The Daya Bay Reactor Neutrino Experiment, located in Southeast China, was designed to measure short baseline oscillation of electron antineutrinos originating from six 2.9 $GW_{th}$ nuclear reactors. In 2012, it discovered the nonzero value of the $\theta_{13}$ mixing angle and currently provides the world's most precise measurement of this neutrino oscillation parameter. The goal of this thesis is to check the performance of the detector nonuniformity correction used by the Daya Bay experiment and then design a new improved version. For that purpose, the Daya Bay experiment is introduced including the procedure of the event reconstruction. Several types of signals are then studied in detail and later they are used to scrutinize the performance of the nonuniformity correction. Several issues are identified, most significantly an absence of radial dependence in the azimuthal part of the correction and inability to deal with dead photomultipliers. A new improved version of the correction that addresses these issues is then designed with the main goal to improve the precision of Daya Bay neutrino oscillation analyses, especially ongoing one which uses neutron capture on hydrogen. The impact of the new improved correction on said analyses is also assessed.