Saskatchewan Test Site
Box 1150
2215 – 8th Avenue
Humboldt, SK S0K 2A0
1-800-567-7264

Manitoba Test Site
Box 1060
390 River Road
Portage la Prairie, MB R1N 3C5
1-800-561-8378

Test Report

Project No. A20048P

Date: January 26, 2021

Client Name: Airguard Inc.

Project Title: Temperature and Humidity Testing of an Airguard Blockage Prevention System

1. Introduction

Airguard Inc. (the Client) manufactures and sells a Blockage Prevention System (BPS) heat exchanger for use with air drills. The Client tasked the Prairie Agricultural Machinery Institute (PAMI) to evaluate the Airguard BPS performance at three different humidity levels and four different temperatures.

Table 1 shows the Airguard BPS performance results measured as both a reduction in the air system plenum relative humidity (RH) and a reduction in hydraulic oil temperature. Results are specific to the test procedure conditions and equipment used as described in the test set-up and procedure section.

Table 1. Summary of humidity and hydraulic oil temperature reduction at tested ambient temperatures and relative humidity conditions.

Ambient		At Plenum Exit		Hydraulic Oil Temperature	
Temp °C (°F)	RH (%)	Temp °C (°F)	RH (%)	Inlet °C (°F)	Reduction Δ°C (Δ°F)
15 (59)	48	34 (94)	9	75 (167)	20 (36)
	83	32 (89)	22	67 (153)	19 (34)
	96	35 (95)	28	78 (172)	21 (37)
24 (75)	54	42 (107)	15	80 (176)	18 (33)
	81	40 (105)	27	81 (178)	19 (34)
	100	42 (108)	34	81 (178)	18 (33)
34 (93)	55	51 (124)	18	82 (180)	16 (28)
	79	51 (124)	27	84 (183)	16 (29)
	96	50 (123)	34	81 (178)	16 (28)
40 (104)	54	55 (130)	20	77 (171)	13 (23)
	81	57 (135)	31	83 (182)	14 (25)
	90	56 (134)	33	83 (181)	14 (25)

2. Test Set-up and Procedure

The Airguard BPS (Model 7720) was fitted onto a Morris EIGHT Series XL 370 air cart fan (**Figure 1**).

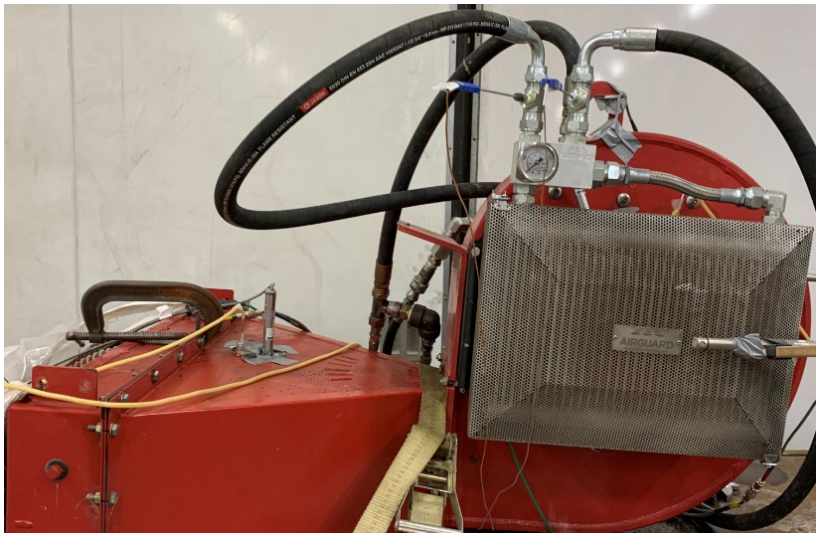

Figure 1. Airguard BPS mounted to a Morris air cart fan.

Testing was conducted in PAMI's environmental chamber, which allowed the temperature and humidity set points to be controlled as listed in **Table 1**.

Air temperature and humidity was measured and recorded with a Somat eDAQ data acquisition system at the following four locations for each trial (temperature and humidity set point):

- Airguard BPS inlet (represents the ambient air conditions)
- Fan inlet (exhaust location of the Airguard BPS heat exchanger)
- Fan Plenum
- Plenum exit point

An electrically driven hydraulic power pack unit was used as the fluid power supply to run the fan. The hydraulic oil was preheated prior to each trial to the values listed in **Table 1**. Hydraulic oil temperature was measured at the following three locations for each trial:

- Hydraulic reservoir
- Airguard BPS heat exchanger oil inlet port
- Airguard BPS heat exchanger oil outlet port

Hydraulic oil flow through the Airguard BPS was recorded using a flow meter. Hydraulic oil pressure was measured and recorded at the following three locations for each trial:

- Hydraulic supply power pack outlet
- Airguard BPS pressure gauge (drop across heat exchanger)
- Flow meter

The air speed was recorded using a vane anemometer and was measured at the Airguard BPS screen inlet.

The hydraulic oil specifications are listed as follows:

- Petro Canada Hydrex AW32 (SKU: HDXAW32DRM)
- Specific Heat at 40°C is 1.97 kj/kg.K; at 100°C is 2.17 kj/kg.K”
- Density (kg/L at 15C) is 0.8591.

Other parameters pertinent to the test criteria are listed in **Table 2**.

Table 2. Operational parameters and measured values during test trials.

Parameter	Value		Units
Fan Speed	4,840		RPM
Hydraulic Oil Flow rate	0.39 (6.25)		L/s (US GPM)
Hydraulic Supply Pressure	16.1 (2330)		MPa (PSI)
Reservoir Oil Temperature	77 (170)		°C (°F)
Oil Pressure Drop across heat exchanger	0.69 (100)		MPa (PSI)
Plenum Static Pressure	5.9 (23.8)		kPa (In H2O)
Fan inlet static pressure (post heat exchanger)	With Screen	-1.2 (-5.0)	kPa (In H2O)
	W/O Screen	-1.1 (-4.6)	
	W/O Exchanger & Screen	-0.8 (-3.2)	

3. Test Results

Findings from the test trial data (**Figure 2**) indicate a reduction in relative humidity (RH) occurs with the addition of an Airguard BPS onto the inlet of an air seeder fan. Results are dependent of test setup, equipment, and parameters selected for the trials as outlined in **Section 2**. Actual reductions will vary depending on the equipment used and operating set points. Relative humidity reduction data measured at the outlet of the fan plenum should not be assumed to be similar to that measured downstream on an air seeder.

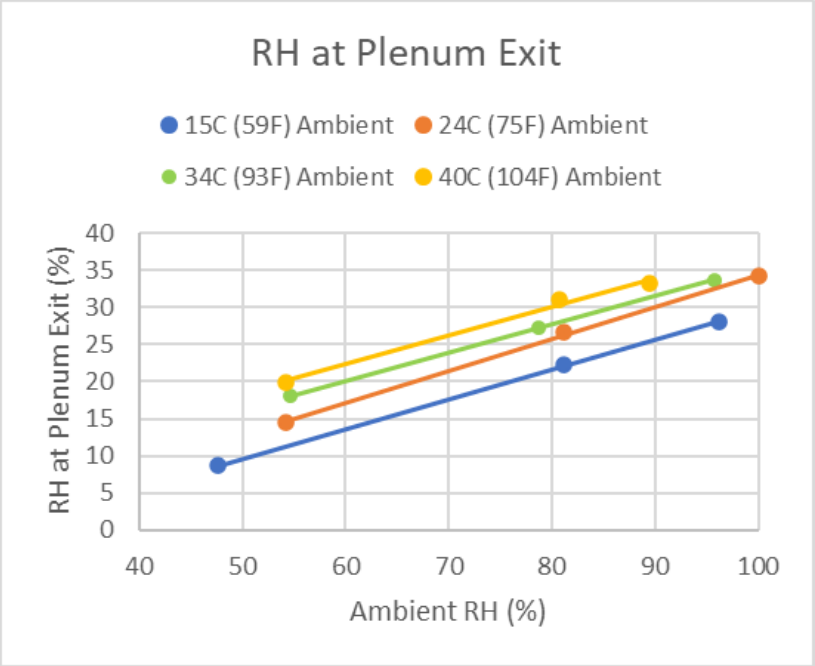

Figure 2. Relative humidity reduction measured at the plenum exit.

The Airguard BPS unit reduced the temperature of the hydraulic oil supply that is used to power the air seeder fan. **Figure 3** illustrates the cooling effectiveness at various ambient temperatures observed during testing. The average Airguard BPS inlet oil temperature during testing was 79°C (175°F). Oil-cooling capacity will be dependent on the inlet oil temperature. Results are dependent on test set-up, equipment, and parameters selected for the trials as outlined in **Section 2**.

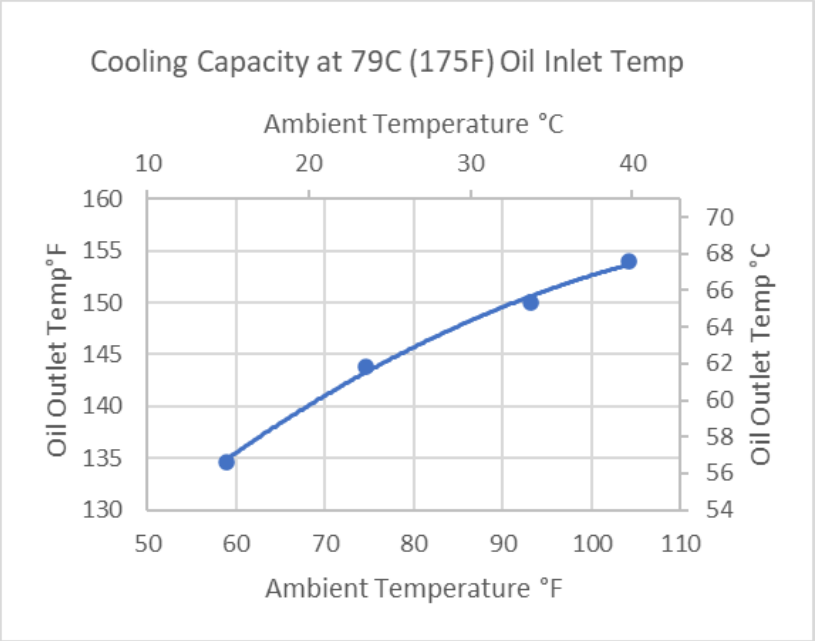

Figure 3. Airguard BPS hydraulic oil cooling capacity (at 79°C [175°F] oil inlet temp).