IMPACT: International Journal of Research in Engineering & Technology (IMPACT: IJRET)
ISSN(E): 2321-8843; ISSN(P): 2347-4599
Vol. 3, Issue 9, Sep 2015, 31-42

ANT COLONY OPTIMISATION APPROACH TO SELECTIVE HARMONIC ELIMINATION IN MULTILEVEL INVERTER

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ABSTRACT

In Selective Harmonic Elimination-Pulse Width Modulation (SHE-PWM) method, low order harmonics are eliminated, while the fundamental harmonic is obtained at the desired value. In this paper, Variable Sampling Ant Colony Optimization (SamACO) algorithm with random initial values is proposed for solving the transcendental nonlinear equations known as Selective Harmonic Elimination (SHE) equations that characterize the selected harmonics in an 11-level inverter. The algorithm is a continuous (combinatorial) optimization algorithm that is based on the food foraging behavior of ants in a swarm. The dynamic exploitation and random exploration operators in the algorithm ensure both accuracy and convergence to global optima. Fast Fourier Transform (FFT) analysis of the synthesized voltage waveform reveals the complete elimination of the $5^{th}, 7^{th}, 11^{th}$ *and* 13^{th} harmonics as their values tend towards zero. Both computational and MATLAB simulation results show that the proposed method is highly efficient for elimination of the selected low order harmonics as well as minimization of the total harmonic distortion (THD).

KEYWORDS: Multilevel Inverter, Samaco, Selective Harmonic Elimination (SHE), and THD