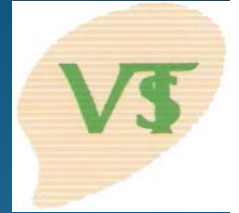


MOST ADVANCED ANALYTICAL FERROGRAPHY LAB





PREDICTIVE MAINTENANCE BY FERROGRAPHY ANALY

- ***Ferrography – What is it all about?***
- It provides Microscopic Examination and Analysis of Debris (particles) separated from lubricating oils. This is a technique in use since 1970,
- ***What type of debris do we expect which are harmful to Lubrication System and the Machine?***
- There are six basic wear particle types generated through the wear process. These include metallic particles that comprise of Normal Rubbing Wear, Cutting Wear Particles, Spherical Particles, Severe Sliding particles, Bearing Wear Particle (Fatigue Spall Particles, Laminar Particles) and Gear Wear (Pitch Line Fatigue Particles, Scuffing or Scoring Particles). There do also exist sand and dirt particles responsible to generate wear particles in the system.
- ***Benefits of Ferrography?***
- Reduction in unscheduled downtime due to wear of rotary components like bearings and gears
- Effective maintenance scheduling
- Improved equipment reliability and safety
- Reduction in maintenance costs
- Maximization of oil change-out intervals that indirectly conserves environmental cleanliness aspect
- Reduction in machine power consumption over a period



- Ferrography Wear Particle Analysis, performed on a lubricant sample, provides the earliest detection of abnormal machine wear condition and pending failure of interacting machine parts due to tribology-related root causes, *before the abnormal wear particles are ground down to sizes small enough to fall within the detection limits of atomic element spectrometers (1 μm for atomic-absorption spectrometer, 3 μm for ICP atomic-emission spectrometer and 8 μm for RDE atomic-emission spectrometer) and before telling peaks and significant patterns in the vibration spectra become sufficiently discerning for detection by machine vibration monitoring and analysis. Ferrography Wear Particle Analysis provides comprehensive in-sights into the machine wear condition by identifying:*
- **the wear mode :**
(e.g. normal rubbing wear, severe sliding wear, cutting wear, corrosive wear, gear wear, bearing wear...)
- **the wear severity**
(wear particle size and concentration)
- **the wear particle metallurgy**
(the source of wear particles) (e.g. iron, steel, copper, babbitt ...)
- **the cause of wear**
(e.g. abnormal loading, misalignment, lube degradation, bearing fatigue spalls, abnormal lubrication condition...)



- It also provides some useful information on:



- **the lubricant condition**

(e.g. presence of black oxides/severe sliding wear particles indicates lubricant unable to withstand the high load and high temperature; presence of red oxides indicates moisture in the system; presence of decomposed friction polymers indicates lubricant breakdown and depletion of EP additives ...)

The filter, breather and/or seal condition

(e.g. presence of filter paper or fibres indicates filter element breakdown; presence of sand/dirt and red oxides indicates poorly functioning breather elements or leaking seals...)

Such early detection and comprehensive information allow for timely preventive actions, based on informed decision, to be scheduled and taken to check and resolve any incipient and developing faults to pre-empt accelerated loss of operating efficiency, premature end of equipment useful life, secondary damage and forced outage.

Such machine condition monitoring is essential for high reliability maintenance especially for mission critical equipment to ensure equipment availability, production quality and plant safety.





SLIDE MAKER - SM225



Innovative Technology



- Ferrography is a powerful tool in controlling maintenance expenses and insuring productivity.
- Veda's Slide Maker SM-225 is a Microprocessor controlled based programmable system prepare a ferrogram slide by drawing the oil sample across a transparent glass substrate in the presence of a strong magnetic field at a highly controlled rated flow than existing Ferrogram Makers which are available in the market. So that non-ferrous deposition will be increased than existing method. This helps us to monitor the condition of nonferrous components such as Journal Bearings, Bushings, Worm Gears, Bearing Cages, etc very effectively.
- Automatically counts sample quantity throughout the year
- Very easy to operate. Skilled person is not required.
- It always maintains constant sample flow rate on the ferrogram even there is Oil Viscosity grade variations (i.e from 50 cSt to 1000cSt and above).





1.INTRODUCTION:

- Veda's Slide Maker SM-225 is a Microprocessor controlled based programmable multi channel system for the use in Ferrography laboratory and extensively in industrial applications where accurate flow rate is essential.
- Pumping action is done by a roller cage driven by stepper motor. The motor and internal are almost independent of temperature. This system has load and line compensation circuit. The rollers are made up of carbon filled nylon for trouble free operation. The electronic circuit provides constant flow rate even there is line voltage or load variation.



2. Check List of Slide Maker SM-225:

Items included in the packing

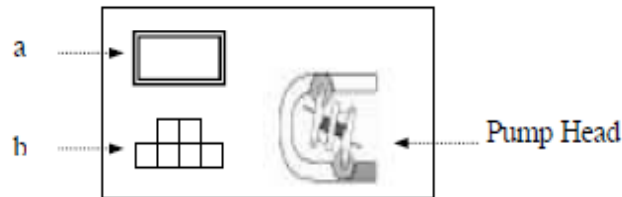


1. Slide Maker model SM-220 - 1 No.
2. 230v, 4 A Power chord with 3 pin plug - 1 No
3. Connector for External Speed control - 1 No.
(by 4 to 20mA current signal)
4. Tubing - 1 Mtr
5. Spare Fuses (1 Amps) - 2 No's
6. Surface Level Indicator



3. General Description :

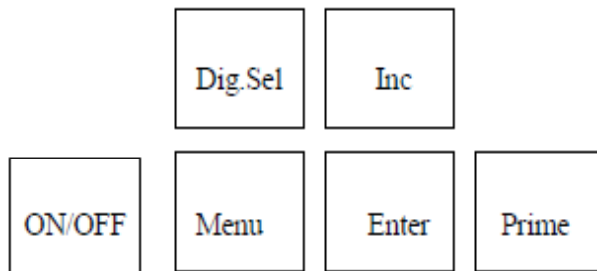
3.1. Front Panel



a. LCD Display

This Eight character Single Line Liquid Display will show the RPM and Timer values.

b. Key Pad



- 1. ON/OFF
- 2. MENU
- 3. DIG.SEL
- 4. INC
- 5. ENTER
- 6. PRIME

Brief Description of the functional keys

1. ON/OFF

Using this key the pump can be switched ON/OFF. The ON condition is indicated by a glowing LED.

2. Menu

This is used to select the RPM, ON time, Interval time etc.

3.DIG.SEL, 4.INC & 5.ENTER

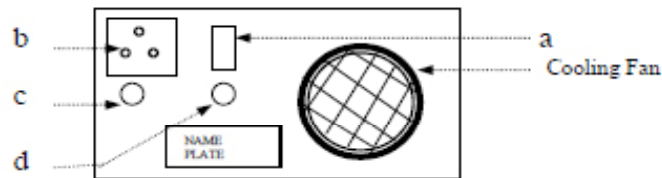
These switches are used to set the desired flow rate and timings

6.PRIME

By keeping this switch in pressed condition the pump can be run at its maximum speed. This switch will work only when the pump is in OFF condition



3.2 .Rear Panel



a. Mains ON/OFF Switch

This switch is used to **ON/OFF** the A.C .Supply to the pump. It has built in indication.

b. A.C.Main socket

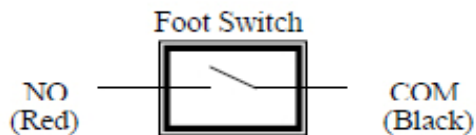
This socket accepts the supply of A.C.230v, 50Hz.Suitable power chord is provided with the pump.

c.Fuse


Protects the electronics and the motor in case of short circuiting. The Fuse rating is 1 Amps.

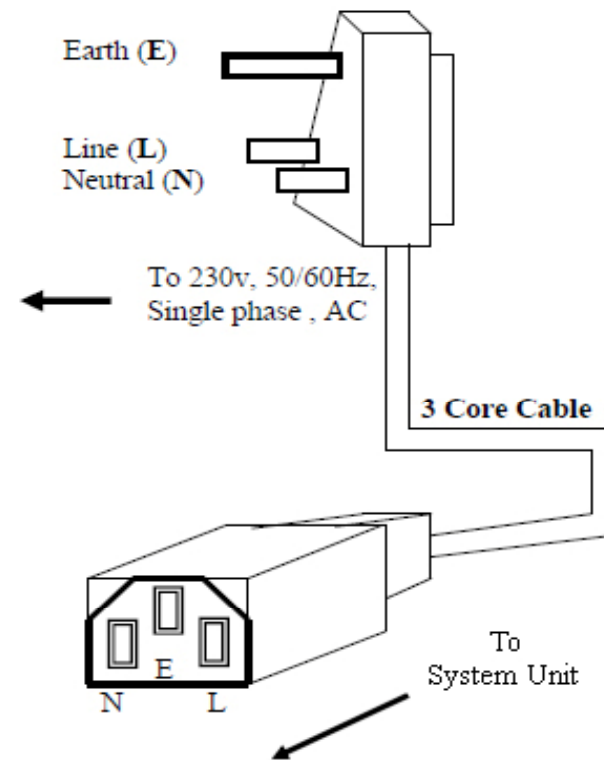
d. Foot Switch Terminal

The NO and Com points from the foot switch can be connected to this terminal, for external control.



4. OPERATION

 **Ensure Proper Earth for the System**





4.1. General

Before start running ensure the following

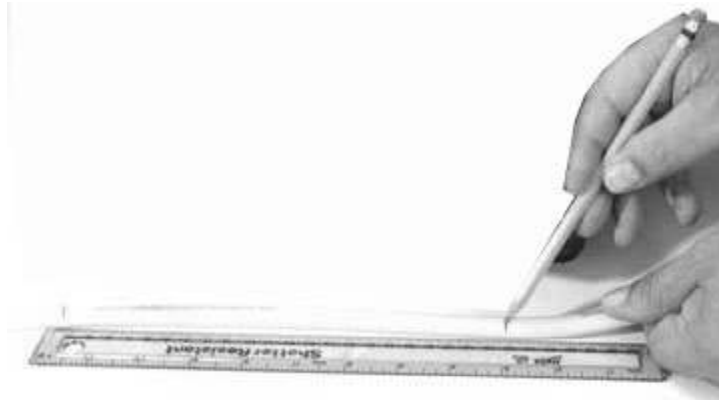
- a. Track and rollers should be clean
- b. Use suction and delivery pipe lines as equivalent to or larger than the diameter of pump tubing to minimize the friction losses.
- c. Delivery and Suction lined as short as possible. Minimize the number of bends.

4.2 Tube Selection

User should select appropriate tubing, which is compatible with the transferring medium chemically and physically.

4.3 .Loading the tube

Fitting the tube in the roller cage is a straight forward procedure requiring no specialised knowledge or expertise.



- 1. Mark 140 mm in the tubing. Ensure the marks should be present in the outside of the tube holders (top and bottom) after tube loading
- 2. Pull back the tube holding lever in the suction side, insert the tube and release the lever.





Step - 1



Step - 2



Step - 3



3. Rotate the roller cage in the clockwise direction so that the tube is automatically in its path.

4. Fit the tube in the delivery side of the tube holding mechanism as described in suction side.

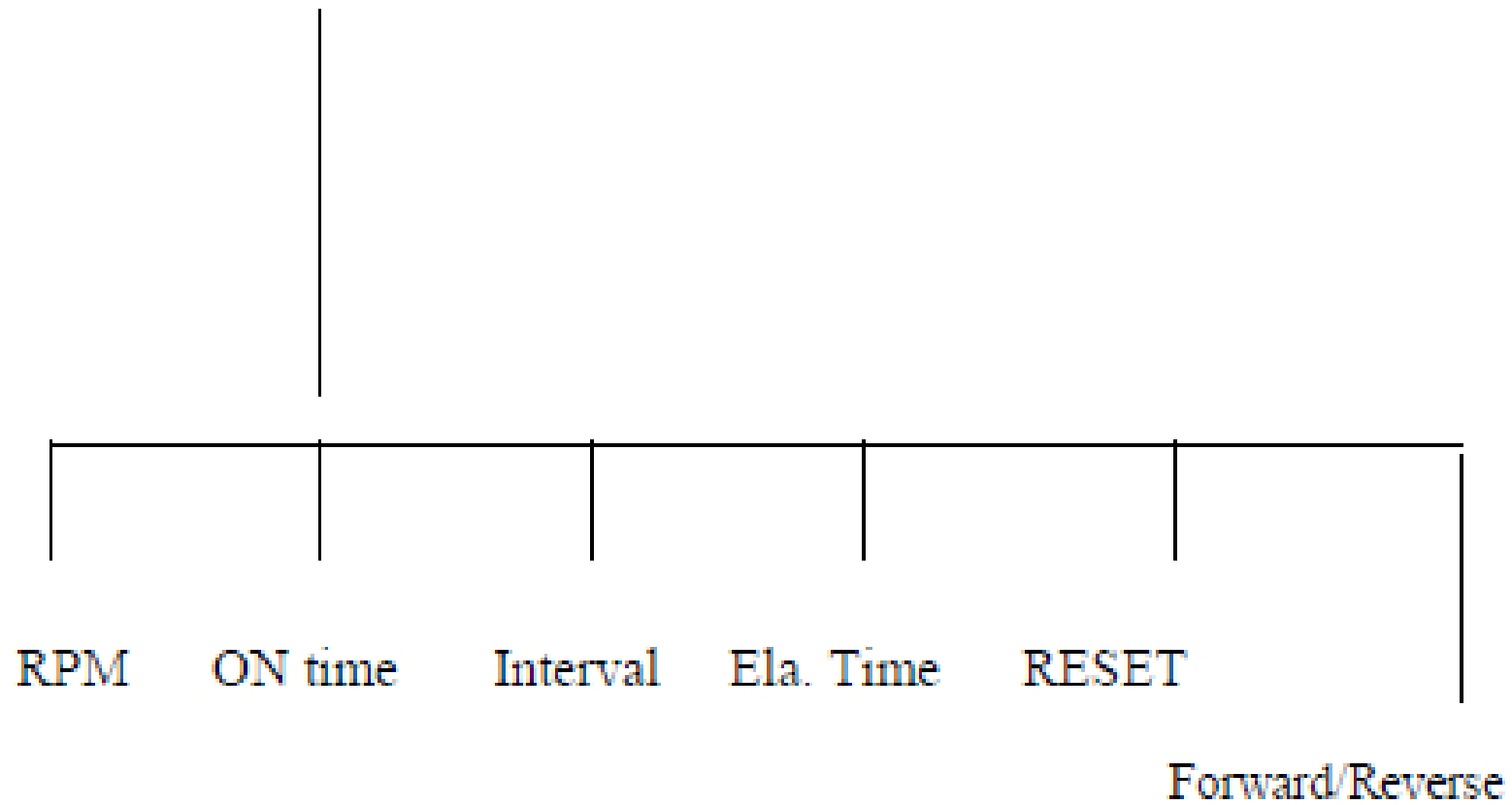
5. Start the motor and confirm the smooth rotation of the rollers over the tube.

NOTE: The rollers are set for 1mm wall thickness tubes. If 1.5 mm wall thickness tube has to be used, Tighten the screws provided in the sides of both the roller holding plates uniformly by using the screw driver. Tighten the screws until required pumping pressure is achieved.



4.4. MENU FUNCTIONS

Menu





- 1. RPM - Speed – 00.01 to 99.99
- 2. On Time - 01 Min. to 99 Hours, 59 Mins.
- 3. Interval - 00.1 Sec. to 99.9 Sec.
- 4. Ela.Time - Elapsed Time- Et. 99:59 (Max.)
- 5. RESET - It reset the elapsed time
- 6. Forward/Reverse - This function is used to change the direction of rotation of the rotor.



a. FLOW RATE SELECTION

- 1. RPM selection

The flow rate can be varied by changing the speed. The speed of the pump head can be varied from 0.01 to 99.99. The approximate flow rate can be selected by using the output per revolution given below for various tubes.

- The approximate ml/rev.:

1 mm I.D. - 0.15 ml

2 mm I.D. – 0.35 ml

3 mm I.D. - 0.85 ml

- The RPM for the required flow rate can be calculated as follows

$$\text{RPM} = \frac{\text{Flow rate(ml/min)}}{\text{ml/rev}}$$

- Example:

1. For a flow rate of 8.5 ml/min in 3mm I.D.tubing

$$\text{RPM} = \frac{8.5}{0.85} = 10.0 \text{ (App.)}$$

The exact quantity of the flow with respect to the RPM has to be measured at the actual environment. Using this output calculate the exact output per revolution and use this calibrated value for further settings.



2. RPM setting

- 1. Press the 'Menu' key, using the 'Inc' key, select the '- RPM -' and press 'Enter'.
- 2. Using 'Dig.Sel'. switch, select the digit in the four digit value.
- 3. The selected digit will blink.
- 4. When the digit is blinking, use the Inc. Key to change the value from 0 to 9 as required.
- 5. Then press the dig.sel. key once again to select the next digit and set the desired value as mentioned in points 2,3 & 4.
- 6. After the completion of RPM entry, press 'Enter'.



b. SETTING THE ON TIME

- The ON TIME can be varied from 1 min to 99 hours. To set the required ON TIME follow the procedure mentioned below.
- 1. Press the 'Menu' switch and select the 'On Time' mode using the 'Inc' key.
- 2. Using the Dig.Sel. switch select the the digit in the four digit value.
- 3. The selected digit will blink.
- 4. When the digit is blinking, use the Inc. Key to change the value from 0 to 9 as required.
- 5. Then press the dig.sel. key once again to select the next digit and set the desired value as mentioned in points 3 & 4.
- Note:
If the Timer value is set at 00.00, then the pump will run
As a normal Peristaltic Pump with manual ON/OFF



c. SETTING THE INTERVAL

- The Interval time can be varied from 00.1 to 99.9 Sec.
- To set the required Interval time, follow the procedure mentioned below.
- 1. Press the 'Menu' switch and select the 'Interval' mode using the 'Inc' key.
- 2. Using the Dig.Sel. switch select the the digit in the three digit value.
- 3. The selected digit will blink.
- 4. When the digit is blinking, use the Inc. Key to change the value from 0 to 9 as required.
- 5. Then press the dig.sel. key once again to select the next digit and set the desired value as mentioned in points 3&4.
- Note:
If the Interval time is set at 00.0, Manual 'ON' is required after the completion of ON time for the next cycle.



5. MAINTENANCE

- The Slide Maker- SM225 does not require any regular service or maintenance .

6 .LUBRICATION

- No lubrication is required as the internal mechanisms are lubricated for life. Lightly lubricate the rollers whenever it is necessary. External lubrication of tubing is recommended for longer life of the tube. Silicon grease(midland silicon MS4 or equivalent)can be used with advantage on all materials except silicon rubber. Glycerin and other non-solvent lubricants can be applied to silicone rubber and other elastomers.



7. TECHNICAL SPECIFICATIONS

- No.of channel : One
- Speed : 00.01 to 99.99 RPM
- Flow Rate : 0.01ml to 3.6 Ltr./hr
- Tubing : 1 to 3 mm I.D with 1 or 1.5 mm wall thickness
- On Time : 1 min to 99 hours,59 Mins.
- Interval Time : 00.0 to 99.9 Sec
- Motor : DC Stepper Motor(Cont.Duty)
- Supply : 230v +/- 10%,50Hz A.C.
- Temp. range : 0 to 70 deg.C
- Weight : 25 Kgs.(Approx.)

Bichromatic Microscope/Ferroscope

- Ferrograms are typically examined under a bi-chromatic microscope that combines the features of a biological and metallurgical microscope. It contains both reflected and transmitted light sources, which may be used simultaneously. Green, Red, and Polarized filters are also used to distinguish the size, composition, shape and texture of both metallic(ferrous and nonferrous) and non-metallic particles.





Video Camera and Image Grabbing Software

- A CCD USB digital camera with High resolution attached to the microscope captures the Images viewed under the microscope at high quality.
- The latest Image Pro-2010 Ver. Image grabbing software captures high quality images.

Advantages :

- External video capture card is not required
- Video & Image capture protection technology
- Anti-theft imaging sensors

Our Most Advanced Ferrography Lab at Shree Cement _ RAS Site , Rajasthan





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