



A SYSTEM AND A METHOD FOR OPERATING AN INDUCTION MACHINE WITH FULL RATED TORQUE

IITM Technology Available for Licensing

Problem Statement

- Load Commutated Inverter (LCI) based drives for medium voltage (MV) induction motors require leading power factor, posing compatibility issues with conventional induction motors.
- Active-reactive Induction Machine (ARIM) offers a solution by employing a dual-stator design, with one winding rated for MV and the other for LV, but faces challenges in providing full torque during starting and low-speed operation.
- There is a need for a **technique to enable LCI-fed ARIM drives to achieve full torque starting** and improve low-speed operation, addressing limitations in commutating voltage at low speeds.

Technology Category/ Market

Category- Power Electronics

Applications- Industrial Automation and Manufacturing, Renewable Energy Systems

Industry - Energy & Industrial Automation

Market - Market size for Power Electronics reached US\$ 46.70 Billion IN 2023, with the total revenue forecasted to exhibit a **CAGR of 5.7%** over the foreseeable future.

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Research Lab

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Intellectual Property

- IITM IDF Ref. **1937**
- **IN 500955 - Patent Granted**

Technology

- **Problem:** Starting and operating induction machines with load commutated inverters (LCIs) in medium voltage applications pose challenges due to the requirement of a leading power factor. While a dual-stator induction machine with one winding rated for medium voltage (MV) and the other for low voltage (LV) addresses this, inadequate commutating voltage at low speeds limits torque capability.
- **Proposed Solution:** The disclosed method and system involve integrating a voltage source inverter (VSI) with the LCI-fed induction machine, utilizing the VSI for providing reactive power to induce a leading power factor at the LCI terminals. Additionally, commutation voltage determination and application of suitable voltage vectors at the LV winding ensure smooth operation and torque control, addressing the starting and low-speed limitations.
- **Objective:** The objective is to enable full-torque starting and low-speed operation of LCI-fed induction machines by effectively managing power factor induction and commutation voltage control, thereby enhancing the performance and applicability of such drives in medium voltage applications.

Advantages

- **Efficiency and Power Factor Enhancement.**
- **Torque Control and Starting Performance Improvement.**
- **Integration and Compatibility**

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Images

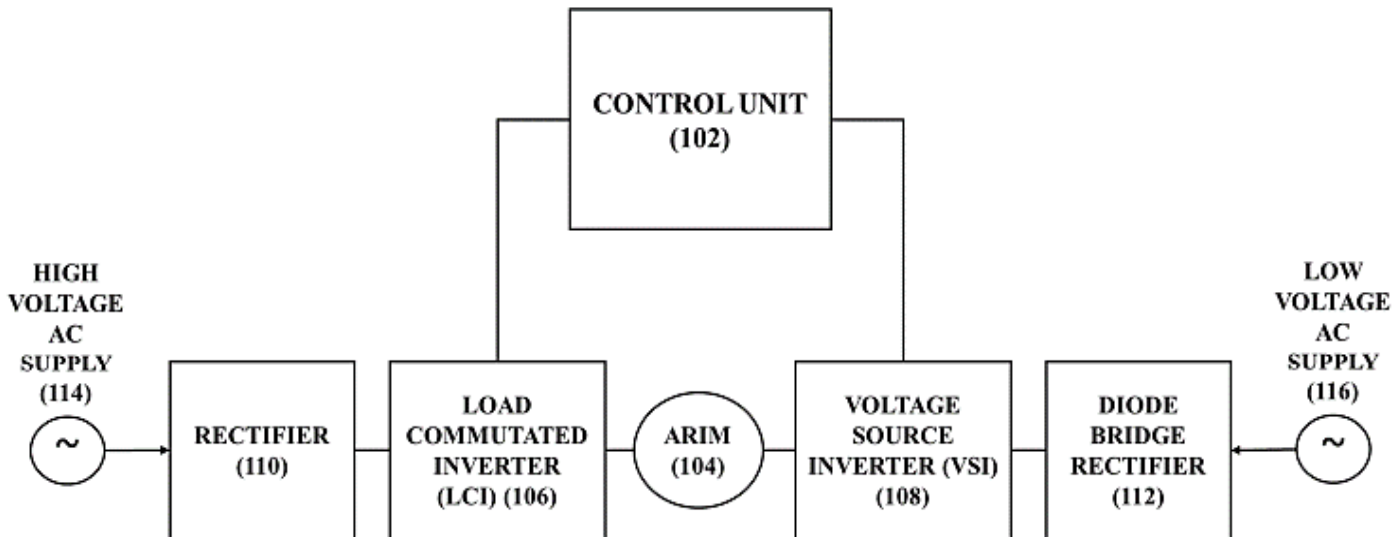


FIG. 1. Block diagram of the LCI fed ARIM drive.

Key Features / Value Proposition

1.

- Dual-stator induction machine with one MV winding and one LV winding.

2.

- LCI supplying active power to MV winding, VSI providing reactive power to LV winding.

3.

- Control unit estimating current unit vectors for LCI, generating firing pulses, and determining commutation voltage for precise operation.

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