

Flexible AC Transmission Devices as a Means for Transmission Line Congestion Management -A Bibliographical Survey

N. Ashokkumar, M. RathinaKumar, M. Yogesh

Abstract— through this paper we have given a bibliographical survey and general environment that is prevailing among researchers and their ideas in the field of transmission line congestion management. More than 124 published articles and research papers from various sources like transactions, journals and conferences have been analyzed and referred in this bibliography.

Keywords – Bibliography, Transmission line congestion.

I. INTRODUCTION

In present scenario we know that the power systems are operating close to its limits. At the same time the demand is increasing consistently. Congestion is defined as, if the power exchanges were not controlled, some lines located on particular paths may become overloaded, and this phenomenon is called congestion and congestion - management is defined as the quick operations taken by the technical persons to relieve the problem. FACTS devices play a major role in this power management. They are broadly classified into series connected devices like TCSC, TCPST which are connected in series with the line and shunt connected devices like SVC, STATCOM etc which are connected in parallel to the line. Also we have combination of series and shunt devices like UPFC. Series devices play a key role in real and reactive power control by controlling phase angle and line reactance thereby it reduces line congestion. Shunt devices play a key role to maintain voltage magnitude thereby it reduces line congestion.

Similarly UPFC tackles both the real and reactive power they can be controlled by controlling phase angle voltage magnitude. In our work we have sorted the papers under series connected devices, shunt connected devices and unified devices.

Publications on topics, relevant to line congestion issues are numerous and it is not possible to accommodate every work in a single paper. We therefore chosen to limit the titles under broad categories as mentioned above. Still more bibliographies are necessary to explore and create a database in this line congestion management studies. The bibliography has been structured into the following sections.

II. BASIC CONCEPTS

This section includes the literatures, which contains basic ideas regarding transmission line congestion management.

- [1]. Silpa Parnandi, Kari Schoder, Ali Feliachi “Power market analysis tool for congestion management”. JES Despscior / Onr (DOD/ONR 14-031-0660).
- [2]. Rahul J.Shimpi, Rajwindra P.Desale, Kunal S.Patil, Jaswantsing L.Rajput, Shailesh B.Charan “Flexible AC transmission system”. International Journal of computer applications (0975 – 8887) volume -1 –No.15
- [3]. Edimar J.de Oliveira, Jose Luiz R.Pereira, Leandro M.Riani, Andre Luis M.Marcato and Leonardo W.Oliveira. “Series Compensation Devices Allocation under contingency constraints”. IEEE Bologna Power tech conference June 23rd -26th Bologna, Italy at 2003.
- [4]. A.L.Abbate, G.Migtiaracca, U.Hager, C.Rehtanz, S.Ruberg, H.Ferreira, G.Fulli, A.Purvins. “The Role of FACTS and HVDC in the future pan – European Transmission system Development”. Angelo.LAbbate@erse-web.it
- [5]. J.Brosda, E.Handschim, fellow IEEE, A.L.Abbate student member IEEE, C.Leder member IEEE M.Trovato, member IEEE. “Visualization for a corrective congestion management based on FACTS devices”. IEEE Bologna power tech conference June 23rd – 26th Bologna, Italy at 2003.
- [6]. Bindeshwar Singh, N.K.Sharma and A.N.Tiwari. “A Comprehensive Survey of Coordinated control Techniques of FACTS controllers in multi – machine power system Environments” 16th National power systems conference, 15th – 17th December 2010.
- [7]. Manasarani Mandala and C.P.Gupta, member IEEE “Comparative studies of congestion management in deregulated electricity market”. 16th National power system conference 15th – 17th December 2010.
- [8]. M.A.Abido “Power system stability Ehnancement using FACTS controllers: A Review”The Arabian Journal for science and Engineering, Volume 34, Number 1B, November 2008.
- [9]. A.Yousefi, T.T.Nguyen, H.Zarei pour, O.P.Malik. “Congestion management using demand response and FACTS devices”. Electrical power and Energy systems 2012.
- [10]. Deepak Divan and Harjeet Johal. “Distributed FACTS – A New concept for realizing grid power flow control”. IEEE transactions on power Electronics Vol 22, No 6, November 2007.
- [11]. Shmuel S.Oven. “Transmission pricing and congestion management : Efficiency, simplicity and open access”. University of California at Berkeley, Berkeley CA 94720.

Manuscript received on March, 2013.

N.Ashokkumar, (EEE, SCSVMV University, Kanchipuram, India)
Dr.M.Rathina Kumar, (EEE, SCSVMV University, Kanchipuram, India)
M.Yogesh (EEE, SCSVMV University, Kanchipuram, India.

Flexible AC Transmission Devices as a Means for Transmission Line Congestion Management -A Bibliographical Survey

- [12]. Pavel Etingor, Nikolai Voropai, Alexandre Oudalor, Alain Germond, Rachid Cherkaoui. "Congestion management using coordinated control of FACTS Devices and load shedding". 15th PSCC. Liege. 22-26 August 2005.
- [13]. C.Unsihuay, R.C.Leme, A.C.Zambroni de souza, J.W.Marangon Lima, M.A.Tomim. "Integrated optimal FACTS allocation with power system stability constraint". 15th PSCC, Liege, 22-26 August 2005. Session 12 paper 3.
- [14]. G.Glanzmann, G.Andersson Eth zurich. "Using FACTS Devices to resolve congestions in transmission Grids". Eth Zentrum, ETL G24.1, 8092 zurich, glanzmann@eeh.ee.ethz.ch.
- [15]. Bindeshwar singh, N.K.Sharma, A.N.Tiwari. "A study on enhancement of loadability of large – scale emerging power systems by using FACTS controllers". (IJCSCE) International Journal on computer science and Engineering Vol 02, No. 05, 2010, 1893-1903.
- [16]. Saeed Mohammadi. "Improvement of power systems operation using smart grid technology". Indian J.Edu.Inf. manage, vol.1, no 6 (sep 2012) ISSN 2277-5374.
- [17]. Nadarajah mithulananthan, Naresh Acharya. "A proposal for investment recovery of FACTS devices in deregulated electricity markets". Electric power systems research 77 (2007) 695-703.
- [18]. K.Mani Chandy, Steven H.Low, Ufuk Topcu and Huan Xu. "A simple optimal power flow model with energy storage". mani@caltech.edu. slow@caltech.edu, utopcu@cds.caltech.edu.
- [19]. Claudio A.Canizares, senior member, IEEE, sameh k.m.Kodsi, student member, IEEE. "Dynamic versus steady – state modeling of FACTS controllers in transmission congestion". ccanizar@uwaterloo.ca, sameh.kodsi@amec.wm.
- [20]. K.Vijayakumar. "Optimal location of FACTS devices for congestion management in Deregulated power systems". International Journal of computer applications (0975 – 8887) volume 16 – No 6 February 2011.
- [21]. Fang Xu and Panos Liatsis. "Congestion management under Inter – regional Trade". Recent Researches in power system science ISSN: 978 -1-6180-023-7.
- [22]. G.Beck, W.Breuer, D.Porh, D.Retzmann. "Use of FACTS for system performance Improvement ". The 16th conference of the Electric power supply industry Energy, Competition, Technology & Bench marking for Economic Globalization 6-10 November 2006.
- [23]. Durga Gautam and Mithulananthan Nadarajah. "Influence of Distributed Generation on Congestion and LMP in competitive Electricity market". World Academy of science Engineering and Technology 39 2010.
- [24]. Liangzhong Yao, Phill Cartwright, Laurent Schmitt, Xiao – ping Zhang. "Congestion management of transmission systems using FACTS". 2005 IEEE /PES transmission and Distribution conference & Exhibition Asia and pacific Dalian, China.
- [25]. Xiao – ping Zhang. "Congestion management challenges and solutions". Touch Briefings 2007.
- [26]. Scott M.Harvey and William W.Hogan. "Nodal and Zonal congestion management and the exercise of market power". January 10, 2000.
- [27]. Seyed Abbas Taher, Hadi Besharat. "Transmission congestion management by determining optimal location of FACTS Devices in Deregulated power systems". America Journal of applied sciences 5(3): 242-247, 2008 ISSN 1546-9239.
- [28]. Ch.Schaffner, G.Andersson. "Use of FACTS Devices for congestion management in a Linalized Electricity market".
- [29]. Ashish saini and A.K.Saxena. "Optimal power flow based congestion management methods for competitive Electricity markets". International Journal of computer and Electrical Engineering Vol 2. No 1, February 2010 1793-8163.
- [30]. Naresh Acharya, Arthit sode – Yome, Nadarajah mithulananthan. "FACTS about Flexible AC transmission systems (FACTS) controllers: Practical Installations and Benefits".
- [31]. Antonio J.Conejo, fellow IEEE, Federico Milano, member, IEEE, and Raquel Garcia – Bertrand, member, IEEE. "Congestion management ensuring voltage stability". IEEE transactions on power systems, Volume 21, No.1 February 2006.
- [32]. Claudio A.Canizares, Hong Chen. "Transmission congestion management and pricing in simple auction Electricity markets". International Journal of Emerging Electric power systems. Volume 1, issue 1, 2004.
- [33]. Mithun M.Bhaskar, Muthyala srinivas, Sydulu Maheswarapu. "Security constraint optimal power flow (SCOPF) –A comprehensive survey". Global Journal of Technology & optimization volume 2, 2011 review Stage

III. TOOLS AND TECHNIQUES

This section contains those publications which are related to operational issues, tools and techniques, technical analysis in the field of transmission line congestion management.

- [1]. H.Iranmanesh, M.Rashidi – Nejad. "Real Genetic Algorithm Based Fuzzy – AHP approach to congestion relief via UPFC". International Journal of systems applications engineering & Development issue 1, volume 6, 2012.
- [2]. Ali Darvish Falehi. "Simultaneous coordinated Design of TCSC – Based damping controller and AVR Based on PSO Technique". Przegląd Elektrotechniczny (Electrical Review), ISSN 0033 – 2097, R.88NR 5b/2012.
- [3]. R.Mohamad idris, A.Khairuddin, M.W.Mustafa. "Optimal Allocation of FACTS Devices in Deregulated electricity market using Bees Algorithm". WSEAS Transactions on power systems ISSN: 1790-5060 Issue 2, Volume -5, April 2012.
- [4]. Igor Kopcak, Luiz C.P.Dasilva, Vivaldo F.Da costa, and Jim S.Naturesa "Transmission systems congestion management by using model participation Factors". IEEE Bologna power tech conference, June 23rd – 26th, Bologna, Italy at 2003.
- [5]. V.Zamani Farahani, A.Kazemi and A.Biglari majd. "Congestion management in Bilateral Based power market by FACTS devices and load curtailments".

- A.B.Power India conference, 2006 IEEE 680 – 685 April 10-12,2006.
- [6]. Elango.K, Paranjothi.S.R, Sharmeela.C. “Congestion management in restructured power systems by FACTS devices and load shedding using Extended quadratic Interior point method”. International Journal of Applied engineering Research. Dindigul volume 2, No 2, 2011.
- [7]. Manisha Agarwal and Aziz Ahmed. “ATC Enhancement for optimal placement of FACTS using Artificial Intelligence (AI) Technique”. IJCSI International Journal of Computer science issues, Vol 9, issue 3 No.1 may 2012 ISSN : 1694 – 0814.
- [8]. Sujatha Balaraman, N.Kamaraj. “Congestion management in deregulated power system using Real coded genetic Algorithm”. International Journal of Engineering Science and Technology Vol 2(11), 2010, 6681-6690.
- [9]. Mohamad K.Hasan. “A Framework for Intelligent Decision support system for Traffic Congestion Management system”. (<http://www.sciRP.org/journal/eng>) doi:10.4236/eng.2010.24037.
- [10]. Aditya Tiwari, K.K.Swarnkar, S.Wadhvani and A.K.Wadhvani. “Optimal power flow with FACTS devices using Genetic Algorithm”. International Journal of power system operation and energy management, ISSN: 2231 – 4407 volume -1 issue – 2,2011.
- [11]. Deependra Singh and K.S.Verma. “GA – Based congestion management in Deregulated power system using FACTS devices”.
- [12]. Mehdi Eghbal, Naotoyorino and Yoshifumi Zoka. “Application of Evolutionary multi objective optimization Algorithm to optimal VAR expansion and ATC Enhancement problems”.
- [13]. G.Glanzmann student member IEEE, G.Andersson, Fellow IEEE. “Coordinated control of FACTS devices based on optimal power flow”.
- [14]. Elango.K, S.R.Paranjothi, C.Sharmeela. “Transmission congestion management in Restructured power systems by Generation Rescheduling and load shedding using rule Based OPF”. European Journal of scientific Research ISSN 1450 -216 X vol 57 No.3 (2011)
- [15]. A.Vergnol, V.Rious, J.Deuse. “Real time grid congestion management in presence of high penetration of wind energy”. 13th European conference on power electronics and applications – EPE 2009, Barcelonne Spain (2009).
- [16]. K.Vijaya kumar. “Multiobjective optimization methods for congestion management in deregulated power systems”. Journal of Electrical and computer Engineering volume 2012, dol 10.1155/2012/962402.
- [17]. Elango.K, S.R.Paranjothi. “Power transmission congestion management in Restructured power system by FACTS devices, Generation Rescheduling and load shedding using Evolutionary programming”. European Journal of scientific Research ISSN 1450 -216x vol 56 No 3 (2011).
- [18]. Sandip Chandra, Abhinandan de. “Improvement of Economic aspect of power netowrl congestion management by Swarm Intelligence based multi – objective algorithm”. International Journal of Engineering science and technology ISSN: 0975 – 5462 Vol 3 No.5 May 2011.
- [19]. Seth Blumsacck member, IEEE, Marrija Ilic, fellow, IEEE and Lester B.Lave. “Separability and independence of congestion and Reliability: Theory and Simulations”. 1-4244-1298-6107 @ 2007 IEEE.
- [20]. R.M.Hermans, P.P.J.Van den Bosch, A.Jokic, P.Giesbertz, P.Boonekamp, A.Virag. “Congestion management in the deregulated electricity market: an assessment of locational pricing, redispatch and regulation”. 2011 8th International conference on the European energy market (EEM) 25-27 May 2011.
- [21]. B.Karthik, S.Chandrasekar. “A Hybrid Technique for controlling multi line transmission system using Interline power flow controller”. European Journal of scientific research ISSN 1450 -216x vol 58 No.1 (2011).
- [22]. V.Srinivasarao, S.P.Singh and G.S.Raju. “Active and Reactive power rescheduling for congestion management using descent gradient method”. Fifteenth National power systems conference (NPSC) IIT Bombay, December 2008.

IV. SHUNT CONNECTED DEVICES

This section contains those publications which are related to operational issues, tools and technical analysis for the shunt controlled devices for relieving the transmission line congestion problems.

- [1]. Kiran kumar kuthadi, N.Suresh. “Enhancement of voltage stability through optimal placement of FACTS controllers in power systems.” American Journal of sustainable cities and society Issue 1 Vol 1 July 2012.
- [2]. Mehrdad Ahmadi Kamarposhti, Hamid soltani. “ The study of maximum loading point in Investigation of capacitor performance with power electronic shunt devices”. Email: ahmadik@gmail.com.
- [3]. H.B.Nagest and P.S.Puttaswamy. “Power flow model of static Var compensator and Enhancement of voltage stability”. International Journal of advances in Engineering & Technology, May2012 ISSN: 2231 -1963.
- [4]. Reza sirjani, Azah Mohamed, Hussain shareef. “Optimal placement and sizing of shunt FACTS devices in power systems using Heuristic optimization Techniques a comprehensive survey”. Przegląd Elektrotechniczny (Electrical Review) ISSN 0033 – 2097 -2012.
- [5]. Sobuj kumar Ray, pejush Chandra sarkar, munshi sabbir ahsan, and M.M.Israfil shahin seddiqe member, IACSIT. “Novel approach of PID control scheme with UPFC’s for damping of oscillations.” International Journal of computer and Electrical Engineering Vol 4, No 2, April – 2012.
- [6]. A.Samimi and M.A.Golkar. “A Novel method for optimal placement of FACTS based on sensitivity analysis for enhancing power system static security.” Asian Journal of applied sciences, 2012. ISSN 1996 -3343, Malaysia.
- [7]. Arindam chakraborty, Shravana K.Musunuri, Anurag K.Srivastava, Anil K.Kondabattini. “Integrating STATCOM and battery energy storage system for power system transient stability:

Flexible AC Transmission Devices as a Means for Transmission Line Congestion Management -A Bibliographical Survey

A review and application". Email: asrivast@eecs.wsu.edu.

- [8]. A.Karami, M.Rashidinejad and A.A.Gharareisi. "Voltage security enhancement and congestion management via STATCOM & IPFC using Artificial Intelligence." Iranian Journal of science & Technology, Transaction B.Engineering Vol 31, No . B3, PP 1289 -301, Republic of Iran, 2007.
- [9]. H.Afrakhte and M.R.Haghifam. "Optimal Islands determination in power system Restoration". Iranian Journal of science & Technology, Transaction B: Engineering Vol 33, No B6, PP 463-476. The Islamic Republic of Iran, 2009.
- [10]. T.Renuka, P.Chandhrasekhar. "Modeling of STATCOM with six pulse SPWM based VSC and its power flow study." International Journal of Engineering and Technology volume 2 No.7, July 2012.
- [11]. M.W.Mustafa and N.Magaji. "Optimal location of Static Var Compensator Device for damping oscillations". American J of Engineering and Applied sciences 2(2): 353-359, 2009 ISSN – 1941-7020.
- [12]. Ahad kazemi and Babak Badrezadeh. "Modeling and Simulation of SVC and TCSC to study their effects on maximum loadability point."
- [13]. Mrs.Nagalakshmi snivarapu, Mrs.R.Kalaivani, Dr.S.R.Paranjothi. "Optimal location of STATCOM to Improve voltage stability using PSO". International Journal of advanced Engineering Technology. ISSN 0976 -3945. Vol.II/ Issue IV/October – December 2011.
- [14]. A.Esmaeili Dahej, S.Esmaeili, A.Goroohi. "Optimal allocation of SVC and TCSC for Improving voltage stability and Reducing power system losses using Hybrid Binary Genetic Algorithm and Particle Swarm Optimization." Canadian Journal on Electrical and Electronics Engineering Vol 3, No.3 March – 2012.
- [15]. J.Sridevi, Dr.J.Amarnath, Dr.G.Govinda Rao. "Zonal power quality improvement using static Var compensator for an Indian utility system". International Journal of Engineering Research and Applications (IJERA) ISSN: 2248 – 9622, vol 2, Issue 3 May – June 2012.p.p – 1320 – 1325.
- [16]. Pankaj Jindal, Shiwani sehgal, Sachin Dhawan. "Voltage stability in Electrical power systems and Benefits of FACTS controllers". International Journal of Engineering Science & Humanities ISSN 2250-3552.
- [17]. Mrinal Ranjan, B.Vedik. "Optimal location of FACTS devices in a power system by means of sensitivity analysis". Trends in Electrical and computer Engineering TECE 1(1) 1-9,2011.
- [18]. Mr.David Smyth. "Using Distributed PV for Volt/Var control and maximum Demand Reduction". www.evolveenergy.com.au. August 2011.
- [19]. Mohammad Mohammadi. "Voltage stability Analysis with static Var Compensator (SVC) for various faults in power system with and without power system stabilizers (PSS)." Research Journal of applied sciences, Engineering and Technology 3(7): 668-676, 2011. ISSN: 2040-7467.
- congestion problems.
- [1]. J.Nikoukar, M.Jazaeri. "Genetic Algorithm applied to optimal location of FACTS Devices in a power system." Proc. Of the 3rd IASME/WSEAS International conference on Energy, Environment, Ecosystems and sustainable development, Agios Nikolaos, Greece, July 24-26,2007.
- [2]. Madhura Gad, Prachi shinde, Prof.S.U.Kulkarni. "Optimal location of TCSC by sensitivity methods." International Journal of computational Engineering Research Volume 2, Issue 6 ISSN: 2250 -3005 October 2012.
- [3]. Alberto D.Delrosso, member, IEEE, Claudio A.Canizares, Senior member IEEE, and victor M.Dona. "A study of TCSC controller Design for Power system Stability Improvement."
- [4]. B.Likhitha, J.Sinivasa Rao, J.Amarnath. "Sensitivity Approach for the effective location of TCSC in a Deregulated Electricity Market." IOSR Journal of Engineering ISSN : 2250 -3021 Volume 2, Issue 6, June 2012, PP – 09-15.
- [5]. Tiberio venegas Trujillo, Claudio R.Fuerte Esquivel and Jose L.Guardado Zarala. "A phase domain modeling of Thyristor Controller Series Compensator for Active power flow control in unbalanced Electric Transmission Networks". Computacion Y sistemas Numero Especial PP 108 -116 @ 2002, ISSN 1405 -5546 Impreso en, mexico.
- [6]. Elango.K, Paranjothi.S.R. "Congestion Management in restructured power systems by FACTS devices and load shedding using extended Quadratic interior point method". International Journal of applied Engineering Research Dindigul Volume 1, No 4, 2011 ISSN 0976-4259.
- [7]. Ali H.Abdul –Jabbar, Mohammed K.Edan, Dr.Jamal A.Mohammed. "Design and Simulation of Control circuit for TCSC Based MATLAB Simulink". Journal of Engineering and development, Volume 15, No 4, December 2011. ISSN – 1813-7822.
- [8]. Md.Nasimul Islam maruf, A.S.M.Mohsin, MD.Asaduzzaman Shoeb, MD.Kafiul Islam, MD.Mokarrom Hossain. "Study of Thyristor Controlled Series Capacitor (TCSC) as a useful FACTS Device". International Journal of Engineering Science and Technology Volume 2(9), 2010,4357-4360.
- [9]. Bindeshwar singh, N.K.Sharma, A.N.Tiwari.K.S.Verma,Deependra singh. "A status review of incorporation of FACTS controllers in multi –machine power systems for Enhancement of Damping of power system and voltage stability". International Journal of Engineering Science and Technology Volume 2(6), 2010, 1507-1525.
- [10]. Satyarir Singh. "Impact of FACTS Devices on transmission Congestion Charges in LMP – Based Market". International Journal of Emerging Volume 2, Issue 9, September 2012 ISSN 2250-2459.
- [11]. Swathi Kommamuri & P.Suresh Babu. "Optimal Location and design of TCSC Controller for Improvement of Stability". International Journal of Instrumentation, control and Automation. ISSN: 2231-1890 Volume -1, Issue 2, 2011.

V. SERIES CONNECTED DEVICES

This section contains those publications which are related to operational issues, tools and technical analysis, for the series controlled devices for relieving the transmission line

- [12]. Nuraddeen Magaji and M.W.Mustafa. "Optimal location of TCSC Devices for Damping oscillations". ARPN Journal of Engineering and Applied Sciences Volume 4, No.3 May 2009 SN 1819-6608.
- [13]. Satyendra Singh and K.S.Verma. "A New method to incorporate TCSC in optimal power flow using Genetic Algorithm". ARPN Journal of Engineering and Applied Sciences Volume 6, No:7 July 2011. ISSN 1819 -6608.
- [14]. J.Miguel Gonzalez, student member, IEEE, Claudio A.Canizares, fellow, IEEE and Juan M.Ramirez, member, IEEE. "Stability modeling and Comparative study of series vectorial compensators". IEEE Transactions on power Delivery.
- [15]. Nadarajah Mithulananthan, Naresh Acharya. "A Proposal for investment recovery of FACTS devices in Deregulated Electricity markets". Electric power systems Research 77 (2007) 695-703.
- [16]. Panda, S.Padhy.N.P and Patel.R.N. "Modelling Simulation and optimal tuning of TCSC Controller". International Journal Simulation model 6(2007)1, 37-48. ISSN 1726-4529.
- [17]. Srinivasa Rao Pudi, S.C.Srivasatara, Senior member, IEEE. "Optimal Placement of TCSC Based on A Sensitivity Approach for Congestion Management". Fifteenth National Power systems Conference (NPSC), IIT Bombay, December 2008.
- [18]. Renu Yadav, Sarika Varshney and Lakmi Srivastava. "Enhancement of Voltage Stability through Optimal Placement of TCSC". International Journal of Power system Operation and Energy Management, ISSN: 2231-4407, Volume -1, Issue -2,2011.
- [19]. Ch.Rambabu, Dr.Y.P.Obulesu, Dr.Ch.Saibabu. "Improvement of Voltage Profile and Reduce Power System Losses by using Multi type FACTS Devices." International Journal of Computer Applications (0975 – 8887) Volume 13, No2,January 2011.
- [20]. L.Rajalakshmi, M.V.Suganyadevi, S.Pameswari. "Congestion Management in Deregulated Power system by Locating Series FACTS Devices." International Journal of Computer Applications(0975-8887) Volume 13 – No.8, January 2011.
- [21]. K.Kavitha, R.Neela. "PSO Based TCSC placement for Security Enhancement." International Journal of Computer Applications (0975-8887) Volume -56 No 9 October 2012.
- [22]. Sunthorn Faimuenwai, Somchart Jiriwipakorn, Sulee Bunjognjit, Nithad Krishna Chinda. "TCSC as a tool to reduce the transmission Congestion charge." 17th International conference on Electricity Distribution, Barcelona 12-15 May 2003.
- [23]. R.Ramachandran, M.Arun, S.Sakthivel. "Optimal transformer tap settings and TCSC size for transmission Congestion Management through PSO Algorithm in a Deregulated Power Market." International Journal of Scientific and Engineering Research Volume 3, Issue 8, August 2012.
- [24]. Anwar S.Siddique, Rashmi Jain, Majid Jamil and Gupta,C.P. "Congestion Management in high Voltage transmission line using Thyristor Controlled Series Capacitors (TCSC)." Journal of Electrical and Electronics Engineering Research Volume 3(8), PP. 151-161, October 2011. ISSN -2141-2367.
- [25]. Sidharth Panda and Narayana Prasad Padhy."MATLAB/Simulink Based model of Single Machine Infinite – Bus with TCSC for Stability studies and Tuning Employing GA." International Journal of Electrical and Electronics Engineering 1:5 2007.
- [26]. S.Meikandasivam, Rajesh Kumar nema, Shailendra kumar Jain. "Behavioral Study of TCSC Device – A MATLAB/Simulink Implementation". World Academy of Science Engineering and Technology 21, 2008.
- [27]. S.Panda, S.C.Swain, A.K.Baliar singh, C.Ardil. "Optimal Supplementary Damping Controller Design for TCSC Employing RCGA." World Academy of Science Engineering and Technology 27, 2009.
- [28]. Pushkar Tripathi, Abhishek Sharma, G.N.Pillai, and Indira Gupta. "Accurate Fault Classification and Section identification scheme in TCSC Compensated Transmission line using Sum." World Academy of Science, Engineering and Technology 60 2011.
- [29]. Bindeshwar Singh, K.S.Verma, Deependra Singh, Rahul Dixit, Baljiv Tyagi. "Introduction to FACTS Controllers a critical Review." International Journal of Reviews in Computing 31st December 2011 Volume -8,

VI. SERIES-SHUNT CONNECTED DEVICES (UNIFIED-POWER CONTROLLER)

This section contains those publications which are related to operational issues, tools and technical analysis, for the series – shunt controlled devices for relieving the transmission line congestion problems.

- [1]. Dr. W. Z. Gandhare, Mohammed Irshad Waheed. "Power System Protection Using UPFC". Excel Journal of Engineering Technology and Management Science (An International Multidisciplinary Journal) Vol. I No. 2 January - June 2012 (Online) ISSN 2277-3339.
- [2]. S.Suresh Reddy S.Sarat kumar Dr. S.V.J.Kumar. "Load Flow Solution For III-Conditioned Power Systems Using Runge- Kutta And Iwamoto Methods With Facts Devices." Journal of Theoretical and Applied Information Technology. © 2005 - 2009 JATIT. All rights reserved.
- [3]. Claudio A. Cañizares, Edvina Uzunovic, John Reeve, "Transient stability and power flow model of the Unified Power Flow controller for various control strategies." Int. J. Energy Technology and Policy, Vol. xx, Nos. xx, 2005
- [4]. K. Arun Kumar Reddy, S. P. Singh, and G. S. Raju, "Optimal Allocation of UPFC for Congestion Management using Interior Point Method." 16th NATIONAL POWER SYSTEMS CONFERENCE, 15th-17th DECEMBER, 2010
- [5]. H.IRANMANESH, H.R.SABOHI. "Investigation to Solve the Congestion Problem of Transmission Lines via Unified Power Flow Controller." Recent Researches in Applications of Electrical and Computer Engineering ISBN: 978-1-61804-074-9.
- [6]. K.S. Verma , S.N. Singh, H.O. Gupta, "Location of unified power flow controller for congestion management." Electric Power Systems Research 58 (2001) 89–96 Received 8 August 2000; received in revised form 30 November 2000; accepted 7 December 2000. PII: S0378-7796(01)00123-7

Flexible AC Transmission Devices as a Means for Transmission Line Congestion Management -A Bibliographical Survey

- [7]. S. Tara Kalyani, G. Tulasiram Das. "Simulation Of Real And Reactive Power Flow Control With UPFC Connected To A Transmission Line", Journal of Theoretical and Applied Information Technology.
- [8]. Nashiren.F. Mailah, Senan M. Bashi. "Single Phase Unified Power Flow Controller (UPFC): Simulation and Construction."European Journal of Scientific Research ISSN 1450-216X Vol.30 No.4 (2009), pp.677-684 © EuroJournals Publishing, Inc. 2009.
- [9]. B. Karthik, S. Chandrasekar. "A Hybrid Technique for Controlling Multi Line Transmission System Using Interline Power Flow Controller." European Journal of Scientific Research ISSN 1450-216X Vol.58 No.1 (2011), pp.59-76 © EuroJournals Publishing, Inc. 2011.
- [10]. P.PAVAN KUMAR, N.POORNACHANDRARAO. "Improvement of power flow in the power system network by using UPFC device." International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com. Vol. 2, Issue 3, May-Jun 2012, pp.1194-1199.
- [11]. Jovan Z. Bebic, Peter W. Lehn and M. R. Iravani. "The Hybrid Power Flow Controller A New Concept for Flexible AC Transmission." Email: lehn@ecf.utoronto.ca. Email: iravani@ecf.utoronto.ca.
- [12]. Arup Ratan Bhowmik, Champa Nandi. "Implementation of Unified Power Flow Controller (UPFC) for Power Quality Improvement in IEEE 14-Bus System." Arup Ratan Bhowmik et al, Int. J. Comp. Tech. Appl., Vol 2 (6),1889-1896. ISSN:2229-6093
- [13]. P. Annapandi and Dr. M. Rajaram. "Multibus System using Thyristor Controlled Series capacitor and Combined operation of UPQC with photovoltaic Array." International Journal of Electrical Engineering. ISSN 0974-2158 Volume 5, Number 6 (2012), pp. 769-781 © International Research Publication House <http://www.irphouse.com>
- [14]. S. N. Singh, Senior Member, IEEE, and I. Erlich, Member, IEEE. " Locating Unified Power Flow Controller for Enhancing Power System Loadability."
- [15]. K.Vijayakumar. "Optimal Location of FACTS Devices for Congestion Management in Deregulated Power Systems." International Journal of Computer Applications (0975 – 8887) Volume 16– No.6, February 2011.
- [16]. A.S Kannan, R. Kayalvizhi. "Utility Of PSO For Loss Minimization And Enhancement of Voltage Profile Using UPFC." International Journal of Scientific & Engineering Research, Volume 2, Issue 2, February-2011 ISSN 2229-5518.
- [17]. Edvina Uzunovic, Claudio A. Cañizares John Reeve. "Fundamental Frequency Model of Unified Power Flow Controller." North American Power Symposium (NAPS), Cleveland, Ohio, October 1998, pp. 294{299.
- [18]. Seungwon An,Thomas W. Gedra. "ESTIMATION OF UPFC VALUE USING SENSITIVITY ANALYSIS."
- [19]. S. Sutha, and N. Kamaraj. "Optimal Location of Multi Type Facts Devices for Multiple Contingencies Using Particle Swarm Optimization." International Journal of Electrical and Computer Engineering 3:13 2008
- [20]. Samina Elyas Mubeen, R. K. Nema, and Gayatri Agnihotri. "Power Flow Control with UPFC in Power Transmission System." World Academy of Science, Engineering and Technology 47 2008.
- [21]. Masoud Mohammad Rahimi Fard, Aref Jalili Irani. "IPFC using for the Congestion management lines in Electricity market restructured on the system IEEE 14 – Bus." Journal of Applied sciences Research, 8(1): 338 -345, 2012, ISSN – 1819 -544x

VII. CONCLUSION

This paper gives an overview of the concepts in the field of transmission line congestion management in power sector with a bibliographical survey of relevant background, practical requirements, the historical events, the present state and techniques. It is based on many research articles published from last 10 years. The citation provided in this bibliographical survey represents an overall perspective of how FACTS controllers can be applied as a solution for transmission line congestion management. FACTS controllers are an emerging field and since it provides the solutions for power sector crisis, more research work is focused in this area.

This bibliographical survey extensively done on the topics of transmission line congestion and its operational issues. This may definitely be helpful to collect information's for researchers and academic circle.