

الآية

بسم الله الرحمن الرحيم

قال تعالى :

﴿اللَّهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ مَثَلُ نُورِهِ كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ
الْمِصْبَاحُ فِي زُجَاجَةٍ الزُّجَاجَةُ كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ
مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ لَمْ
تَمْسَسْهُ نَارٌ نُورٌ عَلَى نُورٍ يَهْدِي اللَّهُ لِنُورِهِ مَنْ يَشَاءُ وَيَضْرِبُ اللَّهُ
الْأَمْثَالَ لِلنَّاسِ وَاللَّهُ بِكُلِّ شَيْءٍ عَلِيمٌ﴾ صدق الله العظيم.

[سورة النور: 35]

الإهداء

يا من أحمل اسمك بكل فخر
يا من يرتعش قلبي لذكرك
أبي يا من أودعتني لله أهديك هذا البحث
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إلى أدبيوحلمي
إلى طريقي المستقيم
إلى طريق..... الهداية
إلى ينبوع الصبر والتفاؤل والأمل
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ABSTRACT

The static synchronous compensator (STATCOM) is one type of FACTS devices which resembles in many respects a rotating synchronous condenser used for voltage control and reactive power compensation. The STATCOM can increase transmission capacity, damping low frequency oscillation, and improving transient stability. This project presents a control block diagram of STATCOM for the transient stability improvement. The SIMULINK/MATLAB software package is used for simulation of test system. In this project the STATCOM is connected to the 500kV line for atypical two machine transmission system. The study demonstrates that STATCOM can improve transient stability and also compensate the reactive power in power system networks.

المستخلص

معوض ثابت التزامن هو واحد من عائلة ضخمة تسمى (FACTS) وهو يشابه في عدة نواحي مكثفات التزامن الدوارة التي تستخدم في تنظيم الجهد وأيضاً في تعويض القدرة الردية. معوض ثابت التزامن له القدرة علي زيادة سعة خطوط النقل كما له القدرة علي تخميد تأرجح الترددات المنخفضة كما له القدرة أيضاً علي تحسين الإستقرارية العابرة والحالات الإنتقالية لمنظومة القدرة الكهربائية . وفي هذه الدراسة تم استخدامه لتحسين الإستقرارية العابرة حيث تم تمثيل منظومة القدرة الكهربائية بواسطة برنامج الماتلاب وتم إجراء الاختبار عليها. وتم تركيب معوض ثابت التزامن علي خط نقل 500 كيلو فولت بين اثنين من الماكينات المتماثلة ذو الجهد 13.8 كيلو فولت . وهذه الدراسة أظهرت أن معوض ثابت التزامن له القدرة علي تحسين الاستقرارية العابرة و أيضاً له إمكانية تعويض القدرة الردية في المنظومة الكهربائية .

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LIST OF SYMBOLS

P	Active power transferred, W
X	Transfer reactance, Ω
X _d	Transient reactance of the machine, Ω
X ₁	Reactance of transmission line, Ω
E	Magnitude of the voltage behind direct axis synchronous reactance of the machine, V
V	Voltage of infinite bus, V
δ	Angle between the voltage E and V, deg
M	Angular moment of the rotor
J	Moment of inertia of the rotor, H
W	Synchronous speed of the rotor, rad/s
P _m	Mechanical power input, M W
P _e	Electrical power output, M W
P _a	Accelerating power, M W
W ₀	no load speed, rad/s
H	inertia constant
δ_0	No load angle, deg
δ_c	clearing angle, deg
A ₁	area of accelerating, m^2
A ₂	area of decelerating, m^2
Q	Reactive power, Mvar
V _{out}	converter output voltage
V _{dc}	DC voltage across capacitor
k	Coefficient
V ₁	System voltage, V
V ₂	Voltage generated by the VSC, V
X	Transmission reactance between V ₁ and V ₂ , Ω
M _a	Amplitude modulation ratio
V _{ac}	AC system voltage, V
α	phase angle, deg
V _{control}	control voltage, V
V _{tri}	triangular voltage, V
M _f	frequency modulation ratio
F _s	carrier frequency, Hz
F _i	fundamental frequency of the converter, Hz
F _h	harmonic frequencies, Hz

Mf	frequency modulation ratio
K	Constant
f1	modulating frequency, Hz
VA ₀	line-to-neutral voltage, V
V _d	dc voltage, V
V _{ll}	line-to-line voltage, V
Q _c	reactive output of controller, M Var
V	system voltage, V
V _c	controller voltage, V
X	reactance between system and controller, Ω
P _{inj}	active power injected by statcom, MW
Q _{inj}	reactive power injected by stator, Mvar
i _d and i _q	the reference currents in the dq coordinates, A

LIST OF ABBREVIATION

FACTS	Flexible Alternative currenttransmissionsystems
DC	Direct current
AC	Alternative current
IGBT	Insulated Gate Bipolar Transistor
IGCT	Insulated Gate commutated Transistor
SVC	Static var compensator
STATCOM	Static Synchronous Compensator
TCSC	Thyristor Controlled Series Compensator
SSSC	The Static Synchronous Series Compensator
DVR	Dynamic Voltage Restorer
SVR	Static Voltage Restorer
PST	Phase Shifting Transformers
UPFC	Unified Power Flow Controller
IPFC	Interline Power Flow Controller
GUPFC	Generalized Unified Power Flow Controller
DFC	Dynamic Power Flow Controller
TSC	Thyristor Switched Capacitors
TSR	Thyristor Switched Reactors
TCR	Thyristor Controlled Reactors
GTO	Gate Turn -off Thyristor
CSC	convertible static compensator
VSC	Voltage Source Converter
HVDC	High Voltage Direct Current
PWM	Pulse Width Modulation
SCR	Series Controlled Reactors
MOSFET	metal-oxide semiconductor field-effect transistor
M1	Machine one
M2	Machine two
IEEE	International electronic and electrical engineering
Pu	per unit
PI	Proportional integral
sec	Second