

SEALER MATERIAL DISPENSE TEST

GM9913P

1 SCOPE. This test procedure is used to determine the flow characteristics of sealer materials through the pump, pipe header, various diameter hoses and orifices. This procedure may also be used to determine any density or viscosity changes in the material after testing.

1.1 Data generated from this test is as follows:

1.1.1 Material flow rates directly from the pump for air motor pressure settings of 40, 50, 60, 70, 80 and 90 psig.

1.1.2 Dynamic pressures at the inlet and flow rates through 1/4", 5/32", 1/8", 3/32", 1/16" and 3/64" orifices with the pump operating at 40, 50, 60, 70, 80 and 90 psig.

1.1.3 For a 10' long 2" header (double extra heavy pipe 1-1/2" ID) and 10 ft long hoses of 1", 3/4", 1/2", 3/8" and 1/4" the following list and pressure data will be generated:

- material static pressures at the pump outlet
- material flow rate directly from the header/hose outlet
- material dynamic pressures at the pump outlet and at the header/hose inlet
- pressure drop per foot across the header/hose

2 REFERENCED STANDARDS.

None

3 EQUIPMENT REQUIRED AND SET-UP.

3.1 PUMP. Select the test pump that is as near as possible to the model to be used in production. The dimensions of internal pump parts subject to wear may be recorded at the beginning of the test procedure for comparison to the remeasured part dimensions after test to determine if there has been any pump component wear.

3.1.1 (1) Side port check (consistent with selected pump)

3.1.2 (1) 1-1/4" npt close nipple (schedule 160)

3.1.3 (1) 1-1/4" npt 45° elbow (schedule 160)

3.2 AIR SUPPLY TO AIR MOTOR.

3.2.1 (1) 1" Wilkerson regulator R30-08-000

3.2.2 (1) 1" Parker Lubro-reg (lubricator)

3.2.3 (1) 1" Milwaukee butterfly actuated ball-valve

3.3 HIGH PRESSURE HOSES.

3.3.1 (1) 1-1/4" x 6' 20C13, male union adapter x male union adapter

3.3.2 (1) 1" x 10' 16C13, mua x mua

3.3.3 (1) 3/4" x 10' 12C10, mua x mua

3.3.4 (1) 1/2" x 10' 8TWM, mua x mua

3.3.5 (1) 3/8" x 10' 6TWM, mua x mua

3.3.6 (1) 1/4" x 10' 4TWM, mua x mua

3.4 ORIFICES (IN 1/2" NPT PIPE-PLUG CARRIER).

3.4.1 (1) 0.250" dia x 0.500"

3.4.2 (1) 0.156" dia x 0.500"

3.4.3 (1) 0.125" dia x 0.500"

3.4.4 (1) 0.093" dia x 0.500"

3.4.5 (1) 0.062" dia x 0.500"

3.4.6 (1) 0.047" dia x 0.500"

3.5 HEADER PIPE FITTINGS AND VALVES (SCHEDULE 160).

3.5.1 (1) 2" npt x 8' pipe

3.5.2 (2) 2" npt x 7-1/2" nipples

3.5.3 (2) 2" npt pipe union

3.5.4 (1) 2" npt x 1' 1/4" reducing bushing

3.5.5 (2) 2" npt 90° elbow

3.5.6 (1) 2" npt x 1" npt reducing bushing

3.5.7 (1) 2" npt x 3/4" npt reducing bushing

3.5.8 (1) 2" npt x 1/2" npt reducing bushing

3.5.9 (1) 2" npt x 3/8" npt reducing bushing

3.5.10 (1) 2" npt x 1/4" reducing bushing

3.5.11 (1) 1-1/4" npt x 1" npt reducing bushing

3.5.12 (1) 1-1/4" npt x 3/4" npt reducing bushing

3.5.13 (1) 1-1/4" npt x 1/2" npt reducing bushing

3.5.14 (1) 1-1/4" npt x 3/8" npt reducing bushing

3.5.15 (1) 1-1/4" npt x 1/4" npt reducing bushing

3.5.16 (1) 1" npt air-actuated ball valve (Hycon)

3.5.17 (1) 1-1/4" npt air-actuated ball valve (Hycon)

3.5.18 (1) 2" npt air-actuated ball valve (Hycon)

SEALER MATERIAL DISPENSE TEST

GM9913P

3.6 SET-UP DIAGRAMS.

- 3.6.1 Figure 1 - test equipment set-up for pump
- 3.6.2 Figure 2 - test equipment set-up for pump and orifice
- 3.6.3 Figure 3 - test equipment set-up for pump and header
- 3.6.4 Figure 4 - test equipment set-up for pump, header and hose
- 3.6.5 Work Sheet - for recording the elapsed time and weight of the dispensed samples
- 3.6.6 Data Sheet - for calculating the flow rates, pump data and graph coordinates for each restrictor

3.7 LAB MEASUREMENT EQUIPMENT.

- 3.7.1 (4) Pressure transducers (0 to 5000 Ψ) with analog gauges
- 3.7.2 (2) pump cycle counter/relays
- 3.7.3 (1) pump cycle limit switch
- 3.7.4 (1) time totalizer
- 3.7.5 (1) 4 channel analyzing recorder (yew model 3655)
- 3.7.6 (1) quart cup actuator
- 3.7.7 (1) electric control panel to integrate analyzing recorder triggers with cycle counters, timer, pump and dispense cup actuator
- 3.7.8 (1) scale (0.1 to 5000 g)

4 DISPENSE TEST PROCEDURE.

4.1 MATERIAL. Fifty-five gal of material is required for testing. A second empty 55 gal drum should also be obtained for recovery of dispensed material so that it may be returned to the sealer material source.

4.2 VISCOSITY. Viscosity of the material should be verified against the value reported by the material supplier. To do this, a press-flow viscosity test shall be run on the material using the identical orifice diameter, operating pressure and material temperature that material supplier used to produce the viscosity data supplied with the material.

4.2.1 The temperature of the material used for viscosity testing should be no less than 75°F. Record the actual material temperature.

4.3 DENSITY. Using a cylinder with a volume of 10 cu in, determine the density of the material at a temperature of 77 to 78°F.

4.3.1 Determine the tare weight of the empty cylinder in grams.

4.3.2 Overfill the cylinder with material and skive off the excess. Weigh the filled cylinder and record the weight in grams.

4.3.3 Subtract the tare weight of the cylinder from the total weight of the filled cylinder then divide by 10 to determine the material density in grams per cubic inch.

4.3.4 This procedure may be run again after the material has been dispensed to determine if there has been a density change due to pumping.

4.4 TEST ENVIRONMENT. The facility that contains the test equipment and the material to be tested must be maintained at a temperature of 65°F.

4.4.1 Newly received material must stay in the conditioned room long enough to have stabilized to 65°F. It must be verified that material throughout the barrel has reached 65°F before flow data may be taken.

4.5 PUMP DISPENSE DATA. This test determines the flow rate directly from the pump outlet. Refer to Figure 1 for set-up.

4.5.1 Install transducer gauge #1, ball valve and cup catch.

4.5.2 Purge system until material flows from outlet (control switch in manual mode).

4.5.3 With the ball valve in closed position (auto mode), set the air motor to 40 PSI and record the static material pressure and corresponding stroke (down or up) onto the work sheet. Then briefly open the ball valve (manual mode) to allow the pump stroke to change direction. Close the ball valve and record the static material pressure with the corresponding stroke onto the work sheet.

4.5.4 Repeat step 4.5.3 for air motor pressures of 50, 60, 70, 80 and 90 PSI. Then deplete static pressure from system (manual mode).

4.5.5 With the material ball valve at the pump outlet in the closed position (auto mode), set the air motor to 40 Ψ .

4.5.6 Initiate the start button:

4.5.6.1 Air valve opens preadjusted air supply to the air motor and engages the pump.

4.5.6.2 Material ball valve at the pump opens

4.5.6.3 The pump will then cycle 3 times on counter #1 to stabilize the pressure and flow rate.

4.5.7 After 3 cycles from counter #1, counter #2 is activated and the following sequence occurs:

4.5.7.1 The timer engages to record the elapsed time of the dispensing pump cycles.

4.5.7.2 The catch cup engages under the material outlet flow path to collect the material dispense sample.

SEALER MATERIAL DISPENSE TEST

GM9913P

4.5.7.3 The recorder activates to collect and print the dynamic PSI data from transducer #1 at a rate of 10 data entries per second.

4.5.7.4 Counter #2 will cycle the pump for a total of 3 additional cycles. At the completion of the 3 cycles the catch cup retracts, the material ball valve closes and the air pressure is released from the air motor.

4.5.8 The weight of the collected material sample along with its elapsed dispense time is recorded onto the worksheet.

4.5.9 Repeat steps 4.5.5 through 4.5.8 for air motor settings of 50, 60, 70, 80 and 90 PSI.

4.6 ORIFICE DISPENSE DATA. This test procedure determines the flow rates and material dynamic pressures at the orifice inlet, for orifice sizes 1/4", 5/32", 1/8", 3/32", 1/16" and 3/64". Refer to Figure 2 for set up.

4.6.1 With the material ball valve in the closed position (auto mode), adjust the air motor air supply to 40 PSI and install the 1/4" orifice.

4.6.2 Initiate the start button:

4.6.2.1 The air valve opens the preadjusted air supply to the air motor and engages the pump.

4.6.2.2 The material ball valve at the pump outlet opens.

4.6.2.3 The pump cycles 3 times on counter #1 to stabilize the pressure and flow rate.

4.6.3 After 3 cycles from counter #1, counter #2 engages and the following sequence occurs:

4.6.3.1 The timer engages and records the elapsed time of the dispensing pump cycles.

4.6.3.2 The catch cup engages under the material outlet flow path to collect the dispensed sample.

4.6.3.3 The recorder begins to collect and print the dynamic pressure data from transducer #1.

4.6.4 The weight of the collected material sample along with its elapsed dispense time is recorded onto the worksheet.

4.6.5 Repeat steps 4.6.1 through 4.6.4 for air motor settings of 50, 60, 70, 80 and 90 PSI.

4.6.6 Remove the 1/4" orifice and install the 5/32" orifice.

4.6.7 Repeat steps 4.6.1 through 4.6.4 for air motor settings of 50, 60, 70, 80 and 90 PSI.

4.6.8 Repeat steps 4.6.6 and 4.6.7 for the remaining orifices.

4.7 HEADER DISPENSE DATA. This test determines the flow rates and material dynamic pressures for 1-1/2" ID x 10' long schedule 160 pipe header. Refer to Figure 3 for setup.

4.7.1 Remove the ball valve cup catch from the pump outlet.

4.7.2 Install 1-1/4" x 6' hose from the pump outlet to the header inlet.

4.7.3 Install the ball valve cup catch to the outlet of the header.

4.7.4 Install transducer gauge #2 to the inlet of the 2" header.

4.7.5 With the control switch in manual position, operate the pump and purge the header with material until it flows from the outlet.

4.7.6 With the material ball valve in the closed position (auto mode), adjust the air motor air supply to 40 PSI.

4.7.7 Initiate the start button:

4.7.7.1 The air valve opens the preadjusted air supply to the air motor and engages the pump.

4.7.7.2 The material ball valve at the pump outlet opens.

4.7.7.3 The pump cycles 3 times on counter #1 to stabilize the pressure and flow rate.

4.7.8 After 3 cycles from counter #1, counter #2 engages and the following sequence occurs:

4.7.8.1 The timer engages and records the elapsed time of the dispensing pump cycles.

4.7.8.2 The catch cup engages under the material outlet flow path to collect the dispensed sample.

4.7.8.3 The recorder begins to collect and print the dynamic pressure data from transducer #1.

4.7.9 The weight of the collected material sample along with its elapsed dispense time is recorded onto the worksheet.

4.7.10 Repeat steps 4.7.6 through 4.7.9 for air motor settings of 50, 60, 70, 80 and 90 PSI.

4.8 HEADER AND 10' HOSE DISPENSE DATA. This test determines the flow rates and material dynamic pressures for 1", 3/4", 1/2", 3/8" and 1/4" diameter hoses.

4.8.1 Remove ball valve cup catch from header outlet.

4.8.2 Install 1" x 10' hose from header outlet.

4.8.3 Install ball valve cup catch to the outlet of the 1" hose.

4.8.4 Install transducer #3 to the inlet of the 1" hose.

4.8.5 With the control switch in manual position, operate the pump and purge the header with material until it flows from the outlet.

SEALER MATERIAL DISPENSE TEST

GM9913P

4.8.6 With the material ball valve in the closed position (auto mode), adjust the air motor air supply to 40 PSI.

4.8.7 Initiate the start button:

4.8.7.1 The air valve opens the preadjusted air supply to the air motor and engages the pump.

4.8.7.2 The material ball valve at the pump outlet opens.

4.8.7.3 The pump cycles 3 times on counter #1 to stabilize the pressure and flow rate.

4.8.8 After 3 cycles from counter #1, counter #2 engages and the following sequence occurs:

4.8.8.1 The timer engages and records the elapsed time of the dispensing pump cycles.

4.8.8.2 The catch cup engages under the material outlet flow path to collect the dispensed sample.

4.8.8.3 The recorder begins to collect and print the dynamic pressure data from transducer #1.

4.8.9 The weight of the collected material sample along with its elapsed dispense time is recorded onto the worksheet.

4.8.10 Repeat steps 4.7.6 through 4.7.9 for air motor settings of 50, 60, 70, 80 and 90 PSI.

4.8.11 Remove the 1" hose and install the 3/4" x 10' hose.

4.8.12 Repeat steps 4.8.1 through 4.8.9 with this hose for each of the air motor settings of 40, 50, 60, 70, 80 and 90 PSI.

4.8.13 Repeat steps 4.8.10 through 4.8.12 for the remaining hoses.

5 SAMPLE DATA WORKSHEET.

Material Temp -

Material
Density -

Material
Viscosity -

Air Motor Pressure	40 PSI	50 PSI	60 PSI	70 PSI	80 PSI	90 PSI
Pump Static PSI	up/dn	up/dn	up/dn	up/dn	up/dn	up/dn
	/	/	/	/	/	/
Dispense Time/Wt.	s/g	s/g	s/g	s/g	s/g	s/g
Pump	/	/	/	/	/	/
Header 2"	/	/	/	/	/	/
Hose 1"	/	/	/	/	/	/
Hose 3/4"	/	/	/	/	/	/
Hose 1/2"	/	/	/	/	/	/
Hose 3/8"	/	/	/	/	/	/
Hose 1/4"	/	/	/	/	/	/
Orifice 1/4"	/	/	/	/	/	/
Orifice 5/32"	/	/	/	/	/	/
Orifice 1/8"	/	/	/	/	/	/
Orifice 3/32"	/	/	/	/	/	/
Orifice 1/16"	/	/	/	/	/	/
Orifice 3/64"	/	/	/	/	/	/

6 DISPENSE DATA CALCULATIONS.

6.1 DISPENSE CYCLE PRESSURES. After the data saved by the recorder has been printed out, determine the average dynamic pressure for each of the dispense cycle recordings by

adding the pressure entries of a designated column and dividing by the number of entries in that column.

NOTE: Each orifice/header/hose will have a separate printout for each air motor pressure setting.

SEALER MATERIAL DISPENSE TEST

GM9913P

Data #	Time(s)	Y1 (PSI)	Y2 (PSI)	Y3 (PSI)	Y4 (PSI)
110	11.0				
111	11.1				
112	11.2				
113	11.3				
114	11.4				
115	11.5				
116	11.6				
117	11.7				
118	11.8				
119	11.9				
120	12.0				
121	12.1				
122	12.2				
123	12.3				
124	12.4				
125	12.5				
126	12.6				
127	12.7				
128	12.8				
129	12.9				

Totals - Y1 = $\Sigma Y1$ Y2 = $\Sigma Y2$ Y3 = $\Sigma Y3$

Number of Entries per column = 20

Averages - Y1 avg = $\Sigma Y1/20$ Y2 avg = $\Sigma Y2/20$ Y3 avg = $\Sigma Y3/20$

6.1.1 The average of Column Y1 (Y1 avg) gives the average dispense cycle pressures for the orifices and the pump (transducer #1).

6.1.2 The average of Column Y2 (Y2 avg) gives the average dispense cycle pressure for the 2" x 10' header (transducer #2).

6.1.3 The average of Column Y3 (Y3 avg) gives the average dispense cycle pressure for each hose (transducer #3).

7 DISPENSE DATA SHEET. NOTE: Each size and type of restrictor (pump, header, hoses or orifices) will have its own Dispense Data Sheet.

Restrictor size and type –
 Material temperature –
 Material density – (H)
 Material viscosity –
 Cycle count of dispense sample: (J) = 3