

Техника и технологии  
Engineering & Technologies

Редакционный совет

академик РАН Е.А. Ваганов  
академик РАН И.И. Гительзон  
академик РАН А.Г. Дегерменджи  
академик РАН В.Ф. Шабанов  
чл.-корр. РАН, д-р физ.-мат. наук  
В.Л. Миронов  
чл.-корр. РАН, д-р техн. наук  
Г.Л. Пашков  
чл.-корр. РАН, д-р физ.-мат. наук  
В.В. Шайдуров  
чл.-корр. РАН, д-р физ.-мат. наук  
В.В. Зув

Editorial Advisory Board

**Chairman:**

Eugene A. Vaganov

**Members:**

Josef J. Gitelson  
Vasily F. Shabanov  
Andrey G. Degermendzhy  
Valery L. Mironov  
Gennady L. Pashkov  
Vladimir V. Shaidurov  
Vladimir V. Zuev

**Editorial Board:**

**Editor-in-Chief:**

Mikhail I. Gladyshev

**Founding Editor:**

Vladimir I. Kolmakov

**Managing Editor:**

Olga F. Alexandrova

**Executive Editor for Engineering & Technologies:**

Vladimir A. Kulagin

CONTENTS / СОДЕРЖАНИЕ

**Ebrahim Ghandehari,**

**Shahrokh Shojaeian and Javad Pourabadeh**

An Improved Multi-Objective Bpso-Based Method for Radial Distribution Networks Reconfiguration

— 617 —

**М.Ю. Чернецкий, А.А. Дектерев, А.П.Бурдуков**

Расчетное исследование факельного горения мелкодисперсного лигноцеллюлозного сырья

— 625 —

**Vladimir A. Kodnyanko**

Numeric-Analytical Method for Determining the Communication Equations of Laplace's Transformants of the Universal Radial Unit of Externally-Pressurized Gas Bearings

— 637 —

**Sergey S. Dobrosmyslov,**

**Vladimir I. Kirko, Gennady E. Nagibin,**

**Oksana A. Resinkina and Zahar I. Popov**

Characteristic Physical-Mechanical and High-Temperature Electric Properties Semicinductor Ceramic Based  $\text{SnO}_2$  with Addition  $\text{MnO}_2$  and  $\text{CuO}$

— 650 —

**Т.Н. Патрушева,**

**С.А. Подорожняк, Г.Н. Шелованова**

Термоэлектрическая добротность в низкоразмерной полупроводниковой среде

— 657 —

Редактор **И.А. Вейсиг** Корректор **Е.Г. Иванова**

Компьютерная верстка **Е.В. Гревцовой**

Подписано в печать 29.09.2013 г. Формат 84x108/16. Усл. печ. л. 9,9.  
Уч.-изд. л. 9,4. Бумага тип. Печать офсетная. Тираж 1000 экз. Заказ 3141.  
Отпечатано в ПЦ БИК СФУ. 660041 Красноярск, пр. Свободный, 82а.

**Editorial board for Engineering & Technologies:**

Vladimir Kulagin Series Editor, Siberian Federal University, Russia  
Yury Alashkevich Siberian State Technological University, Russia  
Sereeter Batmönkh Institute of Heat Engineering and Industrial Ecology Mongolian Academy of Sciences, Mongolia  
Yuri Biba Dresser-Rand Company, USA  
Carsten Drebenstedt Technische University Bergakademie Freiberg, Germany  
Yury Galerkin Saint Petersburg State Polytechnic University, Russia  
Gennady Gritsko Institute of Petroleum Geology and Geophysics Russian Academy of Sciences, Siberian Branch, Russia  
Georg Guggenberger Institute of Soil Science Leibniz University Hannover, Germany  
Lev Endzhievsky Siberian Federal University, Russia  
Feng-Chen Li School of Energy Science and Engineering Harbin Institute of Technology, China  
Vladimir Makarov Siberian Federal University, Russia  
Aleksandr Mineev Siberian Federal University, Russia  
Vladimir Moskvichev Special Designing and Technological Bureau "Nauka" Krasnoyarsk Scientific Center of the Russian Academy of Sciences, Siberian Branch, Russia  
Bernard Nacke Institute of Electrotechnology Leibniz University of Hannover, Germany  
Oleksandr Nemchin CEO of the State Research Institute of Innovative Technologies in Power Energy and Energy Efficiency of the Fuel and Energy Ministry of Ukraine, Ukraine  
Valeriy Nikulin Kamsk Institute of Humanitarian and Engineering Technologies, Russia  
Oleg Ostrovski University of New South Wales, Australia  
Harald Oye Norwegian University of Science and Technology, Norway  
Vasili Panteleev Siberian Federal University, Russia  
Petr Polyakov Siberian Federal University, Russia  
Victor Timofeev Siberian Federal University, Russia  
Ibragim Khisameev Kazan State Technological University, Russia  
Anatoly Shvidenko International Institute for Applied Systems Analysis, Austria  
Galina Chiganova — Siberian Federal University, Russia

*Свидетельство о регистрации СМИ  
ПИ № ФС77-28-722 от 29.06.2007 г.*

**Серия включена в «Перечень ведущих рецензируемых научных журналов и изданий, в которых должны быть опубликованы основные научные результаты диссертации на соискание ученой степени доктора и кандидата наук» (редакция 2010 г.)**

**О.В. Юшкова (Белоногова),  
В.И. Аникина, А.А. Ковалева**

Влияние механоактивации на габитус кристаллической решетки глинозема

— 665 —

**О.И. Подкопаев,  
Т.В. Кулаковская, А.Ф. Шиманский,  
А.М. Погодаев, М.Н. Васильева**

Взаимодействие газовой фазы с расплавом в процессе выращивания монокристаллов германия

— 674 —

**О.Г. Дубровская,  
В.В. Евстигнеев, В.А. Кулагин**

Проблемы очистки сточных вод, содержащих эмульгированные нефтепродукты в оборотных системах замкнутых циклов водопользования, и пути их решения

— 680 —

**Г.Е. Нагибин, Р.А. Назиров,  
С.С. Добросмыслов, Е.Н. Федорова,  
В.Е. Задов, В.А. Шевченко**

Вяжущие на основе технической серы и золошлаковых отходов

— 689 —

**В.И. Ковалев, Ю.Д. Алашкевич**

Алгоритм радиуса окружности точки скрещивания ножей при двухстороннем исполнении гарнитуры

— 699 —

**С.В. Козлачков, И.И. Овчинников**

Анализ конструктивных особенностей защитного устройства деформационного шва для движения велосипедного транспорта

— 705 —

**А.А. Бородин,  
В.Н. Самусенко, В.В. Лазукин**

Адаптивный метод последовательных уступок при решении задачи векторной оптимизации характеристик системы инженерно-аэродромного обеспечения боевых действий авиации ВВС

— 712 —

**Д.М. Астанин**

Пространственная структура познавательного туризма Красноярского края

— 721 —

УДК 621.316.1

## An Improved Multi-Objective Bpso-Based Method for Radial Distribution Networks Reconfiguration

**Ebrahim Ghandehari,  
Shahrokh Shojaeian\* and Javad Pourabadeh**  
*Islamic Azad University, Khomeinishahr branch  
P.O. Box 84175-119, Isfahan, Iran*

Received 15.01.2013, received in revised form 28.04.2013, accepted 09.09.2013

*The present paper will introduce an improved BPSO algorithm for radial distribution networks reconfiguration. In this regard PSO algorithm has extensively been used in many of the previous literatures; however, here a new method will be introduced in order to update swarm position which is not only simple and fast but also has high accuracy. The objective function has four weighted components representing load balancing, total losses of network, voltage deviation and system reliability. The test network is a standard distribution system with 3 feeder and 16 switches. Accuracy and speed of proposed method are compared with three other well-known algorithms to ensure its efficiency.*

*Keywords: BPSO algorithm, Reconfiguration, Restructuring, Distribution network.*

### Introduction

Transmission of electrical energy is the most important task of distribution systems and due to the yearly growing of consumers' loads; these networks will become larger and more complex. Most of distribution networks all over the world are radial and every consumer is fed just from one side. Since these distribution networks are complex and also many plants have been made, it can cause different states for the consumers' feeding. But there are a lot of switches in distribution networks which can change the structure of the network. These switches can be divided into two categories including sectionalizing (normally close) switches and tie (normally open) switches. Change in the structure of network by altering status of its switches which called reconfiguration or restructuring, not only determine the type of consumers feeding but also has more applications. Some of these applications include load balancing, minimizing total losses of system and improving voltage deviation and reliability of network. Utterly reconfiguration is useful when some faults occur in the network. This activity minimizes de-energized loads after faults. So the existing switches are used for both management and maintenance, but the existing paper focuses only on system management. Some other applications of network reconfiguration include increasing capacity of network, reconfiguration with fewest switches, system development, finding optimum place for distributed generation (DG), etc. that are not the subject of the study here. Since there are a lot of switches in the network, reconfiguration issue is a complex optimization problem which has a lot of limitations. Some of these limitations are

© Siberian Federal University. All rights reserved

\* Corresponding author E-mail address: Shojaeian@iaukhsh.ac.ir