

**NATIONAL TREE MARKING PAINT COMMITTEE
MEETING MINUTES
Chicago, IL
May 12-14, 2009**

Attendees:

Gerald Ryszka	R-2	Richard Fitzgerald	WO – FM
Kim Newbauer	R-3	Ron Brouwer	WO – LEI (R-9)
Jacob Somerset	R-4	Kelly Koeppe	WO – AQM
Dan Merritt	R-5	Alex Perez	WO – OSOH (R-3)
Frank Duran	R-6	Tim Radtke	DOI – OSOH
Mary Yonce	R-8	Kolby Hirth	FPL
Mike Van Dyck	R-9	Steve Niles	BLM – O and C
Bill Nightingale	R-9	Randy Terrill	NCP Coatings, Inc.
Ken Dinsmore	R-10	Sherman Drew	NCP Coatings, Inc.
Ted Sandhofer	NFFE	John Thompson	LHB
Dave Haston	SDTDC	Clint Cruse	LHB
Bob Simonson	SDTDC	Randy Cali	LHB
Carl Schaefer	SDTDC		

Introductions

Dave Haston of the San Dimas Technology and Development Center started the meeting with a general welcome and requested an introduction of those attending.

Role of SDTDC – Bob Simonson: SDTDC is an engineering center for testing and development with responsibility for the national tree marking paint (TMP) program. Bob mentioned a potential cooperative agreement with Cal Poly regarding paint testing. Carl Schaefer’s focus will be on performing testing and providing support for the TMP program. SDTDC developed the new paint ordering system that will allow TMP purchasers to order directly from Light House for the Blind (LHB).

WO FM Update – Dick Fitzgerald: Many parts of the nation’s timber industry are affected by the current economic downturn. There are many new issues related to special forest products. Biomass and bio-fuels are an unknown future. The definitions of biomass and bio-fuels are currently under debate. At this time it is hard to tell where we are headed with the new administration regarding budgets. The Washington Office timber staff appears to be well-situated.

Company Presentations

LHB Industries

The TMP program currently employs 3-4 full-time blind individuals. 90% of LHB employees are blind/limited vision people. There was a large drop off in paint purchases in 2008. Citrus based gallons are going to be discontinued. No complaints have been received regarding aerosol functionality. There appears to be (continued) problems with the carriers dropping off shipments without signatures & leaving freight unattended (R-3, R-4 and R-6). LHB stated that labeling

will include more specific information for the carriers. Web-based tracking is also a possibility. Resin costs for paint continue to increase.

NCP Coatings

Randy Terrill presented an overview of NCP including paint production, paint availability, processing, testing, development, and their continued dedication to meeting the needs of their customers.

Orange and Blue Tree Marking Paints are the biggest items produced by NCP for the federal land management agencies. NCP remains in total control of the product from formulation until LHB receives the deliveries in “totes.”

Hybrid paint sample panels (new & weather tested) were displayed; orange, blue, yellow, pink, fire orange, & butterscotch yellow. NCP continues to be ISO 9001 compliant. They appreciate the great ongoing relationship with the Forest Service and Bureau of Land Management.

Acquisitions Management

Kelly Koeppe reported that we now have approval to go outside of GSA for purchasing TMP. We will now purchase directly from LHB. The LHB ordering system will be accessed through the San Dimas website. Any lost, stolen, name changes, and compromised credit cards still need to be reported via the TMP representatives. Name and credit card information is updated only once a month.

New ordering system – We will go to the new system when the contract is awarded. JWOD has sent a letter listing the affected TMP NSN numbers and the paint prices that will be applied. The San Dimas link to the secure LHB web site requires the user name, region, unit, & AAC to be entered. The purchase will resemble most private sector web-based purchasing methods. Pricing will be without shipping cost until you get to the end and the purchaser selects the method of shipping. Shipping cost and method will be based on weight. The new system will be tested by Region 3 (See: Action Items). Net savings for this switch is approximately 12%.

Order issues

Dave Robson continues to be our contact at LHB for troubleshooting and ordering problems. Randy Cali agreed to add expanded statements to the carrier/shipper to prevent the order being ever left unattended or in a non-secure area.

Shipping problems

R-3, R-4 and R-6 are still having problems with carriers dropping off orders without obtaining a signature.

Test Site Status

Color cards will be produced and distributed to test site coordinators (See: Action Items).

Region 3 (Kim Newbauer): All trees testing well, UV exposure appears to be contributing to fade. Hybrid paint samples were applied last December and continue to look good.

Region 5 Hybrid Paint Report (Dan Merritt):

- Fire Orange and Butterscotch Yellow have been on site for 1 ½ years and continue to look strong.
- Fire Orange requires a tissue blot test to reveal tracer element.
- Tracer element tested well for both colors.
- Yellow, Orange, Blue, and Pink hybrids have been on site for 6 months.
- Colors look vibrant and tracer test well.

Region 6 (Frank Duran): Frank Duran expressed concern over the white paint fading and turning grey. Otherwise the other colors are looking good. The hybrid site was not accessible due to snow.

Region 8 (Mary Yonce): Hybrid fire orange looks very red. There appears to be a weak tracer response on hardwoods. Older pink had weak tracer response on hardwoods.

Region 9 (Mike Van Dyck / Bill Nightingale): All colors are satisfactory. They are looking for consistency in their sampling write-ups.

Hybrid paint

The Hybrid TMP is intended to only replace the current waterborne paint if accepted by the TMP committee. It is recommended that the hybrid paint be tested on an actual timber sale or fuels reduction project. The possible uses of fire orange and butterscotch yellow were discussed. There appear to be potential problems with each color (fire orange too close to red and butterscotch yellow not bright enough). There are other color options available.

QPL Testing Update

Information regarding the status of TMP testing, including the information presented and discussed at the TMP meeting, is summarized in the attached memorandum.

Paint Performance

Blue waterborne paint is not testing well for the tracer element at the R-8 test site and in a project area. Mary Yonce is working with Randy Terrill at NCP regarding this problem. The problem that they noted was associated with very weak (to no detectable tracer at all) tracer checks on a few hardwood trees. The R-8 representative has sent some bark samples to Randy Terrill at NCP to test the paint at the NCP lab. The region is hopeful that Randy's lab tests will shed some light on the matter.

R-9 had 3 year fade problem that required repainting.

The question was raised again regarding test site or field failures and the QPL status. If any paint type or color does not meet requirements it can be removed from the QPL. Since there is a single source of supply there would be no paint available for that particular type and color combination.

Aerosol Can Disposal – Implementation of New Policy

All of the regions are pleased with the new non-puncture policy. There were some concerns raised about tracer security regarding disposal of malfunctioning cans. Malfunctioning cans need to be disposed of as hazardous waste. LHB, who occasionally disposes of TMP, confirmed this information. The tracking documentation associated with the hazmat disposal should alleviate concerns regarding tracer security.

2409.12 Chapter 70 Status

The national paint scheme has been revised to allow three leave tree and three cut tree colors:

- Cut tree colors: Blue, Yellow, & Green
- Leave tree colors: Orange, Pink, & White (includes boundaries).

The latest draft will require enterprise teams to follow all requirements of a Forest, including receiving, inventory, storage and security requirements. A draft will be issued to TMP regional representatives for review (See: Action Items).

Paint re-tint issue

Region 5 requested approval to re-tint excess white TMP to a blue or green cut tree color. The request has been denied for the following reasons: 1) TMP has been thoroughly tested and we do not want to allow any modification or field mixing of paint, and 2) prosecution of timber theft cases could be compromised if paint is modified after manufacture. In summary there are too many unanswered questions to allow re-tinting of paint.

Health and Safety Concerns/Issues

Health and safety concerns were discussed thoroughly in conjunction with the review of the FPL test results and the NIOSH response to the request for a new Health Hazard Evaluation. Committee members were reminded that they can refer employees to the FAQ and Health and Safety portions of the TMP website if they have questions regarding the use of TMP.

Law Enforcement

LE investigation guidelines have been added to the TMP website. The guidelines include recommendations that will allow the laboratory tracer to be confirmed without revealing the actual tracer itself. Frank Duran offered to take on the proper documentation and placing it in the FSH system (2400.12B). (See: Action Items).

Equipment

SDTDC still has beefy backpack pumps available for testing. Bob played an informational video for SDTDC.

Tree Marking Paint Web Site

The committee reviewed the website contents. The letter permitting the use of Pink & White (2005) was discussed. The new ordering link will be posted on the current SDTDC paint site.

Continuation of Annual Meetings

The committee discussed the need to continue annual meetings. There was consensus that we need to meet again in one year, and continue to evaluate the need for annual meetings as we move into the future.

Summary of Action Items

- Steve Niles (BLM) & Jacob Somerset (R-4) were added to the tech subcommittee to replace Walt Smith & Sandy Henning, respectively. (complete)
- Color panels will be issued to the regional reps for the test sites. (pending)
- R3 to test the new TMP ordering system prior to implementing nationwide. (complete)
- SDTDC to compose a memorandum which will provide a summary of the testing to-date, including the analytical test results from Forest Products Laboratory and the letter from NIOSH regarding our request for a new HHE. (complete – see attachment)
- SDTDC to send draft chapter 70 out to Tree Marking Paint committee regional representatives for a two week review and subsequently attempt to “fast-track” it through WO Directives for final approval. (complete)
- Mildew resistant paint will be applied to paint test sites to see if that alleviates the issue of white paints fading to grey (complete).
- Hybrid paint will be provided by NCP for use on a sale in one or two regions to determine if any issues arise in production usage. (pending)
- Frank Duran will pursue the addition of the new law enforcement investigation guidelines in the FS Handbook. (pending)

2010 Meeting Location

1st choice: R-10 (Sitka, AK)

2nd choice: R-5 (San Dimas, CA)

3rd choice: R-2 (Denver, CO)

May, 10 through 14, 2010 are the proposed meeting dates.

Attachment – pages 6 -18



Forest
Service

San Dimas Technology
and Development Center

444 East Bonita Avenue
San Dimas, CA 91773
(909) 599-1267

Z File 2400/6700/7120
Code:
Route To:

Date: November 5, 2009

Subject: Updated Information Regarding the Status of Tree Marking Paint (TMP) Testing

To: Regional Forester, R-5

Executive Summary

Extensive testing has demonstrated that current and archived paint samples are substantially similar, demonstrating that previous worker exposure studies are still valid.

In parallel with laboratory testing, a request was submitted to the National Institute for Occupational Safety and Health (NIOSH) for a new health hazard evaluation (HHE) of Forest Service tree marking paint. NIOSH reviewed the previous HHE's as well as contract laboratory reports and determined that a new HHE was not warranted.

NIOSH recommends exploring other options for assuring TMP quality assurance, such as health-based specifications, in lieu of the currently specified limits of detection. Based on NIOSH recommendations the national TMP committee will consider changes to the paint specifications in consultation with industrial hygienists.

Background

At the annual TMP committee meeting in May 2008, laboratory test results (indicating trace amounts of some solvents exceeding specification limits during a single qualification test) were discussed. This testing was an effort to verify that TMP currently in use by our employees meets specification requirements developed with the assistance of NIOSH.

In July 2008 a group which included NIOSH and Department of the Interior (DOI) industrial hygienists, a Forest Service analytical chemist, and national TMP committee members (including a representative of the National Federation of Federal Employees assigned to the national TMP committee) recommended that additional testing be performed at laboratories recommended by NIOSH in order to confirm or refute the April 2008 results. Three laboratories were recommended by NIOSH, however only one was willing to test our paint. DataChem Laboratories tested the paint with a variety of methods in an attempt to optimize accuracy and reported test results in January 2009.

DataChem Laboratories Testing

The results reported by DataChem Laboratories varied greatly relative to the results reported in April 2008 by EIS Analytical. DataChem found differing amounts of trimethylbenzene (TMB) and xylene, did not detect methyl ethyl ketone (MEK), and reported formaldehyde in trace concentrations. After each laboratory (EIS Analytical and DataChem) completed testing, both



informed the Forest Service that they will no longer test Forest Service paint samples. DataChem cited the following:

“For the analysis just completed the samples had to be diluted 1:16,000, 1:420,000 and 1:740,000. Because the compounds of interest are present at relatively low concentrations a slight change in any step can result in gross errors due to the size of the dilutions required for these analyses. Trying to run one of these samples straight would result in contamination to the instrument to the degree that the instrument would be ruined for all but the most simple of analyses. I am sorry but we will not be able to analyze paint samples of this nature for you.”

HHE Request and NIOSH Response

NIOSH performed health hazard evaluations (HHEs) in 1993, 1998, and 2000. The 1993 evaluation was for the older oil-based paint, and the 1998 and 2000 evaluations were for the newly formulated water cleanup TMP. The evaluations in 1998 and 2000 showed without exception that the concentration of solvents in personal breathing zone (PBZ) samples were nondetectable or were present in concentrations that were too low to reliably quantify. The 1998 evaluation included biological monitoring; urine samples did not contain detectable concentrations of the solvents (or related metabolites) studied. In addition, an industrial hygiene survey of tree markers using rain resistant TMP performed by Marine and Environmental Testing Inc for the Eugene District Office of the Bureau of Land Management showed results consistent with the NIOSH data and that employees were not exposed to concentrations exceeding Occupational Safety and Health Administration (OSHA) permissible exposure limits and were also within the more stringent American Conference of Governmental Industrial Hygienists-recommended Threshold Limit Values during tree marking.

The referenced reports can be accessed by any Forest Service or BLM employee at the San Dimas Technology and Development (SDTDC) TMP website at:

<http://fsweb.sdtdc.wo.fs.fed.us/programs/fm/fy03/tmp/tmphs.shtml>

In February 2009, SDTDC requested the assistance of NIOSH in addressing the uncertainties resulting from the laboratory test results of April 2008 and January 2009. This request included an application for a new, updated HHE of TMP. A new HHE would allow NIOSH to verify their recommendations from more than 10 years ago, and confirm (or possibly refute) that employee exposures are below applicable occupational exposure limits (OELs) when using Forest Service specification TMP.

The response from the NIOSH Health Hazards and Technical Assistance Branch is attached as Appendix A¹. As part of their evaluation of the request, NIOSH reviewed previous HHEs, TMP specifications, and previous contract laboratory test reports. The NIOSH response confirmed the difficulties in analyzing TMP and stated that differences in limits of detection among different laboratories (and even within a given laboratory) could be expected and that solvent content

¹ NIOSH recommends that their letter (Appendix B) should be posted at or near work areas of affected employees for 30 days.

could vary depending on how and when the paint samples were collected and how they were stored prior to analysis.

NIOSH does not believe that additional employee exposure monitoring is warranted and rejected the request for a new HHE. Their evaluation of previous HHEs showed that exposures were well below OELs. Additionally, NIOSH stated that the contract laboratory test results which exceeded specification limits likely resulted:

..... “from variations in analysis techniques and difficulties on analyzing samples with such a complex matrix. Such difficulties were not likely fully appreciated at the time specification limits were developed.”

NIOSH further went on to state:

“Given the difficulties in conducting solvent analyses in TMP, and the fact that the specification limits developed several years ago were based on analytical limits of detection (rather than health based considerations or a formalized risk assessment process), USDA Forest Service should explore other options for TMP quality assurance.”

Forest Products Laboratory Testing

In parallel with the request for a new HHE from NIOSH, SDTDC requested technical assistance from the Forest Products Laboratory (FPL) in order to possibly conduct more thorough and accurate solvent testing.

The paint manufacturer archives (stores) a sample of every TMP production batch, dating back to the inception of the low-solvent water cleanup and rain resistant TMPs. The FPL was therefore tasked with comparing archived paint samples with current production paint samples in an effort to confirm or refute that previous HHE's are still valid. Additional goals were to 1) analyze current paint with current specifications, 2) suggest potential specifications changes, and 3) suggest standardized methodology for analyzing future paints.

A FPL analytical chemist dedicated hundreds of hours to this effort, which included a thorough literature review related to testing volatile organic compounds (VOCs) in paint with gas chromatograph test equipment. The following is a summary of information presented at the 2009 annual TMP national committee meeting:

Headspace gas chromatograph-mass spectrometry (GC-MS) was utilized for testing because the instrument was available at the FPL, headspace requires minimal preparatory sample handling (minimizing laboratory errors and making it desirable for transfer to other laboratories), and the headspace (or vapors) contains the paint contaminants of concern. Samples were heated to 140 °F, which well exceeded a worst case tree marking scenario. All testing was performed in duplicate under the same conditions and results were calculated based on response factors. Retention times and mass spectra were compared to authentic standards. In addition to comparing current and archived TMP samples, older oil-based TMP and commercially-available TMP were also analyzed.

In summary the FPL analyzed the headspace vapors of all types and colors of current production TMP and compared the results to archived paint samples from the period of the NIOSH HHEs with respect to current specifications. **The FPL found no substantive difference in the volatile content of the current and archived paints, and chromatographs of current and archived paints were almost identical.** These results strongly suggest that PBZ samples would not be different today than from previous studies. The following summarizes the laboratory results:

Water cleanup paints (Type A):

- Current and archive paint samples were within specification limits with the following exceptions:
 - All of the current paint assayed at or above 0.05 percent total xylenes, whereas the archived paints were at or below 0.05 percent.
 - All of the current paint assayed at or above 0.2 percent trimethylbenzenes (TMBs), as did the archived samples.
 - For all samples, benzene, toluene, and MEK were below 0.001 percent, 0.01 percent, and 0.05 percent respectively.

Water cleanup citrus solvent paints (Type B):

- Both the current and archived paints were within specification limits.

Rain-resistant paints (Type C):

- The current paint samples were within specification limits. The archived paint samples were within specification limits with the exception of a single archived sample (white, manufactured Nov. 2003) was an order of magnitude high in toluene. The same sample also assayed high for xylenes.

Discussion:

FPL Test Results:

The results indicate consistently higher levels of xylenes in current Type A paints as compared to archived samples. However, some of the archived samples were at or very close to the 0.05% limit. In addition, both current and archived samples exhibited variability in total xylene content. The variability may be attributed to the fact that mineral spirits is a technical grade, multi-component solvent and is expected to vary from batch to batch.

Since the archived samples were up to a decade old and could have lost some xylene during approximately 10 years of storage (warehouse conditions were at ambient temperature), the results do not suggest a significant difference in xylene content between current and archived samples.

Analytically, the current and archived Type A paints assayed the same for TMB within the bounds of expected batch-to-batch fluctuations. The FPL reported that analytical evidence indicates TMBs levels have not changed since the period of NIOSH exposure testing. Also of note are the NIOSH test results of bulk paint in 2000 which found TMB levels in excess of specification requirements (HETA 2000-0108, Table 7). NIOSH explicitly footnoted the analytical difficulties with TMBs and mineral spirits and stated the results should be considered semi-quantitative.

Formaldehyde:

The FPL did not analyze for formaldehyde because of its low molecular weight but reviewed the test report from DataChem Laboratories which indicated that formaldehyde exceeded specification limits. An internal review of the DataChem test procedures, and discussion with the laboratory project manager and analyst on October 20, 2009, confirmed their result was a false positive for formaldehyde because the assay had not been conducted according to protocol². The paint manufacturer has certified that they use no formaldehyde in their formulations supplied to the Forest Service (see Appendix B).

Summary

Research-quality analysis performed by the FPL found current and archived paint samples to be substantially similar, demonstrating that previous exposure studies (which showed that employee exposures were without exception within applicable occupational exposure limits) are still valid. In addition, the NIOSH response (in the absence of FPL-provided results) stated that a new HHE was not warranted.

The next step in this process will be to consider changes to the paint specifications based on the NIOSH recommendation to explore other options for assuring TMP quality assurance. In addition, the committee is considering implementation of a requirement that the manufacturer certifies annually that the paint formulation has not changed within the previous 12 months. If formulation changes are made, the national committee will determine the necessary steps to continue to ensure employee safety.

/s/ David V. Haston
DAVID V. HASTON, P.E.
Chair, National Tree Marking
Paint Committee

/s/ John D. Fehr
JOHN D. FEHR
Manager

/s/ Gary W. Helmer
GARY W. HELMER
WO, Safety and Occupational
Health Manager

Enclosures

cc: Donald K Golnick
Tom Peterson
Kolby C Hirth
Ken Dinsmore
Ralph Dorn
Frank Duran

² The laboratory methodology was highly subject to known interferences. The DNPH derivatising agent had not been added to the paint extract, so the 360 nm absorbance detected was due to interference. The 360nm absorbance was therefore incorrectly identified as formaldehyde.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

National Institute for Occupational
Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
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May 12, 2009
HETA 2009-0097

Mr. David Haston
USDA Forest Service
444 East Bonita Avenue
San Dimas, California 91773

Dear Mr. Haston:

On February 13, 2009, the National Institute for Occupational Safety and Health (NIOSH) received your request for technical assistance concerning USDA Forest Service employees' exposure to tree marking paint (TMP). Your request was prompted by a concern about uncertain laboratory test results of TMP samples from April 2008 and January 2009. Because recent TMP analyses indicated that some solvent concentrations exceeded TMP specification limits for some, but not all paint types and colors, you asked NIOSH to conduct a health hazard evaluation (HHE) to measure solvent exposures among forestry technicians. You indicated that health concerns had not been reported by forestry technicians. In response to this request, I reviewed the results of three past NIOSH evaluations of USDA Forest Service employees' exposure to TMP, results of current and prior TMP laboratory analyses, and a copy of the current TMP specifications. This letter summarizes my findings and recommendations.

HHE Review

TMP is used by USDA Forest Service personnel and contractors to mark timber for harvesting. In 1993, NIOSH was asked to conduct an HHE because foresters on tree marking crews reported respiratory irritation, nausea, vomiting, headaches, fatigue, and other health concerns when applying oil-based TMP. Bulk samples of paint were analyzed to determine potential employee exposures and to design a sampling plan. Personal breathing zone (PBZ) air samples collected on foresters for toluene, xylene, ethyl benzene, n-butyl acetate, propylene glycol methyl ether acetate, methyl isobutyl ketone (MIBK), trimethyl benzene (TMB), and total hydrocarbons (THC) were well below applicable occupational exposure limits. In addition, concentrations of methyl ethyl ketone (MEK), MIBK, and toluene, xylene, and ethyl benzene metabolites in urine samples from foresters were below applicable biological exposure limits. However, based on the reports of acute irritation and central nervous system (CNS) effects among foresters, and the possibility that these may have resulted from the combined effects of exposure to low concentrations of multiple solvents, NIOSH investigators recommended that the USDA Forest Service switch to a high-solid, low solvent waterborne paint [NIOSH 1998].

In 1998, NIOSH received a second request for an HHE to evaluate foresters' exposure to a newly formulated waterborne TMP. Bulk paint samples were analyzed by gas chromatography and mass spectroscopy using solvent extracts and headspace air samples of the paint to determine

potential employee exposures and to design a sampling plan. PBZ air sampling was conducted for THC, toluene, TMB, MIBK, MEK, propylene glycol, and 2-butoxy ethanol during tree marking operations. Solvent concentrations in PBZ samples were mostly below the limit of detection or were present at trace concentrations (too low to reliably quantify). Propylene glycol was the only substance detected in quantifiable concentrations (up to 0.35 parts per million). Urine samples analyzed for propylene glycol, MEK, MIBK, and 2-butoxyacetic acid did not contain detectable concentrations of these substances. This evaluation revealed that substitution with the propylene glycol-based waterborne paint resulted in reduced solvent exposures as compared with the earlier HHE. Irritant or CNS symptoms were not reported by foresters. Based on the findings and observations from this evaluation, NIOSH investigators recommended that the USDA Forest Service continue to monitor health symptoms among foresters and encourage the use of work practices that would further limit solvent exposures such as using a minimum number of trigger pulls to mark a tree, and marking trees from an upwind location whenever possible [NIOSH 1999]. The USDA Forest Service subsequently decided to use the waterborne TMP exclusively for all tree marking activities.

In 2000, NIOSH received a third request for an HHE because of reports of nausea, rashes, headaches, and dizziness among some foresters. To evaluate worst-case exposure potential, the HHE was conducted during a time of greatest anticipated work-crew size, high ambient temperature, and low relative humidity. The TMP used was the low-solvent waterborne paint. A bulk TMP sample was analyzed for solvent content as discussed further below. None of the foresters participating in the evaluation reported headaches, nausea, or dizziness during the NIOSH evaluation. Results were similar to the 1998 HHE in that the concentrations of solvents (MEK, toluene, propylene glycol, and THC) in PBZ air samples were either very low or non-detectable. Biological monitoring was not performed during this HHE. NIOSH investigators recommended that the USDA Forest Service continue to document symptoms among foresters and share results with employees. Based on observations that there was a large difference in the amount of paint used on trees of a given size depending on the forester, NIOSH investigators recommended that foresters be trained on using the least amount of paint possible and on using techniques to further limit personal exposures [NIOSH 2000]. NIOSH investigators noted that continued monitoring of employee exposures was not needed unless there was a significant change in the process, formulation, or work practices.

TMP Specifications and Bulk Analyses Review

Table 2 of the USDA Forest Service Specification 2400-400 (dated March 2001) contains a list of the maximum contents of various solvents that can be present in TMP on a wet weight basis. The source of the specifications for individual substances is not given in the document, but you indicated that at least for some substances, these may be based on analytical limits of detection that existed when the specifications were initially developed and for paints that did not result in health concerns or workplace exposures exceeding applicable limits. With the exception of mineral spirits, the specification lists concentrations of 0.2% or less by weight for benzene, xylene, toluene, MEK, MIBK, and TMB, among others. The maximum content of mineral spirits was listed as 9.0%. Several different Environmental Protection Agency (EPA) test methods for

solid waste are cited as applicable test methods in Table 2. The EPA methods are not specific for paint samples, rather they can be adapted for use on a variety of different matrices. Though the EPA methods have tables listing minimum detection limits for various substances, cautionary statements are provided indicating that estimated quantitation limits for individual substances are instrument dependent and also dependent on the choice of sample preparation and introduction method (e.g., purge and trap), and dilution.

I reviewed three analytical reports for bulk paint analyses. The first was from Calcoast Analytical, dated March 30, 1998, and was for waterborne TMP used during the time of the 1998 HHE. The solvent analyses were performed at the request of the USDA Forest Service using ASTM E260. Of the substances analyzed, only toluene was present in detectable concentrations ranging from 0.004% to 0.92% by weight in six paint samples. The mineral spirits content was not reported. No further details were provided on analysis conditions or sample preparation techniques (e.g., dilution). Four of the TMP samples had toluene concentrations exceeding the current specification limit of 0.01%.

In June 2000, a bulk TMP sample was analyzed as part of the HHE by a NIOSH contract laboratory. Analyses were conducted using a modification of EPA method 8260B (purge and trap gas chromatography/mass spectrometry [GC-MS]). Paint samples were diluted 1:5000 for analysis. It was noted in the report that TMB coeluted (came out at the same time) with mineral spirits, and that quantification of mineral spirits was also complicated because the internal standard was not calibrated against a reference standard of aliphatic and alicyclic hydrocarbons. Thus, results for TMB and mineral spirits were considered as semi-quantitative values or estimates. The estimated concentrations of TMB (0.29%) and mineral spirits (10%) exceeded the TMP specifications. To obtain more accurate concentrations for mineral spirits, an attempt was made to inject the paint sample directly into the gas chromatograph (after filtering the sample to remove particulate matter in order to protect the column and injector), however, that effort was not successful in detecting mineral spirits. The analyst noted that it was likely that the mineral spirits were contained within the latex particles that had been removed by filtration.

The analytical report of 10 bulk TMP samples from EIS Analytical Services, Inc. (EIS), dated April 30, 2008, indicated that EPA methods 8015M and 8260B were used to quantify solvents and paint volatile organics. The report noted that MEK and methanol coelute under the analysis conditions and that two other substances that coelute (cyclohexanol and 2-butoxyethanol) were later found not to be present when mass spectroscopy was used for positive confirmation. In addition, the report noted that 2-methoxyethanol and 2-ethoxyethanol, both of which have TMP specification limits, could not be separated chromatographically at the levels associated with the specification limits. Because some of the bulk TMP samples exceeded the specification limits for certain solvents (TMB, styrene, MEK, iso-butyl alcohol, and sec-butyl alcohol), additional testing of the TMP was conducted at DataChem Laboratories, Inc. (DataChem). Although I did not review the DataChem report, you indicated in the HHE request that DataChem tested the paint with a variety of methods to optimize accuracy, and in January 2009, reported results that varied greatly from those reported by EIS. For example, DataChem did not detect MEK but they did detect trace concentrations of formaldehyde. DataChem and EIS have subsequently indicated

that they will no longer test TMP. DataChem noted that the samples had to be diluted up to 1:740,000 and because the compounds of interest are present at relatively low levels, slight changes in any step can result in gross errors due to the size of the dilutions required for analysis. They also noted concerns about ruining their analytical equipment if they were to analyze the samples straight.

Summary

My review of the past HHEs indicates that PBZ exposures for the solvents measured were all very low, well below applicable occupational exposure limits. In addition, for the two HHEs that had biological monitoring, urine concentrations for various solvents and their metabolites were also low and did not exceed biological exposure limits. Past work has shown that some TMP samples exceeded the current specification limits for certain solvents, despite the fact that employee exposures were within acceptable limits during the NIOSH HHEs. In the most recent HHE, NIOSH investigators noted that work conditions likely play a much larger role in a forester's exposure than does the inter-batch variation in TMP component concentration. This was based on observations that there were large differences in application technique and paint usage among foresters.

My review of available analytical reports has confirmed difficulties in analyzing TMP. Problems that were identified include the lack of standard methods, variations in analytical approaches used by different laboratories, problems with coelution of substances of interest, and dilution effects. Problems with coelution make separation and identification of individual components difficult and may explain some of the differences in results reported by different laboratories. For example, if the retention time alone is used for chemical identification, without positive confirmation by mass spectroscopy, then a substance initially thought to be present based on its retention time may have been another substance that happens to coelute at the same time under those analytical conditions. Even if a standardized test method for TMP were available, you could expect differences in limits of detection among different laboratories and even within a given laboratory depending on instrument conditions and other factors on the day of the analysis. In addition, solvent content can vary depending on how and when the paint samples are collected and how they are stored prior to analysis.

Conclusions

NIOSH investigators will not be conducting an onsite evaluation because we do not believe that additional exposure monitoring is warranted at this time. Results of three past evaluations have shown that foresters' exposures have been well below occupational exposure limits, and work practices to further limit employee exposures have been identified. Reports of paint samples exceeding specification limits likely result from variations in analysis techniques and difficulties in analyzing samples with such a complex matrix. Such difficulties were not likely fully appreciated at the time the specification limits were developed. Because the paint manufacturer has indicated that there have not been any changes to the paint formulation since it was developed and evaluated in a NIOSH HHE approximately 10 years ago (except for the cobalt

and tracer content), further testing of the paint would not be productive in the absence of detailed, standardized test methods specific for these paints; strict laboratory reporting requirements; and reasonable tolerance limits. Given the difficulties in conducting solvent analyses in TMP, and the fact that the specification limits developed several years ago were based on analytical limits of detection (rather than health based considerations or a formalized risk assessment process), USDA Forest Service should explore other options for TMP quality assurance. This could include requiring periodic assurances from the manufacturer that the formulation has not changed, and that any changes made with respect to the source or composition of individual paint components are fully documented and evaluated to ensure that they do not affect either product quality or the content of key components.

This letter closes our file on this HHE request. NIOSH recommends that employers post a copy of this letter for 30 days at or near work areas of affected employees. Thank you for your cooperation with this evaluation. If you have any questions, please do not hesitate to call me at 513-841-4597.

Sincerely yours,



Teresa A. Seitz, MPH, CIH
Supervisory Industrial Hygiene Team Lead
Hazard Evaluations and Technical
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References

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NCP Coatings Inc.
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October 5, 2009

Dave Haston
USDA Forest Service
San Dimas Technology and Development Center
dhaston@fs.fed.us

Mr. Haston:

Please use this letter as NCP's certification that that we use no formaldehyde in our Tree Marking Paint formulations supplied to the USDA Forest Service.

Furthermore, other than a slight formulation adjustment to increase the amount of cobalt for improved drying properties and increase of the tracer level for better detection, none of the formulas have been changed since NCP became your Tree Marking Paint supplier.

Sincerely,

Randy Terrill
Technical Director