**Objective:**

The main objective of this project is to design and construct an Active Power Factor Correction (PFC) circuit for an AC-DC converter. The primary goals are to achieve a power factor close to unity (ideally above 0.95) across the entire operating range, implement a control strategy for maintaining a stable and regulated DC output voltage, and thoroughly analyze the performance of the PFC circuit to verify its effectiveness.

**Key Tasks:**

**Active PFC Circuit Design:**

Begin by understanding the characteristics of the AC-DC converter and identifying areas for improvement in power factor.

Choose appropriate components such as power semiconductors, inductors, and capacitors for the active PFC circuit.

Develop a schematic diagram and layout for the active PFC circuit, taking into consideration the specific requirements of the AC-DC converter.

**Unity Power Factor Achievement:**

Utilize control techniques such as boost converters or interleaved PFC to actively shape the input current waveform and align it with the voltage waveform, thus achieving a power factor close to unity.

Employ feedback mechanisms to dynamically adjust the PFC circuit parameters for optimal performance across varying loads.

**DC Output Voltage Regulation:**

Implement a control strategy to ensure a stable and regulated DC output voltage despite fluctuations in the input voltage or load conditions.

Use feedback loops and control algorithms to adjust the PFC circuit parameters in response to changes, maintaining the desired output voltage.

**Performance Analysis:**

Conduct thorough simulations using tools like SPICE to validate the theoretical performance of the active PFC circuit.

Assemble the physical circuit and perform comprehensive testing under various operating conditions.

Analyze the efficiency, power factor, and stability of the PFC circuit across different loads and input voltage ranges.

**Verification of Effectiveness:**

Verify that the active PFC circuit successfully achieves a power factor close to unity throughout its operational range.

Confirm that the DC output voltage remains stable and regulated under varying conditions.

Document the results of the performance analysis and compare them against the project goals.

**Documentation**:

Maintain detailed documentation throughout the design and implementation phases, including schematics, circuit diagrams, control algorithms, and simulation results.

Prepare a comprehensive report summarizing the design choices, testing procedures, and performance analysis, highlighting the achievements and areas for potential improvement.

Collaboration with experts in power electronics and control systems may be beneficial during the project to ensure the best practices are followed, and the final active PFC circuit meets or exceeds the specified requirements. Regular progress updates and reviews will contribute to the successful completion of the Active Power Factor Correction Circuit Design project.

















