

DETERMINATION OF INVERTER CAPACITY TO POWER THE MAIN LIBRARY OF FEDERAL POLYTECHNIC, EKOWE, BAYELSA STATE.

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ABSTRACT

The study focused on the determination of inverter capacity to power the main library of Federal Polytechnic, Ekowe, Bayelsa State. Three research questions were drawn from the study. The study is limited to electrical power load of the main library of Federal Polytechnic Library Ekowe, Bayelsa State. It is also limited to the use of Luminous and Genus Nigeria market capacity of inverter. The researcher adopted construction and fabrication method to construct the 50KVA inverter size. From the finding in research question 1, it was revealed that total power calculated load of main library in Federal Polytechnic Ekowe, was 24.22KW. The maximum calculated load [MCL] PER day is 96.88KWH/DAY. The inverter capacity size for luminous and genus was 50KVA/360 VDC. Finally, it was recommended that academic institutions should introduce inverter power back up systems to power their library against sudden power outbreak.

KEYWORDS: Inverter Capacity, Power, Luminous, Genus.

INTRODUCTION

The library is a study and research center where all academic work takes place. It is pertinent that such environment should be readily equipped with all the modern ICT material to enable student carryout research work effectively. Most ICT and research equipments cannot operate successfully without the supply of electricity to power them. Some of such equipments include internet systems, computers, i-phones, i-pads, interactive board, educational television, e.t.c. The presence of these equipments creates a lot of academic zeal among students to carry out research work.

Nigeria as a country has over the years witnessed poor power supply due to poor distribution system from the power stations. Poor and irregular supply of electricity has persisted in many parts of the country. The problem has been blamed largely to on constant load shedding given the inadequacy of the quality of electricity currently generated in the country [Pointer, 2016]. Due to the poor supply of electricity, there is therefore the need to introduce backup systems like the inverter to sustain electricity for a while in the advent of power failure.

An inverter is an electronic device or circuitry that changes direct current to alternating current. The input voltage and frequency, and overall power handling depend on the design of specific device or circuitry. The inverter does produce any power by the D.C. source. A power inverter can be completely electronic or may be a combination of mechanical effects and electronic circuitry.

A typical power inverter device or circuit requires a relatively stable DC power source capable of supplying enough current for the intended power demands of the system [Wiley, Larry and Lewis,2010]. Other types of inverters are stand- alone inverters, Grid-tie inverters and battery backup inverters. These inverters when installed in the school, industries, churches, e.t.c. can power some equipments pending when electricity will be restored. Therefore, an inverter power system is needed for the sustenance of electricity supply in educational library.

PURPOSE OF THE STUDY

The primary purposes of the study are to;

- Calculate the total load analysis of the equipments available in Federal Polytechnic Library Ekowe.
- Determine the maximum continuous load [MCL] express in watts.
- Ascertain the size of inverter that can power the MCL.

SIGNIFICANCE OF THE STUDY

The study will be of benefit to the students and school management.

For the students, the presence of inverter backup power system will remove fear of power failure during research work using ICT facilities.

For school management, there will be full assurance of power supply to run the main library. It will also give school management the knowledge of the amount of power load available within the library.

SCOPE OF THE STUDY

The study is limited to electrical power load of the main library of Federal Polytechnic Library Ekowe, Bayelsa State. It is also limited to the use of Luminous and Genus Nigeria market capacity of inverter.

RESEARCH QUESTIONS

The researcher adopted the following research questions;

- What is the total load analysis of the equipments available in Federal Polytechnic Library Ekowe?
- What is the maximum continuous load per day [MCL] express in watt?
- What is the size of inverter that can power the MCL?

METHODS

RESEARCH DESIGN

The researcher adopted construction and fabrication method to construct the 50KVA inverter size. The inverter has a D.C input system.

RESULTS

DATA ANALYSIS

RESEARCH QUESTION 1

What is the total load analysis of the equipments available in Federal Polytechnic Library Ekowe?

TABLE 1: DAILY AC POWER CALCULATIONS OR LOAD ANALYSIS IN FEDERAL POLYTECHNIC LIBRARY, EKOWE, BAYELSA STATE.

S/NO	LOAD	QUANTITY	POWER RATING [WATT]	TOTAL POWER RATING [WATT]
1	SET OF HP DESKTOP COMPUTER [CPU + MONITOR+ KEYBOARD+ MOUSE]	40	300	12000
2	CEILING FAN	40	85	3400
3	SHARP AL-1551CS LASER COPIER AND PRINTER	2	655	1310
4	HP LASERJET PRINTER	4	220	880
5	HP COLOUR LASERJET CP1515N PRINTER	2	295	590
6	LIGHTING POINT	80	18	1440
7	ALARM SYSTEMS	1	250	250
8	WATER DISPENSERS	2	145	290
9	SCANERS	4	40	160
10	SERVER COMPUTER	2	450	900
11	LAPTOPS	40	50	2000
	MISCELLANEOUS	1	1000	1000
	MAXIMUM CONTINUOUS LOAD [WATT]			24220

The Maximum Continuous Load [MCL] expressed in Kilowatts = $24220/ 1000= 24.22KW$.

RESEARCH QUESTION 2

What is the maximum continuous load per day [MCL] express in watt?

The main library of the Federal Polytechnic runs from 8 am to 6 pm and this system is intended to provide a backup power of four hours every day.

The MCL PER day is = $MCL * 4HRS=24.22*4=96.88KWH/DAY$

RESEARCH QUESTION 3

What is the size of inverter that can power the MCL?

INVERTER SIZING

To determine the size of the inverter, the maximum continuous load and the maximum start up load are critical since they represent the minimum running and start up capacities of the inverter. The inverter capacity must be greater than the maximum Start up load to enable it accommodate both over load due to surge and permissible actual overload.

$MSL = 36.33KW$

This calculated capacity guided the selection process in choosing from the available capacities in the Nigerian market.

TABLE 2.

S/NO	MAKE	CAPACITIES		
1	LUMINOUS	20KVA/360DC	30KVA/360VDC	50KVA/360VDC
2	GENUS	20KVA/360VDC	30KVA/360VDC	50KVA/360VDC

From the table above 50KVA inverter is most suitable as it meets the conditions stated.

DISCUSSIONS OF FINDINGS

From the finding in research question 1, it was revealed that total power calculated load of main library in Federal Polytechnic Ekowe, was 24.22KW. The maximum calculated load [MCL] PER day is 96.88KWH/DAY. The inverter capacity size for luminous and genus was 50KVA/360 VDC.

CONCLUSION AND RECOMMENDATION

In all, an inverter size of 50KVA/360VDC is what is required to power the entire electrical consumption load of 24.22KW. Therefore it was recommended that academic institutions should introduce inverter power back up systems to power their library against sudden power outbreak.

REFERENCES

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