Hale Products, Inc. Service Bulletins

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Product Type Covered: Hale Pump X **Class 1**

Keywords: Portable Pumps, Engines, Briggs, Air Cooled Gasoline

Product Covered:

All Hale Brigg's Air Cooled V-Twin Gasoline Engine Series Portable Pump Units

Problem Statement:

The Hale V-Twin Brigg's series portable pumping units are designed for ease in installation. For most applications, the units can be installed with very little additional design considerations. Consequently, there are some apparatus designs where additional details will need to be considered in the unit installation. The additional considerations involve engine cooling and auxiliary fuel tank installation/connection. The body of this bulletin will outline requirements and recommendations found in the Brigg's Engine Installation Manual. While the temperatures provided correspond to the Brigg's engines, these basic considerations need to be followed in all engine installations. **Failure to pay attention to the considerations and checks listed below could lead to the following product issues: significant reduction in unit performance and service life, voiding of product warranty, failure of unit to start and operate properly, as well as possible unit failure.**

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Approved by: Project Manager:

Customer Service Designee:

1. **Engine Cooling Considerations:**
   - **1.0** Generally, if the unit is installed where the engine is not enclosed and where the engine is clear of any obstructions that could prevent air flow to and from the unit, no operational issues or failures should occur in regards to engine cooling.
   - **1.1** It is important to note that an engine of only 18 HP is capable of rejecting heat of 54,000 BTU/hr which is equivalent to a furnace that is capable of heating an average size home in colder climates.
   - **1.2** **Cooling problems** typically result when a unit is fully or partially enclosed, or tucked into regions of a vehicle that prevent proper air flow to and from the unit. If the pump is to be installed under any of these parameters, the following considerations must be addressed in the apparatus design.
     - **Adequate exhaust of generated heat away from the unit.**
     - **Adequate flow of cooling air to the engine's blower housing air intake port.**
     - **Adequate supply of cool air into the engine's air intake port (located on the air filter housing).**
     - **Adequate ventilation of heated air and hazardous vapors from the unit when the unit has been shut down.**

1.2.0 **Adequate Exhaust:** The hot air being discharged from around the engine from the blower housing, must be collected and discharged away from the unit. A guideline for the minimum cross-sectional open area that will need to be provided is 1 square inch of open area per cubic inch of piston displacement for the engine: Briggs 35 HP engine displacement: 60.6 cubic inches. Thus, minimum area opening of 61 square inches.

NOTE: Most people assume that the sum of the free area in a louver or screen is equal to the total area of open space required for air intake or exhaust. This is far from the truth as louvers and screens provide resistance against air flow that a single opening does not; the smaller the screen or louvers, the greater the resistance. A good rule of thumb is that the screen and louver size should be a large as possible and that the free area of the screen or louver should be a least twice that of the minimum area opening required. Thus, in the case above the free area of the screen or louvers would need to be: (61 sq. in.) X (2) = 122 sq. in. total area.

1.2.1 **Adequate Air Intake:** The air used to cool the engine should be brought in from outside the enclosure or engine area. The guideline for the minimum cross-sectional area follows everything outlined in section 1.3.1.

1.2.2 **Adequate Air Flow into the Engine Air Intake**: The engine air intake will need to be positioned so that cool air is brought in from outside the engine area: preventing the mixing of the hot air from the engine exhaust, engine blower fan, and/or from the unit enclosure.

NOTE: Deflectors or baffles can be used to direct air flow. Also, air intake adapters can be installed on the air intake port to allow the air to be pulled in from a remote position. If installing adapters or hoses onto the air intake port, the hose inner diameter and/or adapter size should not be less than 1.5 times the inner diameter of the intake port located on the air filter housing. The bends and runs should provide minimal changes in direction so as not to restrict the air flow.

1.2.3 **Adequate Pump Compartment Ventilation:**

1.4.4.1 Ventilation of a compartment or enclosure should be at the highest portion of the compartment or enclosure. This is especially critical during the engine shut down when the flow of the cooling air is stopped.

1.4.4.2 Compartment ventilation must be set up in a way that avoids any recirculation of heated and discharged cooling air back into the cooling air flow of the engine.

1.3 Engine Cooling Check: Ideally, testing should be done in a test room with controlled ventilation, temperature, and fuel. While not ideal, the following procedure should yield desirable results:

1.3.1 Set up a fenced-in area large enough to accommodate the vehicle or unit and personnel running the test.

1.3.2 Enclose the sides of the area with wood, fabric or plastic, to shield the pumping unit from the wind. **Note**: ambient air conditions should be towards the maximum the unit will see, or as close to it as possible.

1.3.3 Fuel should be unleaded gasoline of the type used in the units application (what is available to the end user of the product and meets Briggs specifications [refer to the engine manual]).

1.3.4 Oil will need to be the oil grade required for the ambient temperature the test will be run under (refer to the engine manual).

1.3.5 Engine should have been run in for at least 10 hours under heavy load (max flow condition) prior to performing this engine cooling test.

1.3.6 Pump will need to be connected to a water supply that can provide continuous maximum flow to the unit for 60 to 90 minutes.

1.3.7 The engine will need to run at full throttle for 30 to 45 minutes until the oil temperature has stabilized (no temperature increase over a five minute period).

1.3.8 If necessary the test can be interrupted for a very brief time to refuel the unit.

1.4 MAXIMUM ALLOWABLE TEMPERATURE GUIDELINES:

Note: Temperatures listed are the allowable temperatures above the ambient air temperature to check when the cooling checks are performed (after oil temperature has stabilized).

Cooling Air:	30°F	Engine Air Intake:	45°F
Fuel in Gas Tank:	30°F	Oil in Crankcase/Sump:	210°F
Cylinder Head: (@ spark plug gasket)	430°F		

1.5 TEST METHOD CRITERIA: Note: Method to follow for cooling check.

1.5.0 The ambient (surrounding) air temperature should be measured in a location in the test area that would not be affected by the heat generated by the engine.

1.5.1 The cooling air should be measured inside the fan housing immediately upstream of the cylinder head. This insures that the air temperature measurement is the average of the various air temperatures that are being drawn into the flywheel fan.

1.5.2 The air intake temperature should be measured inside the carburetor air horn between the air cleaner and the carburetor choke. It is important that the measuring thermocouple tip not be exposed to any fuel spray that will affect the temperature reading.

1.5.3 The oil temperature should be measured directly in the crankcase or sump of the engine. The tip of the thermocouple must be immersed in the oil and be in an area where the oil is circulated. Usually, the best and most convenient location is to fasten the thermocouple just beyond the end of the oil fill dipstick that will be in the oil.

1.5.4 The cylinder head temperature is most accurately and conveniently measured with a ring-type thermocouple that replaces the spark plug gasket.

1.6 HOT RESTART TEST: This test is performed to ensure that the unit will restart after it has been run and then shut down for a short period of time (usually a 10 to 20 minute period) and then restarted.

1.6.0 The engine must be run a good 30 to 60 minutes before performing this test.
1.6.1 Place a thermocouple in the fuel in the carburetor bowl.
1.6.2 Shut the engine down and wait 10 to 15 minutes.
1.6.3 Monitor the carburetor fuel temperature during the shutdown heat soak.
1.6.4 The maximum allowable temperature of the fuel in the carburetor bowl should not exceed 80°F above ambient temperature to expect good restarts.
1.6.5 **Remember:** Hot restart ability is dependent upon the fuel system set up (gravity-feed or fuel pump), fuel type, and fuel volatility.

1.7 Design Possibilities to Enhance Unit Cooling:

1.7.0 Install an electric auxiliary fan to either pull additional cooling air into the unit compartment (or enclosure) or to push or pull hot air out of the unit compartment (or enclosure).
1.7.1 Install a vent in the top part of the unit's compartment or enclosure.
1.7.2 Create baffling to separate cooling air coming into the unit from heated air coming from the unit.
1.7.3 Move items in the compartment or enclosure to remove dead spots where heated air can be trapped.
1.7.4 Pipe the engine exhaust away from air intake and out from the compartment or enclosure.
1.7.5 Consider increasing vent holes or louver and/or area size.

2. FUEL TANK INSTALLATION:

2.0 The Briggs fuel pump installed on the engine has a lift capability of 18 inches. Thus, any fuel system which will allow the fuel level to fall below 18 inches from the fuel pump location on the engine will require the installation of an auxiliary fuel pump.
2.1 A gravity feed fuel system will require a fuel shut off valve when the unit is not running. It is required to prevent fuel from running through the carburetor and down the engine into the oil sump when transporting the unit.
2.2 When installing an auxiliary fuel pump, the **original fuel pump supplied on the engine must remain installed on the engine.** Because the Brigg's fuel pump is timed with the engine, it provides the proper pressure of fuel at the proper time. Removing the Brigg's fuel pump will prevent the engine from operating correctly.
2.3 Auxiliary fuel pumps have low lift capabilities (usually around 11 inches). Therefore, an auxiliary fuel pump must be installed just above the fuel tank and connected to the fuel pump on the engine.
2.4 The auxiliary fuel pump must have a check to prevent fuel from flowing back to the tank.
2.5 The auxiliary pump chosen cannot exceed 2 psi at the point connected to the Briggs fuel pump.
2.6 The auxiliary fuel pump must be connected to the unit starting circuit to turn on and the unit shut off circuit to shut down.