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DC starter motor performance testing using labview

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ABSTRACT

This project is aim to incorporate testing system in assembly machine. This is to achieve high quality product with high efficiency in order to customer demand. With this testing system customer reduced material cost with enhanced quality, this testing system planned at the end of the assembly station to check all the component and sort them based on testing system acceptance and rejection. Presenting there is no station to check the component behavior in the assembly process. There for customer is not in a position to either commit precisely or meet the high quality as per the markets requirement.

INTRODUCTION

Lab VIEW is quickly for monitoring and data acquisition. Motor are recorded and analyzed simultaneously by applying Lab VIEW. Automatic measurement and examination of DC motor with high-performance graph is developed in this paper. The input power is measurement by measuring the input voltage, current and power factor with the help of a voltage and current transformer and the output power is measured by measuring the speed and torque.

The output of the voltage and current is given to the Data Acquisition Card (DAQ) which acquires the data for processing and then the efficiency is found out, using Lab VIEW software installed in the personal Computer (PC). Experimental results show that the proposed technique is good than the existing schemes. With development of technology, relationship between motor and industrial production become more and more closely, and motor control requirement are increasing gradually.

So it is important to test comprehensive performance parameters of motor. The motor testing system based on traditional technology platform, which has been a long development time period, high cost, low degree of automation, poor lack of portability and some other shortages, At present, NI company introduction a powerful virtual instrument software-Lab VIEW for automatic detection and control of complex systems.

It can quickly collect data, realize data analysis and data processing. It achieved hardware simulation through software. Hence, a new motor detection system is proposed in this work, the whole process is organized as related hardware to capture and conditioning motor parameters, then establishing friendly human-computer interaction system by USB protocol. At last, Lab VIEW is introduced in data analyzing and processing.

EXISTING SYSTEM

The performances are operated manually in industry for the testing. The process results in increased time delay for the products to reach the destination and also needs man power to the testing machine. The operations show the (Fig: Existing System) performance testing machines are tedious for the works. The efficiency may also not be stable since it depends on the efficiency of the workers area.

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Fig: Existing System 1) Block Diagram

- Check 24VDC and 5VDC (From PC) power available.
- Identify problem area.
- Check sensor operation in problem area.
- Check sensor Inputs to NI.
- Check on Relay that a change in sensor state causes the corresponding Input LED on the light to go on or off. Identify Output in diagram, which is giving problem.
- Ensure that Output LED is cycling on/off with Input.
- Check that Output voltage is correct and cycling on/off with Input.
- Locate Output device and ensure that voltage is reaching device and cycling with Input.
- Ensure that Output device is working correctly (solenoid coil, relay coil, contactor coil, etc.).
- An Input or Output module can be defective in one area or circuit and work correctly in all other circuits.

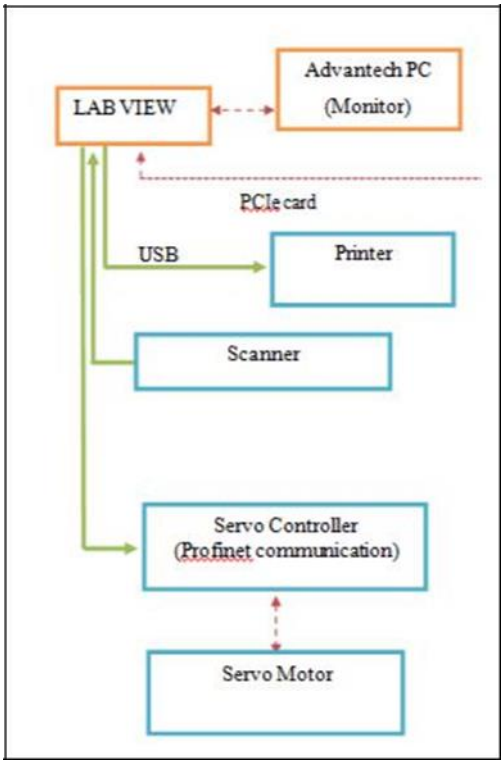


Fig: Block Diagram

- If each field circuit is not fuse protected, the modular internal circuit becomes a fuse and can be destroyed by a field short circuit or any other over current condition.
- Check modular circuit show the (Fig: Block Diagram) if bad, module must be replaced after correcting field fault.
- Shutdown PC prior to changing any module - main power and 24VDC power.

PROPOSED SYSTEM

Introduces the performance Test Software. This gives a document script of the requirements in a system. The objective of this system is to run the starter motor under different set points show the (Fig: Proposed System) and log the motor parameters fir the each and every component in the database.

Fig: Load Test

MODES OF OPERATIONS

- Auto Mode.
- Manual Mode.

The Mode selection can be made by using 3 position selector switches (Either Manual/ Auto).The sequence of operation of the machine in different modes is explained below.

Auto Mode

In this mode, machine operates in the predetermined sequence automatically without human intervention.

Manual Mode

Operator can perform any operation, independent of predefined sequences using manual option provided in the HMI of that particular station.

Machine Power Details

Table: Machine Power Details 1) Block Diagram

ELECTRIC FEATURES	
Year of Building	2018-2019
Type	Manual
Supply voltage	440
Frequency	50Hz
Number of phases	3□ ,N ,PE
Operating Pressure	---

Locate fault in field circuit by disconnecting wires at module and field device, check between wires for short circuit and to ground for short circuit, replace wire if short circuit found.

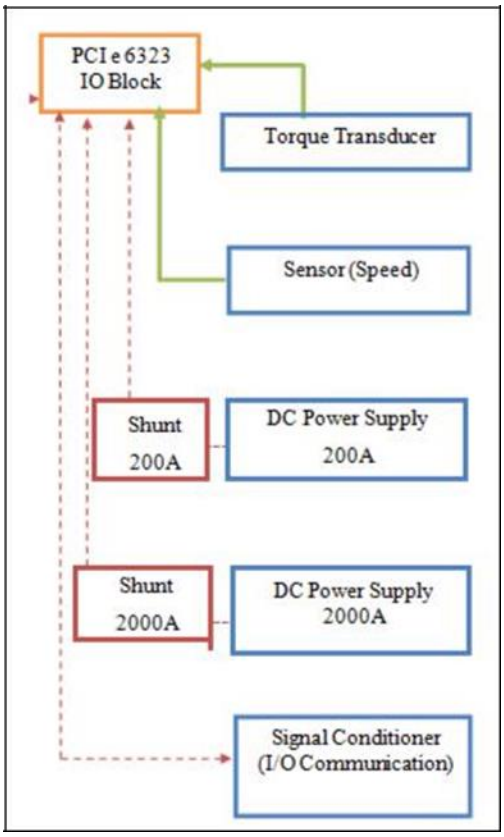


Fig: Block Diagram

Check device for ground, short circuit, mechanical and electrical operation, even when problem found in wires, always also check device show for (Fig: Block Diagram)another fault, if device defective, replace the device and then check total circuit before placing in operation and after restore circuit, check again to ensure circuit and module are operating correctly quickly.

Performance Graph

A high Starting Torque is high important for application or machines hard to start - like positive Displacement pumps, cranes etc. A lower Starting Torque show for (Fig: Sample Reading) can be accepted for centrifugal fans or pumps where the start loads is low or close to zero

Test	Parameter	Value	Min	Max	Sta
Free Run Test	Current	76.69	35.000	80.000	
Free Run Test	Speed	4110	0.000	5000.000	
Free Run Test	Voltage	11.57			
Solenoid Test	Aging	PASS			
Solenoid Test	Hold Current	10.71	0.000	12.000	
Solenoid Test	Open Test	PASS			
Solenoid Test	Pull Current	33.28	0.000	40.000	
Solenoid Test	Voltage Drop	0.22		0.700	
Starter Test	Current Max	802.80			
Starter Test	Direction	CW			
Starter Test	Power Max	2296.84			
Starter Test	Ripple Current	24.00		35.00	
Starter Test	Torque Max	25.89			
Load Test at 100.00 RPM	Solenoid Voltage Drop	0.3599			
Load Test at 100.00 RPM	Starter Current	791.97		800.000	
Load Test at 100.00 RPM	Starter Power	267.29			

Fig: Sample Reading Pull-up Torque

The Pull-up Torque is the low level torque developed by an electrical motor when it runs from zero to full-load speed (before it reaches the break-down torque point).

Break-down Torque

The Break-down Torque is the highest torque available before the torque decreases when the machine continues to accelerate to working conditions

Full-load (Rated) Torque or Braking Torque

The full-load torque gives to produce the rated power of an electrical motor at full-load speed.

ELEMENTS OF BLOCK

Diagram

Initial Panel Power up sequence

- Switch On the isolator switch (-Q1), Miniature circuit breaker (-Q2) and RCCB (-Q3).
- Now the panel gets power up with AC supply, provided all the (-Fxx) series Fuse and the breaker are healthy and on respectively.
- Switch on the DC/AC circuit breaker. Following devices gets the DC supply directly, when the Breaker is switched on.
- NI and its inputs and outputs modules.
- Field input devices such as speed sensors (proximity), selector switch and push buttons.
- Output devices such as tower lamps, control off lamp and NI ready output relay.
- DC Output Power from Programmable Power supplies.
- Prerequisites for machine operation:
- Clean all cylinders and check if they are in the home condition.
- Press the Start push button.
- Ensure the components are loaded into the bins.
- Select either the Auto or Manual mode of operation.
- Press RESET pendant key to clear all error messages.
- Check the home position of all cylinders.
- Press START pendant key to start the operation. Switching OFF The Machine:
- Press STOP or Cycle Stop, Pendent Key.
- Switch off the switches on the PC.
- Switch off the main power supply located in the panel.
- Switch Off the main power supply. 4.4.21 Trouble Shooting The NI Hardware Input And Output:
- Check to ensure main power is on.

While installing the machine, position of each station and its respective panel should be referred from The Machine Layout Diagram. The main power ON/OFF located at panel is used to switch ON the machine. Machine should be installed in the presence of:

- Manufacturer Mechanical Technician.
- Manufacturer Electrical Technician.
- Mechanical Field Engineering.
- Electrical Field Engineer.
- Operators.

Suitable Tools Specifies in the Manual and Lifting Machines are to e used while Handling and Installing the Machine.

Voltage, Current, Speed and Torque DC Motor

Graph Calculation

Voltage is set by the supply. When spinning the motor generates an internal load voltage called back-emf, which is proportional to rpm. The difference between the back-emf voltage and the supply voltage is dropped over the motor's internal resistance (Rm), resulting in a current draw according to Ohm's Law (V = IR). The current produces torque which causes the armature to spin high speed, increasing back-emf and reducing low current until the torque produced is balanced by internal and external loading. If there were no internal losses an unloaded motor would spin high speed enough to produce a back-emf equal to the supply voltage. The current is required to more than internal mechanical losses (brush and bearing friction, wind resistance) and magnetic losses (eddy currents, hysteresis) which are roughly proportional to speed.

Servo Motor

Fig: Servo Motor

They are small in size but pack a bigger punch and very energy-efficient. These features show the (Fig: Servo Motor) allow them to be better to operate remote-controlled or radio-controlled toy cars, robots. Servo motors are also used in industrial applications, robotics, in-line manufacturing show the pharmaceutics and food services.

Function

- Servo motor is used for loading the motor in various loads.
- Servo motors have been around all world for a long time and are utilized in many applications.

D. Pci-e Card-1

The PCIe-6509 is used for Connecting Digital Inputs & Outputs.PCI Express, 96- Channel, 5 V, TTL/CMOS, 24 mA Digital I/O Device.

Fig:Pci-e Card-I

The PCIe-6509 can connect drive external digital devices such as solid-state relays (SSRs). You can configure each show the (Fig: Pci-e Card-I) port for input or output, and no external power supply is required for outputs.

Types of bench testing are:

- No-Load Condition.
- Energized Condition.
- Full-Load Condition.

No-Load Condition

The motor's no-load current flow all of these internal losses. No-load current does not contribute to output torque, and slightly decrease no-load speed due to voltage drop across Rm.

Energized Condition

When an additional load is applied current increases to produce the torque required matching it, and speed reduces due to the increased voltage drop across Rm. As load is further high level using the motor slows down more, eventually reaching stall (zero rpm) where there is no back-emf and all the supply voltage is dropped across Rm, resulting in maximum current and torque.

Full-Load Condition

As loading torque increases linearly but rpm decreases linearly, so maximum.

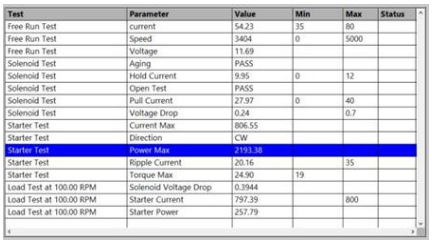
Speed

Table: Operating Values Sample output value

Barcode	4290/ID 4132
Starter Type	M45
Starter Model	1600
Rated Power	2400
Rated Voltage	12.000
Max Torque	25.89
Max Ampere	802.80

Output power occurs at 50% rpm and torque. Motor performance efficiency is the ratio of output power (torque x rpm) to input power (Volts x Amps).

RESULT



Test	Parameter	Value	Min	Max	Status
Free Run Test	current	54.23	35	80	
Free Run Test	Speed	3404	0	5000	
Free Run Test	Voltage	11.69			
Solenoid Test	Aging	PASS			
Solenoid Test	Hold Current	9.95	0	12	
Solenoid Test	Open Test	PASS			
Solenoid Test	Pull Current	27.97	0	40	
Solenoid Test	Voltage Drop	0.24		0.7	
Starter Test	Current Max	806.55			
Starter Test	Direction	CW			
Starter Test	Power Max	2193.38			
Starter Test	Ripple Current	20.16		35	
Starter Test	Torque Max	24.90	19		
Load Test at 100.00 RPM	Solenoid Voltage Drop	0.3944			
Load Test at 100.00 RPM	Starter Current	797.39		800	
Load Test at 100.00 RPM	Starter Power	257.79			

Fig: Sample Result

This method is very reliable than the conventional method because its achieves better fault finding capability and better performance.

Testing the component quality based on conventional testing method (for example random samples of numbers from a batch of size 100) Show the (Fig: Sample Result) Might have all 10 items ok, good but that remaining 90 items are all defective. If we used this automatic test method we will reduce the defective items.

CONCLUSION

The process results in decreased time delay for the products to reach the destination. This performance testing is used to test the motor operating ranges and withstand capability. This is the one of major key point for sell the product to customer.

REFERENCE

[1]. J.Kavita, M.Lavanya, G.R.V. Sai Brahma, K.T Amernath **"Designing a single smart house control using Lb VIEW"** 2014 International Journal of Applied Engineering Research ISSN,PP-26816-26829.

[2]. WeiZhan,Jay R.Porter, Joseph A.Morgan **"Experiential Learning of Digital Communication Using LabVIEW"** 2014,IEEE Transactions on Education.

[3]. Syaifuddin Mold,Saiful A.Zulkifli, Radhata G.A Rangkuti,Mark Ovinis and Nordin saad **"Electrical Vechicle Energy Management System using National Instrument Compact RIO and LabVIEW"** 2013,Instrumentation Measuement and Application (ICSIMA.

[4]. Witoon Prommee, Nit pong Somclaiwong **"The Low-Cost instrument with Lab VIEW and DB25"**2006, SISE-ICASE, International Join Conference.