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Inter Office

Car Engineering

June 16, 1980

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Subject: Toxic and Hazardous Substances - Product Engineering Substitution Actions

Recommendations from a task force on Carcinogens in the Workplace presented May 27, 1980 to the Engineering and Research and the Manufacturing and Supply Subcommittees have been accepted. A copy of the Executive Summary and recommendations (Attachment 1) shows the assignments to the Product Engineering Offices as:

- Eliminate Group A (known substitutes without major redesign) asbestos, hexavalent chromium components and benzene for Job #1, 1985, where possible.
- Assist in defining redesign/development required to eliminate Group B (known substitutes with major redesigns).
- Recommend advanced programs that will define the job of eliminating Group C (substitutes unknown).

Vehicle Materials Development and Planning proposes to coordinate these assignments and take overall responsibility for assuring they are done with the least additional workload on each PEO. We hope to do this by staying in touch and assisting at the working engineer level. Bob Musen, T44134, will be the VMD&P engineer in charge. Please contact him or me with your thoughts on any aspect of what we are planning (Attachment 2).

G. F. Bolling
G. F. Bolling

RAH:vc
attachments

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EXECUTIVE SUMMARY
CARCINOGENS IN THE WORKPLACE

Introduction

At the October 1979 joint meeting of the Engineering and Research and the Manufacturing and Supply Subcommittees, a report on the Occupational Safety and Health Administration (OSHA) Policy for Regulating Workplace Carcinogens was presented by Personnel and Organization Staff. This report noted that final regulations for carcinogens in the workplace were anticipated by the end of 1979. It was agreed that efforts to eliminate the use of potential carcinogens, where possible, should be preceded by analysis of the affected materials and processes. In this regard, a Task Force was established by the Subcommittees to identify potential carcinogens and quantities in use, set targets for elimination of such substances if possible ahead of regulation, take steps to find substitutes, develop a directive and workplan and organize to identify and control potentially carcinogenic substances.

Since October, OSHA has released its Policy which establishes criteria and procedures for the identification, classification, and regulation of potential carcinogens in the workplace. The Policy defines Category I potential carcinogens as substances known to be carcinogenic in humans or which have been demonstrated to be carcinogenic in two separate laboratory animal studies. Category II substances are those where data are suggestive of carcinogenicity in humans and test animals. The Policy also outlines criteria for classifying a substance into Categories I or II and establishes the mechanism for issuance of standards governing use of a particular substance. No specific substances were categorized or standards promulgated with the issuance of the Policy. Normally, once the need for a standard is determined by OSHA, it could take one to two years before the standard is issued. If an "Emergency Standard" is set, the ruling is issued and immediate compliance is required. A number of court challenges of the new Policy are expected to center primarily on stringent rules which virtually preclude use of negative evidence studies when defining the carcinogenicity of a substance and on lack of a cost/benefit criteria in the Policy. The draft list of candidate substances issued by OSHA two years ago is to be revised by July, 1980 followed by a prioritized extract in September.

The Task Force has concentrated on developing the capability for managing the elimination or control of Category I potential carcinogens in the workplace. A start has been made in identifying specific applications for subsequent elimination or control of asbestos, hexavalent chromium compounds and benzene.

Accomplishments

Based on an NVMA report the Task Force has identified thirty-six (36) substances associated with automotive production included in the draft OSHA candidate list. Eleven (11) are currently regulated by OSHA as potential carcinogens, the balance have potential for new regulation. The list of substances was reviewed by the Task Force considering impact on the Company and potential for further regulation resulting in definition of eight priority substances. The highest priority substances, asbestos, hexavalent chromium compounds and benzene, were examined by identifying application to materials and parts and assessing possibility of substitution. A list of asbestos production materials and parts has been developed and forwarded to purchasing for supplier verification of content and availability of possible substitutes. The benzene and hexavalent chromium compound lists are being analyzed by the product offices and Manufacturing Staff to define specific parts usage.

Strategy and Workplan

The initial search for asbestos, hexavalent chromium compounds and benzene defined a preliminary but not complete list of parts and materials containing these substances as listed in the table below. The applications were judgementally categorized into three groups: known substitute material without major redesign, known substitute material with major redesign and no known substitute with advanced engineering required.

Substitution Category	Production Materials/Parts			Nonproduction Materials/Parts		
	Asbestos	Chromium	Benzene	Asbestos	Chromium	Benzene
A - Known without redesign	56	-	-	8	84	1
B - Known with redesign	21	-	-	-	28	1
C - Not known, adv. eng'g req'd	26	22	3	-	4	-
	103	22	3	8	114	2

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The following strategy and timetable are recommended for asbestos, hexavalent chromium compounds and benzene

For applications with known substitute materials not requiring major redesign, eliminate if appropriate by Jan #1, 1983.

- For applications with known substitute materials but requiring major redesign, eliminate if appropriate consistent with cycle plans and facility projects.
- For applications without defined substitutes, advanced engineering will be required before a strategy and timetable can be developed.

If elimination is not appropriate or possible, provide adequate controls on exposure

Strategies and timetables remain to be developed for the balance of the eight priority potential carcinogens

A generalized workplan has been prepared on the basis of the evaluation of the substances referred to above. The workplan requires central program management with action implementation by VAAO/DPO Product Engineering Offices, Purchasing activities, Product Planning, Vehicle activities, Manufacturing activities and the Manufacturing and Supply Staffs. The workplan timing requires one year to define the uses of a potentially carcinogenic substance with elimination requiring two additional years for a substance having a known substitute with no major redesign required. For material applications requiring major redesign the timing is consistent with new product phase V timing of 33 months for vehicle and 45 months for powertrain programs

Although a strategy and workplan are proposed in this paper and efforts have been started in these areas, there are considerable timing and feasibility issues in each of the identified applications. Without funding or directed prioritization over other engineering efforts, the work on the identified asbestos, hexavalent chromium compound or benzene applications cannot proceed under present economic conditions. Nevertheless, a measured Company reaction is necessary to initiate orderly substitution programs with sufficient flexibility to adapt to engineering and economic limitations.

Materials and Toxicology System (MATS)

A new computer data base is being developed which links health, product, and manufacturing data bases to facilitate rapid identification of potential carcinogens and other toxic substances. The links between these systems will provide a method for generating a list of production and nonproduction material specifications which contain Category I substances. To date, of the four major MATS subsystems, two have been completed and the others are being manually operated. In addition, PEP 3-139 which specifies procedures for the review of new materials is being revised to include the necessary actions for entering data on toxic and hazardous substances into the data base. The work to date in development of the Materials & Toxicology System (MATS) has emphasized the need for material definition on all part releases. To this end the total engineering release file has been audited and the responsible PEO's are preparing material definition for all part releases.

Recommendations

Achievement of the elimination or control of potential carcinogens requires a corporate commitment to foster an integrated and sustained effort throughout the Company over a number of years. To accomplish this, the following actions and responsibilities are recommended.

1. Assign hazardous substance control program management responsibility to Environmental and Safety Engineering Staff (Responsibility: Environmental & Safety Engineering Staff - ES&S)
2. Establish a Hazardous Substance Control Committee chaired by Environmental and Safety Engineering Staff. The Task Force would be discontinued. (Responsibility: ES&S)
3. Revise Directive R-101 (Occupational Safety and Health and Control of Hazardous Materials) to reflect adjusted responsibilities for line and staff. No new Policy is required, the matter is covered under Policy C-3, Standards of Corporate Conduct. (Responsibility: ES&S Program Manager)

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4. Adopt as the Company potential carcinogen listing, the 38 current OSHA-regulated and proposed Category I substances used in automotive production. Establish the top eight priorities proposed by the Task Force as Company priorities. Direct that the listing be updated semiannually. (Responsibility: P&O Staff)
5. Complete strategies and timetables for the eight prioritized potential carcinogens (or review and approval by the subcommittees). (Responsibility: ESLS Program Manager)
6. Continue the development of MATS by Environmental & Safety Engineering Staff. A budget and headcount transfer from Engineering Staff has been agreed to. (Responsibility: ESLS Program Manager)

The Company has demonstrated a commitment to protect workers while seeking to eliminate specific substances. Directions on the use of and protection for numerous substances have been issued. Workers are protected by restricting exposure and by special clothing and engineered safeguards designed to keep exposure within known permissible limits. Specific recommendations for eliminating asbestos, hexavalent chromium compounds and benzene follow.

7. Proceed with the elimination of Group A (known substitutes without major redesign) not later than Job #1, 1985 where appropriate as determined by the Hazardous Substance Control Committee. (Responsibility: PEO's, SMD's, Purchasing)
8. Include Group B (known substitutes with major redesign) elimination actions in Phase V of vehicle and powertrain programs and in new plant and renovation projects where appropriate as determined by the Hazardous Substance Control Committee. (Responsibility: ESLS Program Manager, Product Planning, Vehicle Engineering, Manufacturing Staff)
9. Recommend advanced program funding to develop designs and/or substitutes for new production and nonproduction parts and materials to identify feasibility, reliability, cost and weight implications of alternative materials/designs for Group C applications (no known substitute, advanced engineering required). (Responsibility: PEO's, SMD's, Technical Planning, Scientific Research Staff)

The implementation of the above actions and responsibilities should be reviewed periodically by the Engineering and Research and Manufacturing and Supply Subcommittees to provide a forum for discussion, Corporate overview and endorsement of appropriate funding and prioritization of efforts.

Engineering Staff
Manufacturing Staff
May 27, 1980

Vertical line indicates revision at subcommittee direction.

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COORDINATING PRODUCT OFFICE TOXIC MATERIAL SUBSTITUTION ACTIONS
AND
DRAFT STATUS REPORT

As discussed in the meeting with materials responsible personnel in G. F. Bolling's office on May 7, 1980, it was concluded that remote "management-by-assignment" will not do the job required for control of toxic and hazardous materials. Even the simple compiling of a full list of asbestos, hexavalent chromium and benzene applications, for example, requires experienced research which today's austerity budgets cannot absorb. Therefore, as agreed in principle at the meeting, VMD&P proposes to do the following:

1. Assist in refining the initial listing and classification of the top three hazardous material applications.
2. Coordinate substitution development among the PEO's to avoid duplication of effort.
3. Report both PEO and Corporate status of actual elimination and status of development to the ESES program manager. VMD&P reports would be against a product family group. Status by part number detail, if necessary, would remain a PEO responsibility.

Furthermore, simplification of ES-M's in NAAO is a part of the VMD&P charter, and a broad review of materials such as this ought to turn up many like ES-M's in like applications. VMD&P will therefore highlight and include in the substitution recommendations every possibility for commonizing.

The job is large enough to require that it be taken a bite at a time. The bite size should be established by a carefully considered classification of like materials and function. For example, bite size might be: asbestos in friction materials, asbestos in gaskets for high temperature; etc.

Draft Status Report

A draft status report (Exhibit 1) has been prepared by VMD&P for asbestos removal from product families with general classification of friction materials. The report is incomplete, but should serve as a thought starter for content, organization and format. As written, the report is in two parts.

- Recap of each PEO's position and a spread sheet removal action/issues summary.
- Summary of the key aspects of the design development job facing Ford product engineering: government regulation, scope of Ford use, survey of substitute availability and performance, bibliography, and miscellaneous information of a general nature. (This is the basic technical reference information (the glue) that will keep the program on course and avoid duplication.)

Development and the continuing update of this report would be the responsibility of Vehicle Materials Development and Planning based on input by the responsible PEO materials and design engineers, suppliers and staffs. Periodically, a brief general meeting of the materials engineers might be necessary to adjust our course.

Vehicle Materials Development and Planning
 June, 1980

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EXAMPLE

ASBESTOS ELIMINATION FROM PRODUCT COMPONENTS PROGRAM

PART 1 - FRICTION MATERIALS

STATUS REPORT NO. 1

Vehicle Materials Development and Planning
June, 1980

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ADRIANOS ELIMINATION - FRICTION MATERIALS
SECTION 1 - STEEL, IRON

PRODUCT FAMILY
TRUCK
ENGINE
OFFICE 2

BRAKE PADS 1/
(DISC TRUCKS)

Done: [20%] in late 1st
1991. BULKY, TIME AND
MATERIAL REQUIRED.

Done: [0%]
ISSUES: SUPPLIERS NOT READY
TO OFFER EQUIV. PERFORM
IN VOLUME.

[PENDING] PER, ENGINEERING LAB
WITH SUPPLIERS DURING 1991. NO SPECIFIC ELIMINATION TARGET.

BRAKE SHOES 1/
(DRUM TRUCKS)

Done: [0%]
ISSUES: SUPPLIERS NOT READY
TO OFFER EQUIV. PERFORM
IN VOLUME.

[PENDING] PER, ENGINEERING LAB
WITH SUPPLIERS DURING 1991. NO SPECIFIC ELIMINATION TARGET.

WIRE CLUTCHES, BANDS
(AUTOMOBILES, LIGHT TRUCKS)

Done: [100%] in production.

[PENDING] PER, ENGINEERING LAB
WITH SUPPLIERS DURING 1991. NO SPECIFIC ELIMINATION TARGET.

DRIVE SHAFTS
(AUTOMOBILES, LIGHT TRUCKS)

Done: [20%] in production.

[PENDING] PER, ENGINEERING LAB
WITH SUPPLIERS DURING 1991. NO SPECIFIC ELIMINATION TARGET.

TRUCKS

N.A.

N.A.

Done: [100%] in production.

Done: [20%] in production.

TRUCK

Done: [100%] in late 1st
1991. BULKY, TIME AND
MATERIAL REQUIRED.

Done: [0%]
ISSUE: SUPPLIERS NOT READY
TO OFFER EQUIV. PERFORM
IN VOLUME.

[PENDING] PER, ENGINEERING LAB
WITH SUPPLIERS DURING 1991. NO SPECIFIC ELIMINATION TARGET.

N.A.

Done: [100%] in production.

Done: [20%] in production.

TRUCK

Done: [10%] in late 1st
1991. BULKY, TIME AND
MATERIAL REQUIRED.

Done: [0%]
ISSUE: SUPPLIERS NOT READY
TO OFFER EQUIV. PERFORM
IN VOLUME.

[PENDING] PER, ENGINEERING LAB
WITH SUPPLIERS DURING 1991. NO SPECIFIC ELIMINATION TARGET.

N.A.

Done: [100%] in production.

Done: [20%] in production.

TRUCK

TBD

TBD

TBD

TBD

1/ ALTHOUGH 70% MAY BE SHOWN "ADRIANOS ELIMINATION", SCI LAB (A ANDERSON) IS CONTINUALLY
EVALUATING/DIAGNOSING SUPPLIER SUBMISSIONS.

2/ OFFICES NOT AFFECTED: - DEFE, ENGINE, CCD, EED, FPDs

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ASBESTOS ELIMINATION - FRICTION MATERIALS CATEGORY

SECTION 2 - PRODUCT ENGINEERING REPORTS

Activities Review - Brakes

- Passenger Car Chassis - Asbestos free semi-met front disc brake pads were first used in the 1979 Mustang turbo option and Fairmont police package. Usage spread in 1980 models to all Mustang, V8 Fairmont and T-Bird. 1981 usage will increase again to all Fox vehicles and Granada. Bendix is the sole supplier. Semi-mets have proven the least expensive way to improve capacity. The trade off is generally greater rotor wear. All rear brakes are drum with asbestos containing lining.

A general asbestos-free lining development has been initiated by Car Chassis Brake Department with a letter to all the leading lining manufacturers. The letter invites manufacturers to demonstrate feasibility of asbestos free linings by comparing performance to current release over a single set of vehicle test parameters.

- Light Truck - All 1980 model light truck utilize semi-met front disc brake supplied by Bendix. Rears are all drum type with asbestos containing shoes. No non-asbestos substitutes are being investigated.
- Heavy Truck - The majority of Ford heavy trucks are equipped with drum brakes, front and rear, of conventional asbestos material. The very heavy class 16,000 to 20,000 pound capacity front axle trucks utilize disc brakes with semi-met pads. There are no plans to evaluate additional non-asbestos brake materials.

Statistics - 6/80

Number of End Item Brakes

PEO		Actual 1981 Model		Est. 1982 Model		Est. 1983 Model	
		Total	%Non-Abs	Total	%Non-Abs	Total	%Non-Abs
Car Chassis	Front						
	Rear						
Lt. Truck	Front						
	Rear						
Hvy. Truck	Front						
	Rear						

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ASBESTOS ELIMINATION - FRICTION MATERIALS CATEGORY

SECTION 2 - PRODUCT ENGINEERING REPORTS

Activities Review - Clutches

- Transmission and Axle - T&A incentive to develop asbestos substitutions has been largely policy. All wet operating internal transmission clutch plates and bands and locking differential clutch plates have been converted to non-asbestos facing as of ().

A non-asbestos (fiberglass) compound, developed for manual transmission clutches by Raybestos, was used in production of 1980 200 CID Fairmonts. The same material is currently released as an option to all conventional asbestos containing facings. Production of non-asbestos clutches however, will be limited by Raybestos production facilities until other sources are approved (Thermoid in process). Higher cost might also inhibit early release.

- Heavy Truck - clutch facings are being converted to ceramic materials as performance and costs become known. Conventional organics are not adequate.
- Light Truck - No non-asbestos substitutes have shown equivalent performance to date. Possible development for Yuma with Ashai (Japan). Current 90% supplier, Thermoid, assures he can meet EPA proposed exposure limit. All facings beginning 81 are seal coated for assembly safety.

Statistics

Number of End Product Clutches

PEO	Actual 1981 Model		Est. 1982 Model		Est. 1985 Model	
	Total	%Non-Abs	Total	%Non-Abs	Total	%Non-Abs
T&A						
Light Truck						
Heavy Truck						

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ASBESTOS ELIMINATION PROGRAM - FRICTION MATERIALS

SECTION 3 - BACKGROUND TO CURRENT DESIGN DIRECTION

Brakes and Heavy Duty Friction Applications

Asbestos has unique physical and chemical properties which are very difficult to reproduce in a substitute. These properties include a consistent natural lubricity, high temperature function, good permeability to heat generated gases, low cost. Furthermore, braking performance is judged against a highly developed (on asbestos) envelope of GPAS and FMVSS tests.

Three categories of non-asbestos compounds are currently being investigated.

- 1) Semi-metallics (Semi-met) - essentially sponge iron and steel wool plus graphite and borium sulfate held together in an organic matrix.

The graphite is required to prevent welding to the drum or rotor, but has a very low coefficient of friction when wet - it effectively restricts passenger car use to power disc brakes; although they have been applied to heavy trucks.

Semi-met disc brake pads supplied by Bendix today for car and light truck are a composite sandwich of semi-met surface bonded to a reinforced organic backing in turn riveted to a conventional steel pad. The sandwich construction is used primarily because the semi-met material does not have the compressive strength for riveting.

- 2) Sintered metallics - mixtures of iron and copper, some in variable density, used in clutch discs, aircraft brakes. Not likely to become feasible for automotive brakes.
- 3) Non-asbestos organic (N.A.O.) - essentially the same as the current asbestos shoes/pads but with other fibers such as glass. These would seem the best prospect as a substitute involving least product development but N.A.O. materials are not strong structurally & delaminate in the high speed manufacturing process used for passenger car drum brakes. They are compatible with less automated process used in some large truck drum brakes.

Consensus among passenger car product engineers and suppliers is that an N.A.O. material would require a three to five year combined development of drums, shoes, and linings before release.

Regulation and General Corporate Policy

(TBD) tons of asbestos are released to the environment annually as a result of wear of friction material containing asbestos. There is a strong difference in professional opinion as to the hazard from wear debris. High temperatures and pulverizing during wear change asbestos into a different form. The disagreement is to the toxicity of the debris.

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Section 3
Page 2

Regulation and General Corporate Policy (continued)

There is no doubt, however, that asbestos mining and manufacture of asbestos containing products will be increasingly regulated. Regulations will be in the form of airborne exposure limits, and banning of more products containing asbestos in a free condition (as vs. a filler in gaskets and plastics). A ban on the use of asbestos containing friction material is not expected in the near future but regulation will make them more costly and reduce their availability. More information about regulations and the intentions of private sector leadership will be exposed at an EPA sponsored conference July 14, 1980 in Washington D.C. Mr. A. Anderson of the Scientific Lab will attend.

NAAO Car and Truck Policy on product usage of asbestos is defined in CEPL-10: - with certain exceptions, "Newly designed components should not contain asbestos".

EXAMPLE

1/ Bibliography item reference

Vehicle Materials Development and Planning
June, 1980

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APPENDIX - ASBESTOS ELIMINATION PROGRAM, PART 1

Friction Material Suppliers

Company and (Representative)	Products	Comments
Bendix (Carl Calvin - 967-1660 (Ram Lampsa - 967-1500)	* Brake Pads and Linings	* Largest current Ford source for "semi-met" pads, passenger car and truck.
Raybestos (Jim Ellis - 352-1900)	* Clutch Facing - Manual Trans and Brake Lining	* Currently supplying non-asbestos manual trans clutch facings for passenger car.
Abex (John Brown)	* Brake Lining	* Heavy -development of N.A.O. Truck drum brake linings.
Thiokol (Harb Beler - 725-6689)	* Brake Pads and Linings	
H.K. Porter -Thermoid Div. (Tom Derkin - 649-1606)	* Clutch Facings * Brake Linings	
Beral (French Co.)	* Clutch Facings	
Mintex	* Brake Lining	
Nuturn (Jim Mellowa - (615) 367-9900)	* Brake Pads & Linings	
Carlyle ..	* Brake Lining - Heavy Truck	
Kelsey Hayes	* Auto Trans Clutch Facing * Clutch Face - Manual Trans.	
Borge Warner	* Auto Trans Clutch Face	

Exhibit 1
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EXAMPLE
Used as a guide

Vehicle Materials Development and Planning
June, 1980

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Responses from PEO's - Asbestos

1. Climate Control Division
2. Body and Electrical
3. Engine Engineering
4. Ford Parts & Service Division
5. Transmission & Axle Engineering
6. Electrical & Electronics Division
7. Truck and Recreation
8. Truck Operations
9. Chassis Engineering

Supplier Survey Request and Purchasing Activity Responses - Asbestos

10. Climate Control Division
11. Casting Division
12. Electrical & Electronics Division
13. Glass Division

Responses from PEO's - Chromium and Benzene

June 6, 1980

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