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SURFACE VEHICLE RECOMMENDED PRACTICE

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METHOD FOR EVALUATING THE FLOW PROPERTIES OF PUMPABLE SEALERS

***Foreword*—**This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. ***Scope*—**This SAE Recommended Practice sets forth a method for evaluating the flow properties of automotive sealers that have been dispensed via a high pressure automatic system.

1.1 **Background—**For many years, automotive sealers were applied manually by means of an operator-held flow gun. The operator could adjust flow rates by hand speed and/or adjusting the pump pressures up or down as desired. Today, however, some sealers are applied by automated means such as robots, gantry tables, etc. To be effective, an automated system must be capable of applying material at a constant known rate. This demands that the equipment and material handling parameters remain constant, not changing from their initial setup.

2. ***References*—**There are no referenced publications specified herein.

3. ***Principle of Methods*—**This method involves dispensing a sealer through a standard production system. The material being tested is subjected to three separate dispensing conditions at a temperature of 18 °C (65 °F). The three conditions listed below simulate the typical in-plant pumping variations that can cause variability in sealer delivery rates:

a. Condition #1: The material is pressurized from zero static to 10 350 kPa (1500 psi) dynamic pressure with the resulting flow rate being measured. This simulates a "start-up" condition.
b. Condition #2: The material is pressurized under a static condition of 11 040 kPa (1600 psi) for 1 h followed by 1 h of dynamic pressure of 10 350 kPa (1500 psi) during which the material is pumped continuously followed by a flow rate determination. This simulates an accelerated, constant application of material.
c. Condition #3: The material is held under a static pressure of 11 040 kPa (1600 psi) for 24 h followed by a dynamic pressure of 10 350 kPa (1500 psi) during which the flow rate is determined. This simulates a system being left under pressure, overnight, with a subsequent start up the next day.

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4. Equipment

1 - 55 gallon drum of sealant to be tested.
1 - Air operated positive displacement pump (42:1 ratio) with an elevator, follower plate, and air pressure gage(s).
1 - Dispensing system consisting of: (see Figure 1.)

1 - (A) 31.75 mm (1-1/4 in) x 1.83 m (6 ft) hose
3 - (B) Visual test gages - 27 600 kPa (4000 psi), 345 kPa (50 psi) divisions
1 - (C) 50.8 mm (2 in) x 3.05 m (10 ft) header pipe with 31.75 mm (1-1/4 in) I.D.
1 - (D) Limit switch
1 - (E) 31.75 mm (1-1/4 in) to 50.8 mm (2 in) reducing bushing
1 - (F) 50.8 mm (2 in) pipe elbows
2 - (G) Cycle counters
1 - (H) Second timer
2 - (I) Solenoid operated three-way air valve 25.4 mm (1 in)
1 - (J) 50.8 mm (2 in) to 12.7 mm (1/2 in) reducing bushing
1 - (K) 12.7 mm (1/2 in) x 3.05 m (10 ft) hose
1 - (L) 25.4 mm (1 in) x 76.2 mm (3 in) pipe
1 - (M) Reducing bushing with commercial 4.76 mm (3/16 in) nozzle
1 - (N) 25.4 mm (1 in) air actuated ball valve
1 - (O) 25.4 mm (1 in) pipe tee
1 - (P) Cup actuator
1 - (Q) Temperature indicator (digital)
1 - (R) 50.8 mm (2 in) pipe tee
1 - Weight scale (digital)
1 - Air compressor
1 - Control panel for automatic actuators
1 - Climate control room at 18 °C (65 °F)

5. Dispensing System Assembly (See Figure 1):

5.1 Mount limit switch (D) to the pump to indicate complete up-to-down cycles.

5.2 Install the gage (B) #1 to the outlet of the pump equipment.

5.3 Attach a 31.75 mm (1-1/4 in) x 1.83 m (6 ft) hose (A) to the outlet of the pump.

5.4 Attach the other end of the hose (A) to the inlet end of 50.8 mm (2 in) header (C).

5.5 Install the gage (B) #2 to 50.8 mm (2 in) pipe tee (R) on the outlet end of 50.8 mm (2 in) header (C).

5.6 Attach a 12.7 mm (1/2 in) x 3.05 m (10 ft) hose (K) to the outlet of 50.8 mm (2 in) pipe tee (R).

5.7 Attach a 12.7 mm (1/2 in) x 3.05 m (10 ft) hose (K) to the inlet of 25.4 mm (1 in) air actuated ball valve (N).

5.8 Attach a 25.4 mm (1 in) x 76.2 mm (3 in) pipe (L) to the outlet of a 25.4 mm (1 in) air actuated ball valve (N).

5.9 Attach a 25.4 mm (1 in) pipe tee (O) to the outlet end of a 25.4 mm (1 in) x 76.2 mm (3 in) pipe (L).

5.10 Install a gage (B) #3 to the outlet end of a 25.4 mm (1 in) pipe tee (O).

5.11 Install a 4.76 mm (3/16 in) nozzle (M) to the outlet end of a 25.4 mm (1 in) tee (O).

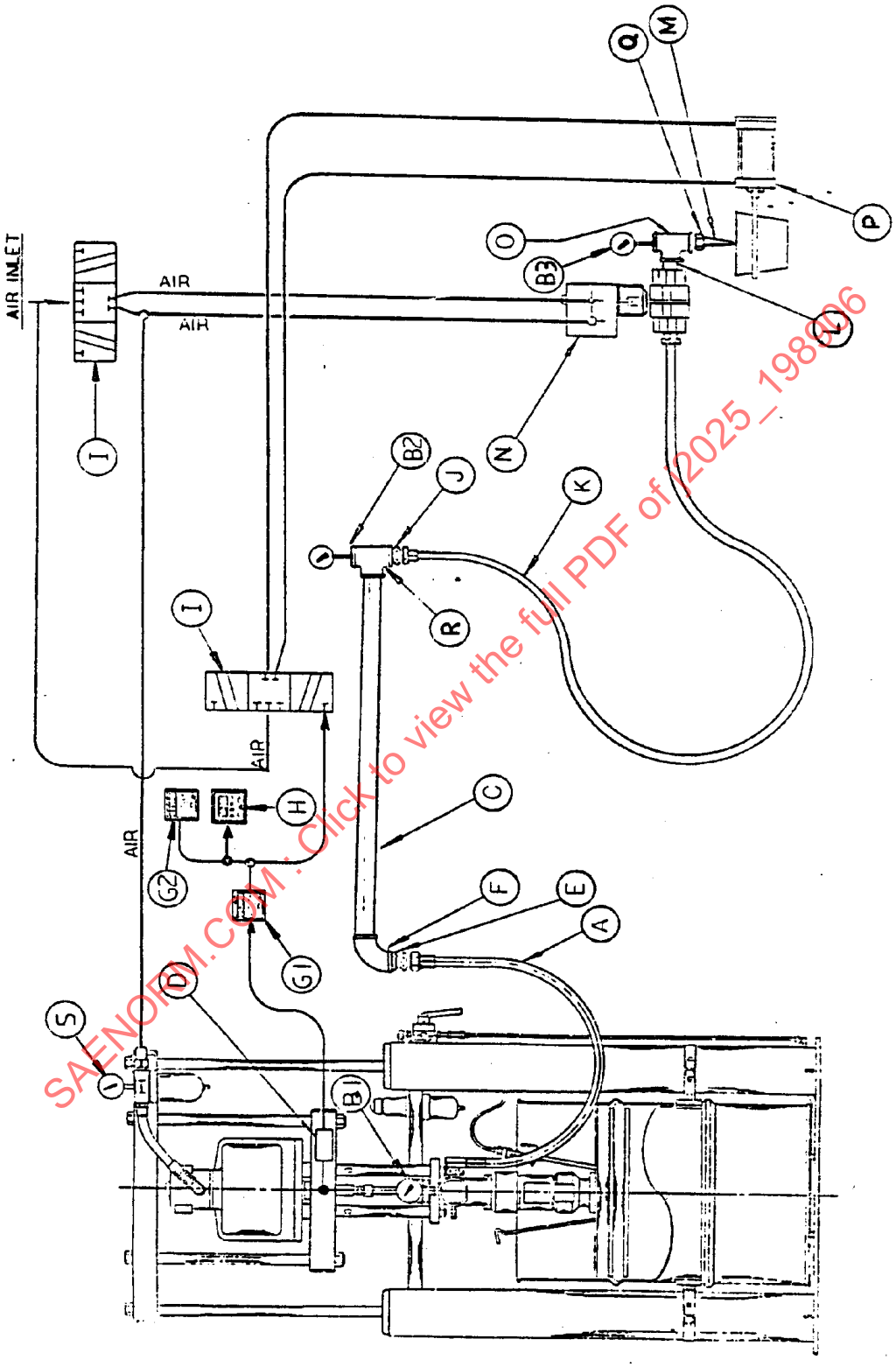

FIGURE 1—

5.12 Attach a temperature indicator (Q) to a nozzle (M).

5.13 Install and position a cup catch (P).

6. Test Procedure #1 - Start-Up Condition

6.1 Condition the material, equipment, and room to 18 °C (65 °F), or as specified, for approximately 72 h.

6.2 Purge the entire system with 5 gallons of test material.

6.2.1 While purging the material, adjust the air pressure to achieve a dynamic pressure at gage (B) #3 of 10 350 kPa (1500 psi).

6.2.2 Note what air pressure is required to the air motor on air gage (S).

6.3 At this point, relieve all pressure from the system and allow the material to stabilize for approximately 1 h.

6.4 Set the air pressure from 6.2.2 on gage (S) required for the 10 350 kPa (1500 psi) dynamic material pressure.[1]

6.5 Set the cycle counter (G) #1 to six complete cycles and counter (G) #2 to three complete cycles.

6.6 Press the start button. At this point, the following will occur:

6.6.1 The actuators to the air motor and a 25.4 mm (1 in) ball valve (N) will switch to open.

6.6.2 The limit switch (D) will count off six complete cycles to counter (G) #1.

6.6.3 Counter (G) #2 will start and count off three complete cycles. At the same time, the following will occur:

6.6.3.1 The timer (H) will turn on and record the time of the last three complete cycles.

6.6.3.2 The cup catch (P) will be actuated to catch the last three complete cycles.

6.6.3.3 After the last three complete cycles, the 25.4 mm (1 in) ball valve (N) will close allowing a static pressure to build in the system.

NOTE—The air motor will remain on.

6.7 Record the pumping information collected during the last three cycles.

6.7.1 Determine the weight of the sealer collected in the cup (P).

6.7.2 Record the time in seconds needed to pump the three cycles as shown on the timer (H).

6.7.3 Record the temperature at the nozzle as indicated by the thermocouple (Q).

6.8 Leave the air motor on for the next procedure and proceed to 7.1.

1. The air motor and material; air actuated ball valve is not actuated until the start button is pushed in. See 6.6.

7. Test Procedure #2 - Constant Application

7.1 Allow the system from 6.8 to remain pressurized in a static condition for 1 h at a pressure of 10 350 kPa (1500 psi) to 11 040 kPa (1600 psi).

7.2 Switch off the counters (G) #1 and #2.

7.3 Press the start button. At this point, the following will occur:

7.3.1 The actuator to the 25.4 mm (1 in) ball valve (N) will switch to open.

7.3.2 Dispense the material for 1 h.

7.3.3 Toward the end of the 1 h run, note the time it takes for nine complete cycles to allow sufficient time to activate the counters (G).

7.3.4 Activate the counters (G) at the predetermined point near the end of the 1 h pumping cycle.

7.3.5 The limit switch (D) will count off six complete cycles to counter (G) #1.

7.3.6 The counter (G) #2 will count off three complete cycles. At the same time, the following will occur:

7.3.6.1 Timer (H) will turn on and record the duration of three complete cycles.

7.3.6.2 The cup catch (P) will be actuated to catch three complete cycles of material.

7.3.6.3 After three complete cycles, the 25.4 mm (1 in) ball valve (N) will close allowing static pressure to build in the system.

NOTE—The air motor will remain on.

7.4 Record the pumping information collected during the last three cycles.

7.4.1 Determine the weight of the sealer collected in cup (P).

7.4.2 Record the time in seconds needed to pump the three cycles as shown on timer (H).

7.4.3 Record the temperature at the nozzle as indicated by thermocouple (Q).

7.5 Leave the air motor on for the next procedure and proceed to 8.1.

8. Test Procedure #3 - 24 Hours Static Pressure

8.1 Allow the system from 7.5 to remain pressurized in a static condition for 24 h at a pressure of 10 350 kPa (1500 psi) to 11 040 kPa (1600 psi).

8.2 Press the start button. At this point, the following will occur:

8.2.1 The actuator to the 25.4 mm (1 in) ball valve (N) will switch to open.

8.2.2 The limit switch (D) will count off six complete cycles to counter (G) #1.