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A Novel Technique for Reduction of Voltage Flicker in D-Statcom

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Abstract: **Voltage flicker is an essential part of power quality in view of inescapability in mechanical frameworks. Be that as it may, flicker mitigation is a standout amongst the most difficult power quality issues from the mitigation planned in view of its irregularity. This paper presents an enhancement for the DSTATCOM control procedure to diminish the instantaneous flicker level (IFL) with the goal that it is lower than detectable level perceived by IEEE and IEC gauges. In addition, it is exhibited that the proposed control calculation is compelling and straightforward, and its execution is confirmed by digital simulation results.**

Keywords: **Flickermeter, D-Statcom, Flicker Mitigation, Voltage Flicker.**

1. INTRODUCTION

In the beginning of power transmission the issues like voltage deviation amid load changes and power exchange constraint were seen because of responsive power unbalances. The greater part of the AC loads are devouring responsive power because of essence of reactance. Substantial utilization of receptive power causes poor voltage quality. Today these Problems have significantly higher effect on dependable and secure power supply in the realm of Globalization and Privatization of electrical systems and vitality exchange [1][3]. The improvement in quick and solid semiconductors devices (GTO and IGBT) permitted new power electronic arrangements to be acquainted with the undertakings of power Transmission and load stream control [2]. The FACTS devices offer a quick and solid command over the transmission parameters On the other hand the custom power is for low voltage distribution, and enhancing the low quality and unwavering quality of supply influencing delicate burdens. Custom power devices are fundamentally the same as the FACTS. Most generally known custom power devices are DSTATCOM, UPQC, DVR among them DSTATCOM is extremely outstanding and can give practical answer for the pay of receptive power and unbalance stacking in distribution framework. DSTATCOM infuses a current into the framework to redress the power factor and receptive power pay. Sounds are decreased by utilizing PWM system [4][5][6]. These power quality devices are power electronic converters associated in parallel or arrangement with the lines and the activity is controlled by a digital controllers. The demonstrating of these perplexing systems that contains both power circuits and control systems should be possible diverse bases. One of the power electronic answers for the voltage direction is the utilization of a D-STATCOM. DSTATCOM is a class of custom power devices for giving dependable distribution power quality. The DSTATCOM applications are essentially for delicate burdens that might be definitely influenced by fluctuations in the framework voltage.

II. RELATED WORK

The mitigation of EAF flicker monetarily and effectively reliably is an intense issue. The fundamental approach for flicker mitigation can be ordered into three sorts. a) Regulating the EAF passive components, for example, source impedance. In spite of the fact that, to some degree, expanding arrangement reactance can relieve the flicker, it lessens power provided and in this way diminishes EAF efficiency. In addition, it is likewise costly and difficult to control upstream transformer reactance or arrangement reactor in the deregulated power framework [7, 8]. Remuneration through the blend of thyristor and passive components, for example, understood Static Var Compensator (SVC) [9]. Not exclusively can SVC enhance the power quality of a closer framework, yet it likewise builds EAF efficiency and brings extra monetary advantages [11][12]. In any case, it's generally low transfer speed can't make up for lost time the time changing flicker. Consequently

its impact in flicker mitigation is constrained. c) The cutting edge arrangement is the Static synchronous Compensator (STATCOM) in light of the Voltage Source-Converter (VSC) [10]. With quick reaction and adaptable control, it performs superior to SVC. At present, STATCOM is viewed as an appropriate FACTS unit for flicker mitigation. For shunt-interface FACTS unit like STATCOM, the Cascade Multilevel Converter (CMC) is the most doable topology due to its conservative structure, simple particularity, quick reaction and clean power quality.

III. MATLAB MODEL

The Matlab Model below shows a Flickermeter model designed according to functional specifications of the international standard IEC 6100-4-15 [1].

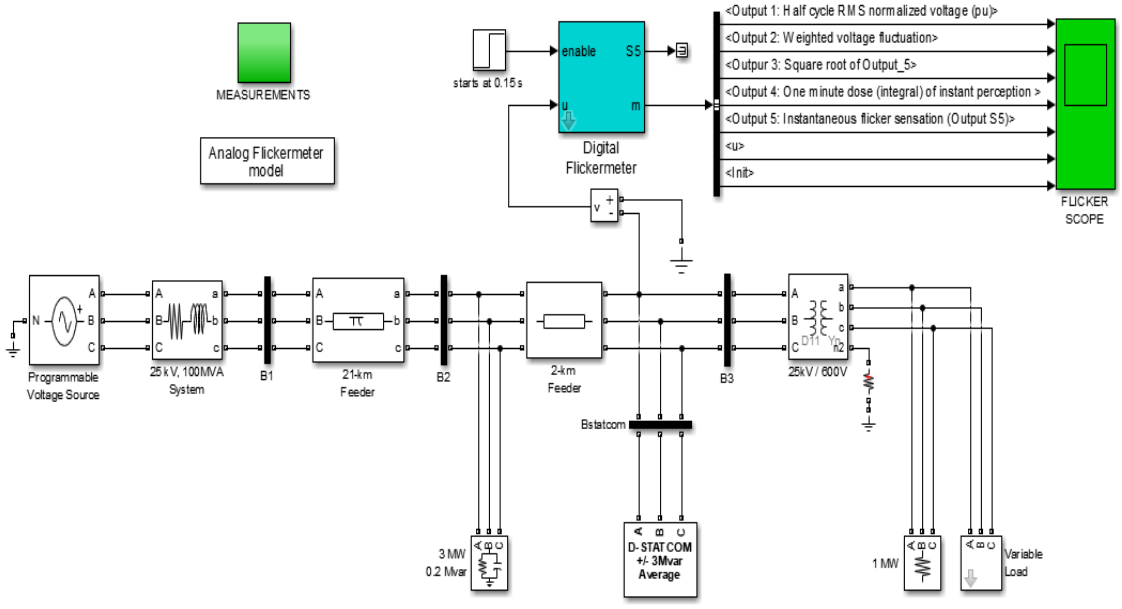

Figure 1: Implementation of flickermeter on D-Statcom

A flicker device is utilized to gauge the instantaneous flicker sensation on terminal voltage of a STATCOM unit as appeared in figure 1. The flickermeter demonstrate is structured by utilitarian details of the global standard IEC 6100-4-15 [1]. The flickermeter is an institutionalized instrument for estimating the flicker acquired by simulation and by factual examination of the reaction of the light eye-cerebrum bind to the info voltage fluctuations. Reference [2] gives a point by point portrayal of the standard square outline. The measurable investigation (module 5 in standard square chart) isn't displayed in the square. With the end goal to limit the underlying transient reaction, the underlying conditions are characterized for the diverse exchange capacities. A settled instatement period (Tini = 0.3 s) is required between the moment the model is empowered (contribution ON = 1) and the calculation of the outcomes. The underlying conditions count are assessed in the cover introduction segment of the square. The model ought to be empowered (contribution ON > 0) after the examined signal (input U) is steady. The flickermeter inside yields of the different modules are accessible in yield m. By and by yield S (instantaneous flicker sensation) settles inside 2 seconds after the introduction time frame is begun (Init signal in yield m) and Output_4 (One moment portion of moment observation signal in yield m) balances out following 2 minutes. Module 1 contains a signal generator for checking the flickermeter setting in the field and a circuit for normalizing (in pu) the RMS estimation of the information voltage at system recurrence (50 or 60 Hz). The generator includes a tweaking voltage (fluctuating sinusoidal or triangular signal) to the crucial (120 Vrms/60 Hz or 230 Vrms/50 Hz). Distinctive relative sufficiency (in %) and recurrence of the fluctuation are characterized in the standard. They should create at Output_5 an instantaneous flicker vibe of 1.

IV. FLICKER CONTROLLER.

The flicker controller assesses reference dynamic and receptive remunerating flows. The flicker meter Calculates stage flicker and contrasts it and the reference flicker level in voltage control square. The reference responsive current is assessed concerning power factor prerequisites. Dynamic current is acquired concerning energy storage rate. The flicker controller square graph is appeared in figure 2.

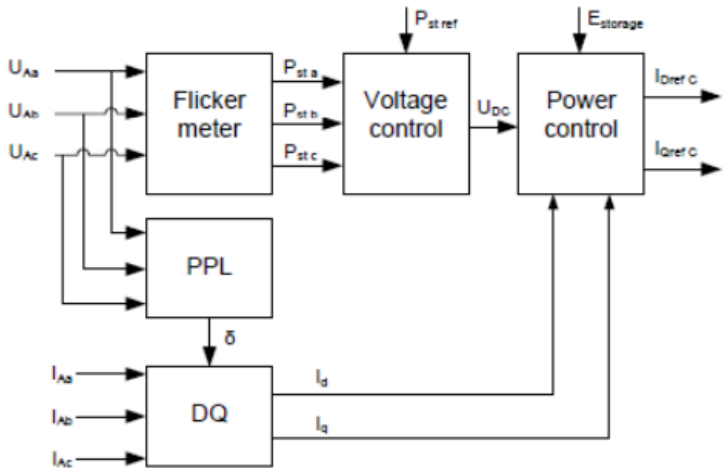

Figure 2: Flicker Controller

V. RESULTS AND SIMULATION

The overall system simulation has been carried out in Simulink using the basic flickermeter model. In this model we made the changes in the feeder line and changed the input voltage source from normal AC to PV and then the wind. We find that the flicker sensation causes a considerable amount of power loss in the D-Statcom distribution system. The first subgraph of the figure 3 depicts the half cycles of the input source voltage measured in rms. The rated output voltage of the Distributed system is shown in subgraph 2 which resembles with a normal sinusoidal signal. The main aim of the flickermeter is to reduce the amount of ripple in the out of the D-Statcom. The subgraph 3 and subgraph 4 of figure 3 represents the various attempts of the flickermeter to reduce the flicker in the output.

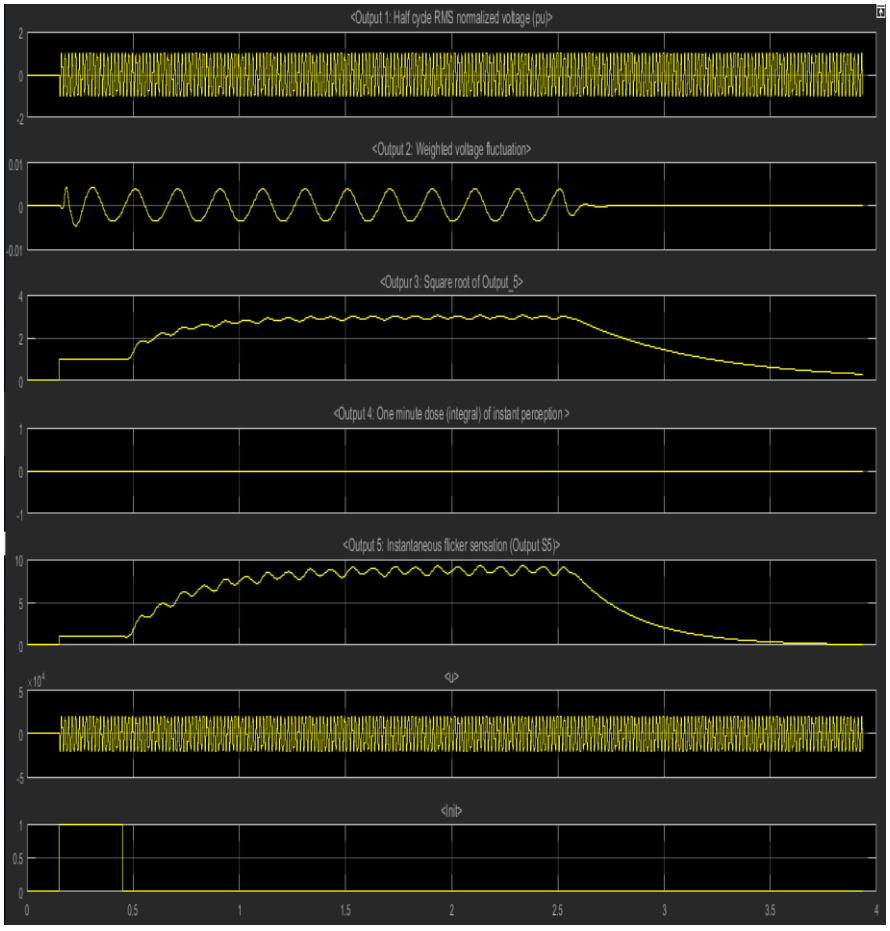

Figure 3: D-Statcom waveforms with and without Flickermeter.

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