

АНАЛИЗ И МОДЕЛИРОВАНИЕ АВТОНОМНОЙ ФОТОЭЛЕКТРИЧЕСКОЙ СИСТЕМЫ С ИСПОЛЬЗОВАНИЕМ СРЕДЫ MATLAB/SIMULINK

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Аннотация: Использование возобновляемых источников энергии и, в частности, солнечной энергии привлекло значительное внимание в последние десятилетия. Проекты по производству фотоэлектрической (PV) энергии реализуются в очень большом количестве во многих странах. Многие исследовательские работы проводятся для анализа и проверки производительности фотоэлектрических модулей. Реализация экспериментальной установки для фотоэлектрической энергосистемы с преобразователем постоянного тока для проверки производительности системы не всегда возможна из-за практических ограничений. Программная имитационная модель помогает анализировать производительность фотоэлектрических модулей, и более полезной будет общая схемная модель, которую можно использовать для проверки любого коммерческого фотоэлектрического модуля. В данной работе представлено моделирование математической модели фотоэлектрического модуля, повышающего преобразователя постоянного тока в переменный, а также было проведено моделирование режимов работы солнечной генерирующей системы при различных нагрузочных характеристиках. Модель, представленная в этой статье, может использоваться как обобщенный фотоэлектрический модуль для анализа производительности любых коммерчески доступных фотоэлектрических модулей. В представленной работе исследовались параметры, которые влияют на производительность генерирующей системы. Результаты получены для работы фотоэлектрических преобразователей постоянного тока в переменный. Представленные характеристики сильно зависят от таких параметров, как солнечная инсоляция, температура рабочей поверхности фотоэлектрического модуля, время заряда-разряда аккумуляторных батарей и др. При изменении одного из значений этих параметров меняются режимы работы солнечной электрогенерирующей батареи. Изменение режимов работы может привести к сбоям всей работы системы, поэтому необходим контроль всех энергетических характеристик установок. Достичь повышения эффективности генерации системы способны предложенные в этой работе действия, направленные на изучение работы фотоэлектрической системы и системы накопления энергии, а также использование необходимых вспомогательных устройств для контроля и управления параметрами установок. Исследования, проведенные в ходе представленной работы, позволяют повысить уровень знаний по контролю и управлению параметрами фотоэлектрических генерирующих установок и расширить возможности их бесперебойной работы и увеличения энерговыработки.

Предмет исследования. Предмет исследования. Анализ и проверка производительности фотоэлектрических модулей.

Материалы и методы. В работе были проведены Реализация экспериментальной установки для фотоэлектрической энергосистемы с преобразователем постоянного тока для проверки производительности системы и исследования действующей компьютерного моделирования параметров интегрированной системой солнечной генерации фотоэлектрическими с использованием программной среды Matlab, а также методы теоретического анализа, математические и статистические методы, необходимые для обработки материалов исследования.

Результаты. оптимизировать работу фотоэлектрических систем и повысить их эффективность.

Выводы. По результатам можно сделать заключение об увеличении эффективности работы солнечных установок с подобными блоками Simulink, что делает её легко моделируемой и анализируемой в сочетании с силовой электроникой для работы системы с максимальной мощностью. Принимая во внимание влияние солнечного излучения и температуры ячейки на выходной ток и мощностные характеристики модуля при помощи предложенной модели возможно значительно увеличить эффективность работы всей установки.

Ключевые слова: Автономная фотоэлектрическая система, программа Matlab/Simulink, фотоэлектрические панели, аккумуляторная батарея, контроллер, нагрузка, температура, энергопроизводительность системы, солнечная генерирующая установка.

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