



Abrasion Study on Naizil Coated Fabrics

Abstract

Naizil has various formulations to combat abrasion damage. The most advanced of these formulations is available in the **HA (High Abrasion)** or **WR (Wear Resistant)** series fabrics. The coating compound used in these products protects the base fabric 4 times more than the standard compound.

Purpose

To compare the abrasion resistance between the following 3 products:

1. Dock Seal- 40oz (Standard formulation coating)
2. NAI-1500-G- 42oz (Grafted, harder formulation coating)
3. **NAI-1500-WR- 42oz (Advanced abrasion resistance coating)**

Materials in Study

	Dock Seal 40oz	NAI-1500-G 42oz	NAI-1500-WR 42oz
Initial Mass (g/[1/100]m)	13.28	14.81	14.05
Thickness of Fabric (mm)	1.21	1.29	1.36
Thickness of Coating (mm)	1.00	1.00	1.10
Color of Coating	Black	Blue	Black

Methodology

The abrasion testing was carried out at Naizil Inc using an internal specified method. Materials and equipment include:

Machine	Aquati Abrasimeter
Sandpaper Type	Gator Grit 40 Aluminum Oxide
Evaluation of Fabric	Every 500 Cycles
Sandpaper Change	Every 1000 Cycles
Mass Pressure on Fabric	2 kg



Abrasimeter



Sandpaper Surface

A cutout of the sandpaper is placed at the head of the abrader. The sample is held above the abrader head and pressed against it with a 2 kg weight. The abrader rotates spirally for 500 cycles and the fabric is then measured for mass loss and inspected visually. The sandpaper was replaced every 1000 cycles. The sample fabrics were abraded until the base fabric was visibly evident.

To view video follow the link: <https://www.youtube.com/watch?v=cLZna8EwZgY>

Results

1. Dock Seal 40

1.1 Table Representation

Cycles	Mass	Mass Change	% Change	Thickness (mm)
0	13.28	0.00	0	1.21
500	12.90	-0.38	-2.86%	
1000	12.65	-0.25	-1.94%	
1500	12.23	-0.42	-3.32%	
2000	11.89	-0.34	-2.78%	
2500	11.49	-0.40	-3.36%	
3000	11.19	-0.30	-2.61%	
3500	10.83	-0.36	-3.22%	
4000	10.53	-0.30	-2.77%	
4500	10.15	-0.38	-3.61%	
5000	9.79	-0.36	-3.55%	0.74

1.2 Before and After



Start of Test



5000 Cycles

1.3 Result interpretation

For the standard Dock Seal 40oz fabric, it took 5000 rotational cycles with 5 sandpaper substitutions to expose the fabric in the centre where the highest amount of abrasion occurs. You can see the base fabric in the picture to the right.

2. NAI-1500-G 42

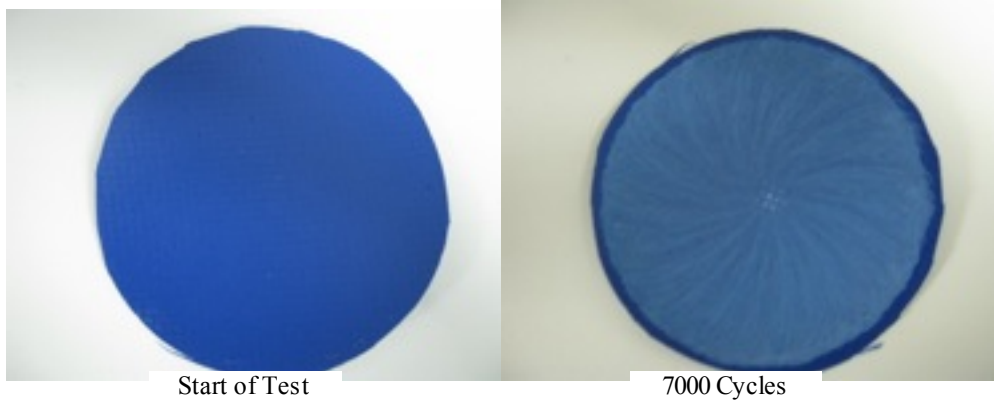
Note about the NAI-1500-G fabric:

The compound used for this fabric is a “grafted” type formulation. Cross linking type additives are used to harden the plastisol. This provides for improved abrasion resistance.

2.1 Table Representation

Cycles	Mass	Mass Change	% Change	Thickness (mm)
0	14.81	0.00	0	1.29
500	14.44	-0.37	-2.50%	
1000	14.15	-0.29	-2.01%	
1500	13.83	-0.32	-2.26%	
2000	13.54	-0.29	-2.10%	
2500	13.25	-0.29	-2.14%	
3000	13.02	-0.23	-1.74%	
3500	12.72	-0.30	-2.30%	
4000	12.45	-0.27	-2.12%	
4500	12.16	-0.29	-2.33%	
5000	11.85	-0.31	-2.55%	
5500	11.55	-0.30	-2.53%	
6000	11.21	-0.34	-2.94%	
6500	10.95	-0.26	-2.32%	
7000	10.68	-0.27	-2.47%	0.74

2.2 Before and After



2.3 Result Interpretation

For the NAI-1500-G 42oz fabric, it took 7000 rotational cycles with 7 sandpaper substitutions to expose the fabric in the centre where the highest amount of abrasion occurs. You can see the base fabric in the picture to the right.

3. NAI-1500-WR

Note about the “HA – WR” Series Compound

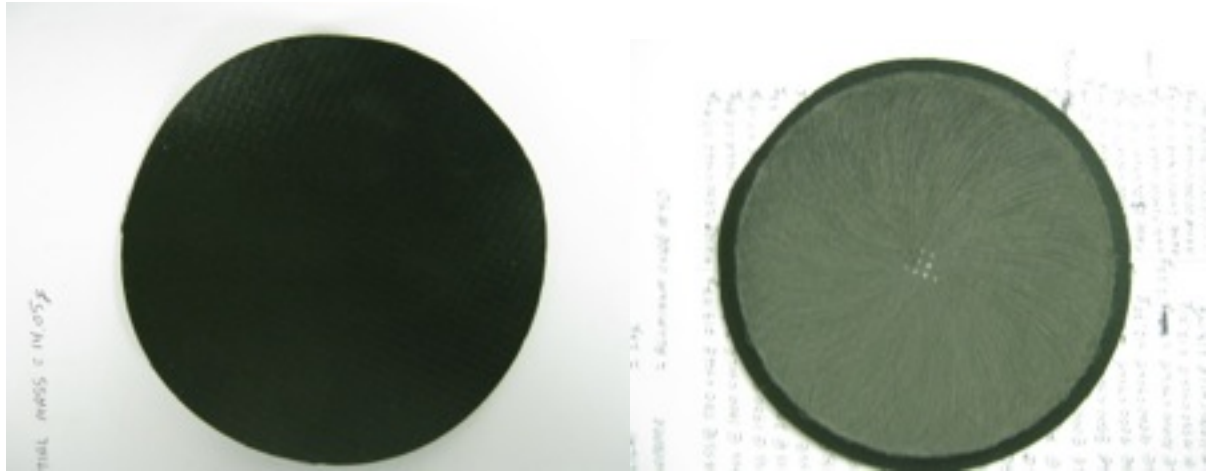
The compound used for our **HA** or **WR** series fabrics was designed to have a high slip at the surface of the material. The compound is also harder. The combination of high slip and hardness makes the surface less susceptible to abrasion. For example, if you take a coin and try to rub the surface, it is difficult to tear into the coating. This type of resistance significantly improves the abrasion resistance.

3.1 Table Representation

Cycles	Mass	Mass Change	% Change	Thickness (mm)
0	14.05	0.00	0	1.36
500	13.97	-0.09	-0.64%	
1000	13.88	-0.08	-0.58%	
1500	13.80	-0.10	-0.72%	
2000	13.70	-0.10	-0.73%	
2500	13.60	-0.09	-0.66%	
3000	13.51	-0.08	-0.59%	
3500	13.43	-0.09	-0.67%	
4000	13.34	-0.10	-0.75%	
4500	13.24	-0.08	-0.60%	
5000	13.16	-0.09	-0.68%	
5500	13.07	-0.08	-0.61%	
6000	12.99	-0.10	-0.77%	
6500	12.89	-0.09	-0.70%	
7000	12.80	-0.10	-0.78%	
7500	12.70	-0.09	-0.71%	
8000	12.61	-0.10	-0.79%	
8500	12.51	-0.07	-0.56%	
9000	12.44	-0.09	-0.72%	
9500	12.35	-0.08	-0.65%	

10000	12.27	-0.06	-0.49%	
10500	12.21	-0.07	-0.57%	
11000	12.14	-0.06	-0.49%	
11500	12.08	-0.08	-0.66%	
12000	12.00	-0.06	-0.50%	
12500	11.94	-0.05	-0.42%	
13000	11.89	-0.06	-0.50%	
13500	11.83	-0.06	-0.51%	
14000	11.77	-0.11	-0.93%	
14500	11.66	-0.06	-0.51%	
15000	11.60	-0.08	-0.69%	
15500	11.52	-0.07	-0.61%	
16000	11.45	-0.06	-0.52%	
16500	11.39	-0.09	-0.79%	
17000	11.30	-0.05	-0.44%	
17500	11.25	-0.06	-0.53%	
18000	11.19	-0.13	-1.16%	
18500	11.06	-0.07	-0.63%	
19000	10.99	-0.07	-0.64%	
19500	10.92	-0.05	-0.46%	
20000	10.87	-0.10	-0.92%	
20500	10.77	-0.08	-0.74%	
21000	10.69	-0.14	-1.31%	
21500	10.55	-0.11	-1.04%	
22000	10.44	-0.09	-0.86%	
22500	10.35	-0.09	-0.87%	
23000	10.26	-0.08	-0.78%	
23500	10.18	-0.08	-0.79%	
24000	10.10	-0.08	-0.79%	
24500	10.02	-0.08	-0.80%	
25000	9.94	-0.10	-1.01%	
25500	9.84	-0.09	-0.91%	
26000	9.75	-0.09	-0.92%	0.74

2.2 Before and After



Start of Test

26000 Cycles

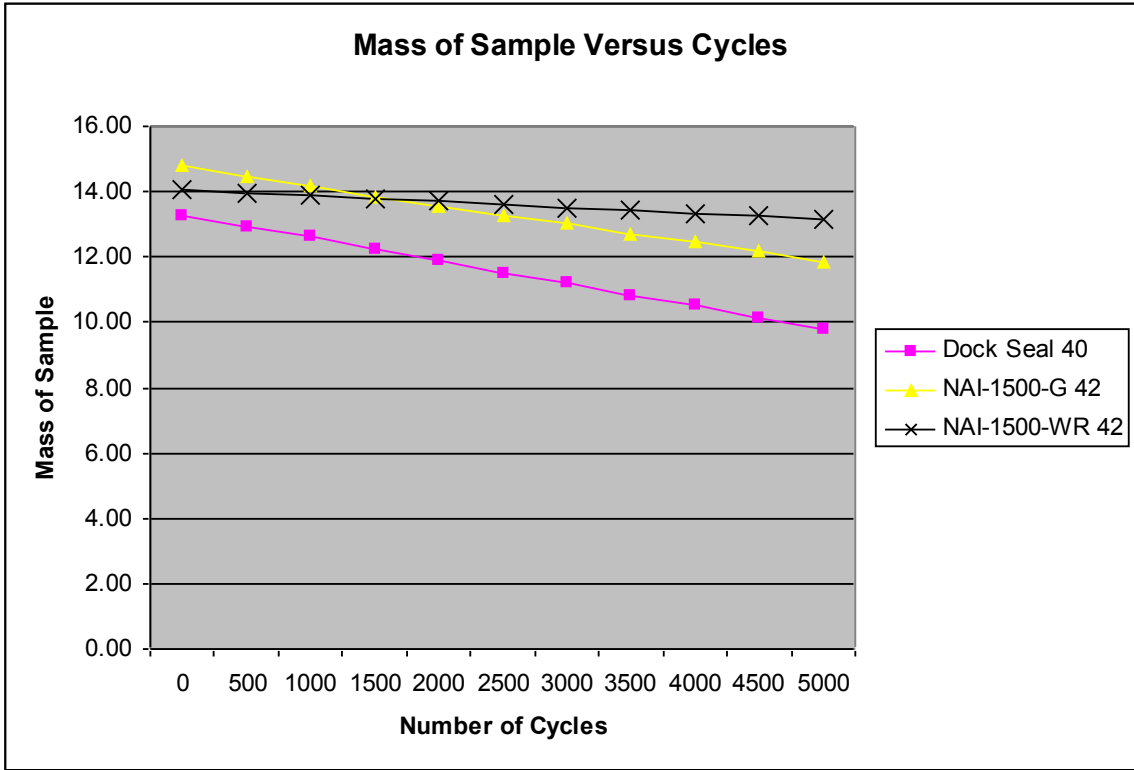
2.3 Result Interpretation

For the NAI-1500-WR 42oz fabric, it took 26000 rotational cycles with 26 sandpaper substitutions to expose the fabric in the centre where the highest amount of abrasion occurs. You can see the base fabric in the picture to the right.

Analysis

Comparison of Results

	Dock Seal 40oz	NAI-1500-G 42oz	NAI-1500-WR 42oz
Initial Mass (g)	13.28	14.81	14.05
Final Mass (g)	9.79	10.68	9.75
Total Mass Loss	3.49	4.13	4.3
Mass Percent Loss	-26.3%	-27.9%	-30.6%
Average Mass Change (g) per 500 Cycles	-0.35	-.30	-0.08
Average % Mass Change per 500 Cycles	-3.00%	-2.20	-0.71%
Initial Thickness (mm)	1.21	1.29	1.36
Final Thickness (mm)	0.74	0.74	0.74
Thickness Loss (mm)	-0.47	-0.55	-0.62
Percent Thickness Loss	-39%	-43%	-45%
# of Cycles to Fabric Exposure	5000	7000	26000



The graph above shows the mass of the fabric sample versus the number of abrasion cycles. It can be seen from the graph that the NAI-1500-**WR** material has the lowest rate of mass loss.

The approximate slope (rate of mass loss in grams/Cycle) of these lines is as follows:

	Dock Seal 40	NAI-1500-G 42oz	NAI-1500-WR 42oz
Slope (g/cycle)	-0.0007	-0.00059	-0.00018
Ratio versus WR sample	1:3.9	1:3.3	
Ratio versed Grafted Sample	1:1.18		3.3:1

The data above shows that the **WR** series formulation offers roughly 4 times the amount of abrasion resistance than our standard formulation and about 3 times more abrasion resistant than our “grafted” formulation.

Conclusion

If abrasion is the most critical feature required for your application, the best product selection would be the **HA** or **WR** series fabrics.

If you have any questions regarding this study, please contact Frank Petizian at engineering@naizilcanada.com or call (905) 857-6633