



Customer Service Bulletin Commercial Business Group

General Product Information

March 3, 2005

<u>Model/Serial Range:</u>		<u>Model Numbers:</u>					<u>Serial Numbers:</u>
03200	03201	03421	03422	03426	03427	<u>03500</u> *	00000-230099999
<u>03501</u> *	<u>03502</u> *	<u>03504</u> *	<u>03530</u> *	<u>03531</u> *	<u>03540</u> *	03541	
03543	03544	03550	03551	03800	03801	03802	
03803	03804	03805	03806	03807	03808	04311	
04312	04323	04327	04334	04340	04345	04350	
04351	04352	04353	04354	04356	04357	04375	
04357	04375	04357	04375	04357	08880	08881	
08882	08883	08884	08885	08886	30410	30411	
30856	30868						

Subject: Recommendations and Specifications for use of Biodegradable Fluids.

This bulletin is a historic reference to identify the units that can be converted to use Toro Biodegradable All-Season Hydraulic Fluid. Only those Model Numbers listed in this bulletin can be converted. Alternative hydraulic fluid specifications that can be used in units after the serial number range listed in this bulletin will be stated in the Operator's Manual for each unit.

Toro Biodegradable All-Season Hydraulic Fluid is currently available in 5-gallon (100-7674) or 55 gallon (108-1189) containers through your local Toro Commercial Products Distributor. Before deciding to convert a unit you will need to understand the following cautions and procedures. Additional information is provided in the Hydraulic System Fluid Recommendations included with this bulletin.

- 1) Make certain your unit is listed in this bulletin or your Operator's Manual specifies your machine is compatible with this fluid.
- 2) Consider the effects of outside influences such as high ambient temperatures and high moisture environments. More frequent fluid changes should be anticipated.
- 3) Toro Biodegradable All-Season Hydraulic Fluid is the only qualified biodegradable type fluid approved for use in the TORO products listed. A fluid that does not perform to the same level may jeopardize the long term performance of hydraulic components.
- 4) ***IMPORTANT:** Do not use biodegradable fluids when the differential housing is the system reservoir (e.g. Reelmaster[®] 5000 Series traction system-units with * in product list above, Groundsmaster[®] 200/300 Series). These fluids do not contain the necessary lubrication properties for a ring gear and pinion application (see your Operator's Manual).
- 5) If using Toro Biodegradable All-Season Hydraulic Fluid in the Greensmaster[®] 3200/3250, an auxiliary oil cooler must be installed to maintain acceptable system temperatures.
- 6) Converting a unit to use Toro Biodegradable All-Season Hydraulic Fluid requires the removal of as much of the original fluid as possible. Mixtures of non-compatible fluids in significant amounts may have adverse effects (e.g. chemical reactions). Flushing procedures and a Product Data Sheet are included with this bulletin.

Hydraulic System Fluid Recommendations

Toro equipment is designed and tested with the most appropriate type of hydraulic fluid for the specific application. The type of fluid selected is based on a variety of factors, such as:

- 1) Hydraulic component manufacturers recommendations
- 2) Toro testing and experience
- 3) The availability of the fluid type throughout the world
- 4) Product application demands

The system fluids most commonly used in hydraulic-driven equipment are petroleum-based products. These fluids serve users well at a reasonable cost. These conventional hydraulic fluids provide adequate lubrication, corrosion protection, and performance characteristics for the various types of hydraulic components in mobile equipment - cylinders, motors, pumps, etc. Another important factor is that seal materials have also been developed and tested to be compatible with these same petroleum-based fluids.

The hydraulic fluid recommendations in each Toro equipment Operator's Manual describes appropriate lubricants for the model identified on the manual cover. Most Toro equipment requires a high viscosity index/low pour point, anti-wear hydraulic fluid with a multi-grade viscosity rating (ISO 46 M). A few select machines use Universal Tractor Hydraulic Fluid (UTHF) which has different material specifications. Both of these types of fluids are petroleum-based mineral oils. Specifications are listed later in this document.

Toro also recognizes that some customers have an interest in a biodegradable fluid for environmental reasons and a shortened recovery timeframe in the event of a leak on the turf. Toro has tested and now offers a vegetable-based Biodegradable All-Season Hydraulic Fluid which can be used in many, but not all of our products. The Groundsmaster[®] 580-D and Reelmaster[®] 4000 series mowers are examples of machines which cannot use a biodegradable fluid due to the extreme heat and pressure associated with the application.

The testing completed to approve these biodegradable fluids involved a considerable amount of lab and field testing to verify the suitability of this fluid for Toro equipment, including all the system components and operating conditions that are encountered.

Biodegradable Fluids in general: Biodegradable fluids must pass certain tests to assure they will not break down or otherwise cause harm within the product or *natural* environment of the application. Some of the general fluids available for sale to customers have good lubrication properties while others may not. Be aware that there are distinct advantages in using the fluids The Toro Company has approved. It is possible for moisture, extreme pressures, and heat created in the hydraulic system to affect unapproved fluids, resulting in accelerated wear due to inadequate lubrication. Failure analysis of such damage has most often revealed that "lack of lubricity" or "lack of lubrication" has been the mode of failure. This type of failure requires "expert" diagnosis because it can easily be misconstrued as other types of component failure/damage which in turn leads to improper conclusions as to the actual root cause. Oil seals may also be incompatible with the additives used in some fluids which may cause the seals to deteriorate and fail prematurely.

The Toro Company will not be responsible for the consequences of using unapproved hydraulic fluids, or those that do not meet the biodegradable specifications identified in the following standards. Charts such as this will be included in all future Operator's Manuals.

The machine's reservoir is filled at the factory with approximately x.x gallons (xx.x l) of high quality hydraulic fluid. **Check the level of hydraulic fluid before the engine is first started and daily thereafter.** The recommended replacement fluid is:

Toro Premium All Season Hydraulic Fluid

(Available in 5 gallon pails or 55 gallon drums. See the parts catalog or Toro distributor for part numbers.)

Alternative fluids: If the Toro fluid is not available, only other conventional, petroleum-based fluids may be used provided they meet all of the following material properties and industry specifications. Check with your oil supplier to see if the oil meets these specifications. The biodegradable fluids listed below may also be used. Note: Toro will not assume responsibility for damage caused by improper substitutions, so use only products from reputable manufacturers who will stand behind their recommendation.

High Viscosity Index/Low Pour Point Antiwear Hydraulic Fluid, ISO VG 46

Material Properties:

Viscosity, ASTM D445:	cSt @ 40°C	44 to 48
	cSt @ 100°C	7.9 to 8.5

Viscosity Index, ASTM D2270:	140 to 160
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Pour Point, ASTM D97:	-34°F to -49 °F
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FZG, Fail stage	11 or better
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Water content (new fluid):	500 ppm (maximum)
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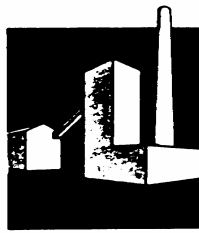
Industry Specifications:

Vickers I-286-S, Vickers M-2950-S, Denison HF-0, Vickers 35 VQ 25 (Eaton ATS373-C)

Note: Many hydraulic fluids are almost colorless, making it difficult to spot leaks. A red dye additive for the hydraulic system oil is available in 2/3 oz (20 ml) bottles. One bottle is sufficient for 4-6 gal (15-22 l) of hydraulic oil. Order part no. 44-2500 from your authorized Toro distributor.

Important: For a fluid to perform well and avoid undesirable side effects it is also extremely important that it contains no more than the maximum water content identified in the specifications above when the fluid is put into the system. Before first introducing biodegradable fluid into a product, the system must be flushed of the original fluid to prevent fluid contamination as described in the technical information from Mobil Corporation included with this bulletin.

If you have any questions regarding this information, please contact your local Toro Commercial Products distributor for assistance.



Mobil Tech Topic



Environmental
Awareness

Mobil EAL® 224H Flushing Procedure

Mobil EAL 224H oil is a readily biodegradable, non-toxic, hydraulic and circulating oil. It is suitable for industrial, marine, and mobile service. Mobil EAL 224H is suitable for high-pressure systems and most systems with servo valves. It also may be used in certain gear applications.

To achieve optimum performance from Mobil EAL 224H hydraulic fluid, a system should be as free of contamination as possible before charging with the final fill of these fluids. Contamination of Mobil EAL 224H fluid can have an adverse effect on its performance as a hydraulic fluid. Contamination can affect the biodegradability and toxicity of Mobil EAL 224H.

To prevent problems caused by admixtures of other fluids and contaminants, Mobil recommends a flushing procedure for systems being converted to Mobil EAL 224H. The degree of flushing depends on the type and condition of the system and the fluid previously used.

This Tech Topic covers procedures for three kinds of flushing systems:

- New systems
- Conversion from automotive oils
- Conversion from industrial hydraulic and circulating oils

New Systems

Many new systems may have an internal coating of rust preventives or may have been run on preservative fluids before shipping. Protective coatings on individual components, such as pumps and valves, should be removed and the components cleaned.

To prepare new systems for Mobil EAL 224H, Mobil recommends a six-step procedure:

Step 1 – If the system contains oil, drain as much as possible from cylinders, filters, pumps, valves, etc. Wipe the reservoir and other accessible interior spaces with lint-free rags. Look carefully for pipe scale, weld spatter, threading compound, gasket cement, shavings, and other debris left behind after installation. Clean as necessary.

Step 2 – Replace filters, if necessary.

Step 3 – Charge the system with sufficient Mobil EAL 224H to assure full circulation to all components.

Step 4 – Operate the system at normal temperatures and loads for a minimum of four hours. Monitor the differential pressure drop across the filter. A filter change may be necessary during this flush because contaminants in the system are incompatible with the Mobil EAL 224H. If this is the case, change the filters and continue to operate the system at normal temperatures, but at reduced loads, until the four hours of flushing are completed.

Step 5 – Drain the system while hot and repeat Step 1. Replace filters.

Step 6 – Add the final charge of Mobil EAL 224H and begin normal operation.

Conversion from Automotive Oils

Automotive engine oils can demonstrate the highest degree of incompatibility with Mobil EAL 224H, particularly if the systems contain moisture. For this reason, special precautions are necessary to assure an adequate flush.

Step 1 – Before draining systems containing wet and/or degraded automotive oils, add a five-percent volume of a noncorrosive petroleum solvent such as Mobilsol® A. Circulate under

normal operating conditions for at least six hours. If the system is unusually dirty, add a ten-percent volume of Mobilsol A to increase the thoroughness of cleaning and reduce cleaning time. This much solvent, however, will drastically reduce the viscosity of the oil. Operating the machine under normal load may cause rapid wear, therefore, operate under light load or no load, and monitor temperatures and pressures.

Step 2 – Drain the system, including all cylinders, accumulators, and lines, while hot.

Step 3 – Install new filters and clean the filter housings.

Step 4 – Fill the system with sufficient Mobil EAL 224H to assure full circulation to all components. If the system was severely contaminated, substitute Mobil DTE® Oil Light, Mobil Vactra® Oil Light, or Mobil DTE Oil 25 for this phase of flushing.

Step 5 – Operate the system for not less than two hours under normal operating conditions.

If the flushing fluid shows any sign of contamination, repeat Steps 2, 3, 4, and 5.

Step 6 – If the previous flushing charge in the system was not Mobil EAL 224H, fill the system with just enough Mobil EAL 224H for good circulation. Operate the system under normal conditions for 30 minutes. Repeat Steps 2 and 3, then proceed to Step 7. If the previous charge was Mobil EAL 224H, skip Step 7.

Step 7 – After repeating Steps 2 and 3, fill the system with the final charge of Mobil EAL 224H. Assume normal operation and monitor filters daily.

Conversion from Industrial Hydraulic and Circulating Oils

Most dry industrial hydraulic and circulating oils are more compatible than automotive oils with Mobil EAL 224H. However, the moisture level in systems previously charged with industrial hydraulic and circulating oils must be reduced to as low a level as possible.

To flush these systems, operate them under normal conditions for least four hours prior to draining. Proceed with Steps 2 through 7 described earlier under "Conversion from Automotive Oils."

Conversion from Synthetic Oils

Systems using synthetic oils require special consideration. Contact your Mobil Representative for guidance.

Spillage and Disposal

Depending on contamination and/or degradation levels, small amounts of

spilled or leaked Mobil EAL 224H will not adversely affect ground water or the environment. For small spills on the ground the uncontaminated product will be readily biodegraded by naturally occurring soil organisms when exposed to air. Nonetheless, spillage of Mobil EAL 224H should be handled similarly to currently accepted methods for conventional mineral oil spills.

Mobil EAL 224H does not contain hazardous substances reportable under CERCLA. Since all oil spills are reportable, even a spill of this vegetable oil-based product must be reported to the National Response Center (the U.S. Coast Guard). Local environmental agencies should also be consulted to clarify local requirements.

Acceptable methods of disposal include use as a fuel supplement, recycling and reclamation (that is, the same disposal practices available for conventional mineral oils). Since Mobil EAL 224H typically will not be a hazardous waste, additional disposal

options may be available, including land farming or processing through sewage treatment facilities, if necessary approvals are obtained from appropriate regulatory authorities.

The flushing solution may not be biodegradable, therefore, it should be disposed of in an environmentally safe manner. Follow procedures used for disposing of conventional mineral oils.

Health and Safety

Based on available toxicological information, Mobil EAL 224H produces no significant adverse effects on health when properly handled and used. No special precautions are suggested beyond attention to good personal hygiene, including laundering oil-soaked clothing and washing skin-contact areas with soap and water. For additional technical information or to order a Material Safety Data Bulletin, call 1-800-662-4525.

Mobil Oil Corporation

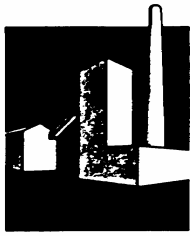
TECHNICAL PUBLICATIONS
3225 GALLOWS ROAD, FAIRFAX, VIRGINIA 22037-0001

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Mobil EAL Series: Flushing Procedure

TT I-6 6095017 (02-27-95)



Mobil Product Data Sheet



Mobil EAL® 224H

Biodegradable, Virtually Nontoxic Antiwear Hydraulic Oil

Description

Mobil EAL 224H was developed to meet stringent performance requirements, as well as to satisfy customer needs for hydraulic oils which are readily biodegradable and virtually nontoxic.

Mobil EAL 224H oil provides the excellent antiwear and film-strength characteristics necessary for hydraulic systems operating under moderate to severe conditions. It is formulated from select, high-quality, high-VI vegetable oils and additives which provide the specific properties required in hydraulic fluids while satisfying the stringent criteria for biodegradability and toxicity. Its 12-stage rating in the FZG Gear Test demonstrates a high level of protection against wear and scuffing. Mobil EAL 224H exhibits outstanding performance in standard industry tests. It is approved in the Vickers V-104C and 35VQ25, and various piston pump tests, and meets the requirements of Denison HF-0 and the TP30283A vane pump tests.

The balanced formulation of Mobil EAL 224H provides superior protection against corrosion, excellent antiwear properties, and ensures very good multimetal compatibility. It also provides excellent thin oil film protection against rusting.

Application

Mobil EAL 224H is the primary recommendation of Mobil for most hydraulic systems operating with oil temperatures in the range of 0°F to 180 F where readily biodegradable and virtually nontoxic fluids are required. It can be used in industrial, marine, and mobile service, including high-pressure systems, system

with servo valves, and all robotics. It may be used in gear applications requiring either an ISO VG 32 or 46 oil with mild extreme-pressure characteristics. Its high viscosity index satisfies other applications requiring an ISO VG 32 or 46 oil. To assure optimum performance, Mobil EAL 224H should not be contaminated with other oils or water. Small amounts of water normally present in hydraulic systems, however, do not significantly affect product performance. Contamination by other oils may change the biodegradability, toxicity, or other performance characteristics of Mobil EAL 224H.

Mobil EAL 224H is designed for hydraulic applications but will work in other applications. Before using in other systems, consult with your local Mobil representative or call 1-800-662-4525.

Typical Characteristics

Physical characteristics are listed in the table. Those not shown as maxi-

mum or minimum are typical and may vary slightly.

Advantages

Mobil EAL 224H offers certain performance benefits:

- A high-performance, readily biodegradable, virtually nontoxic AW hydraulic oil
- Multimetal compatibility protects pumps made of steel and copper alloys
- Excellent protection against rust; good thin oil film protection of surfaces intermittently wetted by oil
- Outstanding load-carrying and antiwear properties for superior protection against wear

Spillage and Disposal

Depending on contamination and/or degradation levels, small amounts of spilled or leaked Mobil EAL 224H will not adversely affect ground water or the environment. For small spills on the ground, the uncontaminated product will be readily biodegraded

	Mobil EAL 224H
Product Number	60183-1
Gravity, API	22.0
Specific Gravity	0.922
Pour Point, °C (°F), typ	-32 (-25)
Flash Point, °C (°F), min	220 (428)
Viscosity	
cSt at 40°C	37
cSt at 100°C	8.4
SUS at 100°F	187
SUS at 210°F	54
ISO VG	32/46
Viscosity Index	213
Rust Protection, ASTM D 665	Pass
Color, ASTM D 1500, max	2.0

by naturally occurring soil organisms when exposed to air. Nonetheless, spillage of Mobil EAL 224H should be handled similarly to currently accepted methods for conventional mineral oil spills.

Mobil EAL 224H does not contain hazardous substances reportable under CERCLA. Since all oil spills are reportable, even a spill of this vegetable-oil-based product must be reported to the National Response Center (the U.S. Coast Guard). Local environmental agencies should also be consulted to clarify local requirements.

Acceptable methods of disposal include use as a fuel supplement, recycling and reclamation (that is, the same disposal practices available for conventional mineral oils). Since Mobil EAL 224H typically will not be a hazardous waste, additional disposal

options may be available, including land farming or processing through sewage treatment facilities, if necessary approvals are obtained from appropriate regulatory authorities.

Biodegradability and Toxicity

Since there are no specific tests which define environmental acceptability, Mobil has selected several criteria to define Mobil EAL 224H. They include tests recognized in Europe by the Organization for Economic Cooperation and Development (OECD), and in the U.S. by the Environmental Protection Agency (EPA). Mobil has tested Mobil EAL 224H against EPA 560/6-82-003 and OECD 301 for biodegradability. It clearly exceeds the 60 percent minimum biodegradability for 28 days which is generally recognized as readily biodegradable.

Mobil has tested the toxicity of Mobil EAL 224H against EPA 560/6-82-002 and OECD 203: 1-12. Although no standards have been established, an LC₅₀ of 1000 ppm is considered the minimum requirement for the 96-hour test. Mobil EAL 224H clearly exceeds that requirement.

Health and Safety

Based on available toxicological information, this product produces no adverse effects on health when properly handled and used. No special precautions are suggested beyond attention to good personal hygiene, including laundering oil-soaked clothing and washing skin contact areas with soap and water. A Material Safety Data Bulletin is available by calling 1-800-227-0707, ext. 3265. For additional technical information or to identify the nearest U.S. supply source, call 1-800-662-4525.

Mobil Oil Corporation

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Mobil EAL 224H

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