

Seal Strength Profile and Sealed Package Vacuum Decay Testing



**Customer
Name
1/1/2023**

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Project Summary

Project Details

Date	January 1, 2023
Customer Name	Customer Name
Address	123 Main St, Anytown OH, 12345
Contact	Customer Contact Info
Lako Technician	Technician Name
Lako Contact	+1 (419) 662-5256 7400 Ponderosa Rd, Perrysburg, OH 43552
Project Number	FT-23-0XX
Lako Estimate Number	12345
Customer PO	12345

Project Summary (continued)

Supplied Materials (continued)

Material	Description	Film Thickness	Package Dimensions
Film 1	Blue Transparent Film, Manufacturer's ID tag	0.003" [0.076 mm]	1" [25.4mm] x 2" [50.8mm] x 3" [76.2mm]

	
Film 1 – As Received	Package 1 – As Received (for reference)

Supplied Parameters

Material	Film 1
Existing Seal Profile	12Pitch
Product	Product
Current Dwell Time	Approximately 300 - 500 ms
Current Seal Temperature	350° F [177° C]
Maximum Acceptable Leak Rate	0.5 mbar·L/s

Project Summary (continued)

Scope of Work

The supplied film is to be tested for hot tack and ultimate seal strength to determine the ideal temperature to use when producing the sealed packages for the Seal Tooth Profile testing. Each of the selected seal tooth profiles will then be used to create packages using the dwell time and temperature as determined using the supplied parameters and seal strength test results.

Test Step	Test Procedure Performed
Preliminary Setup	N/A
Ultimate Seal Strength Profile	ASTM F88-00
Hot-Tack Seal Strength Profile	ASTM F1921-12
Sealed Package Vacuum Decay	ASTM F2338-09

Equipment used:

		
<p>TMI – Hot-Tack Tester and Seal Tester SL-10 75-50</p>	<p>Technopack – MS-405 Impulse Sealer</p>	<p>Inficon – Contura S400</p>

Results

Summary of Results

Seal testing was performed to find the temperature range with the highest Hot Tack strength and Ultimate Seal Strength. The Ultimate Seal Strength consistently increased with the increasing temperature, while the Hot Tack Strength was highest between 265° F [129.4° C] and 295° F [146.1° C].

Packages were then made for vacuum testing using 220 msec dwell time, 1 inch seal width, 50 psi seal pressure, a selection of seal profiles, and the range of temperatures determined to have the best seal strength. This testing measures leak rates, with the target leak rate of less than 0.050 mbar·L/s per Lako standards.

Most of the tested packages had a leak rate around 1 mbar·L/s, and none of them were below the target leak rate. The results did not conclusively indicate that the leak rate was significantly impacted by seal temperature.

Recommendation

Lako's recommendation for this film is to use a moderately aggressive seal profile (such as Lako's H68) and high temperatures and pressures to achieve the best results.

Results (continued)

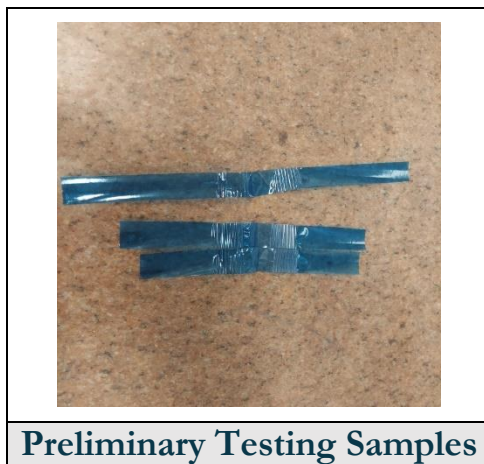
Preliminary Testing Details

Preliminary Setup Testing Details:

Sample Width	Dwell Time	Pressure
1" [25mm]	500 ms	40 psi

Preliminary Setup Testing Results:

Material	Temperature	Observations
Film 1	200° F [93° C]	Film did not seal fully
	250° F [121° C]	Film sealed with no distortions
	300° F [149° C]	Film melted



Preliminary Setup Testing Summary:

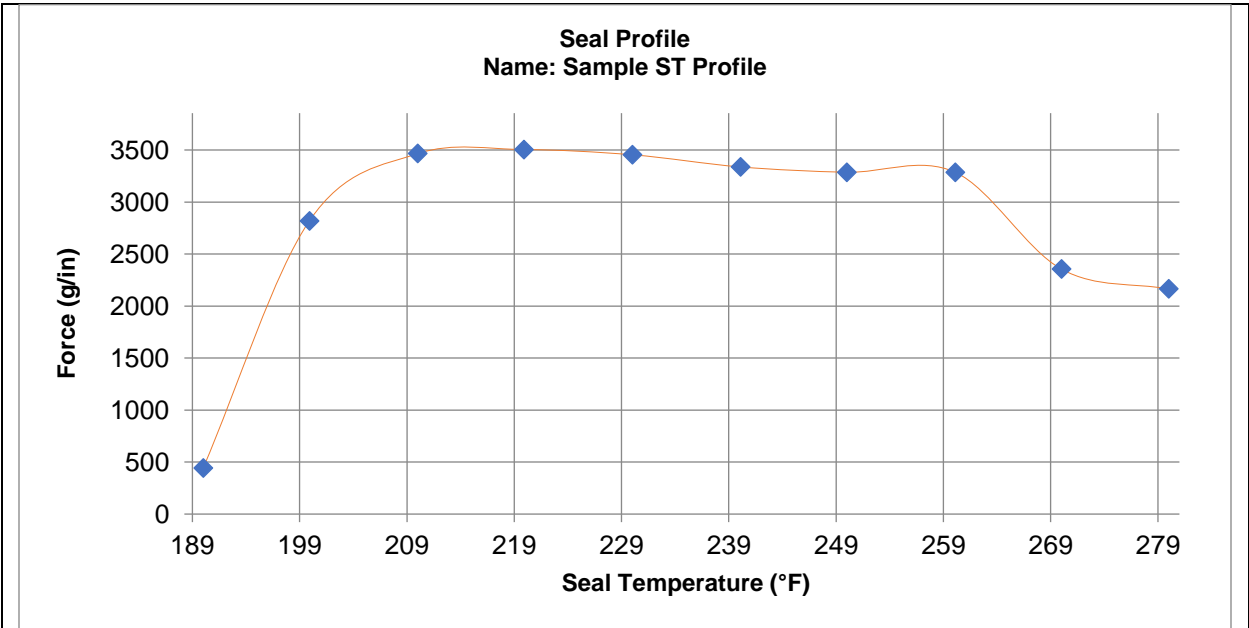
Based on observations from the preliminary testing, the recommended temperature range for Seal Strength Profile Testing is **190° F to 280° F** [88° C to 138° C].

Results (continued)

Ultimate Seal Strength Profile Test

Machine Details:

Title:	Sample Test	Name:	Est 12345 FT-01-023 Sample Test
Machine S/N:	SL10S131102	Date:	01/01/2023 12:00:00 AM
Laboratory Temp:	74°F [23.3°C]	Operator:	XXX
Laboratory Humidity:	45%	Material:	Clear Film 0.003"
Upper Starting Temp:	190.0 °F [88° C]	Lower Starting Temp:	190.0 °F [88° C]
Upper Ending Temp:	280.0 °F [138° C]	Lower Ending Temp:	280.0 °F [138° C]
Seal Length:	1.000 in	Pressure Request:	40.0 PSI
Seal Width:	0.375 in	Jaw Pattern:	Steel Upper/ Steel Lower
Dwell Time:	0.500 sec	Peel Velocity:	0.20 in/sec
Cool Delay:	20.00 sec	Selection Method:	Peak



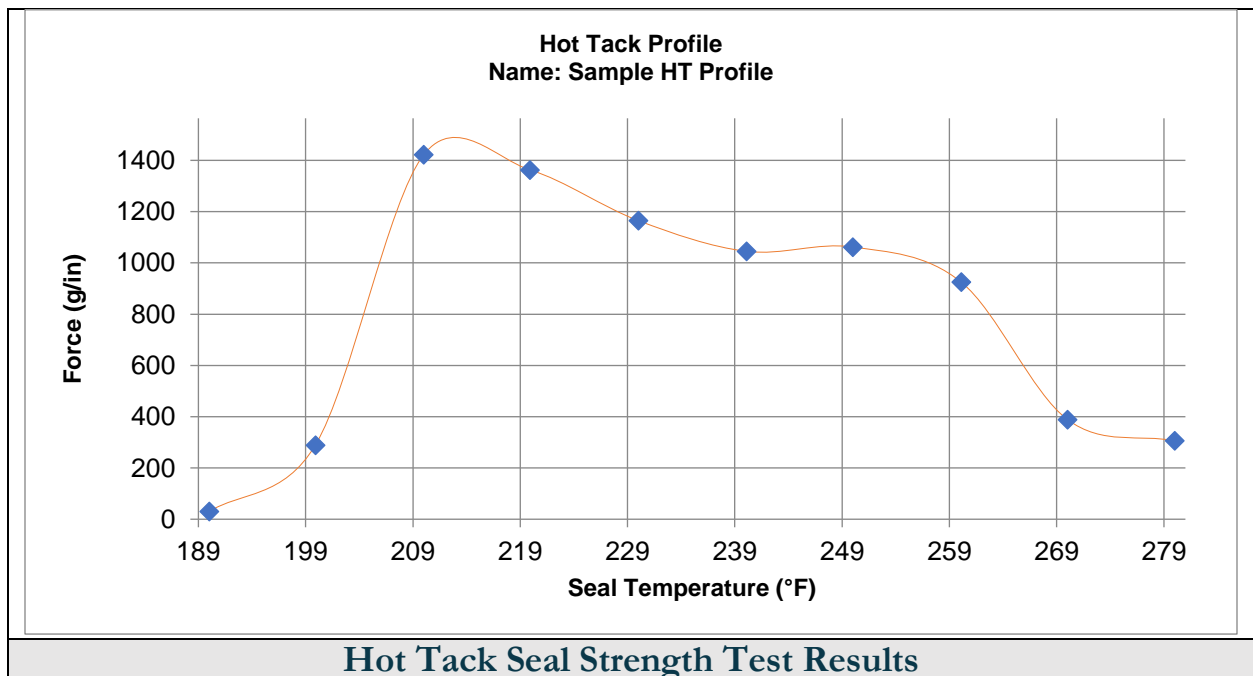
Ultimate Seal Strength Test Results

Results (continued)

Hot Tack Seal Strength Profile Test

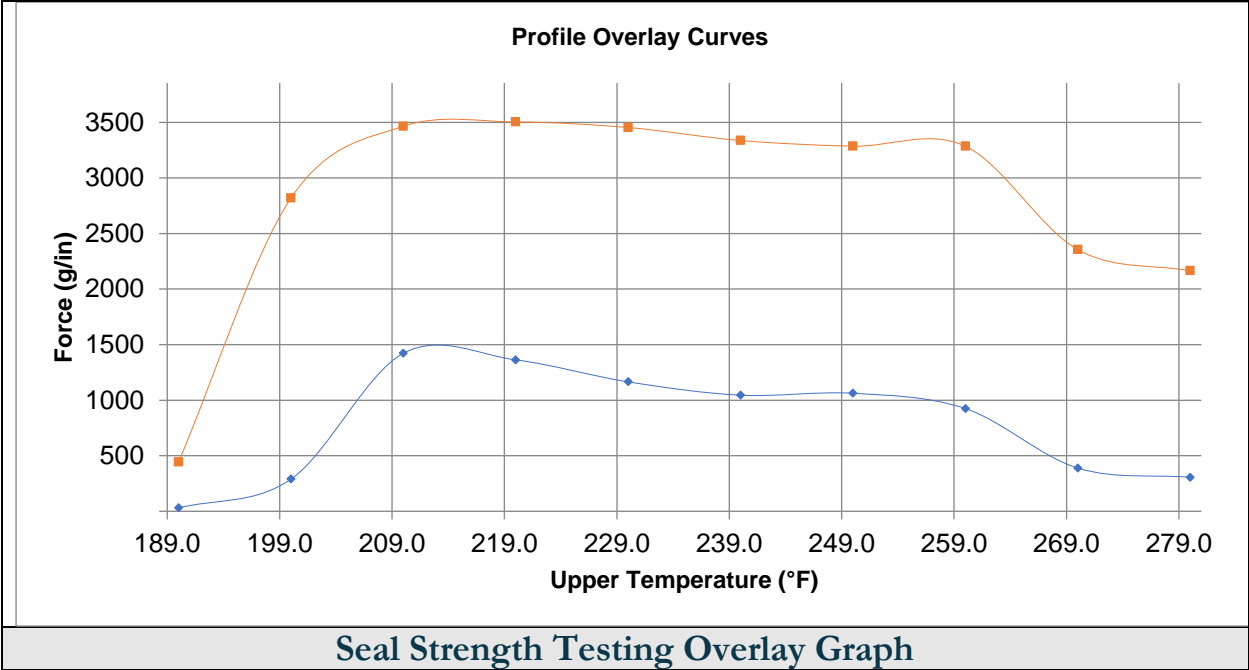
Machine Details:

Title:	Sample Test	Name:	Est 12345 FT-01-023 Sample Test
Machine S/N:	SL10S131102	Date:	01/01/2023 12:00:00 AM
Laboratory Temp:	74°F [23.3°C]	Operator:	XXX
Laboratory Humidity:	45%	Material:	Clear Film 0.003"
Upper Starting Temp:	190.0 °F [88° C]	Lower Starting Temp:	190.0 °F [88° C]
Upper Ending Temp:	280.0 °F [138° C]	Lower Ending Temp:	280.0 °F [138° C]
Seal Length:	1.000 in	Pressure Request:	40.0 PSI
Seal Width:	0.375 in	Jaw Pattern:	Steel Upper/ Steel Lower
Dwell Time:	0.500 sec	Peel Velocity:	0.20 in/sec
Cool Delay:	Immediate	Selection Method:	Peak



Results (continued)

Seal Strength Testing Overlay Graph and Sample Photos



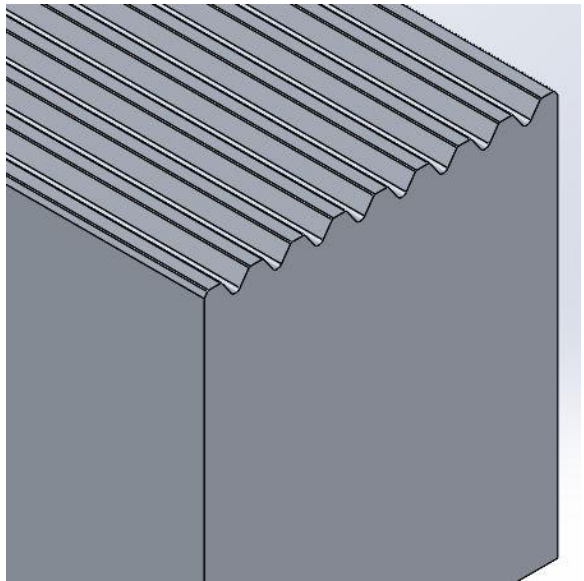

Tested Ultimate Seal Strength Samples

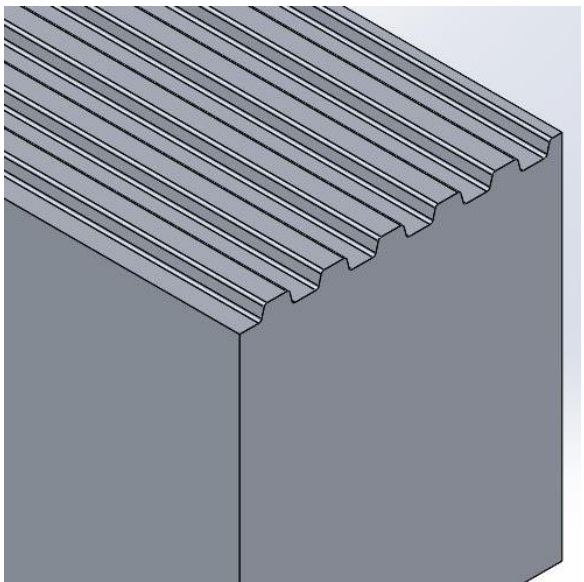



Tested Hot Tack Seal Strength Samples

Results (continued)

Seal Tooth Profile Examples

	
<p>Lako Seal Profile #H68</p>	<p>Package Seal – Profile #H68</p>

	
<p>Lako Seal Profile #H181</p>	<p>Package Seal – Profile #H181</p>

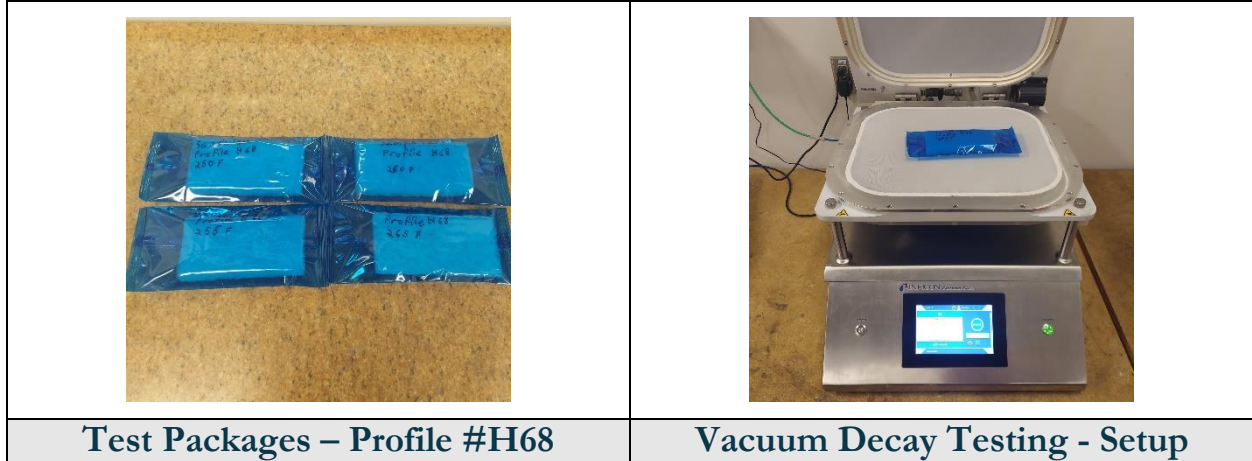
Results (continued)

Vacuum Decay Testing

Material	Profile #	Temp °F	mbar·l/s	Notes
Film #1	H68	210 °F [99° C]	0.467	None
		215 °F [102° C]	0.009	None
		220 °F [104° C]	0.010	None
		225 °F [107° C]	0.628	None

Results (continued)

Vacuum Decay Testing (continued)



Sealed Package Testing Summary

During sealed package testing, seal profiles H181 and H68 were used along with Film 1 to create packages to be tested for hermetic seals in the Contura S400 and then tested for their ability to withstand pressure in the Pack-Vac tank. During this testing, the H181 was able to achieve a hermetic seal at lower temperatures and pressures than the H68 profile.

All testing was completed at LAKO. Equipment and operating conditions vary greatly between the LAKO lab and the client's facility and can be expected to account for some variation in the results achieved at LAKO.