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ISSN: 2278-6848 | Volume: 09 Issue: 02 | April - June 2018
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SIMULATION BI DIRECTIONAL POWER FLOW IN ELECTRICAL TRANSFORMER AND DISTRIBUTION SYSTEM

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ABSTRACT: Bi-directional power flow is considered as power flow in multiple opposite directions. Bi-directional power flow is used daily at factories. It consumes electricity from electric power company. It also gets electricity from in-plant electric power generator. This research considers that bio directional dc power should be input for inverter in order to generate AC power. This system would allow utilization of bio directional flow of DC power. It is to operate AC devices. Such electrical transformer and distribution system would provide power for both AC and DC devices. This research considers that the bio directional dc power should be input for the inverter in order to generate AC power. This system would allow utilization of bio directional flow of DC power to operate AC devices.

ISSN : 2278-6848 03
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KEYWORDS : BIO DIRECTIONAL POWER FLOW, AC, DC, VOLTAGE, POWER FACTOR, POWER

[1] INTRODUCTION

Electricity is considered as usually generated at a power station. It is done by electromechanical generators. That has been primarily driven by heat engines fuelled by combustion as well as nuclear fission. Different energy sources include solar photovoltaic & geothermal power. Electricity generation is known as process of generating electric power from sources of primary energy. It has been first stage in delivery of electricity to users for electric utilities in electric power industry. After those stages such as transmission, distribution, energy storage & recovery, using pumped-storage methods take place. A characteristic of electricity is that it is not a primary energy freely present in nature in remarkable amounts & it must be produced. Production is carried out in power plants.

Electricity is most often generated at a power station by electromechanical generators, primarily driven by heat engines fueled by combustion or nuclear fission but also by other means such as kinetic energy of flowing water & wind. Other energy sources include solar photovoltaics & geothermal power. It has been found that solar power generators or wind power generators would become common for residential use. They would generate lot of electricity. Then, residential electric system would have bi-directional flow. Wind power is use of air flow through wind turbines to mechanically power generators for electric power. Wind power is considered as alternative to burning fossil fuels. It is plentiful as well as renewable. It has been widely distributed. It is clean and produces no greenhouse gas emissions at the time of operation. It needs no water and it occupies little land. Its effects on environment are less than those of non renewable power sources. It has been observed that Offshore wind is steadies. It is stronger as compare to land. The offshore farms are having less visual impact. The construction and maintenance costs are getting higher. The Small onshore wind farms may feed some energy in grid. They could provide electric power. It is to isolated off-grid areas. It has been considered that renewable energy is energy which is generated from natural resources. It is naturally replenished. Wind is a natural resource as it is constantly replenished by sun. It means that winds would always blow as long as sun is available. Scientist explore that sun would continue to shine for next six to seven billion years. This is a bright prospect for wind energy investors.

On other side Photovoltaic modules are using semiconductor materials. It is to generate dc electricity from sunlight. Huge area is required to collect more sunlight achievable. Thus the semiconductor is either make into crystalline cells, flat, thin or put down. Cells have been wired together & sealed into a weatherproof module. It is done within electrical connectors added.

Lot of photovoltaic modules are connected in series. It is done to provide a higher dc voltage to inverter input. Sometimes many of such series strings are connected in parallel. This is because a single inverter could be used for more that 50 modules

Bi-directional power flow in case of electric power supply system is considered as power flow in two opposite directions like tide. Bi-directional power

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flow is going to occur daily at factories. It consumes electricity from electric power company & from an in-plant electric power generator.

[2] SCOPE OF RESEARCH

Bi-directional power flow is going to occur daily at factories. Bi-directional power flow in case of electric power supply system is considered as power flow in two opposite directions like tide. It consumes electricity from electric power company & from an in-plant electric power generator. In such a case, bi-directional power flow occurs. Future power system will highly rely on renewable energy sources. The need for expert designers and operators for such systems is increasing. The concept of renewable energy sources have been discussed by evolving new platforms for design, development and integration of renewable energy sources such as photovoltaic and wind for research and educational efforts.

[3] PROBLEM FORMULATION

In such a case, bi-directional power flow occurs. Future power system will highly rely on renewable energy sources. The need for expert designers and operators for such systems is increasing. The concept of renewable energy sources have been discussed by evolving new platforms for design, development and integration of renewable energy sources such as photovoltaic and wind for research and educational efforts. Some researches include the implementation of energy source emulators and related control issues. This research and involves designing of Electrical Transformer and Distribution System to ensure Bio directional power flow for real time operation. Research consist analysis and control that is providing a state of art platform to solve most challenges of actual renewable sources in modern power systems. Important practical knowledge in this context were gained including wind turbine and generator system behaviour as well as the speed control of motor-generator sets through the inverter-drive electronics.

[4] PROPOSED WORK

In case of direct **current** electric charge flows in one direction only. Electric get charged in alternating **current**. AC current changes direction periodically. Voltage in **AC** circuits periodically reverses because **current** changes direction. The objective of research is to provide Bio directional DC to AC power flow. **Inverters** convert direct current to alternating current. This research considers that the bio directional dc power should be input for the inverter in order to generate AC power. This system would allow use of bio directional flow of DC power to operate AC devices. Such electrical transformer and distribution system would provide power for both AC and DC devices. In proposed work the input parameters would be POWER, POWER FACTOR AND VOLTAGE. The output parameters would be current in ampire. The following simulation and optimization would be made in this research.

Case 1: The AC current with constant power and power factor and dynamic DC voltage.

Case 2: The AC current with constant DC VOLTAGE and power factor and dynamic POWER.

Case 3: The AC current with constant DC VOLTAGE and power and dynamic POWER FACTOR.

[5] RESULT AND DISCUSSION

In this simulation the optimum voltage supply to get particular current in ampire has been calculated. The AC current is influenced by Power (P), Power factor(PF) and voltage (V). Formula for calculation of AC single phase kilowatts to amps has been discussed below:

Phase current I in amps has been equal to 1000 times real power P in kilowatts. It is divided by power factor PF times RMS voltage V in volts:

$I = 1000 \times P / (PF \times V)$

Following is the Simulation of current with dynamic voltage 100V to 1000V and constant power= 0.33 and power factor= 0.8

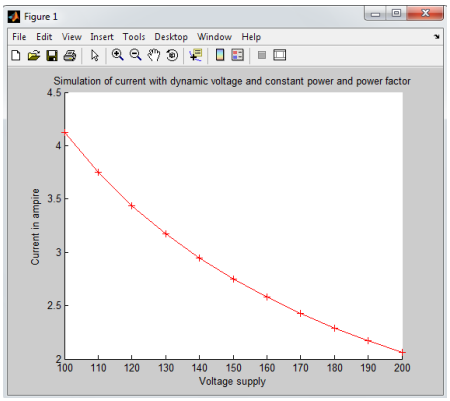

Fig 1 Simulation of current with dynamic voltage (100V-200V) and constant power and power factor

Following is the Simulation of current with dynamic voltage 100V to 1000V and constant power= 0.33 and power factor= 0.8

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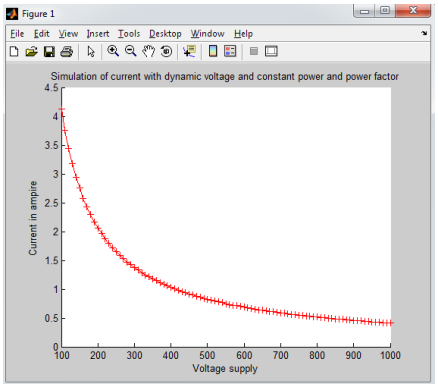

Fig 2 Simulation of current with dynamic voltage(100V-1000V) and constant power and power factor

Simulation of current with dynamic voltage(100V-1000V) and constant power and power factor to get the optimum voltage supply for current of 2.5 ampire

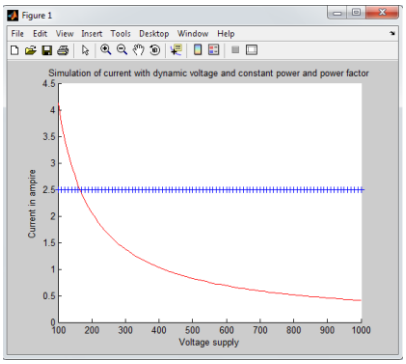

Fig 3 Simulation to get the optimum voltage supply for current of 2.5 ampire

In following simulation it is clear that voltage supply should be at least 160 to get 2.5 ampire current

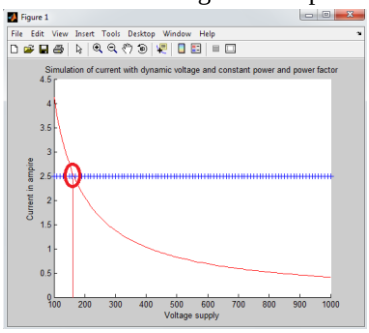

Fig 4 Current in ampire optimization process

Following is the Simulation of current with dynamic power from 0.1 to 0.4 and constant voltage 200V and power factor= 0.8

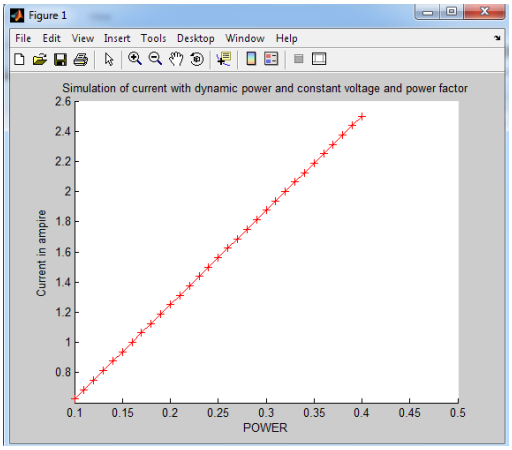

Fig 5 Simulation of current with dynamic power(0.1-0.4) and constant voltage and power factor

Following figure represents the Simulation for optimization of current with dynamic power(0.1-0.4) and constant voltage and power factor

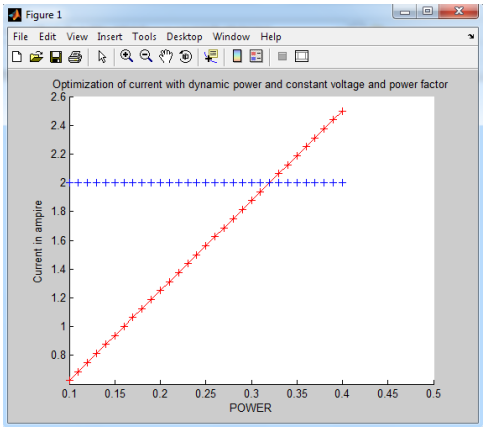

Fig 6 Simulation for optimization of current with dynamic power(0.1-0.4) and constant voltage and power factor

Following figure represents the optimization process of current with dynamic power(0.1-0.4) and constant voltage and power factor

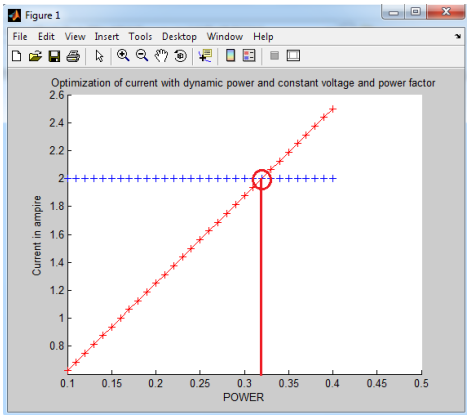

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Fig 7 Optimization process of current with dynamic power(0.1-0.4) and constant voltage and power factor

Following is the Simulation of current with dynamic power factor(0.1 to 1) and constant voltage V=200 and power P=0.33;

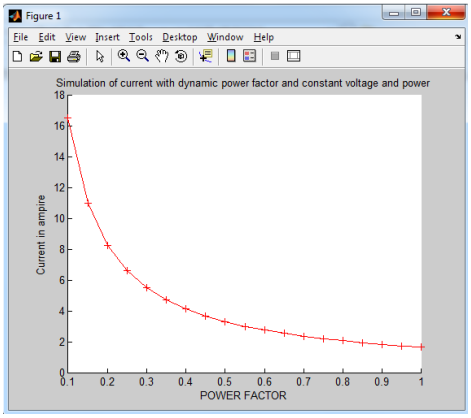

Fig 8 Simulation of current with dynamic power factor(0.1 to 1) and constant voltage V=200 and power P=0.33

Following figure represents the Simulation for optimization of current with dynamic power factor(0.1-1) and constant voltage and power.

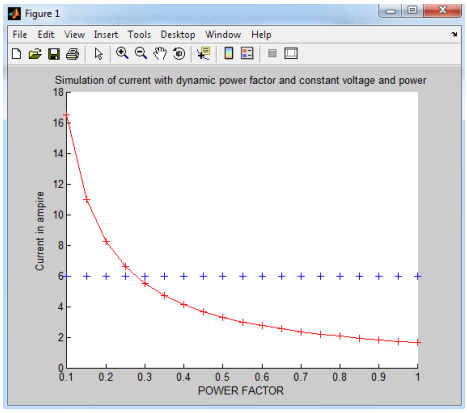

Fig 9 Simulation for optimization of current with dynamic power factor(0.1-1) and constant voltage and power.

Following figure represents the Simulation for optimization of current in 6 ampire with dynamic power factor(0.1-1) and constant voltage and power.

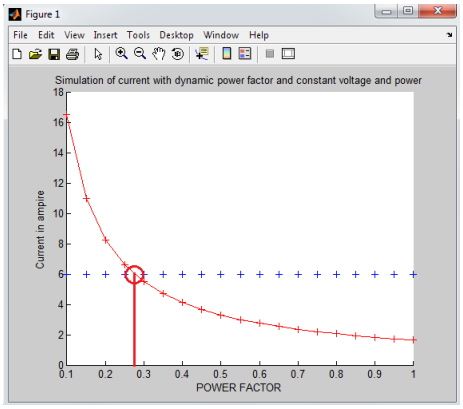

Fig 10 Process for optimization of current with dynamic power factor(0.1-1) and constant voltage and power.

CONCLUSION

It is known in case of direct current that electric charge flows in one direction only. Electric get charged in alternating current. AC current changes direction periodically. Voltage in AC circuits periodically reverses because current changes direction. The objective of research is to provide Bio directional DC to AC power flow. Inverters convert direct current to alternating current.

This research considers that the bio directional dc power should be input for the inverter in order to generate AC power. This system would allow use of bio directional flow of DC power to operate AC devices. Such electrical transformer and distribution system would provide power for both AC and DC devices. In proposed work the input parameters would be POWER, POWER FACTOR AND VOLTAGE. The output parameters would be current in ampire. The following simulation and optimization would be made in this research. In first case AC current with constant power and power factor and dynamic DC voltage has been considered, the results shows that as the voltage increases AC current decreases. In second case AC current with constant DC voltage and power factor and dynamic POWER has been considered, the results shows that as the POWER increases AC current increases. In third case AC current with constant DC voltage and power and dynamic power factor has been considered, the results shows that as the power factor increases AC current decreases.

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