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Automatic Synchronization of Power Line in Power Grid Substation

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ABSTRACT*:* In power grid substation it has beenfound that in financial year there is a great loss of finance in distribution of the power line in CSEB power grid substation, which is mainly due to losses occurred in industrial distribution. The losses are that whenever power failure occurs from the manufacturers of electricity manual synchronization is done to maintain the continuity of supply which gets delay of 1.5 hrs, amount has to be reimburse by the CSEB to the claimed companies through law. To overcome this problem automatic synchronization is done which takes 3 to 4 second for synchronization process. In this process three sensing transformers are employed for observing the quantity of voltage applied for distribution and an opamp is used as a comparator. In this process the microcontroller controls the switching of relays and hence whole synchronization process according to the feeded program.

KEYWORDS: Power grid substation, industrial load, manufacturers, distributors, synchronization, microcontroller.

I.INTRODUCTION

In power grid substation, as per survey and conversation with the officials of power grid substation it has been found that in financial year there is a great loss of finance in distribution of the power line in CSEB power grid substation. It is due to losses occurred in industrial distribution. The loss is that whenever the power failure occurs from the manufactures of electricity the power failure has to suffer by the distributors. The manual synchronization with other distributors is prolong and working efficiently but the problem is that, the manual synchronization provides 1.5 hrs.time of synchronizing, so as per law the time period of 1.5 hrs., amount has to be reimburse by the CSEB to the claimed companies through law. So this is the direct loss suffered by the CSEB.The second loss is the loss by theft, loss by corona, loss by corrosion and loss by overloading. As per the survey the loss amount is greater in CSEB power grid substation by the occurrence of power failure by the manufacturers, so this has to be researched and problem is sorted out by trial observation of auto synchronizing method implemented in the CSEB power grid substation instead of 1.5 hrs.manual synchronizing process and it has been beneficially resulted and work efficiently.

In this process three sensing transformers are employed for observing the quantity of voltage applied for distribution and with this observation an opamp based micro controller controls three relay switching operation, by which, if any of the power line may get off by manufacturer, this is done synchronizing within 3 seconds with the other manufacturer power line. In this process microcontroller works a main role according to observation of the sensing voltage from the sensing transformer, the opamp converts this voltage into digital pulse and provides to the microcontroller, according to this observation the microcontroller performs the command as per software program feeded in microcontroller and operates the three relays simultaneously. NC, NO and C points of the relay are connected with three manufacturers single phase line and from the common point the output is being collected for distribution.

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II.METHODOLOGY

This project is totally based on voltage sharing from three manufacturers and with this sharing method one can overcome the power failure condition, by this process manufacturers can be synchronized very easily. To control this process, controller based electronic sensing devices are employed and microcontroller is employed for soul decision making. The relays are bound to operate according to the comparator sensor of the voltage and by the decision of microcontroller to share the same supply voltages from other manufacturers. The same process as on the national grid is working.

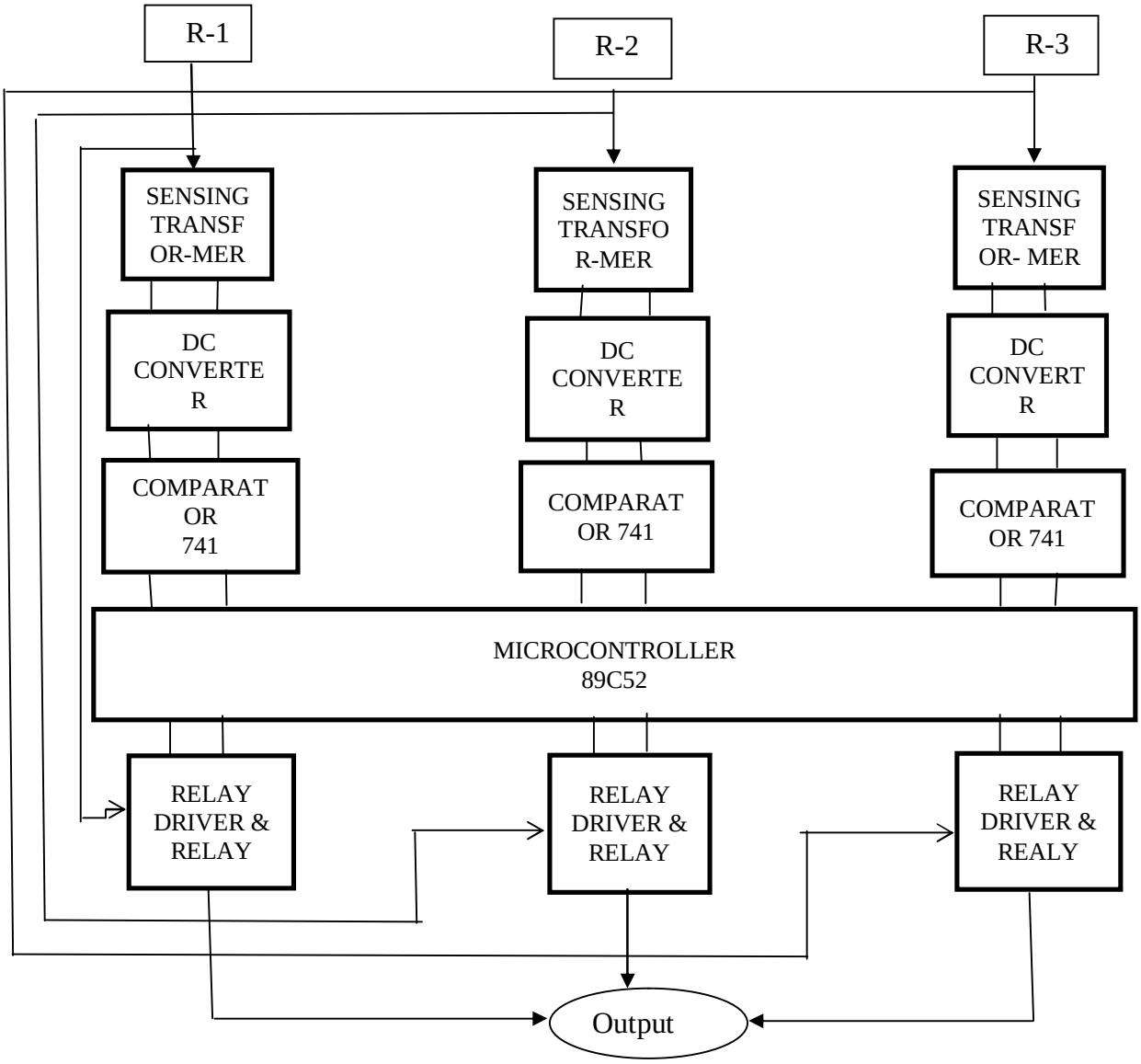

Fig 1: Block diagram of automatic synchronization process

Figure:1 shows the basic block diagram of automatic synchronization of three input line. Three inputs R1, R2 and R3 from the three manufacturer line are given to the first set of the blocks.

The first set of blocks shows the sensing of voltage by 220\12V sensing transformer or step down centre tapped transformer which has two functions to be provided. The first function is to sense the variation of voltage and power.

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The second function is to analysation and comparison by converting it into DC.The second set of blocks consists of DC converter which is basically full wave rectifiers. It converts 12V ac power into dc power, for filtration process capacitor is used. The dc output is given to the third set of blocks consists of comparator IC 741, wired in biasing comparator mode to compare theDC voltage according to the AC input from manufacturers. The next block consists of microcontroller. The output of the comparator is feeded to the microcontroller. The main function of microcontroller is to perform the controlling action according to the feeded program.
The last set of blocks shows the relay driverand relay which is being operated according to the command of the microcontroller. The main function of the relay is switching operation according to the input command. If power failure occurs at any of the manufacturer line, then respective relay switches to another manufacturer line.

III.RESULT AND DISCUSSION

Resultantly as per research in CSEB power grid substation the problem has been analysed and solved through auto synchronization process controlled by sensing transformer, opamp, microcontroller and relays. The time duration of synchronizing process has been reduced to 3 second and with this process no manual synchronization to be provided. The commercial benefit has been increased by this synchronization process. By implementation of this project there is no production loss to industries and hence no financial loss to distributors i.e. CSEB.

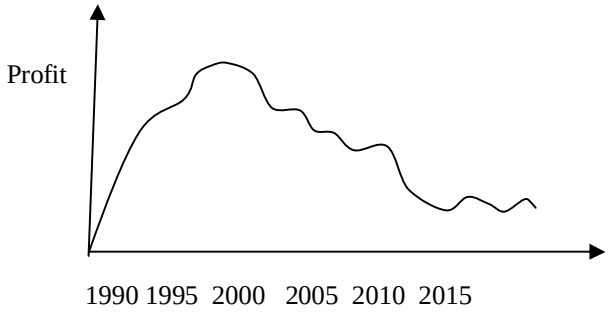

Fig 2: Manual synchronization

Figure2 shows yearly profit of CSEB by using manual synchronization and figure3 shows yearly profit of CSEB by using automatic synchronization. In manual synchronization the profit once increases and then goes on decreasing while using automatic synchronization the profit goes on increasing.

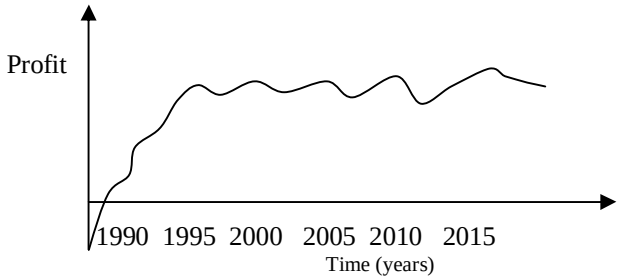

Fig 3: Automatic synchronization

IV.CONCLUSION

Concludingly, the manual synchronization process has been converted into automatic synchronization process. The time delay for manual synchronization is approximately 1.5 hrs.and time delay for automatic synchronizing process is approximately 3 second. Hence the synchronizing time is reduced and man power requirement is also reduced.

As per the survey report the commercial benefit increased because no losses were being claimed by the other companies which is being distribution process, so there is reduction of losses of CSEB and the benefits of CSEB power grid substation has been increased.

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Table1 and Table2shows the comparison between manual synchronization process and automatic synchronization process.

Table 1: Analysis of manual synchronization process

Manufacturer line	Manual synchronization	Synchronizing time	Losses per annum
R-1	Manual shifting	1.6 hrs	40 Lakh
R-2	Manual shifting	1.5 hrs	35 Lakh
R-3	Manual shifting	1.5 hrs	41 Lakh

For manual synchronizing process the approximated value of synchronizing time and losses per annum is given in table1 forpower line R-1, R-2 and R-3. As shown in table1 great loss occurs every year due to large synchronizing time during manual synchronization.

Table 2: Analysis of automatic synchronization process

Manufacturer line	Automatic synchronization	Synchronizing time	Losses per annum
R-1	Automatic shifting	3 second	Nil
R-2	Automatic shifting	3 second	Nil
R-3	Automatic shifting	3 second	Nil

Table2 shows automatic synchronizing time which is reduced to 3 seconds and no losses occurs in automatic synchronizing method, hence automatic synchronizing process is more beneficial.As per the survey report the commercial benefit increased because no losses were being claimed by the other companies which is being distribution process, so there is reduction of losses of CSEB and the benefits of CSEB power grid substation has been increased.

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