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HIGH VOLTAGE PULSE POWER APPLICATION USING ARM7 PROCESSOR

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Abstract— **In this paper we discuss about high voltage pulse power supply technology which is a new effective improvement in dust precipitation which can output pulse width modulation in frequency of 20~50 KHZ duty cycle of 12% to 50%. By using High-Voltage pulse power supply technology variable pulse parameters can be adjusted such as pulse voltage, pulse amplitude, duty cycle, frequency. High voltage device controller is used to generate high frequency and thereby removing dust using dust collector. High frequencies above 20-50 KHZ can be obtained & energy efficiency about 60%-90% can be obtained**

I. INTRODUCTION

The environment is a global problem, and dust in industrial production of human environmental pollution in the largest and direct, is a worldwide problem. The industries of thermal power, metallurgy, cement and else enterprises discharge smokes and dusts everyday, which is a major source of air pollution. High voltage pulse power supply technology has been used in developed country for more than 20 years, which effective have been confirmed.

The power supply work with dual power supply mode. The electrostatic precipitator system consists of PC, high voltage pulse power device controller and the electrical dust collector. The electrostatic precipitator is widely used in various industries because of its advantages of high efficiency, low energy consumption and wide applicability, which can deal with gas of high temperatures and great smoky, and the maintenance costs, is low The power supply work with dual power supply mode.

A typical requirement for dc HV power supplies (HVPSs),including but not limited to long-pulse applications, is the reduction of the output stored energy below a certain level, simultaneously meeting a contradicting requirement of keeping the voltage ripple as low as possible.

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The most promising approach to satisfy these conditions economically is using high-frequency (HF) multiphase topologies in their various incarnations. Closed-loop feedback circuits, in principle, can provide tight regulation and compensate for the line voltage variations, such as droop and line-frequency ripple, although it is not simple to ensure both clean and fast transitions without overshoots and high stability at a dc level. In order to realize high efficiency, almost universally, the converter part makes use of resonance to avoid switching losses.

By a series of basic voltage and micro-pulse voltage composition (maximum pulse repetition frequency of 200Hz) to the

II. IMPLEMENTATION OF HARDWARE

The signal generator generates the signal and device controller (TRIAC) generates high frequency (20~50 KHZ). The noise (dust) which disturbs the normal operation of motor is collected by dust collector and generated high frequency removes dust and brings back the motor to normal operation.

The components used are

- ARM Processor
- Signal Generator
- Electrical Dust Collector
- Zero Cross Inverter
- Device Controller

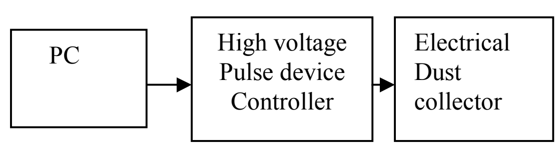

Figure 1. The high-voltage pulse power supply system

III. IMPLEMENTATION OF PULSE GENERATOR

The ARM7TDMI-s is a general purpose 32-bit microprocessor which offers high Performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles and the instruction set and related decode mechanism are much simpler than those of micro programmed complex instruction set computers. This simplicity results in a high instruction throughput and impressive real time interrupt response from a small and cost effective processor core.

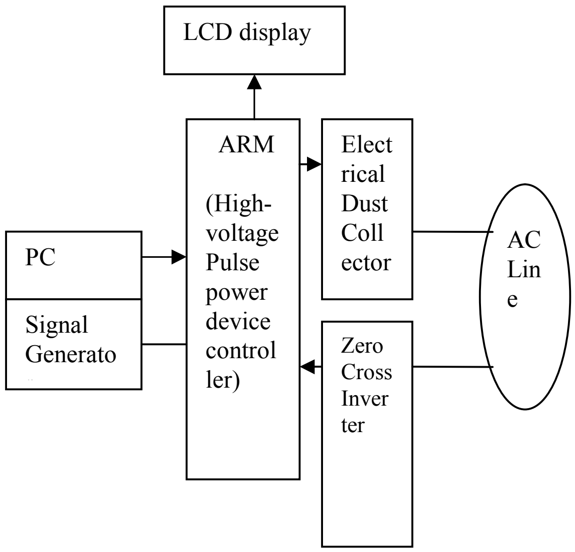

Figure 2.Block Diagram

The LPC21xx and LPC22xx are based on a 16/32 bit ARM7TDMI-STM CPU with real-time emulation and embedded trace support, together with 64/128/256 kilobytes (kB) of embedded high speed flash memory. It contains

- Up to four interconnected CAN interfaces with advanced acceptance filters.
- 10-bit A/D converter providing four/eight analog inputs with conversion times as low as 2.44 ms per channel and dedicated result registers to minimize interrupt overhead.
- Two 32-bit timers/external event counters with four capture and four compare channels each, PWM unit (6 outputs), Real Time Clock (RTC), and watchdog.
- Multiple serial interfaces including two UARTs (16C550), a fast I2C-bus (400 kbit/s), and two SPI interfaces.
- Vectored interrupt controller with configurable priorities and vector addresses.

Pulse width modulation (PWM) is a powerful digitally encoding technique for analog signal. High-resolution counters are used to generate a square wave, and the duty cycle of the square wave is modulated to encode an analog signal.

Typical applications include switching power supplies and motor control. Each PWM generator modulation contains one timer (16-bit down or up/down counter), two PWM comparators, a PWM signal generator, a dead-band generator, and an interrupt/ADC-trigger selector. Each PWM generator block produces two PWM signals which can either be independent signals (other than being based on the same timer and therefore having the same frequency) or a single pair of complementary signals with dead-band delays inserted. The output of the PWM generation blocks is managed by the output control block before being passed to the device pins.

IV. PWM MODULE INITIALIZATION AND CONFIGURATION

PWM module input clock is 6MHz (12MHz system clock has been divided by 2), to be 20 kHz of PWM square wave, that is cycle 50, the PWM counter initial value should be 299.

Here, PWM cycles could have been 300, but in the reduced initial count mode as required by 1, if earlier after increasing by decreasing mode 1 is not required. If that load registers PWM1LOAD 299 PWM, PWM counter PWM1COUNT each time the value of zero, they all automatically loaded from the PWM1LOAD. The main task of the whole control system including: reading and writing PWM data and change the parameter to adjust the waveforms

Software used

- Embedded c
- Keil compiler
- Simulation Software
- Proteus 7.4

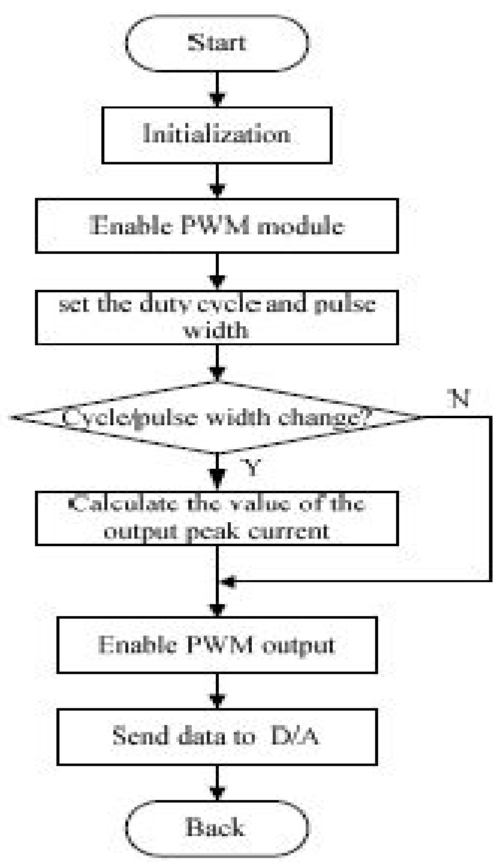

Figure 3. Software flow chart

V. SIMULATION RESULTS

Proteus (Processes and Transactions Editable by users) is a model for constructing clinical workflows with integrated decision support. The workflows are constructed with entities components. For this project, proteus software is used for animated simulation.

Proteus VSM combines a super mixed mode circuit simulator based on the industry standard Spice3F5 with animated component models. Indeed many types of animated model can be produced without resort to coding.

Consequently proteus VSM allows professional engineers to run interactive simulations of real designs, the program to our design in order that we can successfully simulate its behavior. We do this through the commands on source menu.

Go to the source Menu now and select and add/remove source files command. Click on the new button, browse until you reach the "Samples/Tutorials" directory and select the TL.ASM file. Click open and the file should appear in the source code filename drop down list box. We now need to select code generation tool for the file. For our purposes the MPASM tool will suffice. This option should be available from drop down list box and so left clicking will select it in usual fashion.

Finally it is necessary to specify which file processor is to run. In our example, this will be tl.hex (the hex file produced from MPASM subsequent to assembling tl.asm). To attach this file to the processor, right click on the schematic part for the ARM and then left click on this part.

The full list of current available instruments is provided below.

- Oscilloscope
- Logic Analyzer
- Counter/Timer
- Signal generator
- Pattern generator
- Dual Mode I2C Protocol Analyzer
- Dual Mode SPI Protocol Analyzer
- Voltage and current probes,DC/AC Voltmeters and Ammeters

Each instrument has a help file associated with it which can be launched by right clicking on the component (once placed), selecting Edit properties from the resulting context menu, and then hitting the Help button at the right of the resulting dialogue form. This help file will explains all modes of the operation for the instrument and provides a useful reference source in correct operation.

The system functional diagram contains following components

- ARM processor
- Interface circuit
- Device Controller
- LCD display
- Motor & Bulb

The 50 HZ frequency supply is given to the motor and bulb and normal operation takes places so that motor and bulb works. When noise occurs due to the dusty environment the 50 HZ frequency is affected so that motor and bulb cannot work properly.

The device controller (TRIAC) generates high frequency in range from 20~50 KHZ and this is provided to the motor and bulb so that noise is removed and the normal frequency operation takes place leading to efficient working of motor and bulb.

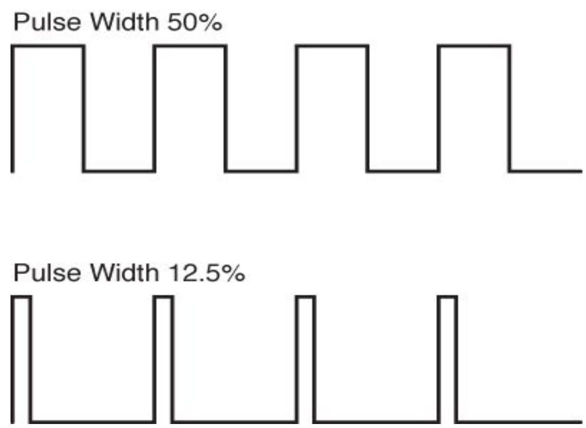

Figure 4. High frequency And variable duty cycle waveforms

The simulation results show three types of operations.

- Waveform and application normal working during 50 HZ supply
- Disturbed waveform and application's improper operation due to noise

Waveform after removal of noise and application's operation after high frequency generation

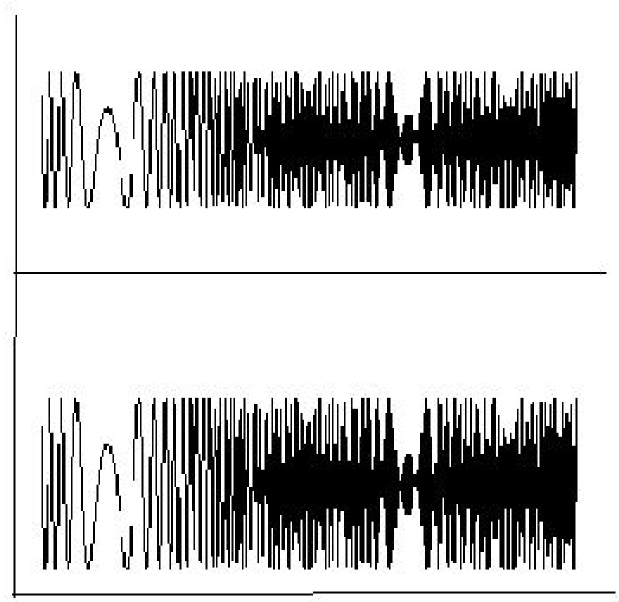

Figure 5.Disturbed waveform and application's improper operation due to noise

Conclusion

This project describes the implementation of high-voltage pulse power controller base on the ARM7 Lpc2129; the pulse parameters can be regulated. It is good technology accordance with the national sustainable development strategies for energy efficiency. High frequencies above 20-50 KHZ can be obtained. Adjustable duty cycle from 12-50% can be achieved. Energy efficiency about 60%-90% can be obtained Cooperates with high power electronic devices and specifically driver modules, it can work stabilized and reliable. Applications include Thermal power industries, Cement factories, Metallurgy, Larger machinery, Flue gas treatment

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