Active Power Enhancement Of HVDC System By MMC

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Abstract: **Modular Multilevel Converter (MMC) is becoming increasingly popular with the development of HVDC connections and, in the future, with the integration of Multi Terminal DC grids. A lot of publications have been published about this topology these last years since it was first proposed. Few of them are addressing explicitly the two different roles that are held by this converter in an HVDC link: power control or DC voltage level control. Moreover, for a given function, different ways of controlling this converter may be considered. This paper proposes an overview of the different solutions for controlling the MMC and proposes a methodology to synthesize the control architecture.**

Keywords: **Modular Multi Converter (MMC); HVDC; DC Voltage Level Control; DC Grid;**

I. INTRODUCTION

HVDC links are anticipated to have a massive improvement because of the growing wants to transmit electrically powered electricity. Even if thyristor era continues to be used for extremely massive application (up to 7 GW), transistor generation is becoming more and more familiar. The first massive undertaking in this region is the Cross Sound Cable (330 MW, a hundred and fifty kV) amongst Long Island and the American continent has become set up in 2002 the usage of a 3-degree converter. Because of the excessive voltage levels, a very huge the quantity of transistors is located in series. However, this large a stack of series switches desires to have nearly same parameters and synchronized ignition to avoid excessively stresses on single additives at some point of switching actions [1] The excessive frequency switching operation of the pulse width Modulation (PWM) (≈ 1 kHz) is likewise responsible for massive losses. The Modular Multilevel Converter (MMC) has been evolved to triumph over the aforementioned problems and gives numerous advantages over previous Voltage–Source Converter (VSC) technology [2]. Indeed, it isn't always an evolution of the classical converter, but a modern-day topology. This idea has been recognized for pretty a long time but the era becomes no longer available to achieve this form of the complicated converter. The MMC converter can be built up the use of both half of-bridge and full bridge sub-modules.

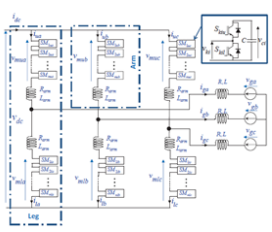

Fig.1.1. MMC topology

II. PREVIOUS STUDY

Many manipulate systems exist inside the literature for the MMC. Some of them are quite simple however they can bring about non sinusoidal output voltages and excessive voltage ripples on capacitor voltages [6]. This is due to a crucial 2nd harmonic issue in arm currents. To decorate voltage first-rate and decrease capacitor voltage ripples, it can be used the CCSC (Circulating Current Suppression Controller) or the manage systems set up. These controls result in best characteristics under ordinary operation however it remains hard to be watching for the conduct particularly running situations which includes unbalanced AC voltages. For example, Hagiwara and Akagi have proved in [9] that the manage offered in [8] may be risky in certain conditions of operation and certain value of the controller parameters. This is the equal trouble as inside the famous case of a buck converter with an L-C input filter out and with regular output energy.

III. MMC MODELLING AND CLASSICAL CONTROL

The three hands of this three-segment converter are composed of simple modules; which might be easy switching cells. Depending on the mobile state, the capacitor voltage is introduced or not in series with the number one electrical circuit. Doing so, the voltage among the '+' pole (or '-pole) and one section (a, b, c) may be modulated with an almost sinusoidal shape [12]. The discretization of the sinus is depending on the number of modules. The look at of MMC can be simplified with the aid of manner of decoupling the trouble of capacitor voltage balancing interior every arm and the problem of world manage (currents and output power control). This decoupling has been first proposed. Presently used now. The voltage balancing gadget may be completed with the aid of using the cells with the maximum charged

capacitors even as arm modern-day is terrible (to lower voltage capacitor of the active cells) and the usage of the cells with the lowest charged capacitors even as arm modern-day is powerful (to increase voltage capacitor of the lively cells). In this paper, it's far considered that the balancing machine works properly then this observes focuses on the global manage shape. If the balancing is nicely finished (vc1=vc2=…=vcn) each arm is same to a capacitor of C/N capacitance with a voltage given with the useful resource of vctot=vc1+vc2+…+vcN and a super dc/dc converter controlled via its obligation cycle as proven in below.

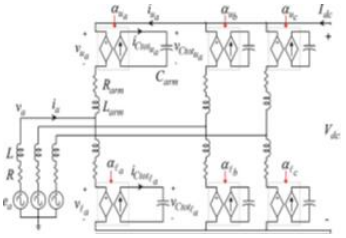

Fig.3.1. Circuit model used for global control.

IV. SIMULATION RESULTS

The grid modern-day manage is supplied. A classical d,q manipulate can be finished but it now not enough for the motive that the harmonic present day that is circulating most of the 3 fingers ought to be cancelled or at least constrained. The suppression of circulating contemporary is based on the double line frequency, terrible-collection rotational frame in which the manipulate the scheme is primarily based on DQ coordinates.

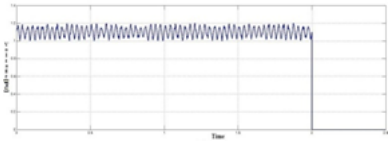

Fig. Disconnectionsof all M SMs

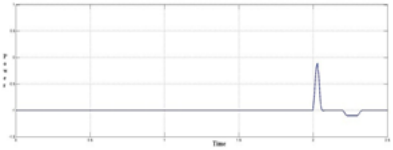

Fig.Disconnection of redundant SMs, global control variables

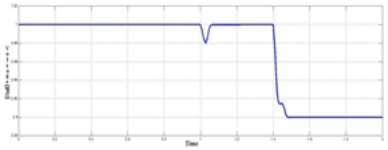

Fig. HVDC validation test case- global control variable

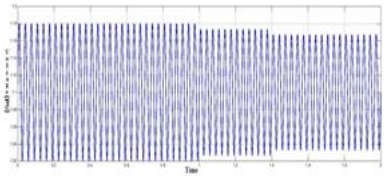

Fig. HVDC validation test case- global control variable

Fig.5.1.Simulation results.

Since the DC factor of the modern-day is managed, the strength exchanged with the DC voltage source is also controlled. An unbalance between AC and DC electricity induces a boom or decrease of the saved strength, so a growth or the decrease of the voltage vcui tot and vcli tot seems as proven on the outcomes.

V. CONCLUSION

This paper has presented distinct solutions to control a MMC either associated with a voltage supply or a DC bus whose voltage is numerous. Two answers of control are rising from the definition of the strength version: manage the energy with the resource of the grid present day or through the usage of the differential modern. Both answers have been simulated and in comparison. For the DC voltage manage, simplest one answer has been furnished but each possibility is also available. Depending on the chosen answer the trade of strength most of the MMC and the AC or DC power is specific. The choice accomplished at this level can also have important impact on the dynamic conduct of a HVDC link or Multi-Terminal DC grid. This statement has to be further studied and quantified.

VI. REFERENCES

[1] J. Chang, “Advancements and tendencies of electricity electronics for business packages,” IEEE IECON, vol. Three, pp. 3021-3022, Nov. 2003.

[2] B. K. Bose, “Technology advancement and developments in energy electronics,” IEEE IECON, vol. 3, pp. 3019-3020, Nov. 2003.

[3] R. D. Klug and N. Klaassen, “High energy medium voltage drives—Innovations, portfolio, dispositions,” in Proc. Eur. Conf. Power Electron. Appl., 2005, pp. 1–10.

[4] B. Wu, High-Power Converters, and AC Drives. New York: Wiley-IEEE Press, Mar. 2006.

[5] P. Steimer, “High energy electronics, tendencies of technology and programs,” in Proc. PCIM, Germany, May 2007.

[6] L. G. Franquelo, J. Rodriguez, J. I. Leon, S. Kouro, R. Portillo, and M. A. M. Prats, "The age of multilevel converters arrives," IEEE Ind. Electron. Mag., vol. 2, no. 2, pp. 28–39, Jun. 2008.

[7] J. Rodriguez, B. Wu, S. Bernet, N. Zargari, J. Rebolledo, J. Pontt, and P. Steimer, "Design and evaluation requirements for immoderate energy drives," in Conf. Rec. IEEE IAS Annu. Meeting, Oct. Five–nine, 2008, pp. 1–nine.

[8] B. K. Bose, "Power electronics and motor drives contemporary development and angle," IEEE Trans. Ind. Electron., vol. Fifty-six, no. 2, pp. 581–588, Feb. 2009.

AUTHOR's PROFILE

P. Hajira Khanam has received the B.Tech (Electrical and Electronics Engineering) degree from Kandula Lakshumma Memorial College of Engineering For Women, C.K. Dinne Mandal, Kadapa in the year of 2013. Currently she pursuing M.Tech (Electrical Power Systems) in Srinivasa Institute of Technology & Science, Kadapa.

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