國立清華大學電機工程學系：實作專題研究成果報告 (A16)

返馳式切換式整流器供電之開關式磁阻馬達驅動風扇

(A flyback switch-mode rectifier powered switched-reluctance motor driven fan)

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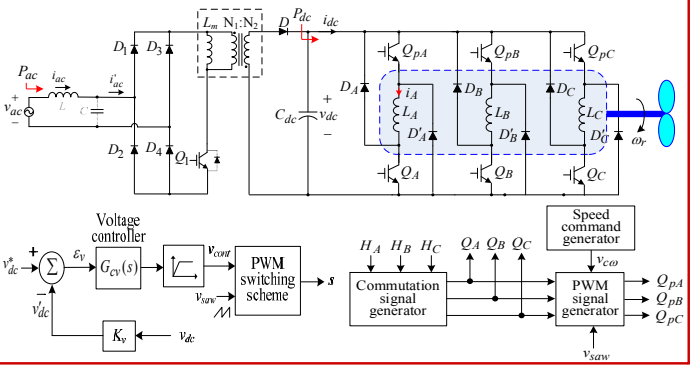
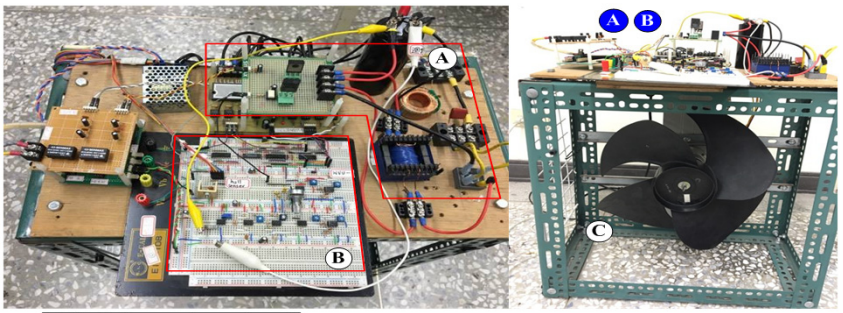
Circuit and control schemes of the developed flyback SMR-fed SRM-driven fan

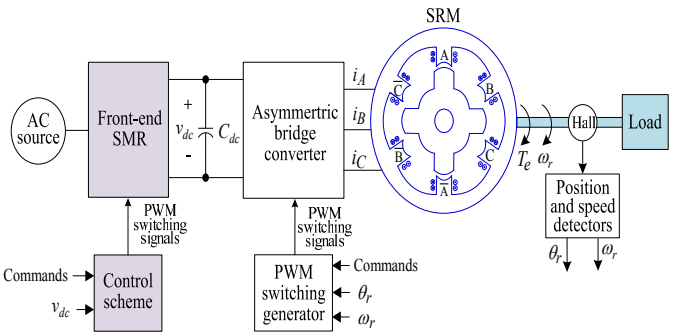


Setup photos of the developed flyback SMR-fed SRM-driven fan

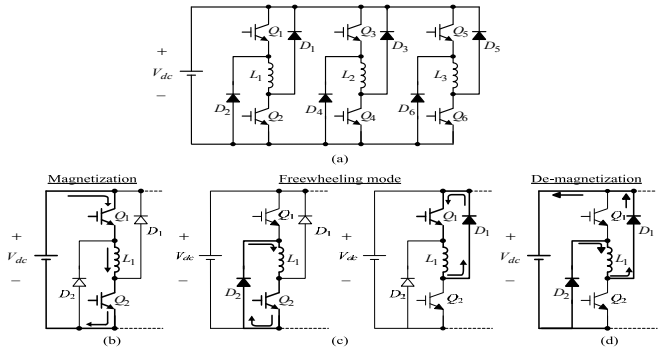


Ⓐ Flyback SMR and IPM-based asymmetric bridge converter　Ⓑ SMR and SRM control circuits　Ⓒ SRM driving fan

System configuration



Asymmetric bridge converter and winding current paths

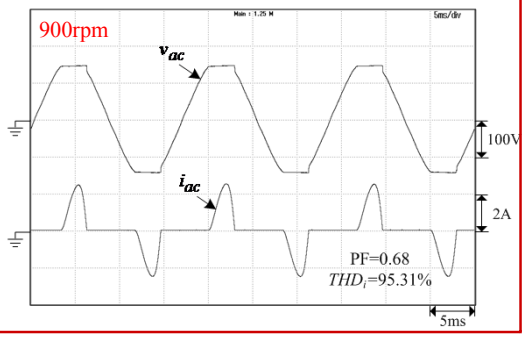


- Switched-reluctance motor (SRM) drive:
  - SRM: Manufactured by ITRI (工研院).
  - Three-phase 70W, 900rpm, 6/4 SRM.
  - Asymmetric bridge converter: realized using the dedicated SRM IPM FCAS30DN60BB (Fairchild).

- Two types of front-end AC/DC converters:
  - Diode rectifier:
  - Flyback SMR: (i) operated under DCM; (ii) realized using analog circuit.

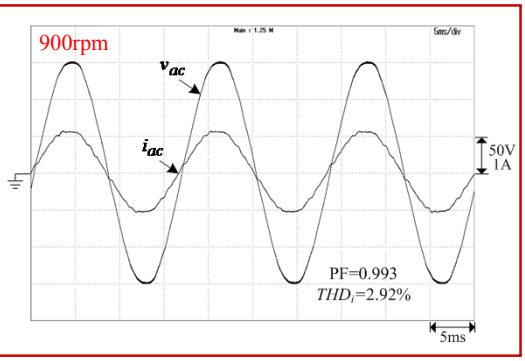
1. Results: Diode rectifier-fed SRM driven fan:

- AC source: 110V/60Hz.
- Fan speed: 900rpm.
- PF = 0.68, THD_i = 95.31%.
- Peaky line current with bad power factor and current total harmonic distortion.



2. Results: Flyback SMR-fed SRM driven fan:

- AC source: 110V/60Hz.
- Fan speed: 900rpm.
- PF = 0.993, THD_i = 2.92%.
- The line drawn power quality is better, and current total harmonic distortion is much less than diode rectifier-fed.



Results: SRM winding currents under 300rpm, 600rpm, 900rpm