

## **AUTONOMOUS STARTING OF DIESEL ALTERNATOR**

### **ABSTRACT:**

The Autonomous Starting Diesel Alternator system is an automated backup power solution designed to ensure uninterrupted electrical supply during mains power failure. The system automatically detects supply interruption, starts the diesel generator, and transfers load without human intervention.

In industrial environments such as defense manufacturing facilities, continuous power availability is essential for protecting sensitive equipment and maintaining operational continuity. Automation improves system reliability, minimizes downtime, enhances safety, and prevents equipment damage through continuous monitoring and protection mechanisms.

### **INTRODUCTION:**

Modern industries require uninterrupted power supply to maintain production, safety, and operational efficiency. Manual generator starting methods introduce delays and risks during power failures. Therefore, autonomous diesel alternator systems are implemented to automatically restore power.

The literature survey discusses research on automatic generator starting, IoT monitoring systems, digital twin technology, and advanced control panels. These studies emphasize reliability, remote monitoring, and fault prediction in modern power systems.

- Objectives of the Project
- Detect mains power failure automatically
- Start diesel alternator without human intervention
- Provide uninterrupted power supply
- Improve safety and reliability
- Reduce operational downtime

A diesel generator converts diesel fuel energy into electrical energy using a diesel engine and alternator combination. It is widely used as standby or emergency power supply in industries, hospitals, defense organizations, and manufacturing plants.

### **Major Components**

**Diesel Engine** – Produces mechanical energy

**Alternator** – Generates electrical energy

**Fuel System** – Supplies diesel fuel

**Air Intake System** – Provides clean air for combustion

**Cooling System** – Prevents overheating

**Lubrication System** – Reduces friction

**Starting System** – Initiates engine rotation

**Exhaust System** – Removes combustion gases

**Control Panel** – Monitoring and protection unit

**Automatic Transfer Switch (ATS)** – Load transfer mechanism

### ➤ **Principle of Operation**

Energy conversion occurs in three stages:

**Chemical Energy** → **Mechanical Energy** → **Electrical Energy**

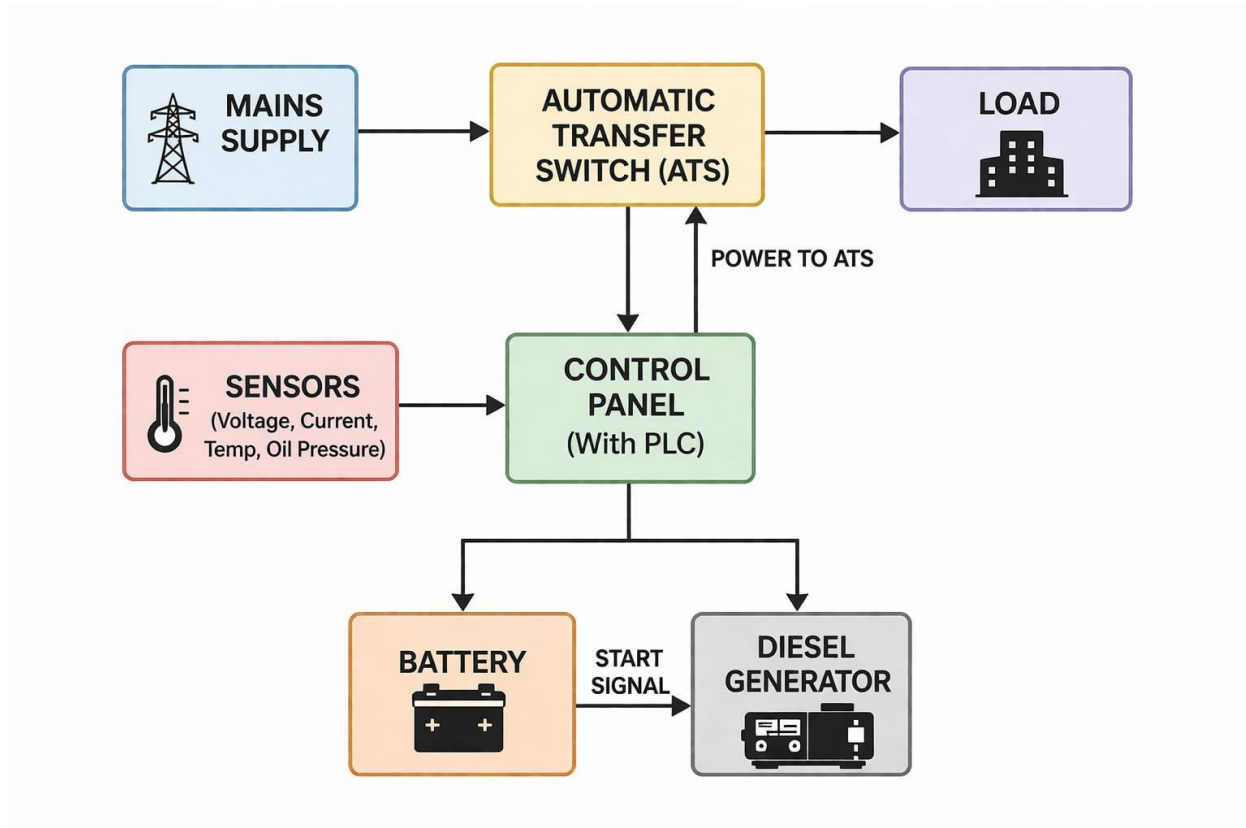
The diesel engine drives the alternator, producing AC power based on electromagnetic induction.

### **Starting Methods:**

- Manual Starting
- Electric (Battery) Starting
- Automatic Starting

- Air Starting
- Hydraulic Starting
- PLC/SCADA Based Autonomous Starting

### BLOCK DIAGRAM:



Automation is essential in modern industrial power systems because even short power interruptions can cause production loss, data failure, and safety hazards.

### Importance of Automation

- Ensures uninterrupted power supply
- Provides faster response during power failure
- Reduces human dependency

- Enhances equipment protection
- Improves system reliability
- Optimizes fuel consumption
- Enables remote monitoring

### **Automation System Components**

- Mains Supply
- Automatic Transfer Switch (ATS)
- Sensors (Voltage, Temperature, Oil Pressure)
- PLC Control Panel
- Battery System
- Diesel Generator
- Electrical Load

The PLC acts as the brain of the system, continuously monitoring parameters and initiating automatic generator starting when required

### **CASE STUDY**

A real industrial-type incident involving a 100 kVA autonomous diesel alternator was analyzed.

Incident Details

Date: 05 November 2022

Time: 02:17 AM

Generator Rating: 100 kVA

Voltage: 415 V, 3-Phase

Starting System: 24V Battery Electric Start

### **Problem Observed**

During grid failure:

Generator failed to start

Engine cranked but did not run

ATS malfunction occurred

Production shutdown happened

### **Root Causes**

Battery undervoltage (18.6 V instead of 24 V)

Starter solenoid failure

ATS contact misalignment

Lack of preventive maintenance

### **Financial Loss**

Total estimated loss: ₹8,07,000

Corrective Measures

Battery health monitoring introduced

Predictive maintenance implemented

ATS contacts replaced

Weekly generator testing scheduled

After modification, generator startup time reduced to 8 seconds.

### **CONCLUSION AND FUTURE SCOPE**

The project on Autonomous Starting of a Diesel Alternator demonstrates an efficient and reliable solution for automatic power backup during power failures. By integrating components such as sensors, control units (PLC/micro controller), battery systems, and automatic transfer switches,

the system ensures quick and smooth starting of the alternator without human intervention. It improves operational safety by continuously monitoring critical parameters like voltage, temperature, oil pressure, and fuel level, and taking necessary actions during abnormal conditions. Overall, this system enhances reliability, reduces manual effort, minimizes downtime, and ensures continuous power supply in industrial and commercial applications.

## **REFERENCES:**

1. Pai, D.K. Self-Starting Diesel Generator International Journal of Electrical Power and Machine Systems, 2025.
2. V. Zachepa and O. Serhiienko, Study of a local source of autonomous power supply on the basis of a diesel generator, 2022.
3. Wenshan Hu and Zhongcheng Lei, Design and Implementation of Digital Twin Diesel Generator Systems, 2023.
4. Septian B, Rakesh P, Dhora Sr, IoT based power monitoring system for diesel generator, 2020.
5. Asebai A, Afghan S, Designing and Implementing Control panel for Diesel generator 2019.
6. Khalaf, A., Hammoodi, A. IoT-Based Monitoring and Controlling System for Diesel Electrical Generators. Anbar Journal of Engineering Science, 2024.
7. Zhao, W., Tang, W., Lin, Z., Xin, Y. Cooperative Control Strategy for Offshore Wind Farm Black-Start Based on Diesel Generator. IEEE Asia Conference on Power and Electrical Engineering, 2022
8. V. Zachepa and O. Serhiienko, Study of a Local Source of Autonomous Power Supply on the Basis of a Diesel Generator, International Conference on Power Engineering Systems, 2022.

9. Septian B., Rakesh P., Dhora S.R., IoT-Based Power Monitoring System for Diesel Generator, International Journal of Smart Energy Systems, 2020