AUTOMATIC PRIORITY BASED LOAD SHEDDING MANAGEMENT

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ABSTRACT

Electric load shedding is implemented to maintain the generation power margin at rated level when load demand is higher than electric supply. This requires mainly when parallel source fails to supply the power. This prevents the widespread system collapse when a fault occurs. The scope of study consists of system analysis, design and simulation. When the main grid got tripped on any fault then entire load will be shifted over a single alternator, which may cause alternator to be overload, and to prevent the collapse of the total load, predetermined amount of load will be removed. Important design considerations for this scheme shedding steps, size of load shed at each step and frequency relay settings. Load restoration after load shedding can only be executed after the system has recovered completely and its normal frequency is restored. Loads should be restored in small blocks sequenced by time delay between successive restorations to allow frequency stabilization. A case study is carried out in a Petrochemical industry in Taloja MIDC, Mumbai, Maharashtra, where a load shedding scheme is designed for its cogeneration plant.

Keywords: load shedding management, alternator fault, load restoration, frequency stabilization

INTRODUCTION

Now government regulations are privatizing the power generation, leads to increase focus on improving quality and reliability of electricity. Power supply to critical process loads is extremely important for an industrial cogeneration power plant not only for continuous production but also important for overall plant safety during severe disturbances. A sudden interruption in production may result in significant economic loss and raise safety concern. Most of the large-scale industries which required heavy amount of electricity and steam have now installed cogeneration units. The cogeneration system describes simultaneous generation of electricity and steam. By installing cogeneration unit's industrial customer can achieve better efficiency of energy usage and enhance the reliability of electricity power supply. To prevent total blackout and to stabilize the system under any abnormal condition, appropriate Islanding and Load Shedding strategies must be developed for industrial cogeneration system. The load shedding technique primarily can be classified as conventional load shedding technique and Adaptive or Intelligent load shedding technique.

Currently PLC based automatic load shedding method is efficient and commonly used method in different power industries. By this method it is easy to disconnect excess amount of load. This system does not include real time configuration.

Shedding off the less important loads is another option to minimise the maximum demand when it reaches the predefined set limit. A direct monitoring system can be designed which will shed the non-essential loads on reaching the preset limit. Normally two types of system exist in this, manual and automatic.

In a simple system, the loads need to be shed manually when there is an alarm on reaching the limit.

Automatic systems are sophisticated ones that has various options of control which allows the operators to perform several sophisticated operations such as,

1. To predict the demand accurately.
2. To display graphically, the present load conditions, available load conditions and the demand limits.

PROBLEM DEFINITION

In the synchronised power system, co-generation plant and main grid supplies the entire load parallelly. The grid coming in company premises mostly uses overhead transmission line which posses' heavy chances of occurrence of fault. If the grid failed to supply power, then the entire load will get shifted over the single alternator. Which may cause alternator to overload and will result in tripping of alternator. Tripping of alternator on overload is not acceptable as it may result in cascade tripping of other equipment, which may also include emergency and critical load like fire alarm system, cooling water system, automatic fire sprinkler and other life-saving equipment. So the system should be design which will monitor the power system and will conduct the load shedding when supply demand is more than the generating capacity.

METHODOLOGY

In this research, we developed and implemented the computer methodology that assists in the management of the distribution network in order to offer predictive solutions, regarding the problem of load shedding. We have given priorities to load based on critical and emergency loads. It sometimes requested by the consumer like process operator or sometimes from a contingency in the interconnected power system. The solution developed offers reliability, productivity and efficiency through an architecture that uses adaptive algorithms and predictive analysis.

The system collects reference data which is the power generation from the alternator by using CT and PT module, compares the same with the power setpoint in the system decided by the users which depends upon maximum loading capacity of alternator. Under island condition If power generation is more than the power setpoint the system will conduct the load shedding and the less critical or non-emergency loads will shut off immediately depends on the priority given by the user. This avoids alternator from being overload and prevents the complete blackout.

When main grid resumes the power then load shedding will be deactivated. And less critical or non-emergency loads can be made ON.

WORKING

Working of the project is based on Atmega8 microcontroller. In this module incoming current and voltage of load is measured with current and voltage transformer module. By multiplying voltage and current, LCD display shows actual power consumption.

Image-1: Power consumption displayed on LCD display

By using up & down keys power set point can be provided as per capacity of the alternator.

Image-2: Power setpoint displayed on LCD display

The loads can be switched ON one by one by using push buttons. And in such condition when power consumption exceeds the power setpoint, the system will consider it as an overload and will initiate load shedding. And according to priorities set by user some loads will be switched OFF automatically. Once the loadswitched OFF by load shedding it will not further ON unless the system is restored.

RESULT

When system achieves overload condition, then according to priorities set by user some of the load got tripped automatically with delay of 500mSec. And no further load will be turned ON. Hence alternator will be saved from overloading and cascade tripping will be avoided. Image shown below gives the demonstration of the project in which non critical load got tripped.

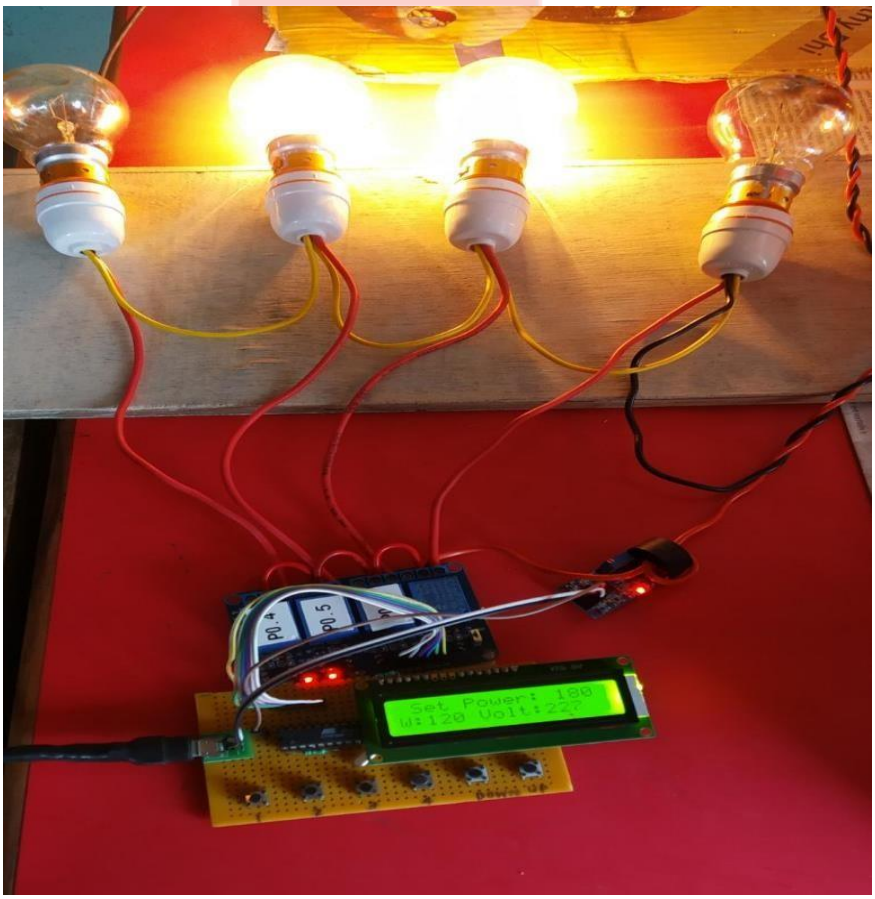

Image-1: Demonstration of the project

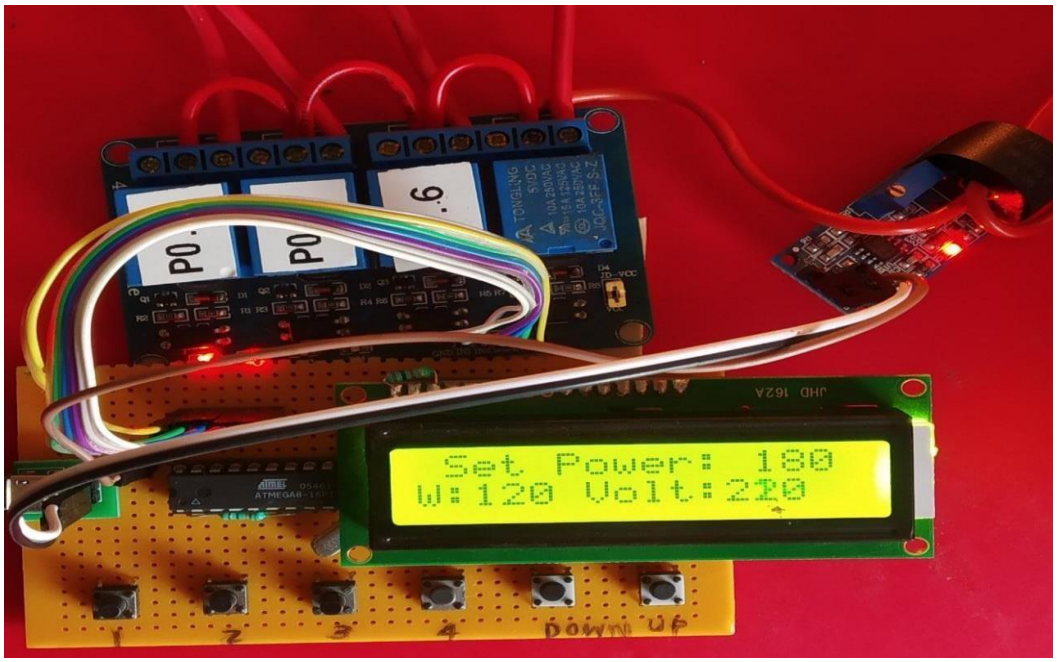

Image-2: Result displayed on LCD display

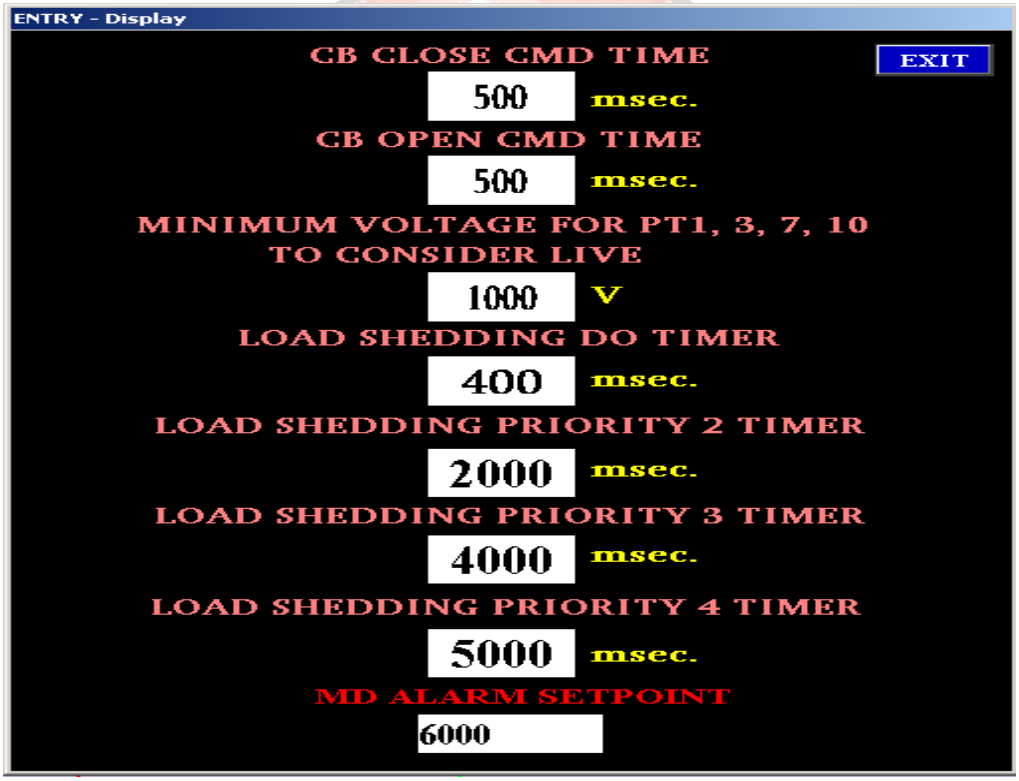

Image-3: Image showing the Priorities with respect to time in co-generation plant in industry.

CONCLUSION

In this research, we used logical regression to monitor the current power generation by the cogeneration unit. Then compares with the setpoint based on the capacity of alternator. If **current power generation > setpoint** then load shedding will be activated. And it will try to keep the load under the safe limit by switching OFF non-

critical and non-emergency load on alternator. Therefor alternator will be saved from overloading and it will avoid complete system collapse.

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