

SPLIT-PHASE AND TAPPED STATOR WINDING INDUCTION MACHINES FOR LCI- AND VSI-FED HYBRID DRIVE APPLICATIONS

IITM Technology Available for Licensing

Problem Statement

- Medium voltage motor drive technologies vary in cost and performance, from economical LCI fed synchronous drives to advanced, costly Multilevel VSI options.
- Existing solutions face trade-offs: cheaper options like LCI drives have operational limitations, while advanced drives offer better performance at a higher cost.
- The challenge is to develop medium voltage motor drives that balance cost-effectiveness with operational flexibility and performance, addressing limitations in current topologies.**

Intellectual Property

- IITM IDF Ref. 1461
- IN 493781 - Patent Granted**

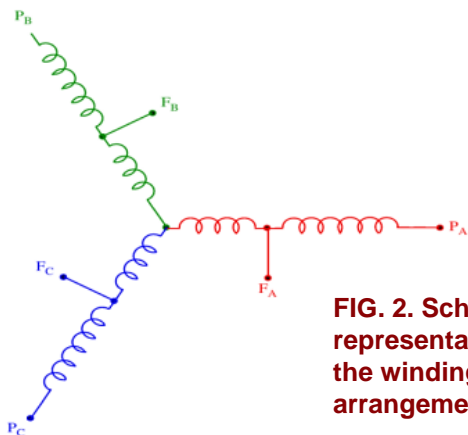


FIG. 2. Schematic representation of the winding arrangements.

Technology Category/ Market

Category - Advanced Motor Drive Systems

Applications- Industrial motor drive applications.

Industry- Automotive Manufacturing, Smart Transportation

Market - The electric drives market, valued at USD 24.5 billion in 2023, is projected to grow to USD 31.4 billion by 2028, with a **CAGR of 5.1%**.

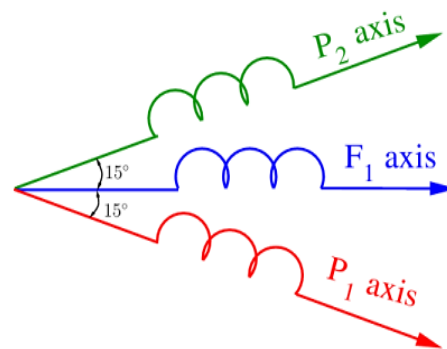


FIG. 1 Schematic representation of the spatial arrangements.

Technology

The invention proposes a hybrid motor drive system utilizing both thyristor-based Load Commutated Inverters (LCI) and low voltage IGBT-based Voltage Source Inverters (VSI) to separately handle reactive and active power requirements, respectively, improving efficiency and performance.

Special winding configurations are introduced to mitigate torque oscillation issues in induction motor drives, enhancing stability and operational reliability.

Various configurations of stator windings are presented, each optimized for hybrid LCI-VSI operation, offering flexibility and adaptability in different motor drive applications.

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

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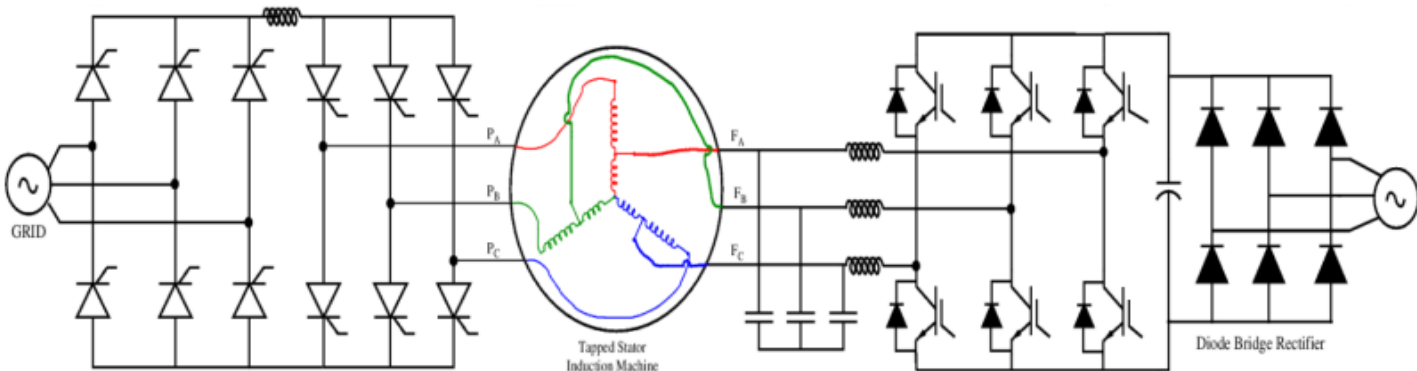
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FIG. 3. The power topology of the hybrid LCI and VSI fed drive.



Key Features / Value Proposition

1. Cost Efficiency:

- Integration of thyristor-based LCI and low voltage IGBT-based VSI optimizes cost-effectiveness in high-power industrial motor drives.

2. Enhanced Performance:

- Special winding configurations address torque oscillation challenges, ensuring smooth and reliable operation in diverse industrial settings.

3. Flexibility & Adaptability:

- Various stator winding configurations cater to different application needs, offering flexibility and adaptability to changing industry requirements.

4. Efficient Power Management:

- Separate handling of reactive and active power requirements improves overall power management efficiency, reducing energy wastage.

5. Operational Reliability:

- Hybrid LCI-VSI technology enhances operational reliability by leveraging the strengths of both thyristor and IGBT-based systems, minimizing downtime.

6. Market Competitiveness:

- The value proposition lies in delivering a balanced solution that combines cost-efficiency, performance optimization, and operational reliability, ensuring competitiveness in the industrial motor drive market.

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