البحث رقم (6)

عنوان البحث	**الامثلية فى الوقت الحقيقي للقدرة غير الفعالة لمنظومة ذكية بأستخدام الخوارزمية الجينية** **A real-time optimization of reactive power for an intelligent system using genetic algorithm**
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Power factor (PF) is a measure of how effectively electricity is used. The low power factor causes considerable power losses along the power supply chain. In particular, it overloads the distribution system and increases the power plant's burden to compensate the expected power losses. Most of the existing PF correction techniques are developed based on placing centralized capacitors, assuming that power systems are static. However, the power systems are dynamic systems such that their states change over time, necessitating dynamic correction systems. In the emerging smart grid systems, real-time measurements can easily be taken for voltage, current and harmonics. Then, the measured data can be transmitted to a PF controller to reach the desired PF value. However, the problem that will arise in real-time applications is how to determine and adjust the optimal capacitor size that can balance the power factor. In this regard, we propose a real-time correction system based on multi-step capacitor banks to improve PF in co-operation with de-tuned filters to mitigate the harmonics. First, a mathematical model has been formulated for the proposed power factor correction system. The mathematical model can be employed to determine the optimal operational settings of the multi-step capacitor and the reactor value that optimize the reactive power while considering the desired PF value and restricting the harmonics. Second, a genetic optimization approach is applied to solve the proposed mathematical model as it can provide accurate solution in a short computational time. A Monte Carlo simulation approach is considered for validating the proposed PF correction system. The simulation results show that the average PF of the randomly generated test instances has improved from 0.7 to 0.95 (35% increase). Furthermore, we conducted real experiments using a PF testbed for experimental validation. The results are found to be consistent with the simulation results, which validate the effectiveness and applicability of the proposed correction system. Furthermore, the saved kVA in one day is estimated to be 26% of total kVA.