

## AUTO PHASE SELECTION BASED ON POWER FACTOR MEASUREMENT

Madhuri Jadhav<sup>1</sup>, Shital Bhalke<sup>2</sup>, Pratibha Bhudhe<sup>3</sup>, Prof. Anil Tekale<sup>4</sup>

<sup>1,2,3</sup> Dept. of electrical engineering, H.S.B.P.V.T.COE, Kashti, Maharashtra, India

<sup>4</sup>Professor, Dept. of electrical engineering, H.S.B.P.V.T.COE, Kashti, Maharashtra, India

\*\*\*

**Abstract:** Quality of the output power delivered from the utilities has become a major concern of the modern industries for the last decade. These power quality associated problems are voltage sag, surge, flicker, voltage imbalance, interruptions and harmonic problems. These power quality issues may cause problems to the industries ranging from malfunctioning of equipment's to complete plant shut downs. Those power quality problems affect the microprocessor based loads, process equipment's, sensitive electric components which are highly sensitive to voltage level fluctuations. It has been identified that power quality can be degraded both due to utility side abnormalities as well as the customer side abnormalities. To overcome the problems This project is designed to provide uninterrupted AC mains supply i.e., 230 volt to a single phase load. This is achieved by automatic changeover of the load from the missing phase to the next available phase in a 3 phase system.

It is often noticed that power interruption in distribution system is about 70% for single phase faults while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where 3 phases is available, it is advisable to have an automatic changeover system for uninterrupted power to critical loads in the event of missing phase.

In this system auto selection is achieved by using a set of relays interconnected in such a way that if one of the relay feeding to the load remains energized always. Under the phase failure condition the corresponding step down transformer secondary delivers zero voltage which is duly rectified to DC and then fed to microcontroller .Microcontroller will check voltage level & o switch on the next relay that delivers the power to the load. The project supplied with three transformers connected to the 3 phases supply.

**Keywords:** Monitoring 3 phases; signal conditioning circuit modeling;

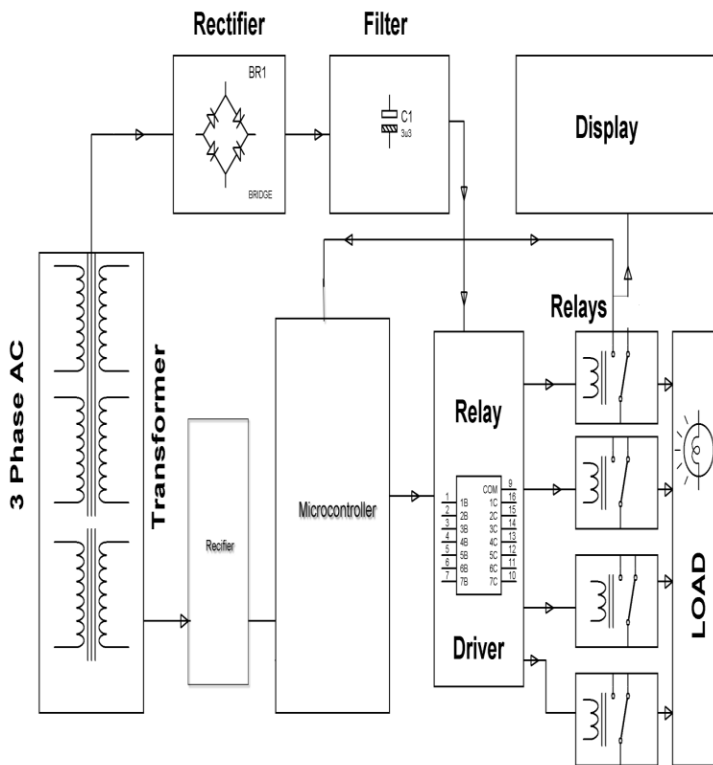
### 1. INTRODUCTION:

The project is designed to provide uninterrupted AC mains supply i.e., 230 volt to a single phase load. This is achieved by automatic changeover of the load from the missing phase to the next available phase in a 3 phase system. It is often noticed that power interruption in distribution system is about 70% for single phase faults while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where 3 phases is available, it is advisable to have an automatic changeover system for uninterrupted power to critical loads in the event of missing phase.

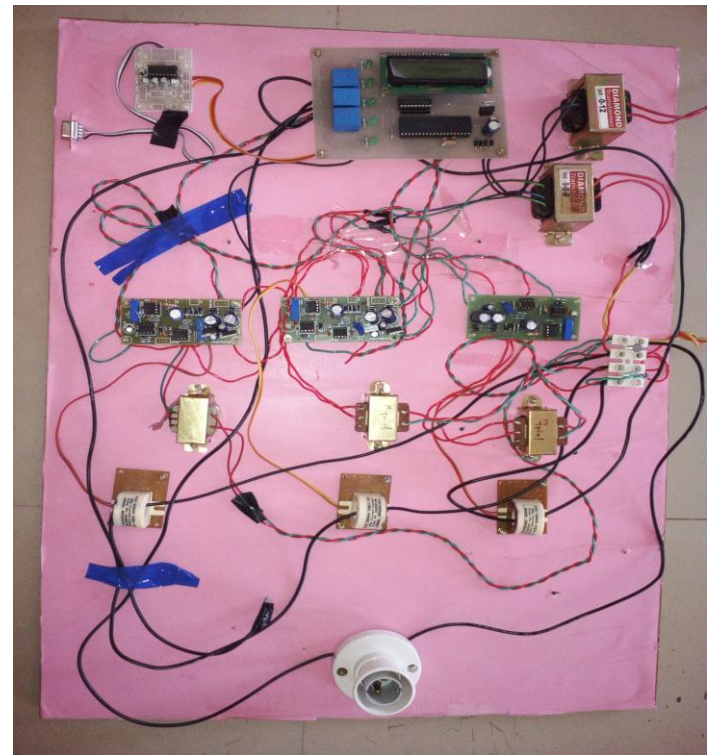
In this system auto selection is achieved by using a set of relays interconnected in such a way that if one of the relay feeding to the load remains energized always. Under the phase failure condition the corresponding step down transformer secondary delivers zero voltage which is duly rectified to DC and then fed to microcontroller .Microcontroller will check voltage level & o switch on the next relay that delivers the power to the load. The project is supplied with three transformers connected to the 3 phases supply.

### 2. BLOCK DIAGRAM:

**3 Phase Sequence Checker:** - The voltage from each of the 3 phases is optically isolated and the o/p from opto-couplers with phase difference of 120 are applied to flip-flop .



**Fig -1:** Auto phase selection based on power factor measurement.



**Fig -2:** Experimental setup.

When any of the phase arises the o/p of flip-flop changes its output of driver transistor changes and it starts conducting which results to detects the phase reversal. Also if any of the phase fails the phase sequence is disturbed and it also detects the phase reversal and activates the relay which in turn deactivates the coil of motor starters and thus preventing the motors from running.

### 3. METHODOLOGY:

Three phase supply are given to three independent transformers connected in together with another transformers from receiving supply,230V is stepped down to 9V.then 9V output of the transformer is given to rectifier, this convert 9V AC into DC output of rectifier is given to the voltage regulator. Voltage regulator provides constant 5V output voltage.an inverter The secondary of the transformers are used to develop DC by half wave rectification and then deriving four number of ....

The DC supply from all the three phases and inverter supply are combined and then fed to the regulator IC 7805 for the circuit operation power. One quad inverter is used in combination with a quad AND the o/p of which are fed to relay driver IC ULN2003. The combination of inverter and AND develops a logic of the i/p to the relay driver IC logic high on the event of any source failure for the next available supply. The relays connected drive the load with interlocking logic from the NO/NC contact such that the 1<sup>st</sup> phase load automatically changes over to any available phase in the event of the phase failure.

### 4. EXPERIMENTAL RESULTS:

#### 4.1 Phase Normal Condition:

Normally when load is connected to Y phase whose power factor maximum that is 0.9 then voltage of three phase is given below figure.

R phase voltage is 243 volts.

B phase voltage is 164 volt.

Y phase voltage is 176 volts.



**Fig -3:** Three phase voltage indication.



**Fig -5:** Phase B power factor indication.

**4.2 Current indication:**

Under normal condition when Y phase power factor is maximum that is 0.9 then current in 3 phases are given in below figure.

R phase current is 0.0 ampere.

Y phase current is 0.0 ampere

B phase current is 0.6 ampere

That is load is connected to phase B.



**Fig -4:** Three phase current indication.

**4.3 Power factor indication:**

Under normal condition when load is connected to phase B then power factor maximum that is 0.9 this is called normal condition.

**4.4 Under less power factor condition**

Under normal condition load is connected to phase b if power factor of this phase reduce then other phase power factor then load is automatically shifted to next available phase. The below figure shows the power factor of phase is 0.8 that is less than normal condition.



**Fig -6:** Less power factor indication

**5. ADVANTAGES:**

1. It provides uninterrupted Single phase from 3-phase, hence distribution system efficiency goes on increasing
2. No need to monitor on the distribution systems.
3. Costless system as compare to overheads required for monitoring it
4. One time installation required.

**5. DISADVANTAGES:**



1. Limitations over the load due to monitoring over the single phase only.
2. System is relay dependent, hence any of relay get faulty whole system is useless.

### 6. APPLICATIONS

- Small and Medium Scale Industries.
- Residential Apartments.
- Offices.
- ATM.
- Hospitals





### 8. CONCLUSIONS:

Thus we have conclude that, a distribution system is overcome from the interruption at load side by provision of the control circuit for monitoring the phase i.e 230v from 3-phase. This is achieved by automatic changeover of the load from the missing phase to the next available phase in a 3 phase system. It is often noticed that power interruption in distribution system is about 70% for single phase faults while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where 3 phases is available, it is advisable to have an automatic changeover system for uninterrupted power to critical loads in the event of missing phase. Hence we get costless control circuit as compare to the efficiency and overheads for finding the fault and recover it.

### REFERENCES:

- [1] The measurement of power factor, and active and reactive power of balance n-phase, n-wire system, by JOHN E. PARTON,B.SC. PH.D. It was published on an institution MONOGRAPH 15 Sept.1952
- [2] Control strategies based on effective power factor for distributed generation power plant during unbalanced grid voltage, published by ,ANTOINIO,CAMACHO,PAU MARTI,2013
- [3] Adaptive single phase fault identification and selection technique for maintaining continue operation of distributed generation published by S.K.salman, S.F.Tan
- [4] Design of Automatic Phase Selector From Any Available 3 phase with the use of logic gate and relay driver,published by, Himadri sil(techno india collage of technology),Saym debnath(technoindia collage of technology) June 2016

### BIOGRAPHIES

	<p>Jadhav Madhuri Ramdas. pursuing the Bachelor Degree in Electrical Engineering from H.S.B.P.V.T.COE, Kashti under SPPU.</p>
	<p>Bhalke Shital Dattatraya. pursuing the Bachelor Degree in Electrical Engineering from H.S.B.P.V.T.COE, Kashti under SPPU.</p>
	<p>Bhudhe pratibha nana. pursuing the Bachelor Degree in Electrical Engineering from H.S.B.P.V.T.COE, Kashti under SPPU.</p>
	<p>Tekale Anil A. Assistant Professor, Dept. of electrical engineering, H.S.B.P.V.T.COE, Kashti, Maharashtra, India</p>