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Real Time Monitoring of TMS320F28335 Based 4Φ SRM Drive using Lab VIEW

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ABSTRACT: Now a day's Switched Reluctance Motor drives (SRM) are mostly used in industrial applications because of the simple construction, high reliability, it's having doubly salient and single excited machine. In this work the hardware results are analysed by using real time software. The TMS320F28335 processor was implemented in this system. The control algorithm consists of inner loop current controller and outer loop speed controller. The Lab VIEW (Laboratory Virtual Instrument Engineering Workbench) software is used to monitoring the real time signals in SRM drive. Lab VIEW is a system design platform and development environment for a visual programming language from National Instruments.The various real time signals are carried out in 4Φ SRM drive. The voltage, current and vibration signals are monitored by using Lab VIEW with Accelerometer, voltage and current DAQ. The voltage, current, vibration, pulse signals are monitored at different load and speed conditions.

KEYWORDS: Switched Reluctance Motor (SRM), Real Time Monitoring, Lab VIEW, TMS320F28335 Processor

I.INTRODUCTION

The switched reluctance motor is an automatically rugged machine, due to the simplicity of its construction and stator winding arrangement. The SRM is an increased attention in applications because cost reduction and variable speed are required. The stator part of SRM is particularly designed to avoid resonance frequencies and associated mode shapes excited by a harmonic magnetic force. In [7], the TMS320F28335 processor is a standalone development platform that enables user to evaluate and develop applications and it has a wide range of application environments. It can be operated up to 150 MHz frequency.In this work a Lab VIEW use relies on graphical symbols rather than text-based language to describe programming actions. Lab View lends itself to a wide range of applications in science, education and industry. The scope of these applications varies from controlling a few instruments to monitoring the control applications. In [8], proposed the new diagnostic technique for real time diagnosis in SRM, the real time values of line currents and phase voltages are measured using Lab VIEW.

In this paper presents the real time verification of DSP based 8/6 SRM drive system. The voltage, current and vibration signals are monitored by using Lab VIEW with Accelerometer, voltage and current DAQ. The voltage, current, vibration, pulse signals are monitored at different load and speed conditions. This paper discussed Lab VIEW in section II, section III brief about experimental setup, section IV discussed about Real time results and discussion, Section V concluded and given the future work.

II. LAB VIEW

Lab VIEW is system design software that provides engineers and scientists with the tools needed to create and deploy measurement and control systems through unprecedented hardware integration. Lab VIEW programs are called virtual instruments (VI), because their appearance and operation imitate physical instruments, such as oscilloscopes and multimeters. Every VI uses functions that manipulate input from the user interface or other sources and display that information or move it to other files or other computers.

NI 9225 is voltage DAQ used to measure the peak voltage in the range of - 415 to 415. It normally has three I/O channel and the measurement can be either channel to Channel or channel to ground. It can measure both AC and DC voltages. The operating temperature of voltage DAQ is -40 to70 C.

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NI 9227 is current DAQ used to measure current up to 5 Irms. It can measure peak current of 14 Amperes. It normally has four I/O channel. The operating temperature of the current DAQ is same as the voltage DAQ.

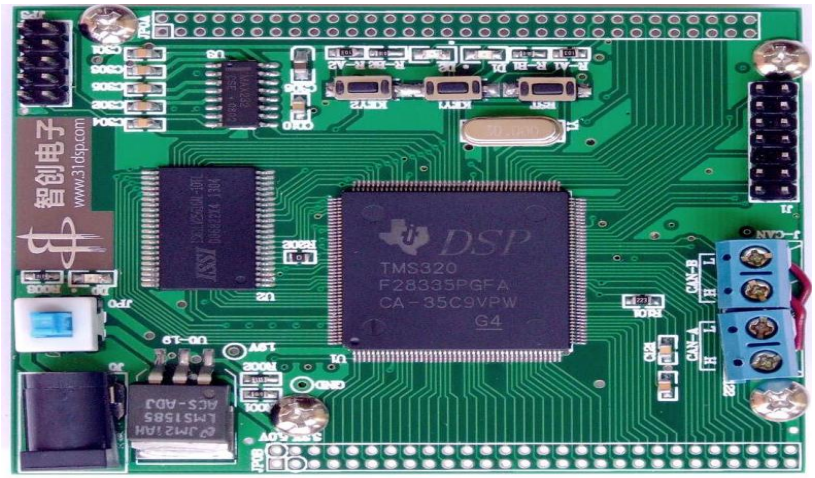

Fig.1 TMS320F28335 development board

The accelerometer (NI 9234) is analog DAQ it has four channels. It can be operate in temperature range from -40.c to 70.c range. To measure the vibration signal by using this accelerometer and analysis of vibration in different load and speed conditions. The Fig.1 shows the TMS320F28335 development board.

III. HARDWARE SETUP

A DSP (TMS320F28335) based SRM drive system is made up of several individual subsystems includes DSP development kit,(TMS320F28335), personal computer, Lab VIEW NI instruments ,Split link converter, Hall sensors, eddy current load and 8/6 pole SRM drive. This arrangement has been used for obtaining experimental results in the form of real time signals like voltage, current, vibrations. The block diagram of experimental setup of SRM drive is shown in Fig.2.

Fig.2 Experimental setup of SRM drive

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IV. RESULT AND DISCUSSION

The various experimental results are obtained from experimental setup at different speed and load conditions using Lab VIEW. The TMS320F28335 processor is used to evaluate by 4Φ SRM drive performance. The different real time simulation results are shown in the Fig.3-8. The real time various results are variable load analysis at constant speed, constant load analysis at constant speed.

1. Variable Load Analysis at Constant speed: In a constant speed of 2000 rpm the voltage, current and vibration signals are measured through Lab VIEW.

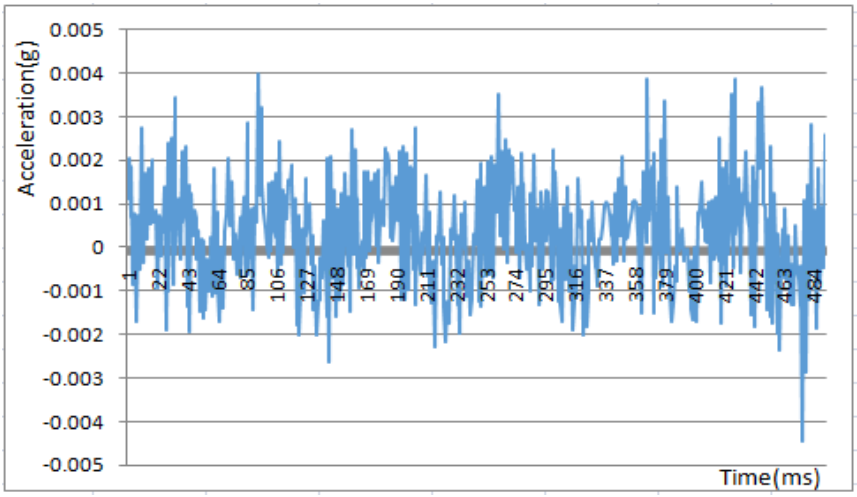

Fig.3 Vibration waveform at 2000 rpm

Fig 3 shows the vibration analysis of the SRM with speed of 2000rpm, in these speed condition the motor vibration is 0.004g.The half of the load to be applied to the SRM drive at the time the maximum current is 7.5mA, the vibration level is 0.004 g.

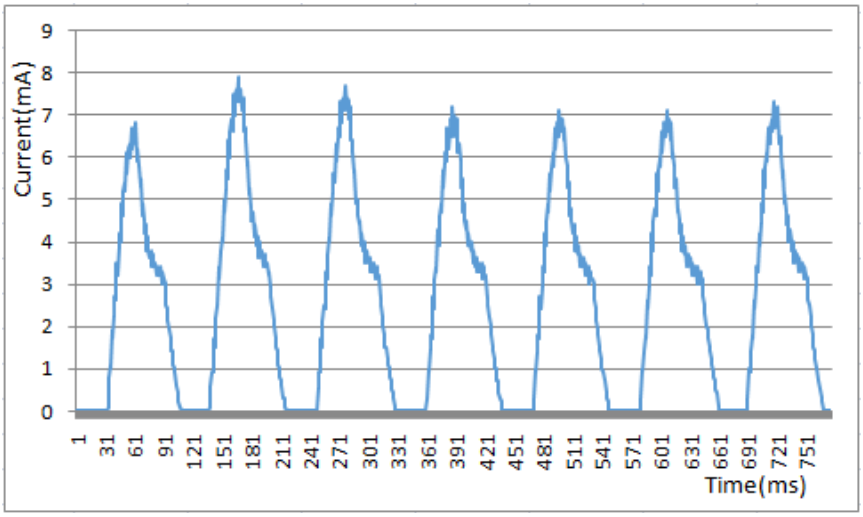

Fig.4 Current waveform at 2000 rpm

The current analysis of the SRM with different load and constant speed condition, in these different load condition the motor current will be increased linearly when speed of the motor increased. If the motor reaches rated speed the current will be increased and achieved his rated current in sometime current may be larger the rated current motor windings will be damaged. In Fig.4 shows the current waveform at 2000 rpm, the current level is 7.5mA.

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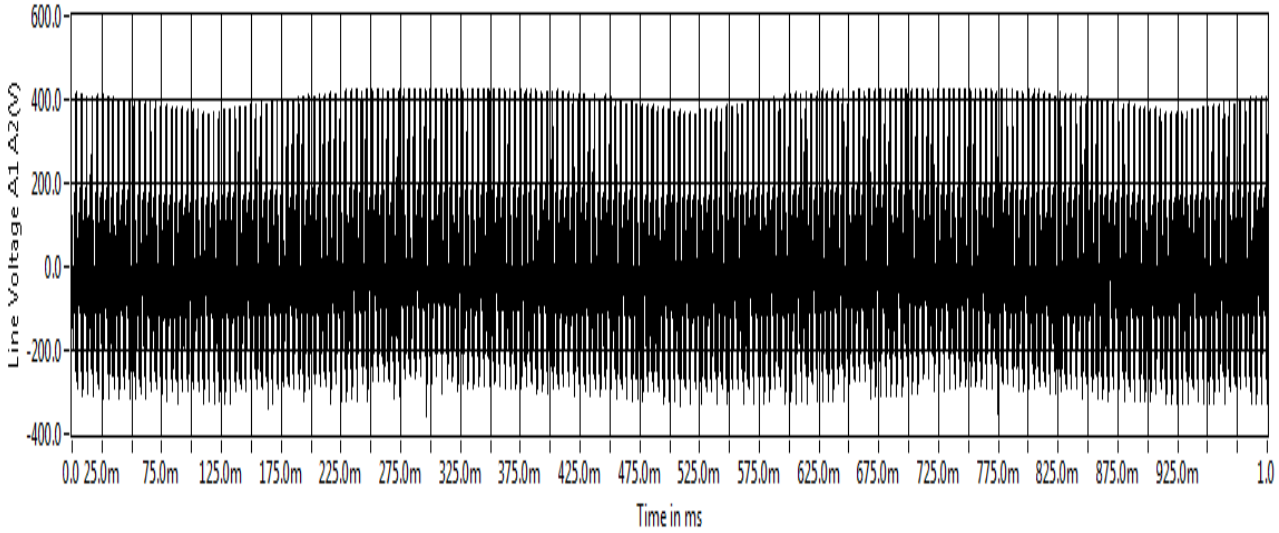

Fig.5 Voltage waveform at 2000 rpm

In Fig.5 shows the voltage waveform of SRM drive at 2000rpm when the speed of motor increased also the voltage level is increased gradually.

2. Constant Load Analysis at Constant speed: In this analysis the constant speed with constant load waveform of voltage, current and vibration shown in Fig.6-9.

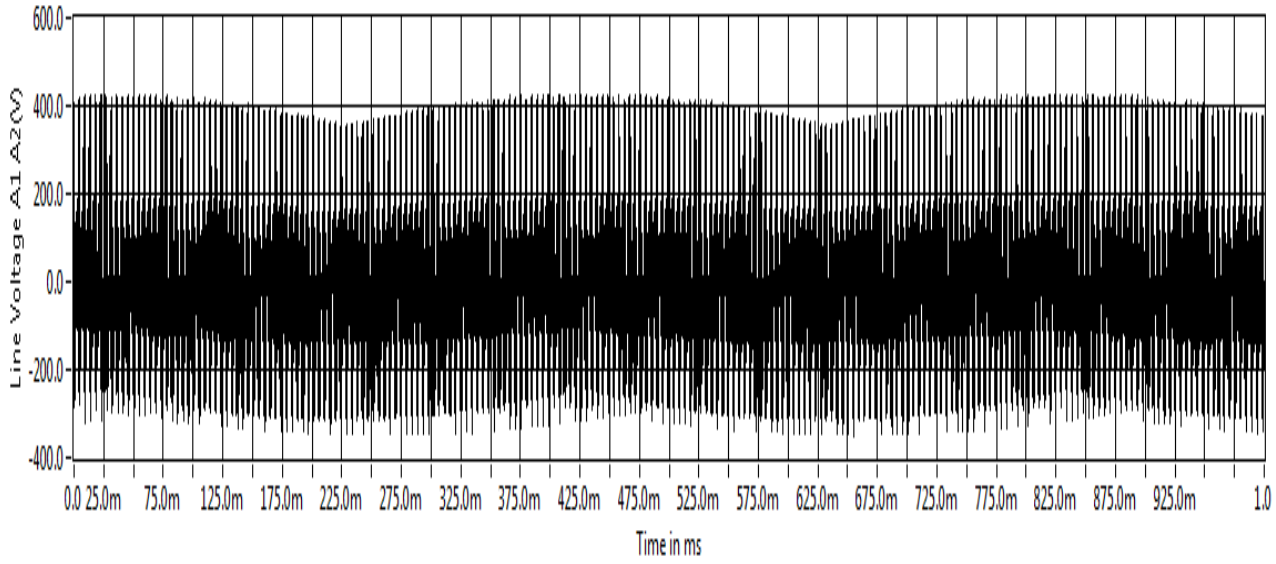

Fig.6 Voltage waveform at 2000 rpm

In Fig.6 shows the voltage waveform of SRM is 2000rpm when the speed of motor increased also the voltage level is increased gradually.

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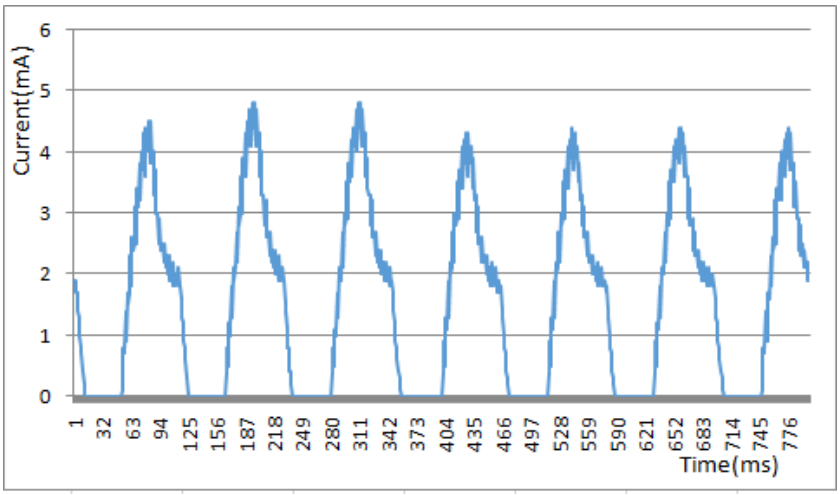

Fig.7 Current waveform at 2000 rpm

Fig.7 shows the current waveform of SRM drive at 2000rpm, the maximum current level is 4.5 mA.

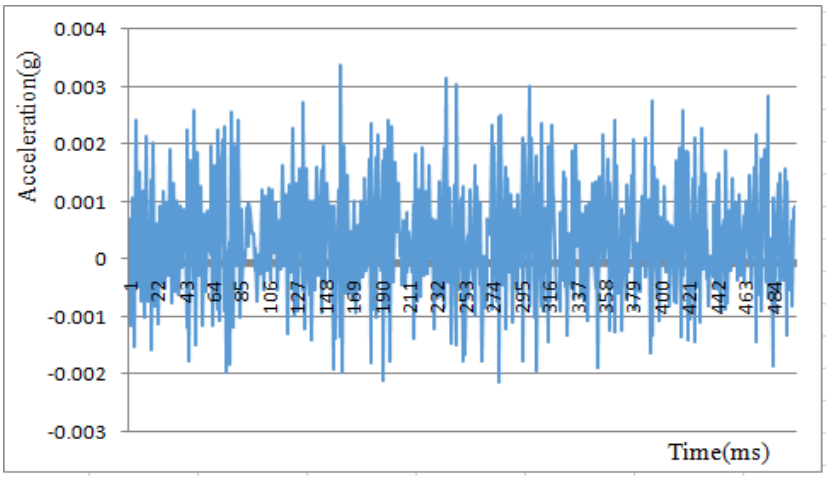

Fig.8 Vibration waveform at 2000 rpm

Fig.8 shows the vibration analysis SRM drive with speed of 2000rpm, in this speed condition the motor vibration will be increased gradually when speed of the motor increased. The vibration level is 0.0035g.

V. CONCLUSION

Switched Reluctance Motor drives (SRM) is a doubly salient, single excited machine because of this simple construction is has a high reliability, low cost. The hardware setup of 4Φ SRM drive consists of DSP controller, split link converter, Hall Effect sensor, current DAQ, voltage DAQ and accelerometer. In this work the TMS320F28335 processor were implemented in this system. The Lab VIEW software is used to monitoring the real time signals in SRM drive.The real time values are carried out in 4Φ SRM drive. The voltage, current, vibration signals are monitored at different load and speed conditions. The real time monitoring value of vibration level at constant load of 2000 rpm is 0.004mm/s^2 and full load condition the vibration is 0.0035 mm/s^2.The future work will be carried out with help of new electronic switching control strategy to reduce the vibration and noise signals.

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BIOGRAPHY

Mekala.N was born in Erode, in1990. She received the B.E degree in electrical engineering from K.S.Rangasamy College of Technology, Tiruchengode, Tamilnadu in 2009 and currently doing M.E (Power Electronics and Drives) at K.S.Rangasamy College of Technology, Tiruchengode, Tamilnadu in 2013.

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