H∞ Robust Current Control for DFIG Based Wind Turbine subject to Grid Voltage Distortions - DTU Orbit (06/12/2018)

H∞ Robust Current Control for DFIG Based Wind Turbine subject to Grid Voltage Distortions

This paper proposes an H∞ robust current controller for doubly fed induction generator (DFIG) based wind turbines (WTs) subject to grid voltage distortions. The controller is to mitigate the impact of the grid voltage distortions on rotor currents with DFIG parameter perturbation. The grid voltage distortions considered include asymmetric voltage dips and grid background harmonics. An uncertain DFIG model is developed with uncertain factors originating from distorted stator voltage, and changed generator parameters due to the flux saturation effect, the skin effect, etc. Weighting functions are designed to efficiently track the unbalanced current components and the 5th and 7th background harmonics. The robust stability (RS) and robust performance (RP) of the proposed controller are verified by the structured singular value μ. The performance of the H∞ robust current controller was demonstrated with a 1.5 MW DFIG model, showing its harmonics suppression ability with DFIG parameter perturbation and improved robustness.

General information
State: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Electric Power Systems, Shenzhen University, China Southern Power Grid Ltd., DONG Energy AS
Contributors: Wang, Y., Wu, Q., Gong, W., Gryning, M. P. S.
Pages: 816 - 825
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Sustainable Energy
Volume: 8
Issue number: 2
ISSN (Print): 1949-3029
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 7.42 SJR 2.318 SNIP 2.452
Web of Science (2017): Impact factor 6.235
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 7.8 SJR 2.368 SNIP 2.967
Web of Science (2016): Impact factor 4.909
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 7.09 SJR 2.717 SNIP 3.22
Web of Science (2015): Impact factor 3.727
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 7.03 SJR 2.554 SNIP 3.898
Web of Science (2014): Impact factor 3.656
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 7.03 SJR 2.043 SNIP 3.712
Web of Science (2013): Impact factor 3.842
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
Scopus rating (2012): CiteScore 6.58 SJR 1.243 SNIP 3.744
ISI indexed (2012): ISI indexed no
Scopus rating (2011): CiteScore 5.13 SJR 0.73 SNIP 3.01
ISI indexed (2011): ISI indexed no
Original language: English
Keywords: Doubly fed induction generator (DFIG), Grid harmonics, Grid voltage distortion, Robust control, Wind turbine
Electronic versions: