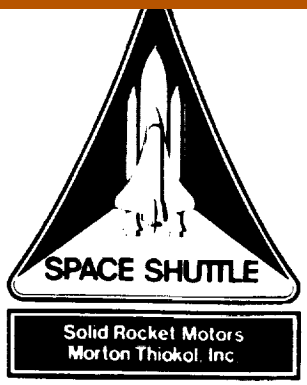

TWR-19544

EFFECTS OF TACKY MAT CONTAMINATION ON BOND DEGRADATION FOR CHEMLOK/LINER AND NBR/LINER BONDS

FINAL REPORT

JUNE 1989

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FINAL REPORT

MAY 1989

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ECS No. SS 1638

1.0 INTRODUCTION AND SUMMARY

It is desirable to place tacky mats by the entrance ways to the rubber layup areas for the SRM segments. The purpose of the tacky mat is to remove dust, lint, etc., from the operator's shoes prior to entering the platform where the layup work is performed. It is possible that a tacky mat could be touched with gloved hands prior to handling the uncured NBR. Due to the potential for inadvertent contamination on bonding surfaces, we were requested to determine if tacky mats are acceptable for use in the M-111 rubber layup workstation. A formal test plan was not issued. Based on the test results of this investigation, tacky mats (Sticky Mate D-1100 Series Model No. D2436-20T) from Clean Room Products Inc., can be used in the M-111 rubber layup stations without causing adverse contamination problems.

The tacky mats were judged solely on the basis of bond degradation caused by either direct or indirect contamination. Test results all indicate that there was no notable NBR/Chemlok or liner/NBR bond degradation on samples contacted with the tacky mat material. NBR/Chemlok test data can be seen in Table I. Figure 1 illustrates the specimen configuration for these tests. Attachment I shows the results for the liner/NBR lab tests. Both direct and indirect contamination was used to test for bond degradation. An explanation of testing procedures for testing of the tacky mat can be read in the Technical Section of Attachment I.

The tacky mat adhesive composition does not contain fluorocarbons or release agents that would affect bonding. To determine whether or not the tacky mat adhesive is soluble in MEK, methyl chloroform, or isopropyl alcohol, a tacky mat was divided into three sections. Each section was subjected to one ounce of one of the fluids to be tested. This fluid was left on until it had evaporated and then the application of solvent was repeated. The tacky mats are also manufactured according to MIL specs to ensure that every mat is identical in construction.

2.0 CONCLUSIONS

1. No NBR/Chemlok or liner/NBR bond strength degradation was noted on samples contacted with the tacky mat. It is concluded that the bond strengths of the tacky mat contaminated surfaces are at least as strong as the cohesive strength of the liner or of the NBR.

3.0 RECOMMENDATION

Based upon bond degradation test results, it is recommended that tacky mats be used in M-111 for shoe dust removal prior to operators entering the rubber layup work area.

TABLE I. NBR/Chemlok Test Results

CONTAMINATION MODE	TENSILE STRESS (PSI)	FAILURE MODE	45° PEEL STRESS (PLI)	FAILURE MODE
PANEL #1 - CONTROL (NO CONTAMINATION)	714	85% COH	175.7	100% COH
	601	90% COH	166.7	100% COH
	731	100% COH	174.9	100% COH
	614	100% COH	161.5	100% COH
	647	100% COH	174.3	100% COH
	666	98% COH		
	660	98% COH		
AVERAGE	661.9		170.6	
COEFF. OF VAR.	6.7		3.65	
PANEL #2 (DIRECT CONTAMINATION; TACKY MAT DIRECTLY ON NBR THEN REMOVED)	779	100% COH	179.1	100% COH
	738	100% COH	160.9	100% COH
	767	100% COH	176.8	100% COH
	760	100% COH	165.9	100% COH
	749	95% COH	159.9	100% COH
	770	100% COH		
	773	100% COH		
	703	100% COH		
AVERAGE	749.96		168.5	
COEFF. OF VAR.	3.31		5.31	
PANEL #3 (INDIRECT CONTAMINATION; GLOVES ON TACKY MAT-THEN GLOVES PRESSED ON NBR)	608	95% COH	176.4	100% COH
	719	100% COH	155.0	100% COH
	682	100% COH	173.8	100% COH
	703	100% COH	162.2	100% COH
	784	100% COH	172.3	100% COH
	735	95% COH		
	776	97% COH		
	605	80% COH		
AVERAGE	701.6		168.0	
COEFF. OF VAR.	9.66		5.36	

NOTE: IF FURTHER TEST DATA ARE REQUIRED, THEY MAY BE OBTAINED THROUGH THE M-53 LABORATORY, LWR NO. 566439

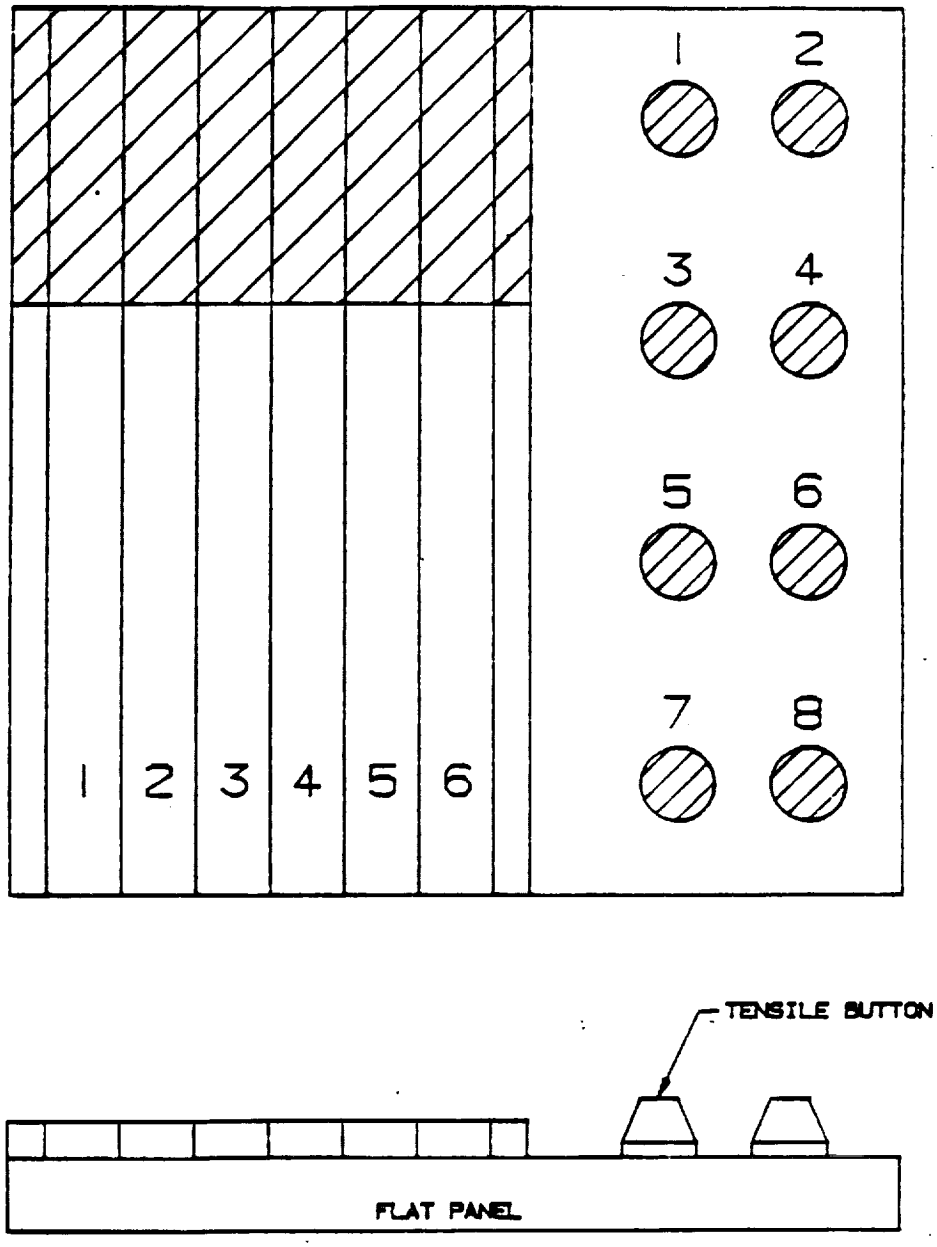

Figure 1. Tacky Mat Contamination

Attachment I. Liner/NBR Test Results

MORTON THIOKOL, INC.
Wasatch Operations
Support Services

Interoffice Memo
30 August 1988
2435-FY89-M081

TO: D. L. Staples

CC: R. R. Hendrickson, L. W. Poulter

FROM: K. A. Madsen
Bonding & Subscale Processing

SUBJECT: SRM STW5-3224 Liner To NBR - Tacky Mat Tests

Introduction

Tacky mats are placed by the rubber lay-up areas for the SRM segments. These mats dust off the shoes prior to entering the platform where the lay-up work is performed. The possibility exists that a tacky mat could be touched with gloved hands prior to handling the uncured NBR. Tests were requested to determine if NBR was accidentally touched would there be any degradation of the liner/NBR bond.

Objective

These tests were conducted to determine the bond strength of liner to NBR after direct or indirect contact with a tacky mat.

Conclusions

No liner/NBR bond strength degradation was noted on samples contacted with the tacky mat.

Discussion

All peel and adhesion samples were liner failure (Table I). Peel values varied from 24.6 to 27.2 lb/in. and adhesion values varied from 175 to 187 psi.

Technical

1. Uncured NBR (7232-0268) was placed on a table and a tacky mat placed on top of it. A roller was used to provide a good contact the tacky mat and NBR.

2. Clean vinyl gloves were placed on a tacky mat and then placed on the NBR several times.

Attachment I. Liner/NBR Test Results (Continued)

3. The treated NBR and a control piece were all vulcanized using Dacron cloth on the treated surface.

4. The Dacron cloth was removed from the NBR and discs cut out and bonded to steel adhesion discs. NBR strips were cut and bonded to steel peel strips.

5. STNS-3224 (296447) was vacuum mixed and used to bond the samples together using 60-mil glue lines.

6. Adhesion samples were tested at 0.5 in./min and 180 degree peel samples at 12.0 in./min.

K. A. Madsen

Attachment I. Liner/NBR Test Results (Continued)

TABLE I
STW5-3224 TO NBR

NBR Surface Treatment	180° Peel (lb/in.)	Adhesion (psi)
None	27.2	167
	26.6	177
	27.0	174
	27.5	225
	27.2	177
	27.7	—
	27.2	184
Tacky mat directly on NBR - then removed	28.4	188
	26.2	175
	27.0	165
	27.1	168
	27.1	186
	27.0	165
	27.1	175
Gloves on tacky mat - then gloves on NBR	25.1	180
	24.2	196
	24.1	175
	24.3	182
	24.2	184
	25.3	207
	24.6	187

All samples were liner failure