Available online at www.sciencedirect.com
SCIENCE DIRECT®
Energy Conversion and Management xxx (2006) xxx–xxx
ENERGY CONVERSION & MANAGEMENT
www.elsevier.com/locate/enconman

Power factor correction technique based on artificial neural networks

S. Sagiroglu [a], I. Colak [b], R. Bayindir [b,*]

[a] Department of Computer Engineering, Faculty of Engineering and Architecture, Celal Bayar Bulvari, Gazi University, Maltepe, Ankara 06570, Turkey
[b] Department of Electrical Education, Faculty of Technical Education, Gazi University, Besevler, Ankara 06500, Turkey

Received 3 August 2005; accepted 15 February 2006

Abstract

This paper presents a novel technique based on artificial neural networks (ANNs) to correct the line power factor with variable loads. A synchronous motor controlled by the neural compensator was used to handle the reactive power of the system. The ANN compensator was trained with the extended delta-bar-delta learning algorithm. The parameters of the ANN were then inserted into a PIC 16F877 controller to get a better and faster compensation. The results have shown that the proposed novel technique developed in this work overcomes the problems occurring in conventional compensators including over or under compensation, time delay and step changes of reactive power and provides accurate, low cost and fast compensation compared to the technique with capacitor groups.
© 2006 Elsevier Ltd. All rights reserved.

Keywords: Artificial neural network; Power factor correction; Synchronous motor

1. Introduction

In electrical systems, all inductive loads fed by alternating current draw active and reactive powers from the line. While the active power is converted into heat, light and mechanical energy or other types of energy, the reactive power cannot be converted. It causes the transformer, alternator, cable, protection relay and other equipment to be larger than their rated values. Therefore, reducing the capacities of production, transmission and distribution of the line is the result of the effects of lower power factor [1,2]. In order to get rid of this effect, the power factor needs to be corrected [3].

In practical applications, reactive power compensations have generally been achieved by employing constant capacitor groups using some relays, timers and contactors. These types of systems are known as classical methods and have some mechanical problems, slow responses, over or under compensation and harmonics

* Corresponding author. Tel.: +90 312 212 6820/1221.
E-mail address: bayindir@gazi.edu.tr (R. Bayindir).

0196-8904/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.enconman.2006.02.018