was used in tesla model's.[10] Ying, T. K., ET. Al, 31, 525-530. Studies on rechargeable NiMH batteries it was provided 3.2–3.7 V nominal voltNiMH hydride batteries are used in hybrid automobile batteries its cost should be around 14000 NiMH batteries and operate around ambient temperature. For example, the Toyota™ Prius (II-V models) use sealed NiMH batteries, which are estimated to have a 150,000 mile battery life based on the manufacturer's More complex charge algorithm High self-discharge — typically 50% higher than NiCd.

3. METHODOLOGY

The method adopted is subjective and comparative study of automobile batteries existing in the market. Around 50 articles were studied and out of which 20 articles were ranked from 1 to 20 based on their relevance to this study. The various parameters studied on these batteries are:

- Battery Specification
- Battery power
- Charging time
- Cost of battery

- Limitations From the study and data collection, ranking of batteries is done based on (a) Power output, and (b) Charging time, as these two are observed as critical parameters. Following rankings, the high ranked batteries were mapped for future analysis of a battery combining these two high ranked batteries.

Table -1: Max. Power and Minimum Time Charge

Battery	Max. Power v	Battery	Minium time charge
Aluminum Ion	4v	Aluminum Ion	1
Lithium-Ion	3.7v	Lithium-Ion	2
L-P-B	3.7	Lithium Polymer	3
Nickel Cadmium	1.2v	Nickel-Cadmium	1.3
Deep Cycle	12v	Deep Cycle	2
N-M-H-B	1.2 V	N-M-H-B	15
Silver Calcium	14.8v	Silver Calcium	4
S-N-C-B	48 V	S-N-C-B	5-6
L-M-S-B	4 V	L-M-S-B	4-6
Sli Battery	24v	Sli Battery	12

L-I-P-B	3.2v	L-I-P-B	4
Z-B-F-B	1.8v	Z-B-F-B	7
U-S-B	2.7v	U-S-B	10
V-R-L-A-B	12v	V-R-L-A-B	12
Z-M-O-B	1.3v	Z-M-O-B	9
Wet Cell Battery	12 V	Wet Cell Battery	7
Lead Acid	2.45v	Lead Acid	8
L-C-D-B	2.4v	L-C-D-B	6
S-W-B	1.23v	S-W-B	4
Lithium Sulfur	2.5v	Lithium Sulfur	6

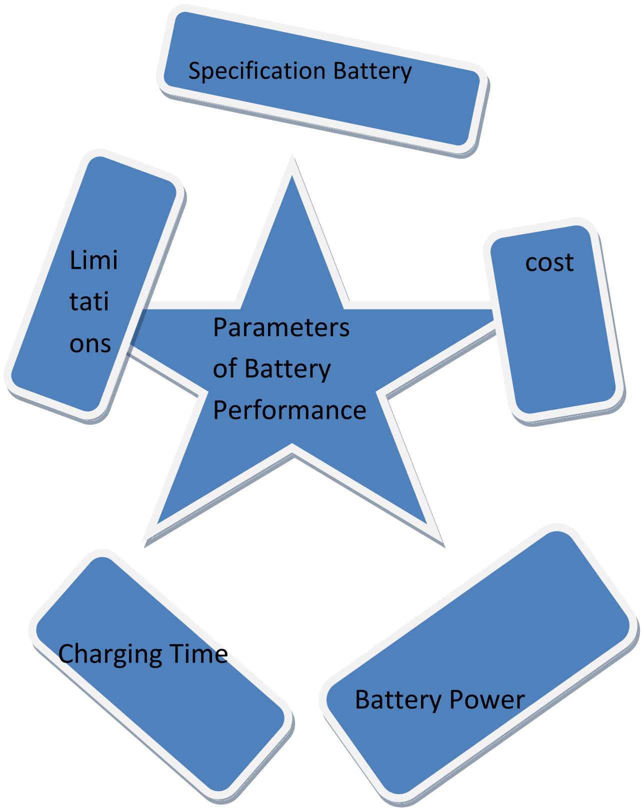

Fig 1: Factor/Parameter Analysis [2H3L Model]

Table -2: Ranking in Maximum Power Output and Minimum Charging Time

Name of Battery	Ranking on Maximumpower out-put	Ranking on minimum ChargingTime
Sli Battery	2	19
Lithium-Ion	9	3
L-A-B	13	15
N-M-H-B	18	20
S-N-C-B	1	11
L-P-B	7	5
L-M-S-B	8	9
N-C-B	19	2
Deep Cycle	4	4
Silver Calcium	3	6
L-I-P-B	10	7
Z-B-F-B	15	13
Ultra Super	11	17
V- R- L-A-B	5	18
Z- M-O -B	16	16
Wet Cell	6	14
Aluminum Ion	20	1
L- C- D-B	14	10
Sea Water-B	17	8
Lithium Sulfur	12	12

3.1 Mapping Based On Maximax and Minimin Ranking

A mapping of Maximax power and Minimin charging time is carried out from the details furnishedin the table to find the batteries delivering maximum power and minimum charging time, which happens to be battery- sodium nickel chloride and Battery – Aluminum ion Battery.

Table -3: Mapping Based On Maximax and Minimin Ranking

Rank	Types of Batteries	Maximum Power	Rank	Types of Batteries	Minimin ChargingTime
1	S-N-C-B	48V	1	S-N-C-B	1min
2	L-I-B	3.7v	2	L-I-B	2hr
3	L-P-B	3.7v	3	L-P-B	3hr
4	N-C-B	1.2v	4	N-C-B	1.3hr
5	D-C-B	12v	5	D-C-B	2hr
6	N-M-H	1.2v	6	N-M-H	15-20hr
7	S-C-B	14.8v	7	S-C-B	4hr
8	S-N-C	48v	8	S-N-C	5-6hr
9	L-M-S-B	4-5V	9	L-M-S-B	4-5hr
10	SLI-B	24v	10	SLI-B	12-16hr

11	L-I-P-B	3.2v	11	L-I-P-B	4hr
12	Z-B-F-B	1.8v	12	Z-B-F-B	7hr
13	U-S-B	2.7v	13	U-S-B	10hr
14	V-R-L-A	12v	14	V-R-L-A	12hr
15	Z-M-O	1.3v	15	Z-M-O	9hr
16	W-C-B	12v	16	W-C-B	7hr
17	L-A-B	2.45v	17	L-A-B	8hr
18	L-C-D-B	2.4v	18	L-C-D-B	6hr
19	S-W-B	1.23v	19	S-W-B	4hr

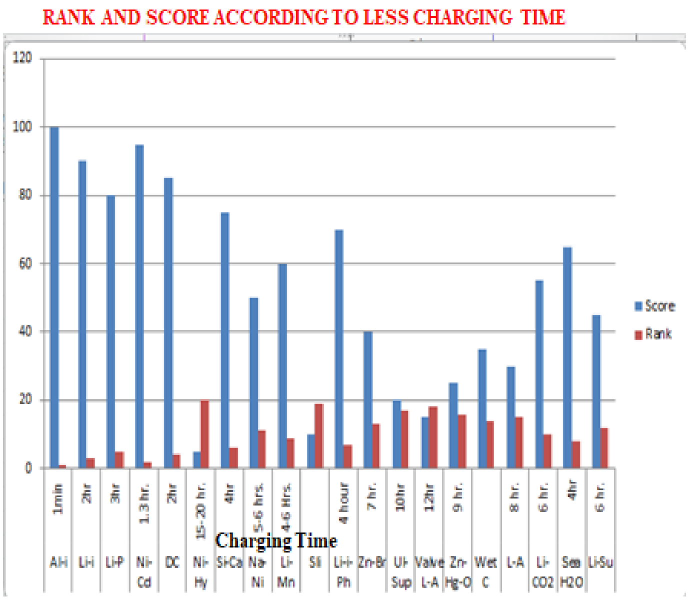

Chart -1: Rank and Score according to Less Charging Time

Table -4: Charging Time in Minute for 48 Volts

Name of Battery	Power in Volts	Charging Time in Min for 48 volt
SLI Battery	48v	360min
L-I-B	48v	1560min
L-A-B	48v	4800min
N-M-H-B	48v	48000min
S-N-C-B	48v	360min
L-P-B	48v	2340min
L-M-S-B	48v	3456min
A-I-B	48v	12min
D-C-B	48v	480min
S-C-B	48v	779min

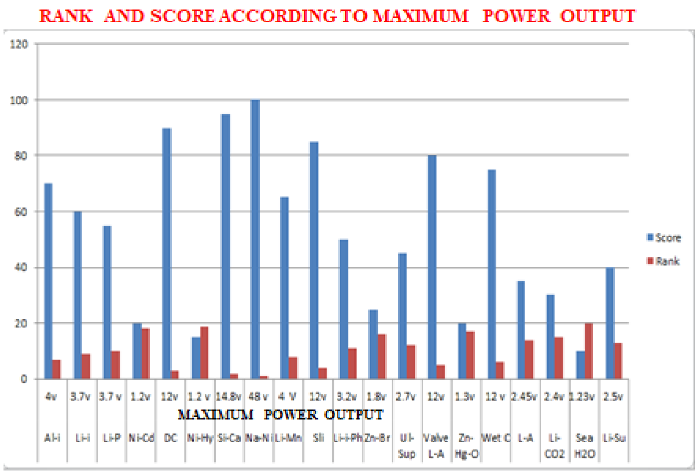

Chart -2: Rank and Score According maximum Power Output

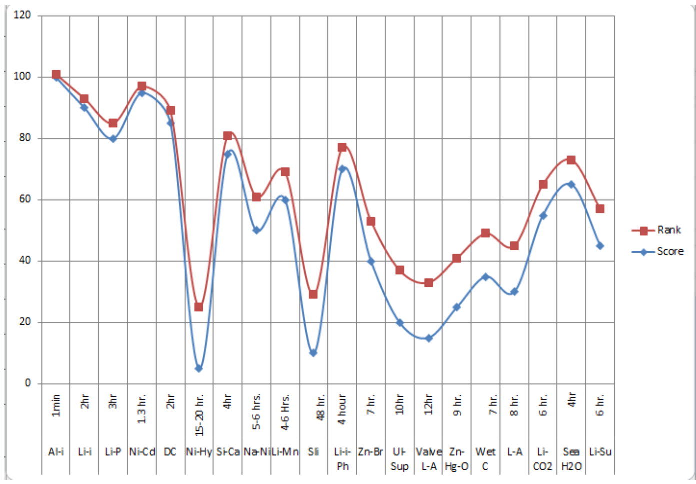

Chart -3: Rank and score according to less charging time

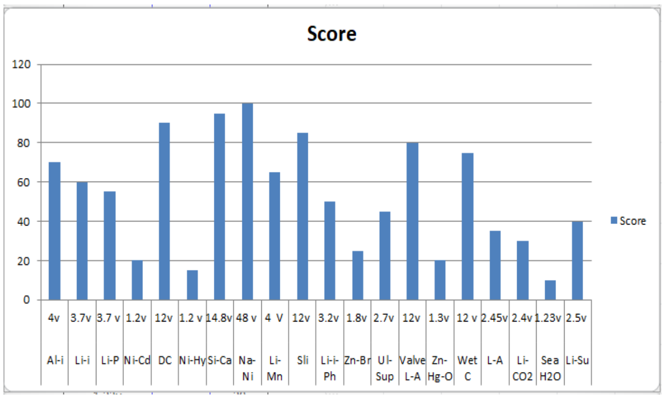

Chart -4: Score according to maximum power output

3.2 COMPARATIVE STUDY ON MAPPING

1. Sodium battery is taking 360 minutes for 48V charging capacity, but Aluminum-Ion-battery is taking only 12 minutes for 48V charging capacity.

2. Lithium-ion batteries are taking 1560 minutes for 48V charging capacity.
3. Lead acid battery batteries are taking 4800 minutes for 48V charging capacity.
4. Lithium manganese spinel battery is taking 3456 minutes for 48V charging capacity.

4. FINDING AND RESULT

The sodium nickel chloride battery and aluminum ion Battery have maximum performance on each factor, that is, "power capacity" and "less charging time". A combined experimental study of these two batteries is mandatory for a high performance and optimized battery for energy sources.

4.1 CONCLUSIONS

Conclusion of the studies It also recharge quickly and hold their charge longer S- C -B and A-I-B revels maximum power and minimum charging time because its high power output and low charging time. its high energy density allows batteries efficiency them to power complex energy sources.

5. LIMITATIONS

1. I have done studies around 50 articles only due to less access to journals and periodicals.

2. I have read article with the help of internet without visiting other libraries and reference sources in IITs and other premier institutions.

3. Some data has been collected from other sources such as media and newspapers.

4. I have not performed the experimental work due to lack of time.

5.1 RECOMMENDATIONS

The rechargeable batteries should be most recommended because they seem like a good idea as they are more eco- friendly for the environment at first glance however we have tested commonly available rechargeable batteries we have identified that their charging to should be more faster than liquid cell batteries and its performance should be good And its manufacturing cost should be minimum and price should be affordable foreveryone.

The cheap Batteries can be found but great care to needs to be taken using low quality batteries can lead to early battery failure and short battery life.

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