THERM-A-GAP^{TM} PAD70TP Reliability Report

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Executive Summary

THERM-A-GAP^{TM} PAD70TP is a high performance, highly conformable thermally conductive gap filler pad with 7.0 W/m-K thermal conductivity. It provides superior thermal performance and long-term stability over conventional thermal pads with very low compression force. This document outlines the examination of the physical and thermal reliability of this high performance gap filler.

Samples of manufacturing batches of THERM-A-GAP^{TM} PAD70TP were subjected to long term environmental aging under dry heat conditions, as well as thermal impedance versus thickness, compression versus deflection.

THERM-A-GAP^{TM} PAD70TP exhibits superior long term physical and thermal reliability. This material demonstrates resistance to the thermal oxidative degradation associated with continuous application temperatures of up to 125℃.

TABLE OF CONTENTS

1.0 Introduction

1.1 Purpose

The purpose of the document is to explain the mechanical and environmental tests and the corresponding measurements that were performed on samples of Chomerics thermally conductive gap filler THERM-A-GAP ™ PAD70TP.

1.2 Sample Set-Up Summary

The samples were tested at a thickness of 0.100 inches (2.5 mm). The thermal impedance and compression as a factor of pressure were measured for each sample.
The measurements were taken initially and after heat aged processes. The heat aged processes were steady temperature at room temperature, 85°C/85RH,125°C.

2.0 Steady Temperature Test

2.1 Purpose

The purpose of the steady temperature test is to ensure the reliabilityof the samples after exposure to a range of air temperatures.

2.2 Procedure

The samples were placed into the test chambers at room temperature,85°C/85RH,125°C for 1000 hours. After the 16 hours, the first set of samples were taken out of the aging environment and left at room temperature. Measurements of three of the samples for each thickness were taken after a minimum of 2 hours. The process was repeated after 144, 300,500, and 1000 etal. hours.
After the 24hrs hour recovery period, the final measurements were taken in a laboratory environment to test for the normal performance of the samples.

2.3 Acceptance Criteria

Minimal visible decomposition will be allowed. The acceptable level of decomposition is to be defined. Mechanical decomposition is allowed as long as the material still remains within specification after testing. Thermal decomposition is allowed as long as the material still remains within specification after testing.

2.4 Sample Preparation

For thermal properties test, samples were cut to 1.3inch diameter discs before aging and for compression deflection test， samples were cut to 0.5inch diameter discs before aging. Samples were spread out and not stacked during aging.

2.5 Thermal Properties

Three samples were tested at 50°C and 20PSI of pressure for each aging condition per ASTM D5470. TIM tester as figure1.

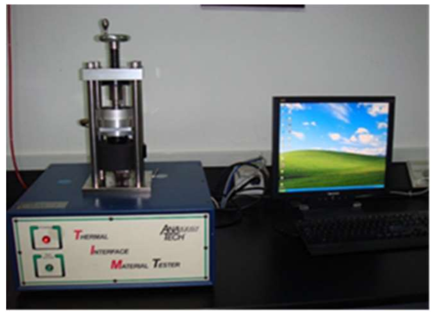


Fig.1. TIM tester

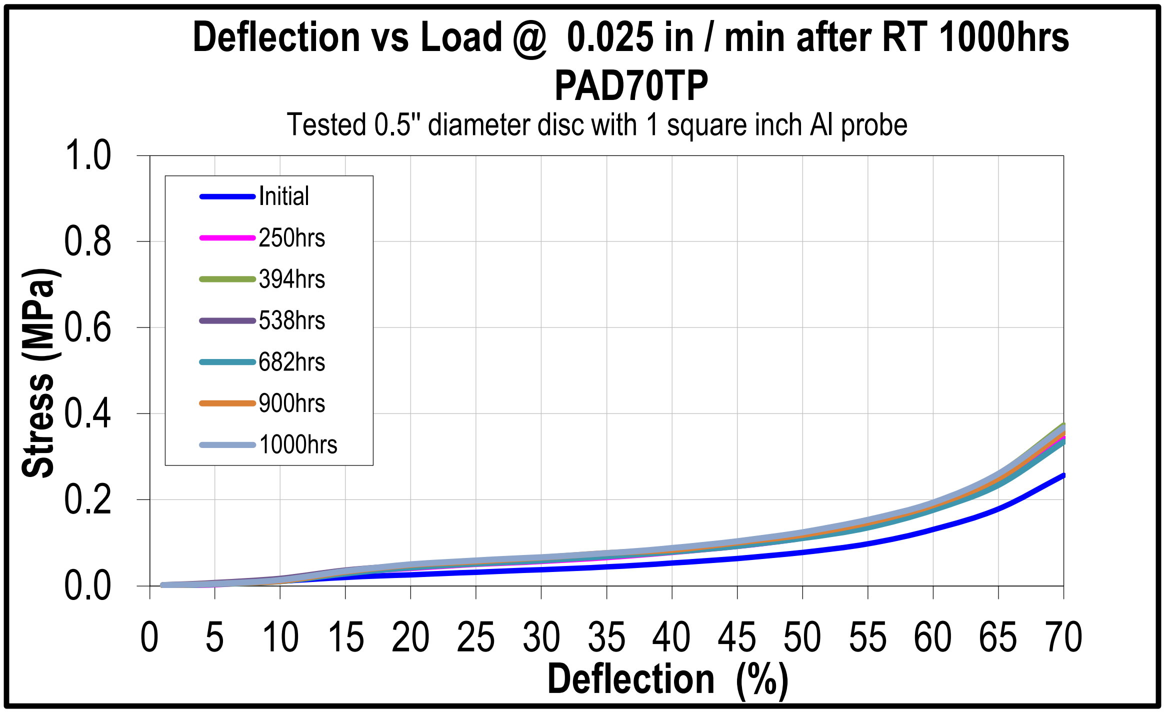
2.6 Compression Deflection

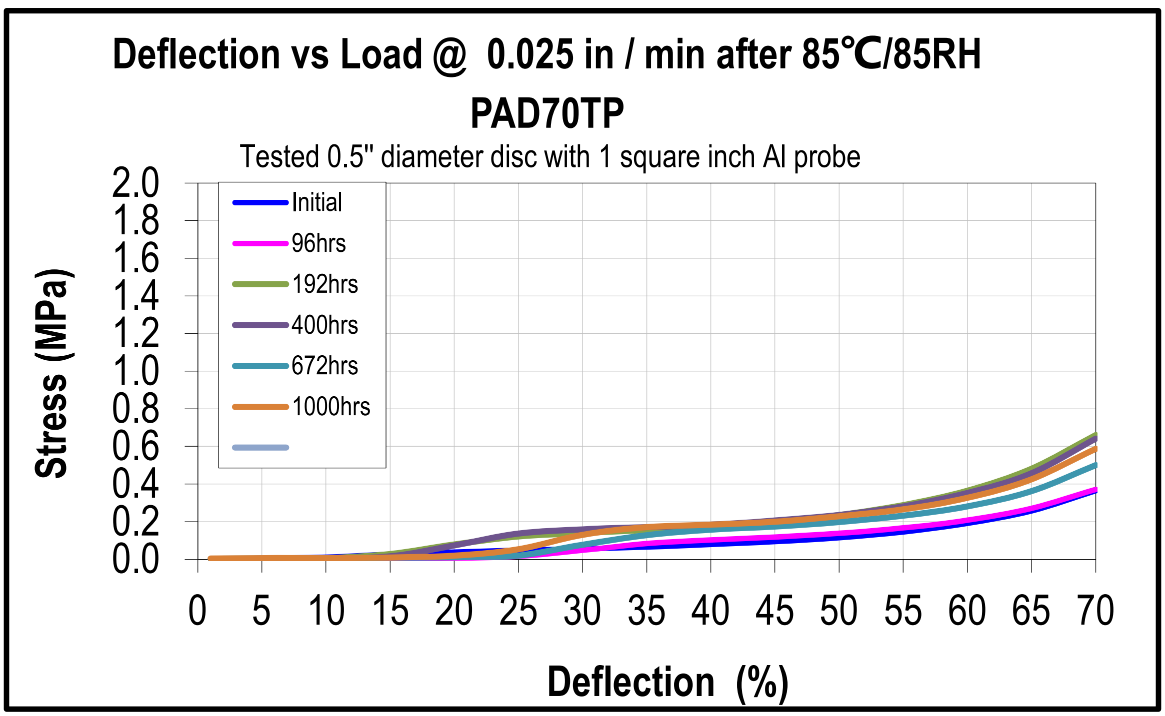
Samples were tested in a laboratory environment on a Texture Analyzer (from Texture Technologies) Three samples were tested for each aging condition. Samples were tested at 0.025 in/min（or 1inch/min for HW method） up to 50% deflection, the limit of the load cell. TA tester as figure2.

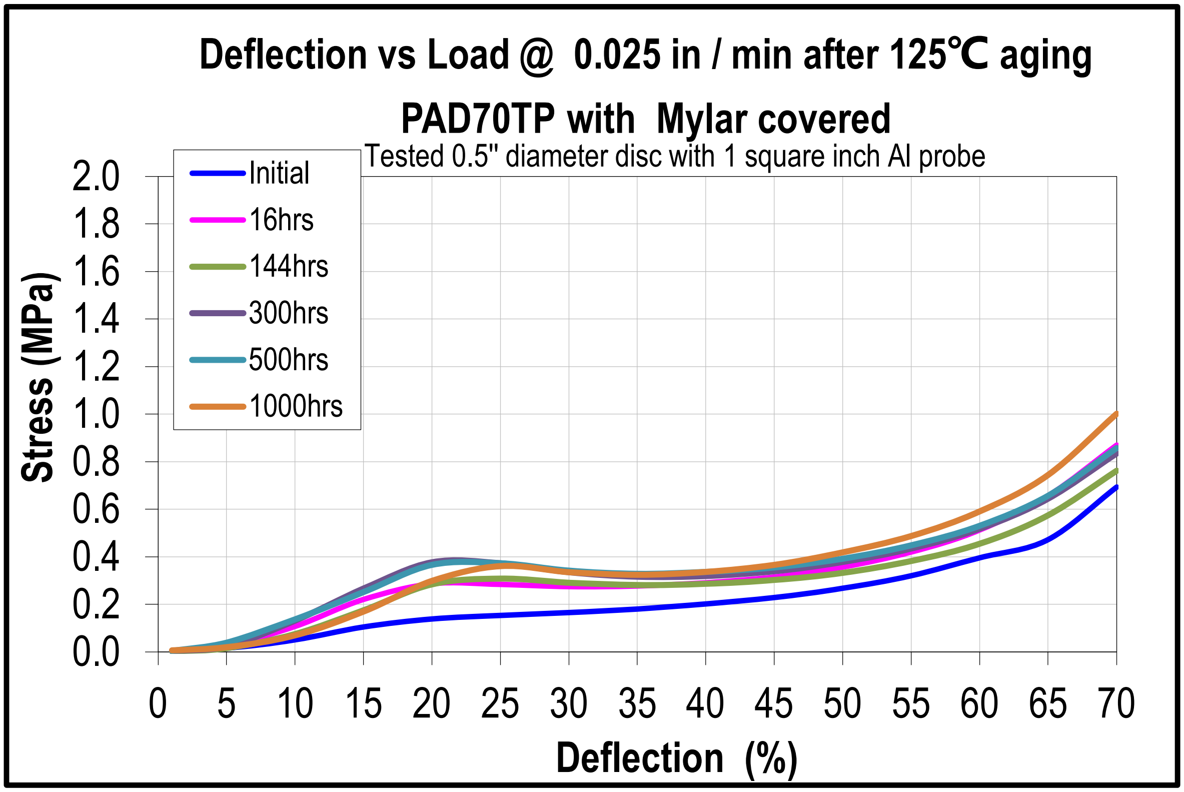
Fig.2. TA tester

3.0 Results

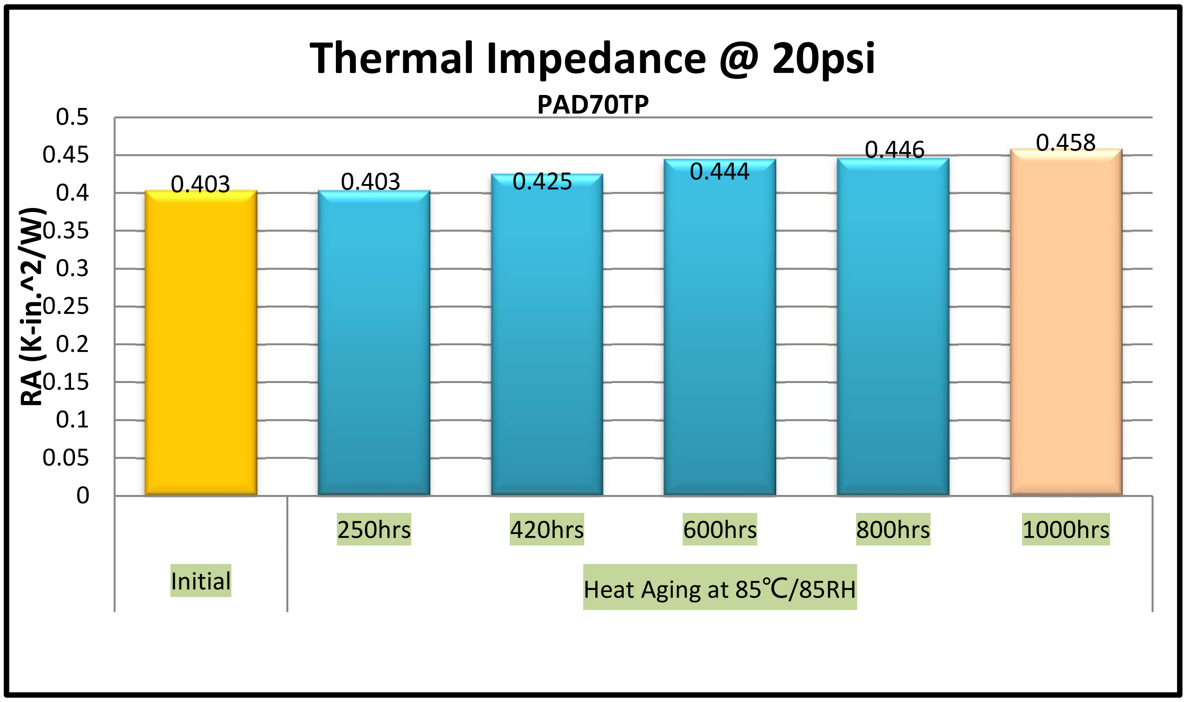
3.1 Compression Deflection






Deflection vs Load @ 0.025 in / min after 125℃ aging
PAD70TP with Mylar covered
Tested 0.5" diameter disc with 1 square inch Al probe
Initial
16hrs
144hrs
300hrs
500hrs
1000hrs
Stress (MPa)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70
Deflection (%)

3.2 Thermal Impedance change

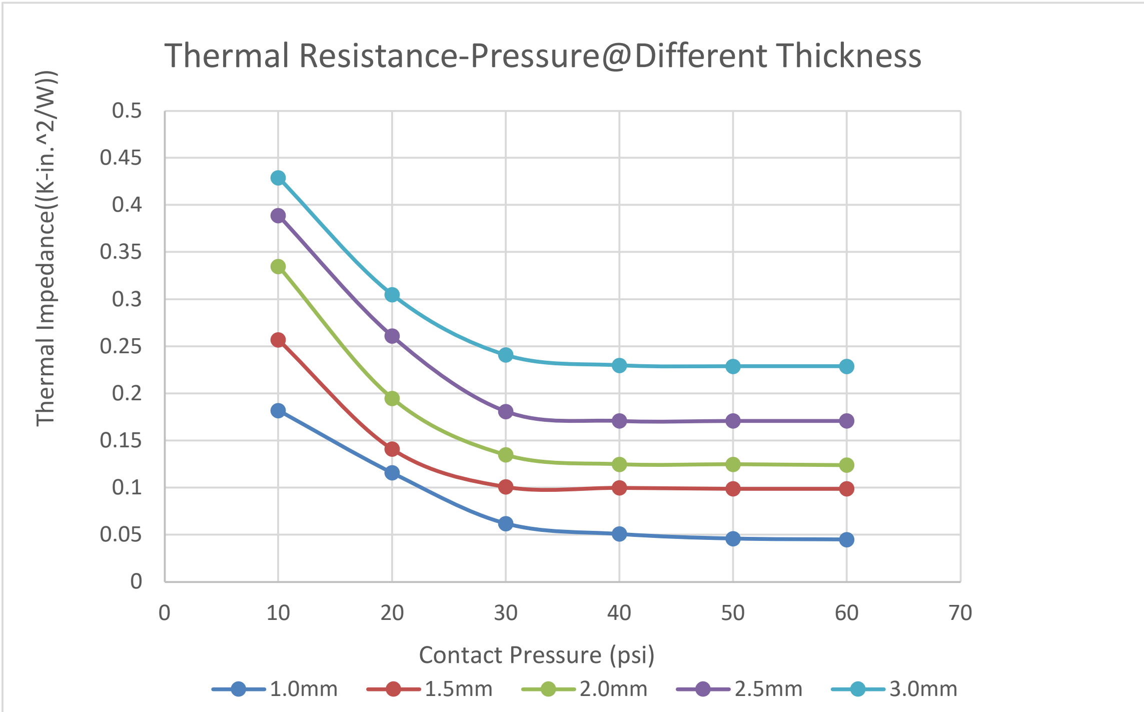


A Thermal impedance was tested according to ASTM5470

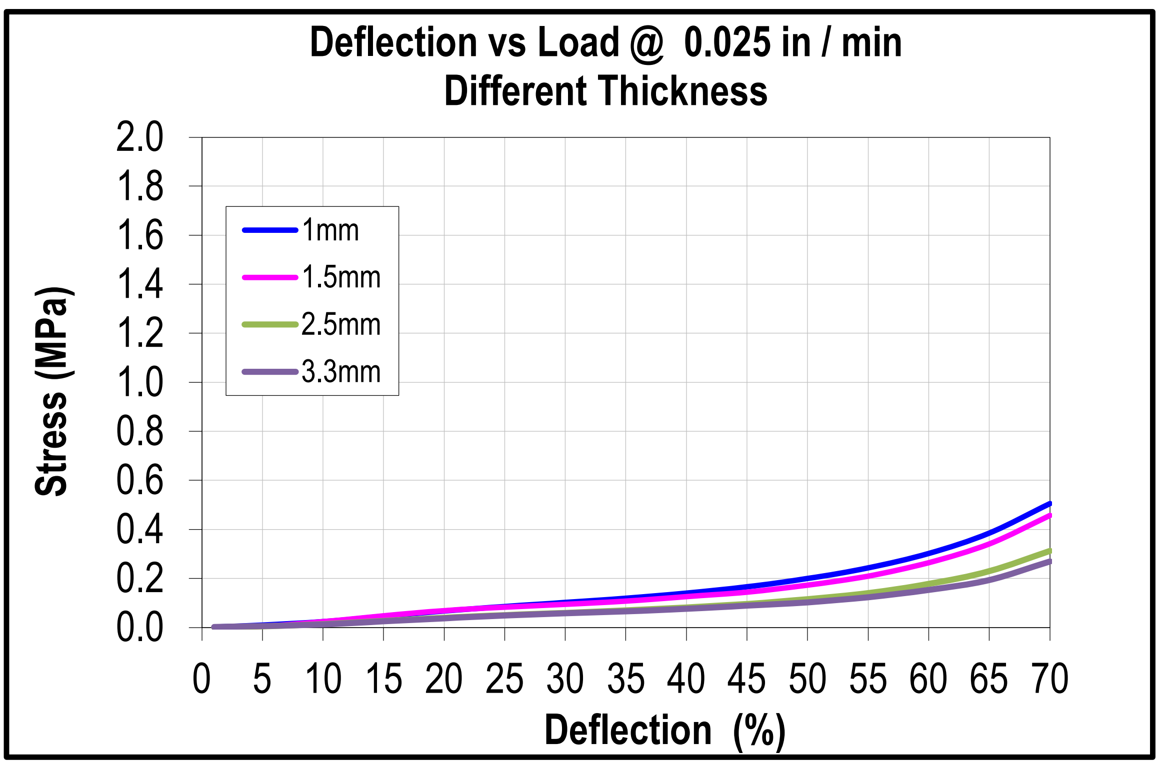
3.3 Shore OO Hardness

Aging time (Hrs)	Hardness (Shore OO) Room temperature Conditioning	Hardness (Shore OO) After 1000hours 85°C/85R.H. aging
0	15.00	15.00
120	24.33	30.00
240	27.00	33.67
360	27.67	31.67
720	28.00	36.00
840	27.67	36.00
1000	28.67	39.33

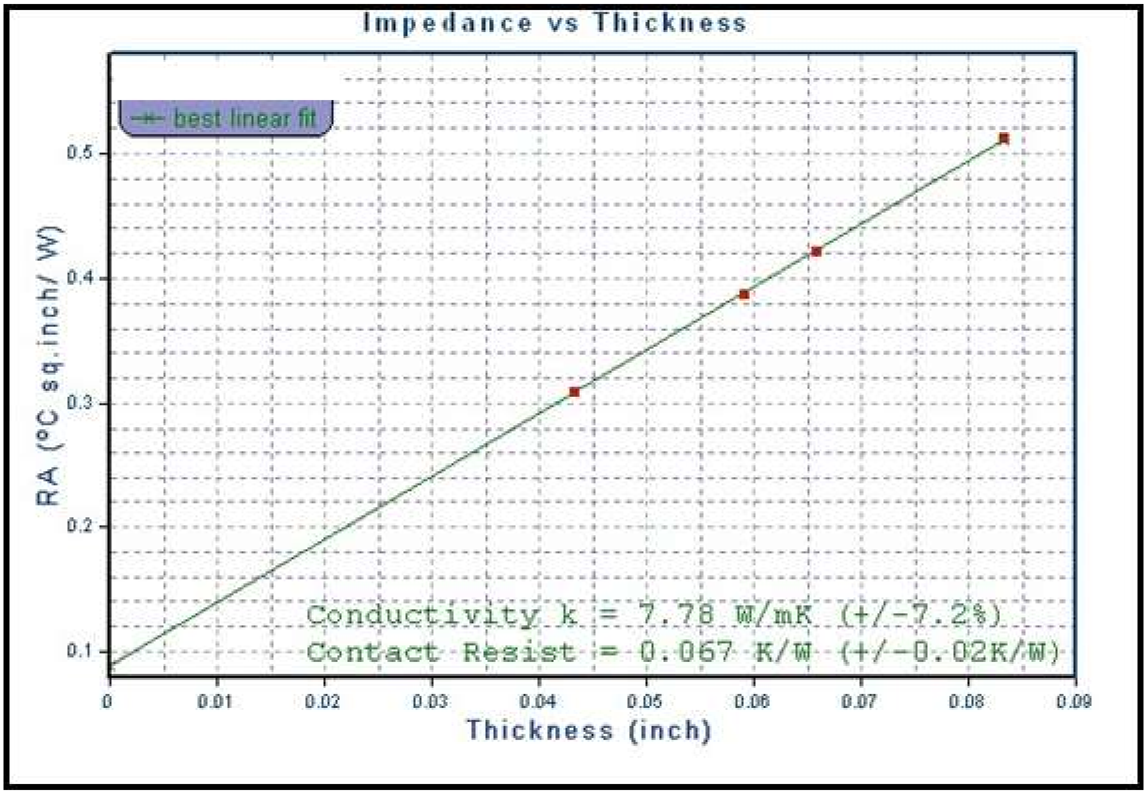
Footnote:
The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.



Appendix A: Thermal Impedance vs Different Pressure



Appendix B: Compression Deflection –Different Thicknesses



Appendix C: Thermal Impedance @10psi vs Different Thickness