



National Marine
Manufacturers Association

Energy Policy Research Foundation Ethanol Roundtable

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April 15, 2008





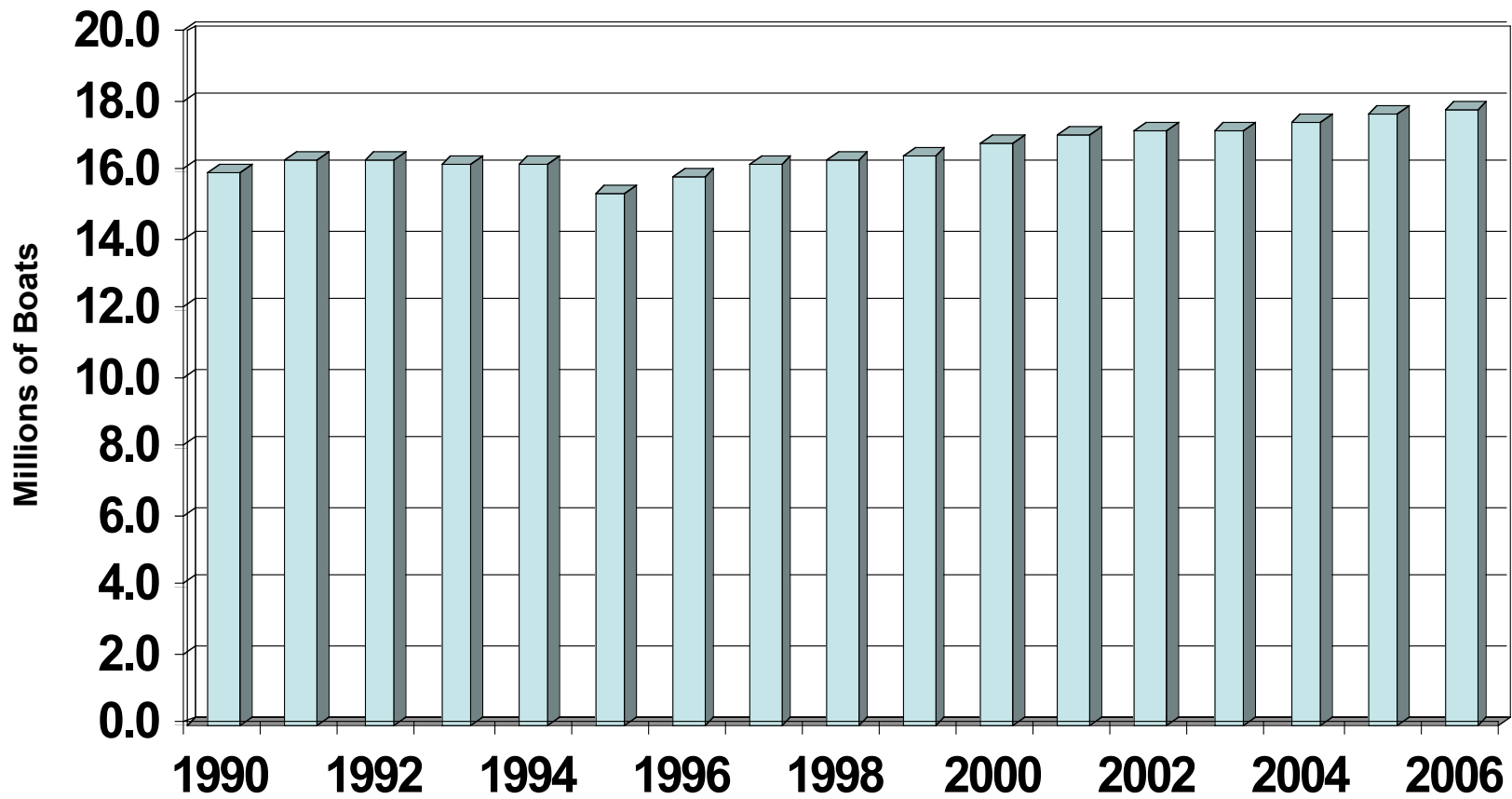
Recreational Marine Factoids

- Boating is big business – \$39.5 billion sales in marine products
- Boating is a uniquely American industry
 - 3249 USCG Registered Boatbuilders based on Manufacturer Identification Code
- America is 50 percent of the world market for boating products





Recreational Boats Owned





Recreational Marine Engine Categories

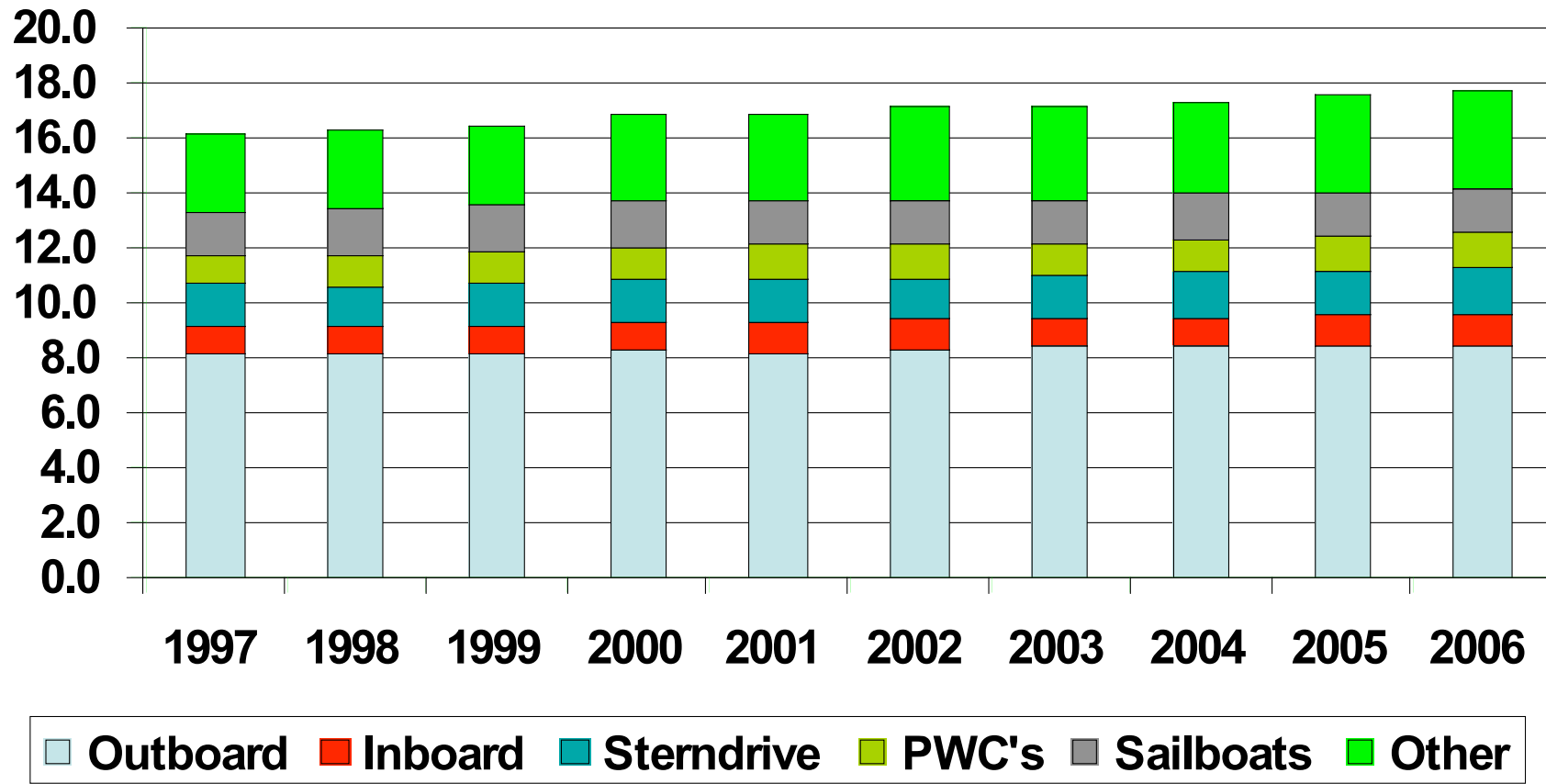
SI Marine

- Outboards
- Personal Watercraft
- Stern drive/Inboard
- Marine generators





Recreational Boats in Use by Engine Type



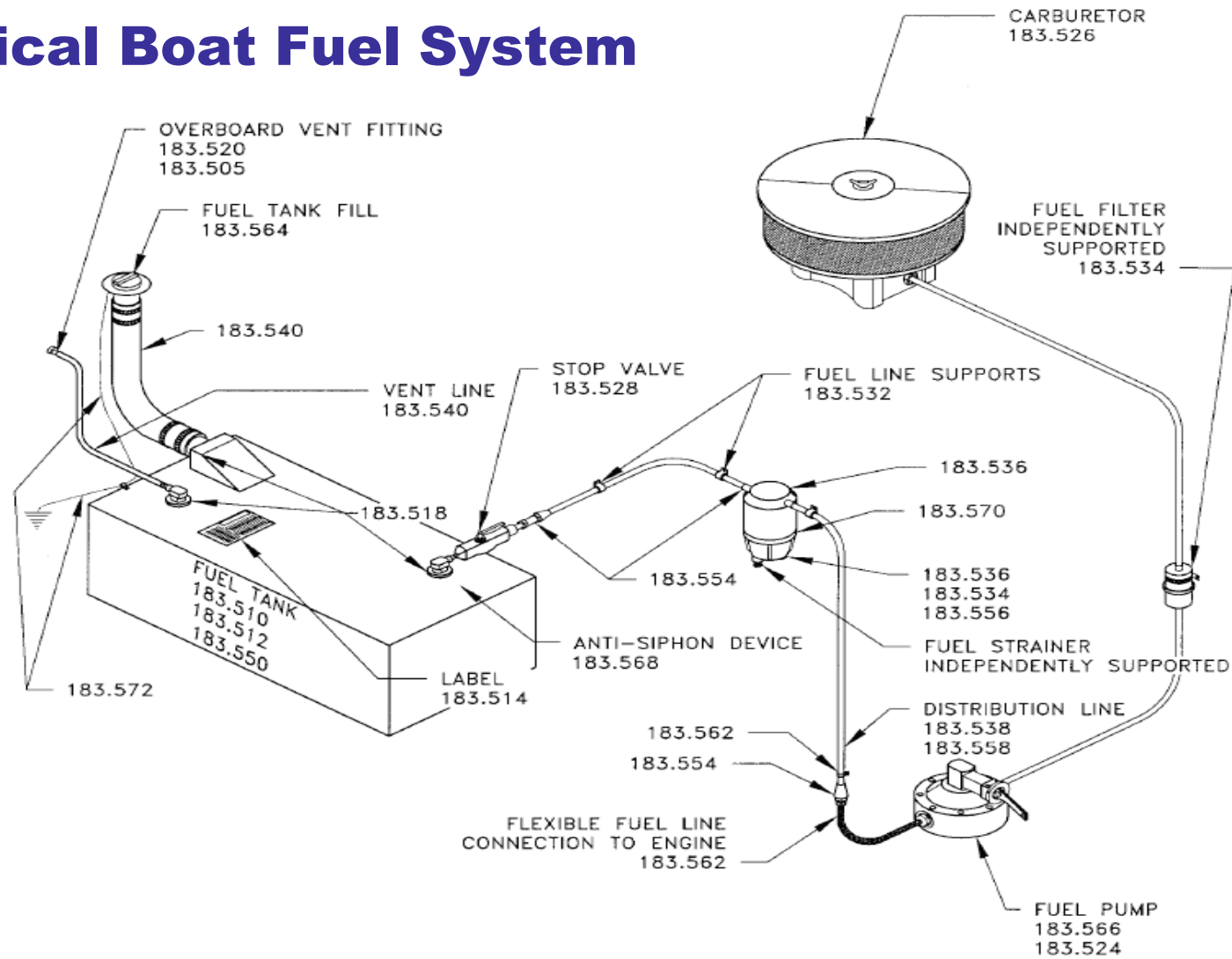


Boat Fuel System Components





Typical Boat Fuel System





Fuel Tank Failure Risks

- Fuel tank materials degradation
 - Leaks develop in fiberglass
 - Corrosion to steel tanks
 - Corrosion to zinc parts



Ethanol Fuel Harms Boat Engines, Lawsuit Claims

Portfolio Media, New York (April 7, 2008)--A boat owner has filed a proposed class action against several major oil companies including Exxon Mobil Corp., ConocoPhillips Co. and Chevron USA Inc., claiming that their ethanol-blended gasoline damages marine fuel tanks and engines.





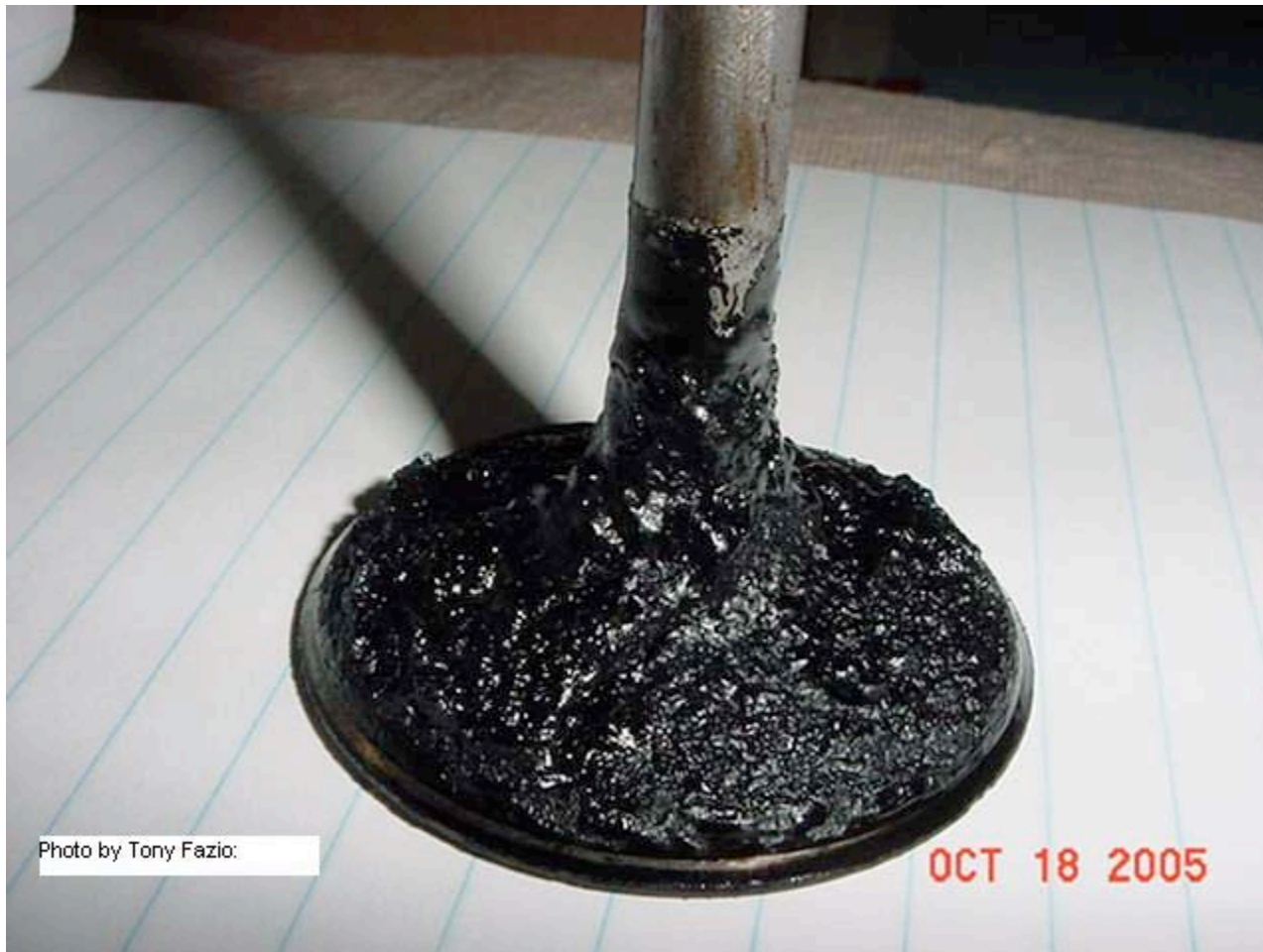


Post-mortem analysis of fiberglass fuel tank after exposure to ethanol fuel. Result of ethanol scouring inside of fuel tank.





Fuel/Resin
mixture
caused by
scouring of
resins inside
fuel tank,
which are
then passed
through filter
into the fuel.



Valve with
carbon
build-up
from
breakdown
of the resin
in fiberglass
fuel tanks.



NMMA Concerns with increased Ethanol in Fuel

- What makes the Marine Industry unique?
 - Spans from single small engines to 1100 HP multi-engine applications
 - Operate at high power settings - High fuel consumption
 - No gravity or pressure feed fuel systems
 - Long periods of storage
 - Open vented fuel systems
 - Just starting feedback loop engine controls



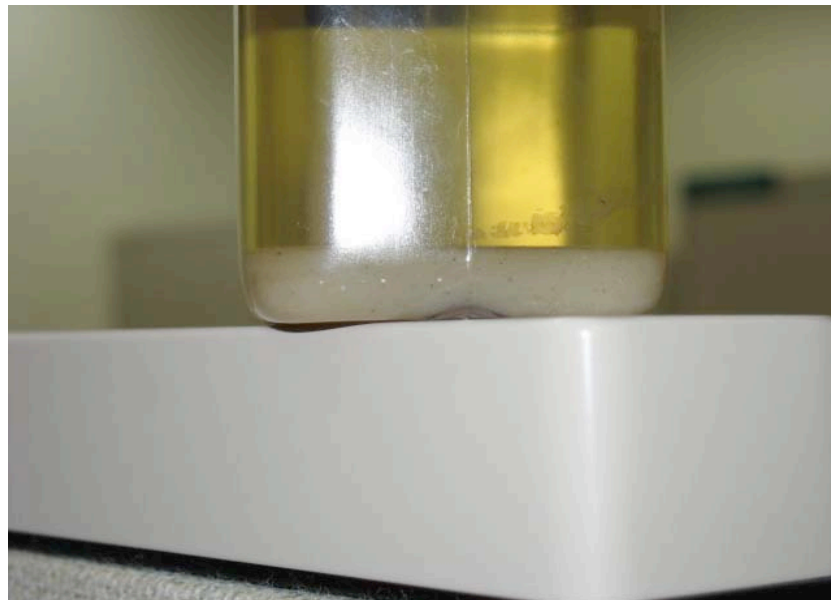
NMMA Concerns with increased Ethanol in Fuel

- Long periods of storage
 - Increased water in boat tanks
 - Possible phase separation if fuel is stored over a wide temperature range.



NMMA Concerns with increased Ethanol in Fuel

Ethanol Fuel retrieved from a boat in 2006





NMMA Concerns with increased Ethanol in Fuel

**Fuel System Component attacked by Ethanol
Fuel retrieved from a boat in 2007**





NMMA Concerns with increased Ethanol in Fuel

- Spans from single small engines to 1100 HP multi-engine applications
 - Many configurations for engines and boat fuel systems



NMMA Concerns with increased Ethanol in Fuel

- Operation at high power settings-
 - Lower range on same amount of fuel
 - Higher fuel flow capability components may be needed (bigger filters, larger diameter fuel lines, bigger anti-siphon valves)



NMMA Concerns with increased Ethanol in Fuel

- No gravity or pressure feed fuel systems
 - Increased vapor due to fuel lift and higher RVP of E20
 - Poor hot restart, vapor lock



Engine Types

- Carburetor 2-Stroke Outboards - Premix
- Carburetor 2-Stroke Outboards – Oil Injection
- Fuel Injected 2-Stroke Outboards – Oil Injection
- Direct Injected 2-Stroke Outboards – Oil Injection
- Carburetor 4-Stroke Outboards
- Fuel Injected 4-Stroke Outboards
- Fuel Injected, Supercharged, 4-Stroke Outboards



Engine Types

- Carburetor 4-Stroke Inboards/Sterndrives
- Fuel Injected 4-Stroke Inboards/Sterndrives
- Fuel Injected, Supercharged, 4-Stroke Inboards/Sterndrives
- Fuel Injected, Catalytic Converter Equipped, 4-Stroke Inboards/Sterndrives



Engine Tests

- Most sensitive examples of each engine type must be tested for durability and emissions on all possible blends
- Emissions – Most engines are open loop and will run lean
 - NOx emissions expected to increase due to lean operation
- Durability – Higher exhaust gas temperatures may lead to valve failures and lean misfire may lead to piston failures



Engine Test Requirements

- Emissions tests on all potential blends and industry recommended examples of each engine technology – Standard 5 Mode Test
- Durability Testing on all potential blends and industry recommended examples of each engine technology
- Durability testing to consist of 300 hour WOT full power (standard industry test)



GAGE PRODUCTS COMPANY

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FERRISDALE, ILLINOIS 60525

BRAZILIAN FUEL E22

GASOLINE

UN1203

TOX # 018816 TOX#158951

NET WT: 343.2
BATCH NO. 40546

GALS 00055



40525

FOR DEPOSIT DRUMS:
DEPOSIT REFUNDED ONLY
IF DRUMS ARE IN CLEAN
USEABLE CONDITION WITH
BUNGS TIGHTENED.

Eye Contact: Flush immediately with copious amounts of water for at least 15 minutes while holding eyelids open. Seek medical attention.

Skin Contact: Remove contaminated clothing/shoes. Flush skin with water. Follow by washing with soap and water. If irritation occurs seek medical attention. Do not reuse any clothing until it has been thoroughly cleaned and dried.

Inhalation: Remove victim to fresh air and provide oxygen if breathing is difficult. Administer artificial respiration if not breathing. Seek medical attention.

Ingestion: Do not induce vomiting. If vomiting occurs spoon carefully. Keep head below hips to prevent aspiration of liquid into the lungs. Seek medical attention.

DANGER: "EMPTY" CONTAINERS RETAIN RESIDUE AND VAPORS AND CAN BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, DRILL, GRIND, OR EXPOSE TO HEAT, FLAME, SPARK, OR OTHER SOURCE OF IGNITION. IT MAY EXPLODE AND CAUSE INJURY OR DEATH. DISPOSE OF EMPTY CONTAINERS ACCORDING TO LOCAL, STATE AND FEDERAL LAWS. GROUND ALL EQUIPMENT ASSOCIATED WITH THIS PRODUCT.

IN CASE OF SPILL: ELIMINATE ALL IGNITION SOURCES. EVACUATE AREA. WEAR APPROPRIATE SAFETY EQUIPMENT. SHUT OFF SOURCE OF LEAK. DIKE AND CONTAIN. PUMP FREE MATERIAL INTO SALVAGE VESSELS. SOAK UP RESIDUE WITH A SUITABLE ABSORBENT. DISPOSE OF ABSORBENT IN OPEN - HEAD DRUMS ONLY. DISPOSE OF PROPERLY. IN CASE OF EMERGENCY CALL CHEM-TREC 1-800-424-9300

FIRE FIGHTING: CLEAN AREA OF UNPROTECTED PERSONNEL. USE WATER FOG TO KEEP FIRE-EXPOSED SURFACES COOL. EXTINGUISH WITH FOAM, DRY CHEMICAL OR CO₂. DO NOT USE A DIRECT STREAM OF WATER. WEAR A SELF-CONTAINED BREATHING APPARATUS IF ENTERING A CONFINED SPACE OR IF IN CONTACT WITH VAPORS OR SMOKE.



1/12/2008

NOTICE: CONTAINERS MUST BE EMPTY BEFORE RETURN

MSDS NUMBER
40525

HEALTH	3
FLAMMABILITY	4
REACTIVITY	0
PERSONAL PROTECTION	G