Journal Publication of International Research for Engineering and Management (JOIREM)
Volume: 04 Issue: 05 | May-2026
ISSN (O) 3107-6696

QUALITY CONTROL AND TESTING METHODOLOGY FOR INDUSTRIAL ASR AND MCC PANELS

ANIKET AVINASH SHENDAGE

DEPARTMENT OF ELECTRICAL ENGINEERING
N.K ORCHID COLLEGE OF ENGINEERING AND TECHNOLOGY, SOLAPUR

Abstract - An industrial Motor Control Centre (MCC) and Automatic Step Regulator (ASR) panel are specialized electrical enclosures designed to manage, distribute, and optimize power in heavy industries. They control high-power electric motors, regulate voltage, and improve power factor correction in harsh factory environments. Just like other power distribution gear, these panels are operated by programmable logic controllers (PLCs), smart meters, or manual control switches.

The purpose of industrial ASR and MCC panels is to automate motor operations and maintain power quality across a facility. However, their functions go beyond simple distribution; they protect expensive industrial machinery from electrical faults, spikes, and overloads. Generally, these panels work as centralized control hubs where small control signals safely manage massive electrical currents. This is achieved through a network of circuit breakers, contactors, relays, and busbars that isolate or connect high-voltage circuits.

***Keywords*:** Electrical Safety Engineering, Power Distribution Panels, Motor Control Centre, Auto Slip Regulator

1. INTRODUCTION

The implementation of a standardized inspection and testing framework for industrial control panels fulfils a range of essential objectives in heavy engineering power distribution systems. Fundamentally, these procedures serve as a **critical validation checkpoint**, enabling the verification of wiring integrity, component ratings, and structural assembly before the equipment is deployed on the factory floor. This capability is pivotal for preventing catastrophic short circuits and ensuring the safe flow of electricity within heavy industrial grids.

Moreover, rigorous testing protocols offer **crucial safety isolation**, verifying that low-voltage control circuits (such as PLCs) are completely and safely isolated from high-voltage power switchgear within the Motor Control Center (MCC) panels. This safeguards operators against potential flash hazards and minimizes electromagnetic interference.

2. Body of Paper

Design and develop a robust, standardized, and cost-effective Quality Control (QC) and Testing Methodology tailored for the specific demands of industrial ASR and MCC panels. The testing framework must meet stringent international standards (such as IEC 61439) for electrical safety, operational reliability, and thermal performance, while addressing emerging trends like smart factories, IoT-enabled switchgear, and renewable energy integration.

The solution must optimize testing cycle times, reduce manual diagnostic errors, and ensure compatibility with diverse industrial power architectures. Additionally, the methodology must guarantee that the panels can withstand harsh environmental conditions, including high ambient temperatures, heavy dust, continuous vibrations, and electromagnetic interference (EMI) typical in heavy industries.

The quality process should prioritize automation, repeatability, and safety, aiming for a system that minimizes testing downtime, prevents component waste, and lowers manufacturing costs without compromising on safety or grid reliability. Ultimately, the developed testing methodology should enhance the factory-floor reliability, functionality, and lifecycle of industrial panels while supporting the digital evolution of power distribution technology.

Table -1: Process Flow Diagram

The quality control methodology for **Motor Control Center (MCC)** and **Automatic Supply Restoration (ASR)** panels involves a systematic sequence of physical inspections, continuity tracing, insulation testing, and logic calibration. Before testing begins at a vendor facility or project site, panel interiors are thoroughly cleaned to eliminate metallic dust, moisture, and debris, preventing dangerous electrical flashovers. Since Saisidha Engineering operates via decentralized field sites rather than static testing laboratories, the testing team relies on calibrated portable instruments (like Meggers and multimeters) to verify panels against approved Single Line Diagrams (SLD). A comprehensive startup check sheet is completed for every project layout—including sugar factories, irrigation schemes, and substations—ensuring all component ratings match customer standards before formal testing begins.

Fig -1: **MCC PANEL**

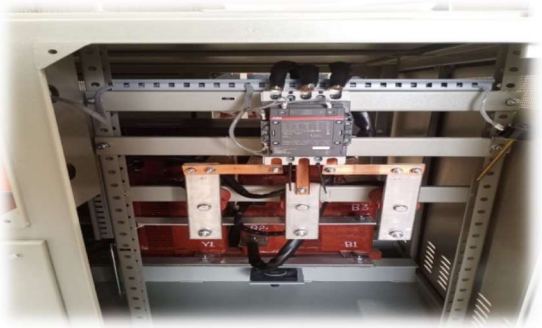

Fig -2: **ASR PANEL**

3. CONCLUSIONS

This project validated precise testing methodologies and fault simulation frameworks for industrial ASR and MCC panels to guarantee high- and low-voltage equipment reliability. The findings demonstrate that manual logic verification introduces human error, whereas automated systems achieve superior accuracy. Utilizing programmable logic controllers (PLCs) and automated relay test kits enabled fast, repeatable simulation of field faults within standard operating parameters. This systematic approach streamlines inspection workflows, reduces manual intervention, and eliminates testing risks, reinforcing strict quality control in heavy electrical manufacturing.

ACKNOWLEDGEMENT

The authors gratefully acknowledge SAISIDHA COMPANY for providing the internship opportunity, industrial panels, and test rigs essential for this research. We also sincerely thank the faculty and technical staff at NKOCET COLLEGE for their continuous academic guidance and laboratory support throughout this project.

REFERENCES

1. Saisidha Engineering Industries Pvt. Ltd., Corporate Infrastructure Profile, Technical Machine Specifications, and Global Engineering Portfolio, Pune, India. https://saisidha.com/

2. Tangible India Control Systems, Tangible India is an electrical automation manufacturer that designs and builds custom industrial control panels, including PLC, HMI, and VFD systems. https://www.indiamart.com/tangible-india/

3. M/s. Eltech Engineering, Eltech Engineering manufactures, exports, and supplies advanced electrical equipment, specializing in automated slip regulators and magnetic soft starters for industrial motors. https://www.eltechengineering.in/

4. **Bureau of Indian Standards (BIS)**, IS 8623 / IS 16655: Specification for Low-Voltage Switchgear and Controlgear Assemblies, Part 1: Type-Tested and Partially Type-Tested Assemblies.