EATON	ENGINEERING TEST REPORT	REPORT NUMBER: 226394

Eaton
Technical Center
Maumee, Ohio U.S.A.

TITLE: Summary Test Report for Thermoplastic Airbrake tubing (Eaton Part Numbers 3270-061, 3270-101, and 3253-061) for leaching of BBSA's (n-Butyl Benzene sulfonamide).

DATE: 12/16/09

TESTED BY: LAB TECHNICIAN

Chad Borton
Lab. Technician

WRITTEN: ENGINEER

Drew Stamm 12/16/09

APPROVED: CHIEF ENGINEER

Troy Lutz

PURPOSE:

To determine the possibility of BBSA's (n-Butyl Benzene sulfonamide) leaching from the tubing in field service.

BACKGROUND:

Samples were returned from Mack to test for the level of BBSA's still present in the returned tubing. Some valve manufacturers and suppliers have received complaints of reduced brake timing and Mack is inquiring if BBSA's could be leaching from the returned samples and contributing to the reduced brake timing.

One Valve Manufacturer/Supplier representative, Paul Johnston from Meritor/Wabco also raised the issue at the SAE Airbrake tubing and fitting committee meeting on 10/6/09 in Chicago. He indicated a NHSTA investigation through Mack has been initiated.

REFERENCES:

ASTM D7210-06
ASTM E168
TR 226309

TEST SPECIMENS:

Returned Samples from Mack off of trucks Including:
3270-061 - 3/8" Eclipse
3270-101 - 5/8" Eclipse
3253-061 - 3/8" NT^2

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RETURN PART DECRIPTION TABLE:
See Below:

Bag – Part Description	Bag- Code/unit #	Tube	Tube Lot
Relay Supply from Tank	CXN6124367	3270-101 green	55605
Sample Relay control Valve	CXN612 1692 Unit# 405	3253-061 green	13359
Control Line	CXN6121692 Unit #1401	3270-061 green	13041
Relay Valve inlet Control from ATC Valve	CH6124367	3270-061 green	(01/06)
Discharge Line to Wet Tank	6618830-4366	3270-101 blue	Unidentifiable
Relay Line	CXN1696 Unit # 405	3270-101 green	54520
Dryer Delivery Line	CXN6121696 Unit # 405	3270-101 blue	Unidentifiable
Primary Tank to Relay	CXN6121692 Unit# 405	3270-101 green	54520
Dryer to Wet Tank	CXN6121692 Unit # 401	3270-101 blue	Unidentifiable
Supply to Relay Valve	#6618830-4366	3270-101 green	55606
N/A	N/A	3270-061	11585-090817

BBSA Test Procedure:	
SAMPLE NUMBERS:	One sample from ID of tubing listed in Test Table.
TEST STANDARD	Presence of BBSA (n-Butyl Benzene sulfonamide)
DESCRIPTION	Soxhlet extraction column on each sample and then comparing the extracted oil on the FT-IR (vs. a BBSA control). Testing for presence of BBSA in ID material of tubing.
TEST APPARATUS:	FTIR device
TEST SAMPLES:	See test table below
PROCEDURE:	Per Maumee Test Lab procedures ASTM D7210-06 & ASTM E168
ACCEPTANCE CRITERIA:	Testing for presence (and level if possible) of BBSA in ID material of tubing in test table.
RESULTS:	See below and in Appendix

TEST RESULTS

Bag – Part Description	Bag- Code/unit #	Tube	Tube Lot	Presence of BBSA
Returned Samples				
Relay Supply from Tank	CXN6124367	3270-101 green	55605	Detected in FTIR test
Sample Relay control Valve	CXN612 1692 Unit# 405	3253-061 green	13359	Detected in FTIR test
Control Line	CXN6121692 Unit # 1401	3270-061 green	13041	Detected in FTIR test
Relay Valve inlet Control from ATC Valve	CH6124367	3270-061 green	(01/06)	Detected in FTIR test
Discharge Line to Wet Tank	6618830-4366	3270-101 blue	Unidentifiable	Detected in FTIR test
Relay Line	CXN1696 Unit # 405	3270-101 green	54520	Detected in FTIR test
Dryer Delivery Line	CXN6121696 Unit # 405	3270-101 blue	Unidentifiable	Detected in FTIR test
Primary Tank to relay	CXN6121692 Unit# 405	3270-101 green	54520	Detected in FTIR test
Dryer to Wet Tank	CXN6121692 Unit # 401	3270-101 blue	Unidentifiable	Detected in FTIR test
Supply to Relay Valve	#6618830-4366	3270-101 green	55606	Detected in FTIR test
			Level of BBSA Detected:	**7.8% - 10.9% by weight of sample tested**

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CONCLUSIONS:

Assessment of Butyl Benzene sulfonamide (BBSA) levels present in used airbrake tubing was performed using a Soxhlet extraction technique (ASTM D7210-06) that employed lab grade methanol as the solvent. Total extract was measured for weight and then subjected to Fournier Transform Infrared Spectroscopy (FTIR) for identification of residue according to ASTM E168.

Calculations based on weight measurement of the Soxhlet residue indicate total extraction levels ranging from 7.8% to 10.9% of the weight of the material tested, which correlates to the total amount of BBSA plasticizer found in original, unused airbrake hose. Appendix A details a FTIR plot and search hit list indicating the presence of BBSA at high confidence values (.92), thereby identifying it as the primary constituent of the extracted residue. The measured variance in content is normal and exists due to normal manufacturing process variation.

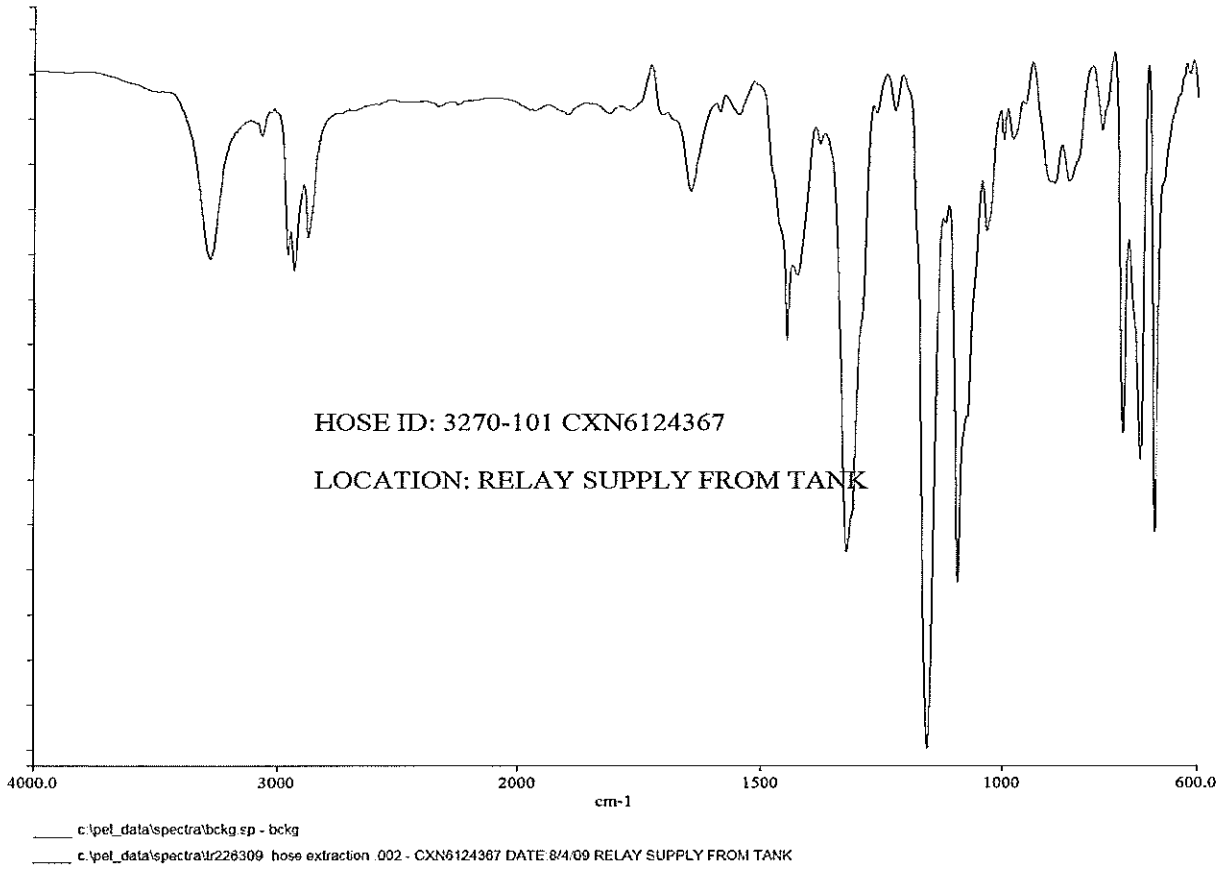
This testing found the presence of BBSA in the returned product at quantities equivalent to original unused hose. Therefore, it is concluded that the BBSA present in the customers system could not have been extracted from the returned Eaton tubing (part numbers 3270-061, 3270-101, & 3253-061).

Drew Stamm 12/16/09

APPENDIX A:

FTIR Plot for sample:

Relay Supply from Tank	CXN6124367	3270-101 green	55605



FTIR Search List for sample:

Relay Supply from Tank	CXN6124367	3270-101 green	55605

FT-IR_EXTRACT_CXN6124367_DATE80409_3270-101_GREEN

TR226309 HOSE EXTRACTION .002 / SEA250.lbd Euclidean Search Hit List

- 0.920 SE0173 N-BUTYLBENZENE SULFANOAMIDE UNIPLEX 214 UNITEX
- 0.874 SE1069 N-(2-HYDROXY PROPYL) BENZENESULFONAMIDE UNIPLEX 225 UNITEX SMEAR ON KBR
- 0.821 SE1646 N-ETHYL-TOLUENESULFONAMIDE (O&P) KBR/CAPILLARY FILM
- 0.766 SE1645 N-ETHYL-P-TOLUENESULFONAMIDE KBR/CAST FILM
- 0.751 SE1067 N-ETHYL O/P - TOLUENE SULFONAMIDE UNIPLEX 108 UNITEX SMEAR ON KBR

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TITLE: Summary Test Report for Thermoplastic Airbrake tubing (Eaton Part Numbers 3270-061, 3270-101, and 3253-061) for leaching of BBSA's (n-Butyl Benzene sulfonamide).

DATE: January 13, 2010

WRITTEN: ENGINEER

Jason Stark

Jason Stark

APPROVED: ENGINEERING SUPERVISOR

Troy Lutz

Troy Lutz

PAGE:
2

WAS:
Volvo

CHANGED TO:
Mack

REASON:
In 4 locations on page 2 a reference to Volvo was stated. This was incorrect as it should have referenced Mack.